22 April 2024

Cabra Developments Limited
Unit 9B
30 Foundry Road
Silverdale Auckland

Attn: Duncan Unsworth

Dear Duncan

Private Plan Change Contamination Assessment - Cabra Sites, Hobsonville, Auckland

(Our Reference: 23849.000.006_03)

1 Introduction

ENGEO Ltd was requested by Cabra Developments Limited to undertake a contamination assessment to support a private plan change (PPC) application to Auckland Council for rezoning of the properties located at 10, 12, 14 and 16 Sinton Road and 15, 17 and 17a Clarks Lane, Hobsonville, Auckland (shown on Figure 1). The plan change will comprise rezoning the land from 'Future Urban Zone' to a residential zone (combination of Single House, Mixed Housing Suburban and / or Mixed Housing Urban) under the Auckland Unitary Plan. This work has been carried out in accordance with our signed agreement dated 12 April 2024.

Figure 1: Site Area

Left: Red dash indicates wider peninsula area

Right: Blue perimeter indicates private plan change area

2 Scope of the Assessment

ENGEO has previously undertaken geotechnical and environmental assessments of 10, 14 and 16 Sinton Road and 15 Clarks Lane, Hobsonville; these reports should be read in conjunction with this letter. We understand that the PPC will also incorporate 12 Sinton Road, and 17 and 17A Clarks Lane (pink area shown on Figure 1) into a single application.

This assessment has been completed with the intention of identifying key environmental constraints or data gaps that may preclude future conversion from 'Future Urban Zone' to a residential zone.

Previous site investigations were considered suitable to support the plan change application and no further site investigation works were proposed. Therefore, this assessment comprised a desk-based assessment of the three additional lots not previously investigated, in addition to the wider peninsula (pink area and red area shown on Figure 1, respectively), and review of the relevant findings from the previous investigations completed.

3 Site Description

Site information and the site setting are summarised in Table 1 and Table 2, respectively.

Table 1: Site Information

Item	Description
Legal Description	Lot 25 ALLOT 2 SO 958 (10 Sinton Road) Lot 7, 8, 9 DP 57408 (12, 14 and 16 Sinton Road) Lot 2 DP 92753 (15 Clarks Lane) SECT 1 and 2 SO 532948 (17 / 17A Clarks Lane)
Current Land Use	The site comprises rural residential lots, with the majority of the land grassed, aside from the gravel driveway and building footprints.
Site Area	Approximately 16.4 ha
Territorial Authority	Auckland Council

Table 2: Site Setting

Item	Description
Topography	The landform is characterised by broadly undulating topography descending from the southern side of Clarks Lane and Sinton Road towards the Waiarohia and Wallace Inlets to the north and northeast. The coastal margin is characterised by low height (typically 5 to 10 m) slopes between 30 and 50 degrees with a sub-vertical soil or very weak rock cliff exposed in the tidal zone.
Local Setting	The site is situated in a rural residential area and is bound by Sinton Road or Clarks Lane to the southeast, lifestyle blocks to the southwest and northeast, and by the Waiarohia Inlet to the northwest. Overland flow paths are mapped in Auckland Council GeoMaps as typically flowing northwest into the Waiarohia Inlet. A portion of the Waiarohia Inlet is identified as a significant ecological area (Auckland Council Geomaps). This area is primarily to the southwest of the site however includes a portion of the coastal margin of 14 and 16 Sinton Road. Auckland Council's records of consented landfills was reviewed for the presence of landfills in the area - no landfills are recorded near the site.
Geology	The site is mapped by GNS Science as being underlain by Takaanini Formation pumiceous river deposits in the southern portion of the site (formerly named Puketoka Formation), comprising relatively young and weak sedimentary strata encountered across much of the Auckland area. The northern portion of the site is mapped as being underlain by East Coast Bays Formation, comprising alternating sandstone and mudstone with variable volcanic content.

4 Site History and Desktop

4.1 Aerial Photographs

Aerial photographs dating from 1940 to 2023 were reviewed for relevant visible features on the site and surrounding area. The aerials were sourced from Auckland Council GeoMaps, Retrolens and Nearmaps.

From 1940 to the later 1980s the site primarily comprises agricultural land. Buildings which are assumed to be residential, or sheds associated with agricultural activities are observed on 10 and 14 Sinton Road during this time. Horticultural activity is observed at 14 and 16 Sinton Road, and 15 Clarks Lane from 1988. Buildings are noted to be constructed and removed from this time; however, the use of the site appears to primarily remain rural residential.

The wider peninsula (red area shown on Figure 1) has historically been of a similar nature to the site. The Upper Harbour Motorway was constructed to the south of the site circa 2010. Residential (high-density) and commercial redevelopment of land to the south of the motorway, and southeast of the site, commences after this time.

4.2 Previous Investigations

ENGEO has previously undertaken geotechnical and environmental assessments of the properties at 10, 14 and 16 Sinton Road and 15 Clarks Lane, however we understand that the PPC will also incorporate 12 Sinton Road, and 17 and 17A Clarks Lane into a single application.

ENGEO completed environmental site investigations for 10, 14 and 16 Sinton Road and 15 Clarks Lane in 2023 and 2024. The report identified the following potential activities which are included on the Hazardous Activities and Industries List (HAIL[1]). The following activities are considered potentially have occurred on all or some of the sites:

- HAIL ID A10: Persistent pesticide bulk storage or use including sports turfs, market gardens, orchards, glass houses or spray sheds. *Areas of cropping / vineyard.*
- HAIL ID G5: Waste disposal to land. *Areas where dumping of domestic waste was identified.*
- HAIL ID I: Any other land that has been subject to the intentional or accidental release of a hazardous substance in sufficient quantity that it could be a risk to human health or the environment. *Use of lead-based paints and asbestos on buildings. Burn piles. Use of small volumes of fuel / oil.*

As part of the investigation, sample locations were positioned to target potential HAIL areas. A selection of topsoil, potential fill material and buried topsoil samples from each lot were submitted for analysis of contaminants of concern (heavy metals / metalloids, organochlorine pesticides (OCPs), polycyclic aromatic hydrocarbons (PAHs) and / or asbestos (semi-quantitative).

The results of these investigations identified isolated areas requiring remediation on each lot due to concentrations of contaminants which exceed the adopted human health and / or environmental criteria.

Based on the results of these investigations, the redevelopment of three of the lots (10 and 16 Sinton Road and 15 Clarks Lane) are subject to the the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (the “NESCS”). The NESCS covers changes to land use and soil disturbance. Additionally, Section E30 of the AUP may apply to 10 Sinton Road and consent relating to land contamination under the AUP may be required.

A Remediation Action Plan (RAP) was prepared for each lot.

Once the remediation works at 14 Sinton Road have been carried out, it was considered that, based on Regulation 5(9) of the NESCS, the NESCS will no longer apply as the DSI shows that the concentrations of contaminants reported for the remainder of the site are at, or below, background concentrations. We also consider that Section E30 of the AUP will no longer apply as soil at the site will not be considered ‘contaminated land or land containing elevated levels of contaminants’.

[1] Ministry for the Environment. (2011). Hazardous Activities and Industries List (HAIL).

5 Conclusions

This assessment is not intended to replace the need for a PSI and / or DSI for 12 Sinton Road and 17 / 17A Clarks Lane during future redevelopment.

ENGEO did not identify activities which would be likely to preclude future conversion of this area to residential land use from a contamination perspective, provided that the relevant provisions of the NESCS and the Auckland Unitary Plan are followed when the change in land use occurs.

Additional environmental investigation will be required prior to earthworks, subdivision and / or change in land use, and remedial works will be determined by the findings of the previous (and any future) investigation works.

6 Limitations

i. We have prepared this report in accordance with the brief as provided. This report has been prepared for the use of our client, Cabra Developments Limited, their professional advisers and the relevant Territorial Authorities in relation to the specified project brief described in this report. No liability is accepted for the use of any part of the report for any other purpose or by any other person or entity.

ii. The recommendations in this report are based on the ground conditions indicated from published sources, site assessments and subsurface investigations described in this report based on accepted normal methods of site investigations. Only a limited amount of information has been collected to meet the specific financial and technical requirements of the Client's brief and this report does not purport to completely describe all the site characteristics and properties. The nature and continuity of the ground between test locations has been inferred using experience and judgement and it should be appreciated that actual conditions could vary from the assumed model.

iii. Subsurface conditions relevant to construction works should be assessed by contractors who can make their own interpretation of the factual data provided. They should perform any additional tests as necessary for their own purposes.

iv. This Limitation should be read in conjunction with the Engineering NZ / ACENZ Standard Terms of Engagement.

v. This report is not to be reproduced either wholly or in part without our prior written permission.

We trust that this information meets your current requirements. Please do not hesitate to contact the undersigned on (09) 972 2205 if you require any further information.

Report prepared by

Claire Davies, CEnvP

Associate Environmental Consultant

Report reviewed by

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Attachments

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Project Number 23849.000.002

Preliminary and Detailed Environmental Site Investigation

10 Sinton Road, Hobsonville, Auckland

Submitted to:
Cabra Developments Limited
Unit 9B, 30 Foundry Road
Silverdale
Auckland 0932

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ENGEO Document Control:

Report Title	Preliminary and Detailed Environmental Site Investigation - 10 Sinton Road, Hobsonville			
Project No.	23849.000.002	**Doc ID**	01	
Client	Cabra Developments Limited	**Client Contact**	Duncan Unsworth	
Distribution (PDF)	Duncan Unsworth, Cabra Developments Limited			
Date	**Revision Details / Status**	**Author**	**Reviewer**	**WP**
27/10/2023	Issued to Client	CD	LL	JT

SQEP Certifying Statement

I certify that the site has been assessed in accordance with current New Zealand Regulations and guidance documents and that this report has been prepared in general accordance with the Ministry for the Environment's Contaminated Land Management Guidelines No. 1: Reporting on Contaminated Sites in New Zealand, 2021.

I am considered by ENGEO Limited to be a suitably qualified and experienced practitioner (SQEP) able to certify reports pursuant to the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011, based on the company's definition of a SQEP as given below.

Report Reviewer

27 October 2023

(Date)

ENGEO Limited requires that a SQEP has the following Qualifications / Experience:

- *Tertiary science or engineering qualification relevant to environmental assessment.*
- *A minimum of 10 years of relevant experience.*
- *Registration with a professional body that assess and certifies environmental professionals in the competency criteria of training, experience, professional conduct and ethical behaviour.*

1 Introduction

ENGEO Ltd was requested by Cabra Developments Limited to undertake an environmental investigation of the property at 10 Sinton Road, Hobsonville, Auckland (herein referred to as 'the site'; shown in attached Figure 1). This work has been carried out in accordance with the signed agreement dated 2 August 2023. The purpose of the assessment is to support a resource consent application for the proposed redevelopment of the site.

We have been provided with a draft masterplan for the property which indicate that redevelopment comprises demolition of the existing buildings to allow construction of a residential subdivision.

This environmental investigation has been undertaken to satisfy the requirements of the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (the "NESCS"). This investigation provides information regarding the presence of land contaminants that may pose a risk to future site users and site redevelopment workers. The results of this investigation have been used to evaluate whether remediation is necessary prior to site redevelopment, and to assess the requirement for resource consent under the NESCS.

This investigation also addresses the requirements of regional regulations covering discharges to the environment from contaminated sites during and post-redevelopment works; namely, the Auckland Unitary Plan (AUP; Auckland Council, 2016).

This investigation was undertaken in general accordance with the Ministry for the Environment (MfE) Contaminated Land Management Guidelines (CLMG) No. 1: Reporting on Contaminated Sites in New Zealand (MfE, 2021a) and CLMG No 5: Site Investigation and Analysis of Soils (MfE, 2021b). The investigation was supervised, and the report reviewed and approved by a suitably qualified and experienced contaminated land practitioner in accordance with national environmental regulations for soil contamination. A geotechnical assessment at the site is occurring concurrently (ENGEO, 2023).

1.1 Objectives of the Assessment

The objective of the preliminary site investigation (PSI) was to gather information relating to current and historical potentially contaminating activities at the site. The works comprised review of historical site information and review / assessment of information gathered during the site walkover undertaken on 15 August 2023.

The intrusive investigation (Detailed Site Investigation; DSI) was undertaken to assess:

- The type, extent and concentration of contaminants of potential concern identified during the desktop assessment (PSI).
- Whether the identified contaminants of concern pose a potential unacceptable risk to human health or identified environmental receptors and soil is suitable to remain on-site.

Note: Whilst this investigation provides an assessment of the site under contaminated land regulations (i.e., the NESCS and the AUP), the results can be used for disposal characterisation purposes. However, additional testing may be required or recommended to fully inform disposal options for excess site material.

2 Site Information

Site information is summarised in Table 1.

Table 1: Site Information

Item	Description
Legal Description	LOT 25 ALLOT 2 SO 958
Current Land Use	The majority of the site is used as grazing land for livestock. Two residential structures and two sheds are present in the southern portion of the site.
Proposed Land Use	Residential
Site Area	2.7291 hectares
Territorial Authority	Auckland Council
Zoning (AUP)	Future Urban Zone
Geology	The site is mapped by GNS Science (GNS, 2001) as being underlain by Puketoka Formation alluvium in the southern portion of the site, comprising pumiceous mud, sand, and gravel with lenses of muddy peat and lignite. The northern portion of the site is mapped as being underlain by East Coast Bays Formation, comprising alternating sandstone and mudstone with variable volcanic content.
Topography	The site gently slopes to the northwest from RL 18 m to RL 5 m.
Hydrology	The upper end of an overland flow path is mapped in Auckland Council GeoMaps as flowing west through the centre of the site into the Waiarohia Inlet, a tributary of the Waitemata Harbour.
Hydrogeology	A groundwater assessment was not completed as part of this investigation; however, during the geotechnical investigation the ground became saturated at 4.0 m below ground level (bgl) in one hand auger borehole, and standing groundwater, at a depth of 4.9 m bgl was observed in the other. The Geotechnical Investigation Appraisal and Site Walkover completed by CMW Geosciences in 2016 (CMW, 2016; refer to Section 3.4) indicates that standing groundwater was observed at a depth between 1.6 m and 3.5 m bgl in seven of the eight hand auger boreholes drilled at the site. Based on the topography of the site, the mapped overland flow path and the nearest watercourse, shallow groundwater likely flows in a west to northwest direction.

3 Site History

ENGEO reviewed aerial photographs, property file documentation and Auckland Council's response to a contamination enquiry. Relevant information obtained during this review is summarised below.

3.1 Aerial Photographs

Aerial photographs dating from 1940 to 2023 have been reviewed (refer to Appendix 1). The aerial photographs were sourced from Auckland Council GeoMaps, Retrolens and Nearmaps. Relevant visible features on the site and surrounding area are summarised in Table 2.

Table 2: Aerial Photograph Summary

Date	Description
1940	The site is located on the edge of the Waiarohia Inlet and the northernmost extent appears to form part of the wetland area. The site and surrounding area comprise agricultural land. The majority of the site itself appears to be used for grazing. Four buildings are present in the southern portion of the site, one of which appears to be the existing dwelling with an associated garage / shed to the rear. The other buildings are smaller rectangular shaped buildings, observed adjacent to the eastern boundary.
1950	A brighter area to the east of the dwelling may represent an area of ground disturbance or vegetation clearing. No significant changes to the surrounding area are observed.
1959	A large building has been construction at the centre of the southern portion of the site. No significant changes to the surrounding area are observed.
1963	Two additional large buildings have been constructed to the north and east of the building located at the centre of the southern portion of site. A smaller building has also been constructed to the south of this building. Significant areas of bare ground are noted in this area. A small building has been constructed to the west of the existing dwelling. A smaller shed is observed in the northern portion of the site. No significant changes to the surrounding area are observed.
1972	The northern and southern buildings at the centre of the site, the northernmost building on the eastern boundary have been removed or demolished. A small building has been constructed to the north of the dwelling. No significant changes to the surrounding area are observed.
1975	The two buildings at the centre of the site have been removed or demolished; one may have been relocated southeast where a similar sized building is now observed. A large oval track has been created in the central eastern part of the site. No significant changes to the surrounding area are observed.
1978	One of the smaller buildings to the south of the oval track has been removed or demolished. No significant changes to the surrounding area are observed.

Date	Description
1980	The two buildings to the west of the dwelling are no longer observed, however an additional small building has been constructed to the south. The building to the south of the circular feature appears to have been replaced with another building, which is of a similar size to the building currently observed on-site. A dwelling has been constructed on the neighbouring property to the southwest.
1988	No significant changes to the site are observed. Horticultural activity is observed on surrounding properties but not immediately adjacent to the site. A large area of bare ground to the southeast of the site is later identified as a reservoir.
2000	The oval feature is now grassed. A small building has been constructed to the south of the existing building in the east. Increase in horticultural activity in the surrounding area, including on neighbouring land to the southwest. Note: similar observations were observed in the 1996 aerial photograph however image quality is too poor to assess detail.
2004	Three small rectangular buildings have been constructed to the west of the dwelling in the southern portion of site. No significant changes to the surrounding area are observed.
2008	A small mound is observed in the northwest corner of the site; this becomes large before being removed / cleared circa 2015 / 2016. No significant changes to the surrounding area are observed.
2017	Two of the small buildings to the west of the dwelling have been removed or demolished. Vehicles are parked on grassed areas around the dwelling. An aerial photograph from 2018 shows bare areas of ground in these locations which indicates that vehicles were stored on the site for some time. No significant changes to the surrounding area are observed.
2018	Area of bare ground to the northeast of the buildings is likely associated with livestock. No significant changes to the surrounding area are observed.
2019	No significant changes to the site are observed. Shipping containers line the access road to the property east of the site.
2021	No significant changes to the site are observed. On the site to the east vegetation has been cleared from a large area near Sinton Road with mounds constructed to the north, east south-east.
2023	No significant changes to the site are observed. The majority of the cleared area on the site to the east has become overgrown. Tipped piles of soil from an unknown source are visible in the remaining small, cleared area.

3.2 Property File Review

The property file held by Auckland Council was reviewed on 16 August 2023. A summary of the information potentially relevant to this investigation is provided in Table 3 below.

Table 3: Property File Summary

Date	Description
1974	Building permit application for construction of concrete block horse boxes. A drawing indicates that the small building first observed in the 1972 aerial photograph is a garage, and the larger building to the northeast, observed in the 1975 aerial photograph, is the horseboxes.
1979	Building permit application for a garage.
1984	Building permit application for additions to dwelling.
1997	Request from Waitakere City Council for owner to seek a building consent to convert stables into a granny flat. A subsequent document indicates that the stables were relocated prior to conversion. Building permit application for construction of a garage to the south of the granny flat in the southeast corner.
1998	A drainage drawing depicts the location of the house near the eastern boundary.

3.3 Auckland Council Site Contamination Enquiry

The Site Contamination Enquiry response (dated 15 August 2023) prepared by Auckland Council was received and reviewed on 16 August 2023 (Appendix 2).

Auckland Council's response states that there is no contamination information held for the site. Auckland Council also noted that due to the age of buildings on-site, there is potential for these buildings to contain or have contained asbestos and / or lead-based paints.

In preparing the response, Auckland Council reviewed records within 200 m of the site for pollution incidents, bores, contaminated site and air discharges, closed landfills and identified HAIL activities. A summary of records is provided in Table 4 however the features discussed in these records are not considered to present a significant potential risk to the proposed redevelopment activities.

Table 4: Site Contamination Enquiry Response Summary

Date	Description
-	Council's records identify 'HAIL sites' at the following addresses. No details of the nature of activities are included in the response, however based on the aerial review (Section 3.1) we consider it is likely related to historical horticultural activities. • 6, 12, 14 and 16 Sinton Road • 15 Clarks Lane • Brigham Creek Road (Address not specified)
1980s - 2010	• Three consents (Note: either cancelled or expired) relating to damming a tributary of the Waiarohia Inlet and use of water for irrigation of pasture and crops at 6 Sinton Road. An additional proposed consent for this site relates to works within the watercourse to form an access track. • Consent to construct a groundwater borehole for the extraction of groundwater for irrigation of pasture and an orchard at a property on Sinton Road.

3.4 Previous Reporting

CMW Geosciences undertook a geotechnical appraisal to inform a due diligence process prior to purchase (CMW, 2016). The appraisal included drilling of eight hand auger boreholes across the site to a depth up to 5 m bgl. Variable topsoil depths were encountered (between 200 mm and 400 mm thick) and no fill material was encountered.

4 Current Site Conditions

The site walkover and intrusive investigation works were completed on 15 August 2023 by ENGEO environmental scientists.

Observations of conditions present at the site are summarised in Table 5. Photographs taken during the site visit are included in Appendix 3.

Table 5: Current Site Conditions

Site Conditions	Comments
Overview	The site is located on the western side of the intersection of Clarks Road and Sinton Road. A vacant single-storey dwelling, garage, implement shed and granny flat (with associated garage) are positioned near the Sinton Road frontage in the southern portion of the site. The buildings are accessed via two gravel driveways. The northern portion of the site comprises paddocks that have been left fallow and are not currently in use. The western and eastern boundary is defined by a shelterbelt.
Surrounding Land Use	The site is bound by Sinton Road to the south, lifestyle blocks and residential dwellings to the east and west, and by the Waiarohia Inlet to the north. Horticultural activity is observed in the wider area.

Site Conditions	Comments
Site Building(s)	The cladding, soffits and gable ends to the dwelling appeared to comprise potential asbestos containing material (PACM), whilst the garage was metal clad. PACM was also identified on the gable ends to the garage. Roofing material on both buildings comprised corrugated metal sheeting. A shed present to the southwest of the main dwelling was metal clad with corrugated metal sheeting. The granny flat is constructed of concrete blocks, with PACM soffits and gable ends. The garage is metal clad with PACM soffits. Roofing material on both were observed to be corrugated metal sheeting. The site buildings were observed to be in a poor state of repair (refer Appendix 3).
Potential Sources of Contamination	PACM was observed on the building exterior. Weathering of, or damage to, this material may have to have resulted in contamination of surrounding soil. Two small stockpiles which appeared to have been fly-tipped were noted to the southeast of the dwelling. One stockpile comprised a brown clayey silt with rootlets, whilst the other comprised an orange / grey clayey silt, with debris and rubbish. Brick, plastics, ceramics, and general domestic rubbish was identified in the northeast and northwest corners of the site, within the coastal margin. The ground surface beneath the area in the north which may have been subject to stockpiling was investigated using a hand auger; however, there were no indicators of potential contamination (e.g. staining, fill material, building debris etc).
Potential for On - Or - Off - Site Migration of Contaminants	Whilst overland flow may form a pollution pathway towards the northwest, it is more likely that, most rainfall will infiltrate the ground due to the lack of significant hardstanding areas at the site. Contaminant transport (if relevant) would therefore more likely be into the ground and then via groundwater flow, rather than surface water flow.
Other Information of Note	There was no evidence of building debris was observed at the surface in the vicinity of the former buildings identified in the southern portion of the site.
Limitations	The northern site boundary is lined with trees / shrubs. Minimal access around this area may result in limitations regarding visibility of potential contamination.

5 Potential HAIL Activities

If current or historical activities included on the Hazardous Activities and Industries List (HAIL; MfE, 2011a) are identified at a site the NESCS may apply. Based on the information reviewed as part of this environmental investigation and observations during the site walkovers, the following activities listed on the HAIL may have been historically and / or are currently present at the site:

- HAIL ID E1: *Asbestos product manufacture or disposal including sites with buildings containing asbestos products known to be in a deteriorated condition* – The existing buildings were derelict and construction materials observed during the site walkover included PACM. Construction materials containing asbestos may result in contamination of adjacent soils during cutting of asbestos-containing building material (e.g. for service installation) and weathering of exterior building material.

- HAIL ID G3: *Fill sites* – Waste material including brick, plastics, ceramics, and general domestic rubbish was identified in the northeast and northwest corners of the site, within the coastal margin. Based on the type and location of waste it is considered possible that this material may have been deposited by wind / water associated with the inlet and / or fly-tipping from the site. Additionally, two small stockpiles (approximately 2 m^3 each) of soil appeared to have been fly-tipped to the southeast of the main dwelling. An area in the northwest may have also been subject to stockpiling.

- HAIL ID I: *Any other land that has been subject to the intentional or accidental release of a hazardous substance in sufficient quantity that it could be a risk to human health or the environment* – It is possible[1], that lead-based paint may have been used on buildings at the site. Contamination of surrounding soils may have occurred as a result of leaching, flaking of the paint or maintenance work (sanding) on the paint surface.

The PSI indicates that the site has not been subject to horticultural activity, however this is observed on the neighbouring property to the west. Although likely to not present a significant risk to the site, there is potential for application of agrichemicals to have resulted in spray drift onto site. It is recommended that shallow soil along the western boundary of site is assessed, however this is not likely to represent a HAIL activity (e.g. HAIL ID H).

6 Preliminary Conceptual Site Model

A preliminary conceptual site model (CSM) has been developed to assess the potential exposure pathways present at the site. A contamination conceptual site model consists of three primary components. For a contaminant to present a risk to human health or an environmental receptor, all three components are required to be present and connected. The three components of a conceptual site model are:

- Source of contamination.
- An exposure route, where the receptor and contaminants come into contact (e.g. ingestion, inhalation, dermal contact).
- Receptor(s) that may be exposed to the contaminants.

The preliminary CSM based on the findings of the desktop investigation and observations during the walkover is summarised in Table 6.

[1] The use of white lead in paint was banned in 1979, however some special-purpose paints may still contain red lead. WorkSafe recommends that if a building was built in the 1980s or earlier, it is best to presume that it has been painted with lead-based paint (Guidelines for the Management of Lead-based Paint, Revised September 2013 by the Ministry of Health and the Ministry of Business, Innovation and Employment).

Table 6: Preliminary Conceptual Site Model

Potential Source of Contamination	Primary Contaminants of Concern	Possible Extent of Contamination	Potential Pathway	Potential Receptor
Building materials containing asbestos (existing and former) *(HAIL ID: E1)*	Asbestos fines and fibrous asbestos	Shallow soil within and adjacent to the current and former building footprints	Inhalation of asbestos fibres released from impacted soils / dust	Future site users / site redevelopment workers Surrounding residents
Undocumented fill *(HAIL ID: G3)*	Metals / metalloids, polycyclic aromatic hydrocarbons (PAHs) and asbestos fines and fibrous asbestos	Fill material and stockpiles	Soil ingestion, inhalation of dust, and / or dermal contact	Future site users / site redevelopment workers Surrounding residents
			Leaching of contaminants	Surrounding environment
Potential lead-based paint on former and existing buildings *(HAIL ID: I)*	Lead	Shallow soil within and adjacent to the current and former dwelling footprint	Soil ingestion, inhalation of dust, and / or dermal contact	Future site users / site redevelopment workers Surrounding residents
			Leaching of contaminants into surface / shallow groundwater	Surrounding environment

7 Intrusive Investigation

ENGEO completed an intrusive investigation at the site on 15 August 2023.

7.1 Methodology

A judgmental sampling approach was adopted to investigate potential HAIL activities at the site (as indicated in Figure 1). Based on the potential sources of contamination on-site, contamination (if present) was expected to be in shallow surface soils and / or fill material; therefore, the investigation comprised shallow hand augers and test pits to a maximum depth of 0.7 m.

A summary of the investigation method for each area of concern is provided in Table 7. Refer to Figure 1 for investigation locations.

Table 7: Investigation Methodology

Area of Concern	Investigation Methodology	Investigation Location
West corner, potentially subject to stockpiling	Assess impact to surface soil as a result of stockpiling unknown material.	S01 and S02
Stockpiles in southern portion of site	Characterise stockpiled material.	S39 and S40
Western boundary	Shallow sampling across western boundary to assess impact to surface soil as a result of potential spray drift from neighbouring horticultural area.	S03 – S05
Former Buildings	Shallow sampling within and / or adjacent to the building footprint where the age of construction, or materials used in construction (i.e., PACM and / or paint) indicated the potential for contamination, and where storage of agrichemicals may have occurred.	S06 – S18 S24
Existing Buildings		S19 – S23 S25 – S29
Coastal Margin	Assess potential impact to surrounding soil as a result of fly tipping.	S37 and S38

Note: Shallow investigations were carried out in areas of the site with limited history to provide further information regarding ground conditions in these areas (locations S30 to S36; Figure 2). Samples were collected but not analysed.

Fieldwork and sampling were undertaken in general accordance with the procedures for the appropriate handling of potentially contaminated soils as described in the MfE Contaminated Land Management Guidelines No. 5: Site Investigation and Analysis of Soils (MfE, 2021b). The following was undertaken during the investigation:

- All soil samples were screened for visual and olfactory evidence of contamination.
- Samples were given a unique sample ID to identify the depth and location from where they were collected on-site.
- Samples were placed into laboratory-supplied sample containers using a new pair of nitrile gloves for each sample. The containers were capped, labelled with a unique identifier and placed into an insulated container and kept cool prior to transport to Eurofins New Zealand under a standard chain of custody.
- Prior to the collection of each sample, handheld equipment was decontaminated using potable water, Decon 90 solution and distilled water.

7.2 Ground Conditions

Ground conditions encountered during the intrusive investigation are summarised in Table 8. With the exception of fly-tipped material, no visual or olfactory evidence of contamination was noted during soil sampling. Table 8 also provides a summary of the soil samples collected and selected analysis suite. Refer to Figure 1 for sample locations.

Table 8: Soil Sample Summary

Investigation Location (Sample ID)	Depth of Material Type (m bgl)	Material Type	Sample Depth (m bgs)	Requested Analyses
S01 – S36	0.0-0.2/0.3	Topsoil (with gravels at S23 and S25)	0.0 - 0.25	Heavy metals / metalloids (S01 – S10, S12 – S29) PAHs (S01, S02) OCPs (S03 – S05) Asbestos (presence/absence; S06 – S10, S12 – S18, S24) Asbestos (semi-quantitative; S19 – S23, S25 – S29)
S03	0.2 – 0.4	Greyish brown CS	0.3	COLD HOLD
S01 - S13, S30 – S36	0.2/0.4-0.6	Orange/gey CS (native)	0.4 – 0.5	COLD HOLD
S14 – S29	0.25/0.3 – 0.5	Yellowish brown SC (native)	0.25 – 0.5	COLD HOLD
S37 and S38	0.1 – 0.3	Brown CS, with general domestic rubbish (e.g. fragments of pipe) and building materials (brick, glass, and plastic).	0.1 - 0.3	Heavy metals / metalloids and asbestos (semi-quantitative)
S39	Stockpiled Material	Topsoil	Surface	Heavy metals / metalloids
S40		Orange / grey CS with occasional waste such as plastic, brick and glass.	Surface	Heavy metals / metalloids, SVOCs and asbestos (semi-quantitative)

Notes: CS = clayey silt; SC = silty clay; PAH = polycyclic aromatic hydrocarbons; OCPs = organochlorine pesticides; SVOC = semi-volatile organic compounds.

7.3 Assessment Criteria

Analytical results were assessed to determine consenting requirements and options for disposal of any soil which may be taken off-site.

Human Health Criteria

The following criteria were used to assess the risk to future site users:

- Development plans have not been finalised, therefore the soil contaminant standards from the Methodology for Deriving Contaminants in Soil to Protect Human Health ("the Methodology"; MfE, 2011b) for standard residential and high-density residential land use have been selected based on the anticipated land use.
- The soil guideline values for standard residential and high-density residential land use from the New Zealand Guidelines for Assessing and Managing Asbestos in Soil (GAMAS; BRANZ, 2017).
- In accordance with Contaminated Land Management Guidelines No.2 – Hierarchy and Application in New Zealand of Environmental Guideline Values (CLMG 2; MfE, 2011c) for contaminants not listed above.

As discussed in Section 3.2.1 of the Methodology (MfE, 2011), the NESCS does not assess a maintenance or excavation worker exposure scenario as the risks to those workers is more appropriately managed under New Zealand health and safety legislation. Therefore, potential risks to contractors responsible for carrying out the earthworks and future maintenance are not further assessed.

Surrounding populations are considered to be adequately protected on the basis that the risks to future site users is acceptable.

Environmental Criteria

In the Auckland region, potential discharges to the environment from land containing elevated levels of contaminants are managed through the AUP (AUP, 2016). Therefore, the permitted activity criteria in the AUP have been adopted as environmental criteria for this report.

Background Criteria

To assess the results against the natural background levels:

- Background concentrations for non-volcanic soils in the Auckland region (AC, 2001).
- The laboratory limit of reporting (LOR) where no natural background level for a given contaminant is available, or where the natural background limit is below the limit of reporting. The exception to this is asbestos where the recorded presence of asbestos below the LOR is also considered an exceedance of the natural background levels.

7.4 Soil Analysis Results

The soil results summary table included in Appendix 4 compares soil contaminant concentrations in the samples tested with the adopted investigation criteria. Full analytical laboratory reports are included in Appendix 5. Soil sample locations are shown in appended Figure 1.

A summary of the chemical and asbestos testing results is provided below:

- As discussed previously, the development plans have not yet been finalised and therefore the analysis results have been compared to both high-density and standard residential land use criteria:
    - The concentration of asbestos, arsenic or lead in samples collected from four former building footprints (S08, S14, S15, and S16) and two samples collected adjacent to the existing dwelling (S19 and S23) exceeded the adopted health criteria for high-density residential landuse.
    - The concentration of asbestos and / or heavy metals / metalloids (specifically arsenic, cadmium and lead) in samples collected from five former building footprints (S08, S14, S15, S16 and S18), seven samples collected adjacent to the existing dwelling and auxiliary buildings (S19 to S23, S25 and S26) exceeded the adopted health criteria for standard residential landuse.
- The concentrations of lead in two samples collected from two former building footprints (S14 and S18) and four samples collected adjacent to the existing dwelling and auxiliary building (S19 to S21, and S23) exceed the adopted environmental assessment criterion.
- The concentration of pyrene in one of the samples of stockpiled material (S40) in the southern portion of the site exceeded the environmental assessment criterion; however, the risk-driver for the adopted pyrene criterion is related to soil being in direct contact with groundwater. This material could therefore be re-used on-site but should be placed some distance above the highest level that the groundwater table can reach.
- Three soil samples collected from the former and existing building footprints in the central and southern part of the site (S09, S20 and S27) recorded asbestos, albeit at a concentration that does not present an unacceptable risk to human health. The source of the elevated concentration is likely the use of asbestos containing materials in the construction of the former and existing buildings.
- Concentrations of heavy metals / metalloids (arsenic, cadmium, chromium, copper, lead and zinc) and asbestos were recorded that exceed background concentrations in samples collected from soil within or adjacent to the footprints of former and existing buildings in the southern portion of the site and from an isolated location adjacent to the western boundary. In addition, PAH was detected in samples from the stockpiled material in the southern portion of the site and material along the coastal margin. This material is not consistent with Auckland Council's definition of cleanfill and would need to be disposed of at an appropriately licenced managed fill or landfill site if it is removed from the site.

The source of the elevated concentrations is unknown, however is likely associated with the materials associated with the former and existing buildings. The elevated pyrene result identified in one of stockpile samples was likely present in soil imported to the site. Based on the likely sources of contamination elevated contaminant concentrations are likely limited to shallow soil or stockpiled material.

Due to concentrations of contaminants which exceed both the human health and environmental guidelines being recorded at the site, further work is required to ensure that the site is suitable for the proposed end use (high-density or standard residential use). As the majority of the impacted material is topsoil, we consider the most cost-effective solution would be remediation of the impacted soil by excavation and off-site disposal. The area of the site requiring remediation will vary depending on if high-density or standard residential development is proposed.

7.5 Quality Assurance and Quality Control

The quality assurance / quality control (QA / QC) procedures undertaken during the works included:

- Each soil sample was given a unique identification number.
- All samples were placed directly into a cooled container prior to transport to Eurofins laboratory under ENGEO standard chain of custody.
- Sampling equipment was decontaminated using a triple wash method (as previously stated) between each sample location.

Eurofins are accredited by International Accreditation New Zealand (IANZ) for the analyses performed. Additionally, Eurofins are accredited to AS-4964-2004: *Method for Qualitative Identification of Asbestos in Bulk Storage* for the analysis of suspected asbestos in soil samples, and to the international standards NZ ISO/IEC 17207:2018 *General requirements for the competence testing and calibration laboratories* in accordance with the GAMAS (BRANZ, 2017).

Our review of the laboratory QA reports indicated the following:

1. The relative percent difference (RPD) for mercury and PAHs (specifically benzo(a)anthracene, benzo(a)pyrene, benzo(g,h,i)perylene and phenanthrene) recorded in the laboratory's duplicate samples exceeded the acceptable limits (31 - 49%, with an acceptable limit of 30%); however, the laboratory report states it passes Eurofins Environmental Testing's QC Acceptance Criteria as defined in the Internal Quality Control Review.

These findings are not expected to materially impact the conclusions of this report as all results for these contaminants are below assessment criteria.

7.6 Conceptual Site Model

The preliminary CSM from Section 6 has been updated based on the findings of the intrusive investigation and is summarised in Table 9.

Table 9: Conceptual Site Model

Potential Source of Contamination	Potential Pathway	Potential Receptor	Acceptable Risk?
Building materials containing asbestos (existing and former) *Asbestos fines and fibrous asbestos (HAIL ID: E1)*	Inhalation of asbestos fibres released from impacted soils / dust	Future site users / site redevelopment workers Surrounding residents	**No** The concentration of asbestos fibres / fibrous asbestos in three former building footprints (S08, S15, and S16) exceeded the human health criterion. Asbestos fibres / fibrous asbestos were detected in two samples collected in soil adjacent to existing buildings; however, the recorded concentrations are below the guidance criteria.
Undocumented filling / Fly-tipping *Metals / metalloids, polycyclic aromatic hydrocarbons (PAHs) asbestos fines and fibrous asbestos (HAIL ID: G3)*	Soil ingestion, inhalation of dust, and / or dermal contact	Future site users / site redevelopment workers Surrounding residents	**Yes** The concentration of contaminants of concern were below human health criteria.
	Leaching of contaminants	Surrounding environment	**No** With the exception of one sample, all samples analysed reported concentrations of relevant contaminants of concern below the environmental discharge criteria. The concentration of pyrene in one of the samples of stockpiled material (S40) exceeded the environmental assessment criterion; however, the risk-driver for the adopted pyrene criterion is related to soil being in direct contact with groundwater. The material can be re-used on-site but should be placed at an elevation above the highest groundwater table.
	Inhalation of asbestos fibres released from impacted soils / dust	Future site users / site redevelopment workers Surrounding residents	**Yes** No asbestos was detected in the samples analysed.

Potential Source of Contamination	Potential Pathway	Potential Receptor	Acceptable Risk?
Building materials containing asbestos (existing and former) *Asbestos fines and fibrous asbestos (HAIL ID: E1)*	Inhalation of asbestos fibres released from impacted soils / dust	Future site users / site redevelopment workers Surrounding residents	**No** The concentration of asbestos fibres / fibrous asbestos in three former building footprints (S08, S15, and S16) exceeded the human health criterion. Asbestos fibres / fibrous asbestos were detected in two samples collected in soil adjacent to existing buildings; however, the recorded concentrations are below the guidance criteria.
Potential lead-based paint on former and existing buildings *Lead (HAIL ID: I)*	Soil ingestion, inhalation of dust, and / or dermal contact	Future site users / site redevelopment workers Surrounding residents	**No** The concentration of lead in six samples collected within or adjacent to former / existing building footprints (S14, S18, S19, S20, S21 and S23) exceeded the standard residential human health criterion. Two samples (S19 and S23) also exceeded criteria for high-density residential land use.
	Leaching of contaminants	Surrounding environment	**No** The concentration of lead in six samples collected within or adjacent to former / existing building footprints (S14, S18, S19, S20, S21 and S23) were above the environmental discharge criterion.
Elevated concentration of arsenic and cadmium within former building footprint, and arsenic adjacent to existing dwelling.	Soil ingestion, inhalation of dust, and / or dermal contact	Future site users / site redevelopment workers Surrounding residents	**No** The concentration of arsenic and cadmium in four samples collected within or adjacent to former / existing building footprints (S14, S22, S25 and S26) exceeded the standard residential human health criterion. One sample (S14) also exceeded criteria for high-density residential land use.
	Leaching of contaminants	Surrounding environment	**Yes** Concentrations were below environmental assessment criteria.

8 Regulatory Context

In Auckland, soil disturbance and change of land use on sites with potentially contaminated soils are covered by:

- Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (NESCS, 2011).
- Auckland Unitary Plan (AUP, 2016).

8.1 The NESCS

The intent of the NESCS is to protect the human health of the site's end users and the surrounding populations.

8.1.1 Applicability

The NESCS may apply to specific activities on sites where an activity on the HAIL (MfE, 2011a) has, or is more likely than not to have occurred. The activities to which the NESCS applies are listed in Table 10, which is based on the template provided in the Users' Guide: National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health ("the Users' Guide"; MfE, 2012). This table and the results of analysis of soil samples from the site (refer to Section 7.4) confirms the NESCS applies to the site.

Table 10: Applicability of NESCS

NESCS Checklist	
Is an activity described on the HAIL currently being undertaken on the piece of land to which this application applies?	Yes
Has an activity described on the HAIL ever been undertaken on the piece of land to which this application applies?	Yes
Is it more likely than not that an activity described on the HAIL is being or has been undertaken on the piece of land to which this application applies?	Yes
If 'Yes' to any of the above, then the NES for Assessing and Managing Contaminants in Soil to Protect Human Health may apply. Check the five activities to which the NES applies:	
Is the activity you propose to undertake removing or replacing a fuel storage system or parts of it?	No
Is the activity you propose to undertake sampling soil?	No
Is the activity you propose to undertake disturbing soil?	Yes
Is the activity you propose to undertake subdividing land?	Unknown
Is the activity you propose to undertake changing the use of the land?	Yes
If also 'Yes' to any of the above activities, then the NES for Assessing and Managing Contaminants in Soil to Protect Human Health is likely to apply.	

8.1.2 Consenting Requirements

Contaminant concentrations were detected in samples from the site which exceed the relevant human health criteria. ENGEO has not been provided with proposed soil disturbance or disposal volumes. If earthworks will not meet the permitted activity criteria outlined in Regulation 8(3) of the NESCS it is considered, based on the results of analysis of samples described in this report, that soil disturbance, off-site disposal and changing use will be a restricted discretionary activity consent under Regulation 10 of the NESCS. Table 11 demonstrates compliance with the conditions for a restricted discretionary activity consent.

Table 11: NESCS Restricted Discretionary Activity Criteria

Restricted discretionary activity criteria (Regulation 10(2))	
(a) a detailed site investigation of the piece of land must exist	Meets criterion. A DSI (this report) has been prepared for the site.
b) the report on the detailed site investigation must state that the soil contamination exceeds the applicable standard in regulation 7:	Meets criterion.
(c) the consent authority must have the report.	Meets criterion. We understand the DSI will be submitted to Auckland Council.
(d) conditions arising from the application of subclause (3), if there are any, must be complied with.	Meets criterion. Conditions arising out of subclause 3 (matters over which control is reserved) will be included in the resource consent for the works.

8.2 REGIONAL PLAN

8.2.1 Consenting Requirements

The AUP (AC, 2016) sets out consent requirements for managing discharges to the environment from land containing elevated concentrations of contaminants.

The site investigation described in this report identified contaminant concentrations in the soils above the regional environmental discharge criteria (i.e. permitted activity criterion) for lead and pyrene in topsoil and stockpile of fill at the site. On sites with elevated concentrations of contaminants, soil disturbance requires consent unless the conditions of Rule E30.6.1.2 of the AUP (AC, 2016) can be met. Based on the proposed areas that require remediation, the permitted activity volume from Rule E30.6.1.2 (200 m^3) will likely be exceeded and controlled activity consent will be required for the site. Table 12 demonstrates compliance with the conditions for a controlled activity consent.

Table 12: Criteria from E30.6.2.1

Discharges of contaminants into air, or into water, or onto or into land not meeting permitted activity standards E30.6.1.2, E30.6.1.1; E30.6.1.2; E30.6.1.3; E30.6.1.4; or E30.6.1.5	
(1) A detailed site investigation (contaminated land) must be prepared and submitted to Council for consideration	Meets criterion. Assumes this document will be submitted to Council.
(2) A site management plan (contaminated land) must be prepared and submitted to Council for consideration	Meets criterion. A Remedial Action will be prepared.
(3) A remedial action plan (contaminated land), relevant must be prepared and submitted to Council for consideration	Meets criterion. A Remedial Action will be prepared.
(4) The report on the detailed site investigation (contaminated land) must state either that: (a) the concentrations of soluble contaminants in any of the following: (i) overland stormwater at the site boundary, (ii) surface water within the site, or (iii) groundwater at the site boundary must not exceed the guideline values specified in Table 3.4.1 Trigger values for toxicants at alternative levels of protection in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC 2000 Guidelines) for marine or freshwater, where relevant, at the level of protection for 80 per cent of species, except for benzene where 95 per cent of species shall apply; or (b) discharges from the land are highly unlikely to cause significant adverse effects on the environment; or (c) the contamination associated with the land must be contained beneath a continuous impervious layer and must be located above the highest seasonal groundwater level beneath the site.	Meets criterion. Subject to following the controls within the RAP, discharges from the land as a result of the soil disturbance are highly unlikely to cause significant adverse effects on the environment.

9 Conclusions

Based on the information reviewed as part of this investigation and observations during the walkover, activities listed on the HAIL may have may have been historically and / or are currently being undertaken on-site. The intrusive investigation identified that:

- The concentration of asbestos, arsenic or lead in samples collected from four former building footprints (S08, S14, S15, and S16) and two samples collected adjacent to the existing dwelling (S19 and S23) exceeded the adopted health criteria for high-density residential landuse.
- The concentration of asbestos and / or heavy metals / metalloids (specifically arsenic, cadmium and lead) in samples collected from five former building footprints (S08, S14, S15, S16 and S18), seven samples collected adjacent to the existing dwelling and auxiliary buildings (S19 to S23, S25 and S26) exceeded the adopted health criteria for standard residential landuse.
- The concentrations of lead in two samples collected from two former building footprints (S14 and S18) and four samples collected adjacent to the existing dwelling and auxiliary building (S19 to S21, and S23) exceed the adopted environmental assessment criterion.
- The concentration of pyrene in one of the samples of stockpiled material (S40) in the southern portion of the site exceeded the environmental assessment criterion; however, the risk-driver for the adopted pyrene criterion is related to soil being in direct contact with groundwater. This material could therefore be re-used on-site but should be placed some distance above the highest level that the groundwater table can reach.
- Three soil samples collected from the former and existing building footprints in the central and southern part of the site (S09, S20 and S27) recorded asbestos, albeit at a concentration that does not present an unacceptable risk to human health. The source of the elevated concentration is likely the use of asbestos containing materials in the construction of the former and existing buildings.

Due to concentrations of contaminants which exceed both the human health and environmental guidelines being recorded at the site, further work is required to ensure that the site is suitable for the proposed end use (high-density or standard residential use). As the majority of the impacted material is topsoil, we consider the most cost-effective solution would be remediation of the impacted soil by excavation and off-site disposal. The area of the site requiring remediation will vary depending on if high-density or standard residential development is proposed.

The NESCS may apply to specific activities on sites where an activity on the HAIL (MfE, 2011a) has, or is more likely than not to have occurred. Based on the results of this investigation, we consider that HAIL ID E1, G3 and I apply to the site. As the permitted disturbance volume, removal volume and / or time frame is unlikely to be complied with, and the results of analysis of samples described in this report identified contaminant concentrations in the soils above the human health criteria, a restricted discretionary activity consent under Regulation 10 of the NESCS will be required for the site.

As the estimated remedial volume is likely to exceed the permitted activity volume from Rule E30.6.1.2 of the AUP (200 m^3), controlled activity consent under rule E30.6.2.1 will likely be required.

10 Recommendations

10.1 Additional Investigation

Additional investigation is recommended to delineate the vertical and lateral extents of known and potential impacted material within the footprint of former buildings and adjacent to the two existing dwellings. The proposed additional investigation works are detailed in the Remediation Action Plan (RAP) that has been prepared for the site.

10.2 Remediation Action Plan

It is recommended that the earthworks for the planned redevelopment be managed in accordance with the RAP that has been prepared for the site. The RAP outlines remediation and validation requirements for soil impacted by contaminants above the human health and environmental discharge criteria, as well as monitoring and management procedures for the balance of the earthworks due to the potential for encountering unidentified contamination.

10.3 Closure Reporting

Following completion of remediation works a Site Validation Report (SVR) should be prepared to document the remediation works and validation works. The SVR should also confirm that works have been undertaken in general accordance with the RAP.

10.4 Disposal Options

The objective of this investigation was to satisfy the requirements of the NESCS and AUP, however the results can be used to inform disposal options. The findings of this investigation indicate that large areas of the site are likely to be considered “cleanfill” for disposal purposes (AUP, 2016). The presence of contaminants above regional background concentrations in southern portion of the site and coastal margin mean that excess soil generated during redevelopment works in these areas cannot be considered “cleanfill” for disposal purposes or reused at another earthworks site. It is likely that shallow soil through the majority of the northern portion of the site /and deeper soil across the site can be classified as cleanfill; however, additional testing prior to, or as part of, redevelopment works is required to confirm this.

11 Limitations

i. We have prepared this report in accordance with the brief as provided. This report has been prepared for the use of our client, Cabra Developments Limited, their professional advisers and the relevant Territorial Authorities in relation to the specified project brief described in this report. No liability is accepted for the use of any part of the report for any other purpose or by any other person or entity.

ii. The recommendations in this report are based on the ground conditions indicated from published sources, site assessments and subsurface investigations described in this report based on accepted normal methods of site investigations. Only a limited amount of information has been collected to meet the specific financial and technical requirements of the client's brief and this report does not purport to completely describe all the site characteristics and properties. The nature and continuity of the ground between test locations has been inferred using experience and judgement and it should be appreciated that actual conditions could vary from the assumed model.

iii. Subsurface conditions relevant to construction works should be assessed by contractors who can make their own interpretation of the factual data provided. They should perform any additional tests as necessary for their own purposes.

iv. This Limitation should be read in conjunction with the Engineering NZ/ACENZ Standard Terms of Engagement.

v. This report is not to be reproduced either wholly or in part without our prior written permission.

We trust that this information meets your current requirements. Please do not hesitate to contact the undersigned on (09) 972 2205 if you require any further information.

Report prepared by

Claire Davies, CEnvP

Associate Environmental Consultant

Report reviewed by

Lotta Liddell, CEng CEnv MICE

Senior Environmental Engineer

12 References

AC, 2001. Auckland Regional Council. (2001). Background Concentration of Inorganic Elements in Soils from the Auckland Region, Auckland Regional Council, Technical Publication No. 153.

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FIGURES

Legend

- Site Boundary
- Approximate footprint of former building(s)
- Area of Waste Material

0 10 m 20 m

ENGEO

Produced by **Datanest.earth**

Title: Site Location and Key Features		
Client: Cabra Developments Limited		Figure No.: 1 Size: A3
Project: 10 Sinton Road, Whenuapai	Drawn: CD	
Date: 10-10-2023	Checked: LL	
Proj No.: 23849.000.001_03	Scale: 1:1090	Version: 1.0

Legend

- Site Boundary
- Environmental Investigation Location
- Approximate footprint of former building(s)
- Area of Waste Material

0 25 m 50 m

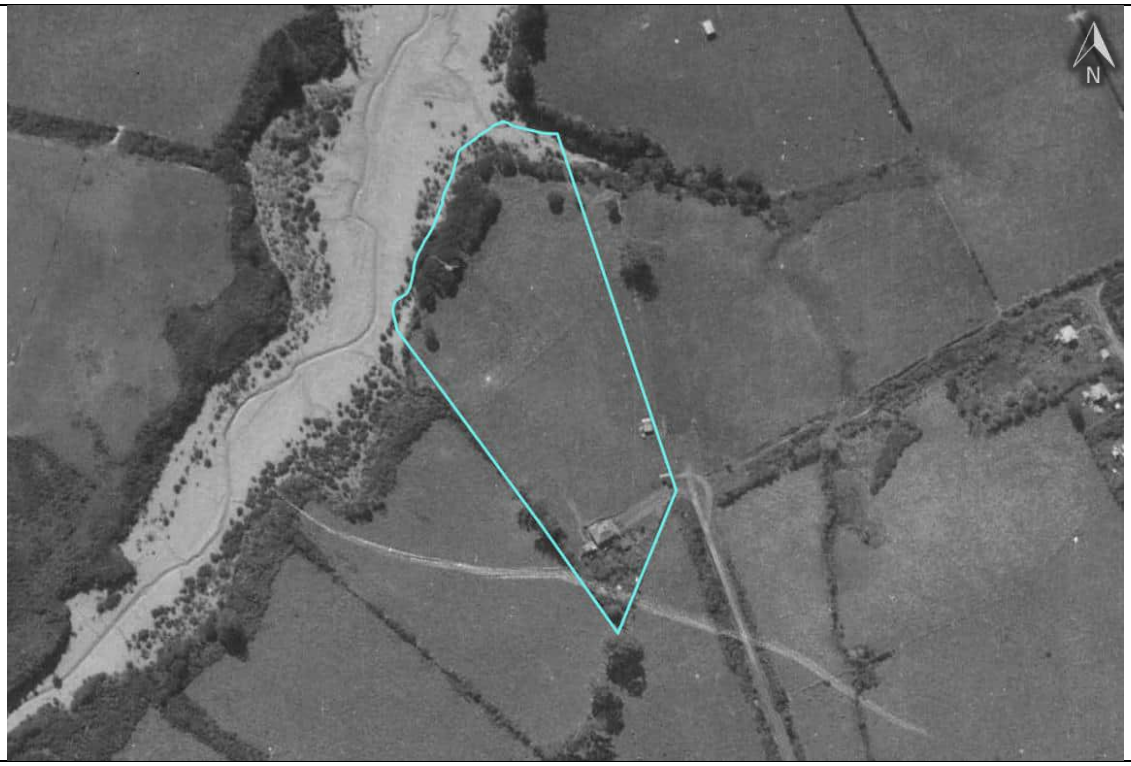
ENGEO

Produced by **Datanest.earth**

Title: Environmental Investigation Location Plan		
Client: Cabra Developments Limited		Figure No.: 2 Size: A3
Project: 10 Sinton Road, Whenuapai	Drawn: CD	
Date: 11-10-2023	Checked: LL	
Proj No.: 23849.000.001_03	Scale: 1:1119	Version: 1.0

APPENDIX 1:

Aerial Photographs



1940 (Retrolens NZ)

1950 (Retrolens NZ)

1959 (Auckland Council GeoMaps)

1963 (Retrolens NZ)

1972 (Retrolens NZ)

1975 (Retrolens NZ)

1980 (Retrolens NZ)

1988 (Retrolens NZ)

2000 (Auckland Council GeoMaps)

2004 (Google Earth Pro)

2008 (Auckland Council GeoMaps)

2010 / 2011 (Auckland Council GeoMaps)

2017 (Nearmaps)

2023 (Nearmaps)

APPENDIX 2:

Site Contamination Enquiry Response

15/08/2023

Engeo Limited
8 Greydene Place
Auckland

Attention: Jack Hammond

Dear Jack,

Site Contamination Enquiry – *10 Sinton Road Hobsonville*

This letter is in response to your enquiry requesting available site contamination information within Auckland Council records for the above site. Please note this report does not constitute a site investigation report; such reports are required to be prepared by a (third-party) Suitably Qualified and Experienced Practitioner.

The following details are based on information available to the Contamination, Air & Noise Team in the Resource Consent Department. The details provided may be from former regional council information, as well as property information held by the former district/city councils. For completeness the relevant property file should also be requested to obtain all historical records and reports via 09 3010101 or online at:

https://www.aucklandcouncil.govt.nz/buying-property/order-property-report/Pages/order-property-file.aspx.

1. Hazardous Activities and Industries List (HAIL) Information

This list published by the Ministry for the Environment (MfE) comprises activities and industries that are considered likely to cause land contamination as a result of hazardous substance use, storage, and/or disposal.

There is no contamination information held within Council's records for the site (Sinton Road Hobsonville).

Please note:

- *If you are demolishing any building that may have asbestos containing materials (ACM) in it, you have obligations under the Health and Safety at Work (Asbestos) Regulations 2016 for the management and removal of asbestos, including the need to engage a Competent Asbestos Surveyor to confirm the presence or absence of any ACM.*
- *Paints used on external parts of properties up until the mid-1970's routinely contained lead, a poison and a persistent environmental pollutant. You are advised to ensure that soils affected by old, peeling or flaking paint are assessed in relation to the proposed use of the property, including high risk use by young children.*

2. Consents and Incidents Information (200m radius of the selected site)

The Council database was searched for records of the following activities within approximately 200 metres of the site and results are displayed in Figure 1 below:

- Pollution Incidents (including air discharges, oil or diesel spills)
- Bores

- Contaminated site and air discharges, and industrial trade process consents
- Closed Landfills
- Air quality permitted activities
- Identified HAIL activities

Figure 1: Selected Consents, Incidents and HAIL activities within approximately 200m of the subject site

Legend:

All Consents
All Applications
All Permitted Activities
All Bores
Closed Landfill (Auckland Council owned)
Closed Landfill (Privately owned)
All Incidents
HAIL activities

Relevant details of any pollution incidents and consents and HAIL activities are appended to this letter (Attachment A). Please refer to the column titled 'Property Address' on the spreadsheet to aid in identifying corresponding data on the map.

For any identified HAIL sites, please refer to the tab "HAIL activities" for more information (Column C and D include HAIL activity details where these are available).

Please note:

The HAIL activity hatching in Figure 1 only reflects whether a site has been identified as a HAIL site (both verified and non-verified) by the Council and the type of HAIL associated with the site. This does not confirm whether the site has been formally investigated or the contamination status of the property (e.g. contaminated, remediated etc.). Additionally, due to limitations within Council's records, the specific HAIL activity is not included in the data for all properties. For further information on any of these known HAIL sites, a subsequent site contamination enquiry can be lodged for the specific property (up to 5 adjacent properties can be covered in one request).

While the Auckland Council has carried out the above search using its best practical endeavours, it does not warrant its completeness or accuracy and disclaims any responsibility or liability in respect of the information. If you or any other person wishes to act or to rely on this information, or make any financial commitment based upon it, it is recommended that you seek appropriate technical and/or professional advice.

If you wish to clarify anything in this letter that relates to this site, please contact contaminatedsites@aucklandcouncil.govt.nz. Any follow up requests for information on other sites must go through the online order process.

Should you wish to request any of the files referenced above and/or listed in the attached spreadsheet for viewing, please contact the Auckland Council Call Centre on 301 0101 and note you are requesting former Auckland Regional Council records (the records department requires three working days' notice to ensure the files will be available).

Please note Auckland Council cost recovers officer's time for all site enquiries. As such an invoice for $128 for the time involved in this enquiry will follow shortly.

Yours Sincerely,

Contamination, Air and Noise Team
Specialist Unit | Resource Consents
Auckland Council

CONSENT_NUMBER	FILE_REFERENCE	CONSENT_HOLDER	BORE_ID	GRANTED_DATE	REVIEW_DATE	EXPIRY_DATE	CONSENT_STATUS	PROCESSING_OFFICER	PURPOSE	WORKS_DESCRIPTION	EASTING	NORTHING	ACTIVITY_STATUS	LAND_USE	LAND_USE_UPDATED	LAND_USE_NOTE	BORE_USE	ACTIVITY_DESCRIPTION	SITE_NAME	SITE_DESCRIPTION	MAIN_AQUIFER	AQUIFER	SUB_AQUIFER1	SUB_AQUIFER2	ENVIRONMENT_REPORTING_AREA	ALW_PLAN_ZONES	TLA	HYDSYS_NUMBER	DATE_DRILLED	TOTAL_DEPTH	GROUND_ELEVATION	STATIC_WATER_LEVEL	STATIC_WATER_DATE	BORE_LOG	AQUIFER_TEST	DIAMETER_FROM	DIAMETER_TO	DIAMETER	CASING_FROM	CASING_TO	CASING_TYPE	CASING_DIAMETER	SCREEN_FROM	SCREEN_TO	SCREEN_TYPE	CONTRACTOR	CONSULTANT	DATE_CREATED	PROPERTY_ADDRESS	LOC_TYP
0			2601								1746420	5926520	Drilled					Drilled pre-1987 for ANDREWS IA &RM by *** DRILLER UNKNOWN ***.			Waitemata	Kumeu Waitemata	Kumeu Zone 3			Kumeu Waitemata			20000101	182				Y		0	182	100	0			100						20170601		Point

CONSENT_NUMBER	FILE_REFERENCE	ACTIVITY	CONSENT_HOLDER	CONSENT_STATUS	GRANTED_DATE	REVIEW_DATE	EXPIRY_DATE	PROCESSING_OFFICER	PURPOSE	WORKS_DESCRIPTION	EASTING	NORTHING	ACTIVITY_ID	ACTIVITY_STATUS	ACTIVITY_DESCRIPTION	SITE_NAME	SITE_DESCRIPTION	DATE_CREATED	PROPERTY_ADDRESS	LOC_TYP	MONITORING_OFFICER	PREVIOUS_INSPECTION_DATE	NEXT_INSPECTION_DATE
4218	AGB23839	Take	IH ANDREWS RM ANDREWS	Replaced	19881109		19881231		To take from a Bore up to 65 cmpd for - Pastoral		1744630	5926520	3185		To take from a Bore up to 65 cmpd for - Pastoral			2/06/2017	SINTON RD HOBSONVILLE Waitakere City	Point		Invalid Date	Invalid Date
5190	XX854571	Dam	WH COLLISTON & CO LTD	Replaced	19860704		19901231		ASSORTED CROPS		1744700	5926680	309	Existing	ASSORTED CROPS		6 SINTON RD, HOBSONVILLE	2/06/2017	6 Sinton Road Hobsonville Waitakere	Point		Invalid Date	Invalid Date
5191	XX854572	Take	WH COLLISTON & CO LTD	Cancelled	19860704		19901231		To take from a Dam up to 160 cmpd for - Pastoral	dam	1744700	5926680	2186		To take from a Dam up to 160 cmpd for - Pastoral		6 Sinton Rd, Hobsonville	2/06/2017	6 SINTON RD HOBSONVILLE Waitakere City	Point		Invalid Date	Invalid Date
6500	AGB961128	Take	IH ANDREWS RM ANDREWS	Expired	19890905		19940531		2.5 hectares of Orchard ******		1744630	5926520	2184				SINTON ROAD, HOBSONVILLE	2/06/2017	SINTON RD HOBSONVILLE Waitakere City	Point		Invalid Date	Invalid Date
9046	XX924671	Dam	Anthony Gerard Koenen & Janet Stephanie Koenen	Expired	19930525	19961231	20060531	_Michelle Daly	To Dam an unnamed tributary of the Waiarohia inlet.	A 6 metre high earth dam, located approximately 25 metres east of Sinton Road, Hobsonville.	1744700	5926680	309	Existing	ASSORTED CROPS		6 SINTON RD, HOBSONVILLE	2/06/2017	6 Sinton Road Hobsonville Waitakere	Point		Invalid Date	Invalid Date
9426	UPWW463	Coastal Structure	Ivan Jujnovich Christine Jujnovich	Expired	19871101		2001 0331	_Harbour's Act Approval	Occupation of part of the CMA with a jetty.	Jetty (29m x 1.5m = 43m2).	1746342	5926926	21599	Constructed	Coastal Structure: Wooden jetty (29m long x 1.5m wide) with round concrete piles. The jetty is in good order. Usable at high tide - 2m of water - dries out at low tide. Foreshore is mangrove and mud. (Previously structure general 654)		Adjacent 21 Rata Road, Waiapomia Creek, Waitemata Harbour.Map Ref: NZMS 260 R11 567887	2/06/2017	Adj 21 Rata Road, Waiapomia Creek, Waitakere City Waitemata Harbour WCC	Point		Invalid Date	Invalid Date
11214	54/27/123	Coastal Structure	United Networks Ltd	Expired	19761208		19960930		licence provides for overhead cables OVER THE WAIAOHIA CREEK.	POWERLINE CROSSING (112M OVER CREEK).	1745500	5927000	20615		(Previously pipeline 868)		WAIAOHIA CREEK, WHENUAPAI, HOBSONVILLE	2/06/2017		Point		Invalid Date	Invalid Date
37561	25655	Stream Work	Anthony Gerard Koenen & Janet Stephanie Koenen	Issued	20150202	20110201	20440136	_Nicola Watson	To authorise works within a watercourse associated with the forming of an access track.		1744700	5926495	21455	Proposed	Works within a watercourse associated with the installation of a culvert to construct an access to the site.	6 Sinton Road	New culvert on man made stream to facilitate vehicle crossing.	2/06/2017	6 Sinton Road Hobsonville Waitakere	Point	Graeme Ridley	Invalid Date	Invalid Date

SAPSiteID	PropertyAddress	HAILCode	HAILDescription	ValidFrom
11132817	12 Sinton Road Hobsonville			1/06/2016
11134008	15 Clarks Lane Hobsonville			1/06/2016
11131581	16 Sinton Road Hobsonville			1/06/2016
11131592	14 Sinton Road Hobsonville			1/06/2016
11143991	Brigham Creek Road Whenuapai			1/06/2016
30003910	Brigham Creek Road Whenuapai			1/06/2016
30003919	Brigham Creek Road Whenuapai			1/06/2016
11134039	6 Sinton Road Hobsonville			1/01/1900
11134039	6 Sinton Road Hobsonville			1/01/1900

APPENDIX 3:

Site Photographs

Photo 1: Dwelling and garage at 10 Sinton Road. Stockpiles in foreground.

Photo 2: Shed to the west of the dwelling.

Photo 3: Granny flat in the south-eastern corner.

Photo 4: Garage associated with granny flat.

Photo 5: View across north-western portion of the site, showing head scarps.

Photo 6: View across eastern portion of site, looking south.

Photo 7: Waste materials deposited along coastal margin.

Photo 8: Waste materials deposited along coastal margin.

APPENDIX 4:

Results Summary

Table A: Comparison of Soil Results to Assessment Criteria

				Heavy Metals/Metalloids								Polycyclic Aromatic Hydrocarbons									Organochlorine Pesticides	Semi-volatile Organic Compounds (excl OCPs / PAHs)	Asbestos	
Investigation Location	Depth (m bgl)	Sample ID	Date	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc	Acenaphthene	Acenaphthylene	Anthracene	Benzo[a]pyrene (middle bound)	Benzo(g,h,i)perylene	Fluorene	Naphthalene	Phenanthrene	Pyrene			Asbestos Containing Material (ACM)	Asbestos Fines / Friable Asbestos (AF/FA)
S01	0.1	S01 0.1	15-Aug-23	1.6	0.15	5.8	3.5	11	0.15	2.3	14	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	nt	nt	nt	nt
S02	0.1	S02 0.1	15-Aug-23	1.6	0.12	6	2.2	8.1	0.17	2.7	8.1	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	nt	nt	nt	nt
S03	0.1	S03 0.1	15-Aug-23	0.8	0.14	4.8	2.6	8.8	0.12	1.5	11	nt	nt	nt	nt	nt	nt	nt	nt	nt	<LOR	nt	nt	nt
S04	0.1	S04 0.1	15-Aug-23	0.7	0.1	4.3	1.8	6.7	0.05	1.7	8	nt	nt	nt	nt	nt	nt	nt	nt	nt	<LOR	nt	nt	nt
S05	0.1	S05 0.1	15-Aug-23	5.4	**0.67**	9.1	26	**84**	0.06	3.6	110	nt	nt	nt	nt	nt	nt	nt	nt	nt	<LOR	nt	nt	nt
S06	0.2	S06 0.2	15-Aug-23	3.3	0.28	8.2	10	26	0.06	2.2	160	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	NAD	NAD
S07	0.2	S07 0.2	15-Aug-23	4	0.2	9.5	10	15	0.09	3.4	76	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	NAD	NAD
S08	0.2	S08 0.2	15-Aug-23	2.6	0.33	8.1	10	12	0.11	2.5	140	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	NAD	**0.053**
S09	0.2	S09 0.2	15-Aug-23	3.3	0.18	8.4	11	25	0.1	3.9	62	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	NAD	**0.00049**
S10	0.2	S10 0.2	15-Aug-23	1.5	0.09	4.2	2.4	7.7	0.07	1	57	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	NAD	NAD
S12	0.2	S12 0.2	15-Aug-23	2.4	0.26	4.5	13	44	0.18	24	100	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	NAD	NAD
S13	0.2	S13 0.2	15-Aug-23	1.9	0.17	5.3	4.5	9.1	0.16	2.1	15	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	NAD	NAD
S14	0.0 - 0.3	S14 0.0-0.3	15-Aug-23	**50**	**3.2**	**130**	**96**	410	0.13	16	**290**	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	NAD	NAD
S15	0.0 - 0.25	S15 0.0-0.25	15-Aug-23	3.8	0.11	9.2	12	34	0.14	6.3	55	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	NAD	**0.1**
S16	0.0 - 0.25	S16 0.0-0.25	15-Aug-23	5.4	0.23	8.9	15	**110**	0.14	5.7	140	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	NAD	**0.0026**
S17	0.0 - 0.3	S17 0.0-0.3	15-Aug-23	7.5	0.45	7	18	**210**	0.09	3.3	140	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	NAD	NAD
S18	0.0 - 0.25	S18 0.0-0.25	15-Aug-23	9.2	0.51	8.7	**150**	280	0.14	4.4	150	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	NAD	NAD
S19	0.0 - 0.2	S19 0.0-0.2	15-Aug-23	8	0.32	14	33	**670**	0.16	8.6	120	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	NAD	NAD
S20	0.0 - 0.15	S20 0.0-0.15	15-Aug-23	7.2	0.28	16	34	470	0.13	14	180	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	NAD	**<0.001**
S21	0.0 - 0.15	S21 0.0-0.15	15-Aug-23	6.4	0.22	9.3	29	260	0.13	6	94	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	NAD	NAD
S22	0.0 - 0.2	S22 0.0-0.2	15-Aug-23	**24**	0.2	19	34	**190**	0.16	14	**330**	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	NAD	NAD
S23	0.0 - 0.2	S23 0.0-0.2	15-Aug-23	9.1	**0.67**	12	39	760	0.26	17	**350**	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	NAD	NAD
S24	0.0 - 0.35	S24 0.0-0.35	15-Aug-23	8.5	0.17	25	33	**67**	0.05	35	100	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	NAD	NAD
S25	0.0 - 0.2	S25 0.0-0.2	15-Aug-23	**24**	0.14	21	17	27	0.1	4.3	40	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	NAD	NAD
S26	0.0 - 0.2	S26 0.0-0.2	15-Aug-23	**25**	0.19	21	**51**	**150**	0.03	4.9	170	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	NAD	NAD
S27	0.0 - 0.3	S27 0.0-0.3	15-Aug-23	9.3	0.14	15	21	55	0.09	7.4	91	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	NAD	**<0.001**
S28	0.0 - 0.2	S28 0.0-0.2	15-Aug-23	2.9	0.06	5.4	7.2	25	0.04	2.8	48	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	NAD	NAD
S29	0.0 - 0.2	S29 0.0-0.2	15-Aug-23	1.9	0.02	3.1	3.1	9.4	0.05	1.2	12	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	NAD	NAD
S37	0.3	S37 0.3	15-Aug-23	2.1	0.04	5.6	6	46	0.03	1.6	110	<LOR	<LOR	**0.07**	**0.06**	<LOR	<LOR	<LOR	**0.05**	**0.07**	nt	nt	NAD	NAD
S38	0.1	S38 0.1	15-Aug-23	1.3	0.02	3.9	3.4	19	0.08	2.3	22	<LOR	<LOR	<LOR	**0.09**	**0.04**	<LOR	<LOR	**0.03**	**0.1**	nt	nt	NAD	NAD
S39	Surface	S39 (STOCKPILE)	15-Aug-23	1.4	0.04	5.3	5.8	7.3	0.05	2.5	11	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	NAD	NAD
S40	Surface	S40 (STOCKPILE)	15-Aug-23	**14**	0.12	39	33	62	0.19	18	110	<LOR	<LOR	**0.09**	**1.2**	**0.5**	**0.04**	<LOR	**0.42**	**1.8** [12]	<LOR	<LOR	NAD	NAD
Assessment Criteria:																								
Human Health Criteria (High-density Residential) [1]				45	230 [4]	1500 [5]	10000	500	1000	1200 [6]	60000 [6]	3600	-	18000 [11]	24	-	2400 [10]	49 [7]	-	1600 [7]	various	-	0.04 [8]	0.001 [8]
Human Health Criteria (Residential) [1]				20	3 [4]	460 [5]	> 10,000	210	310	400 [6]	7,400 [6]	3600	-	18000 [11]	10	-	2400 [10]	49 [7]	-	1600 [7]	various	-	0.01 [8]	0.001 [8]
Environmental Criteria (Auckland Unitary Plan) [2]				100	7.5	400	325	250	0.75	105	400	-	-	-	20	-	-	0.043 [7]	5 [10]	1.2 [7]	various	-	-	-
Background Criteria (Auckland - Non-Volcanic) [3]				**0.4 - 12**	**< 0.1 - 0.65**	**2 - 55**	**1 - 45**	**< 5 - 65**	**<0.03 - 0.45**	**0.9 - 35**	**9 - 180**	**< LOR**	**< LOR**	**< LOR**	**< LOR**	**< LOR**	**< LOR**	**< LOR**	**< LOR**	**< LOR**	**< LOR**	**< LOR**	**< LOR**	**< LOR**

Notes:
All results and criteria are presented in mg/kg dry weight basis, except asbestos which is reported as %w/w
Full results are included in the laboratory reports
LOR: Limit of Reporting; Results below LOR or background are shown in grey text
nt: not tested
- : no applicable criteria
NAD: No Asbestos Detected (Note:' <0.001' indicates asbestos detected, but below the limit of reporting)

1: MfE (2011) Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health (Residential Land Use), or selected in accordance with CLMG No. 2
2: Environmental discharge criteria selected in accordance with Section E30.6.1.4 of the Auckland Unitary Plan (Auckland Council, 2016).
3: Background Ranges of Trace Elements in Auckland Soils (Non-Volcanic Range). Table E30.6.1.4.2 of the AUP (Auckland Council, 2016).
4. Assumes soil pH of 5.
5. Criteria for Chromium VI were conservatively selected.
6. National Environment Protection (Assessment of Site Contamination) Measure (NEPM). Residential A criteria listed.
7. Ministry for the Environment (2011) Petroleum Hydrocarbon Guidelines. Human Health Criteria from Table 4.10 (All Pathways) for Residential land use, Silty Clay and contamination depth < 1m. Criteria for protection of groundwater quality from Table 4.20 for silty clay; contamination depth <1m and groundwater depth 2m.
8. New Zealand Guidelines for the Assessment and Management of Asbestos in Soil (BRANZ, 2017). Commercial and Industrial Land Use.
9. New Zealand Guidelines for the Assessment and Management of Asbestos in Soil (BRANZ, 2017). All Land uses.
10. United States Environmental Protection Authority Regional Screening Levels for Residential Soil (accessed 2023). Default value for TR = 10-6, THQ = 1.0.
11. Canadian Council of Ministers of the Environment Soil Quality Guidelines for the Protection of Environmental and Human Health (Accessed 2022): Residential/Parkland Land use
12. Ministry for the Environment (2011) Petroleum Hydrocarbon Guidelines. Criteria for protection of groundwater quality from Table 4.20 for silty clay; contamination depth <1m and groundwater depth 2m. The concentration of pyrene exceeds the environmental assessment criterion; however, the risk-driver for the adopted pyrene criterion is related to soil being in direct contact with groundwater. Therefore, material can be re-used on-site but should be placed above the high groundwater table.

APPENDIX 5:

Analytical Reports and Chain of Custody Documentation

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

ENGEO Ltd
8 Greydene Place
Takapuna
Auckland 0622

Attention: **Claire Davies**

Report **1018885-S-V2**
Project name 10 SINTON ROAD
Project ID 23849.000.002
Received Date Aug 18, 2023

Client Sample ID			**S01 0.1**	**S02 0.1**	**S03 0.1**	**S04 0.1**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins Sample No.			**K23-Au0053407**	**K23-Au0053408**	**K23-Au0053409**	**K23-Au0053410**
Date Sampled			**Aug 15, 2023**	**Aug 15, 2023**	**Aug 15, 2023**	**Aug 15, 2023**
Test/Reference	LOR	Unit				
Polycyclic Aromatic Hydrocarbons (NZ MfE)						
Acenaphthene	0.03	mg/kg	< 0.03	< 0.03	-	-
Acenaphthylene	0.03	mg/kg	< 0.03	< 0.03	-	-
Anthracene	0.03	mg/kg	< 0.03	< 0.03	-	-
Benz(a)anthracene	0.03	mg/kg	< 0.03	< 0.03	-	-
Benzo(a)pyrene	0.03	mg/kg	< 0.03	< 0.03	-	-
Benzo(a)pyrene TEQ (lower bound)*	0.03	mg/kg	< 0.03	< 0.03	-	-
Benzo(a)pyrene TEQ (medium bound)*	0.03	mg/kg	0.04	0.04	-	-
Benzo(a)pyrene TEQ (upper bound)*	0.03	mg/kg	0.08	0.08	-	-
Benzo(b&j)fluoranthene[N07]	0.03	mg/kg	< 0.03	< 0.03	-	-
Benzo(g.h.i)perylene	0.03	mg/kg	< 0.03	< 0.03	-	-
Benzo(k)fluoranthene	0.03	mg/kg	< 0.03	< 0.03	-	-
Chrysene	0.03	mg/kg	< 0.03	< 0.03	-	-
Dibenz(a.h)anthracene	0.03	mg/kg	< 0.03	< 0.03	-	-
Fluoranthene	0.03	mg/kg	< 0.03	< 0.03	-	-
Fluorene	0.03	mg/kg	< 0.03	< 0.03	-	-
Indeno(1.2.3-cd)pyrene	0.03	mg/kg	< 0.03	< 0.03	-	-
Naphthalene	0.1	mg/kg	< 0.1	< 0.1	-	-
Phenanthrene	0.03	mg/kg	< 0.03	< 0.03	-	-
Pyrene	0.03	mg/kg	< 0.03	< 0.03	-	-
Total PAH*	0.1	mg/kg	< 0.1	< 0.1	-	-
p-Terphenyl-d14 (surr.)	1	%	115	116	-	-
2-Fluorobiphenyl (surr.)	1	%	57	59	-	-
Metals M8 (NZ MfE)						
Arsenic	0.1	mg/kg	1.6	1.6	0.8	0.7
Cadmium	0.01	mg/kg	0.15	0.12	0.14	0.10
Chromium	0.1	mg/kg	5.8	6.0	4.8	4.3
Copper	0.1	mg/kg	3.5	2.2	2.6	1.8
Lead	0.1	mg/kg	11	8.1	8.8	6.7
Mercury	0.01	mg/kg	0.15	0.17	0.12	0.05
Nickel	0.1	mg/kg	2.3	2.7	1.5	1.7
Zinc	5	mg/kg	14	8.1	11	8.0
Sample Properties						
% Moisture	1	%	27	27	29	25

Client Sample ID			S01 0.1	S02 0.1	S03 0.1	S04 0.1
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			K23-Au0053407	K23-Au0053408	K23-Au0053409	K23-Au0053410
Date Sampled			Aug 15, 2023	Aug 15, 2023	Aug 15, 2023	Aug 15, 2023
Test/Reference	LOR	Unit				
Organochlorine Pesticides (NZ MfE)						
2.4'-DDD	0.01	mg/kg	-	-	< 0.01	< 0.01
2.4'-DDE	0.01	mg/kg	-	-	< 0.01	< 0.01
2.4'-DDT	0.01	mg/kg	-	-	< 0.01	< 0.01
4.4'-DDD	0.01	mg/kg	-	-	< 0.01	< 0.01
4.4'-DDE	0.01	mg/kg	-	-	< 0.01	< 0.01
4.4'-DDT	0.01	mg/kg	-	-	< 0.01	< 0.01
DDT + DDE + DDD (Total)*	0.01	mg/kg	-	-	< 0.01	< 0.01
a-HCH	0.01	mg/kg	-	-	< 0.01	< 0.01
Aldrin	0.01	mg/kg	-	-	< 0.01	< 0.01
b-HCH	0.01	mg/kg	-	-	< 0.01	< 0.01
Chlordanes - Total	0.01	mg/kg	-	-	< 0.01	< 0.01
cis-Chlordane	0.01	mg/kg	-	-	< 0.01	< 0.01
d-HCH	0.01	mg/kg	-	-	< 0.01	< 0.01
Dieldrin	0.01	mg/kg	-	-	< 0.01	< 0.01
Endosulfan I	0.01	mg/kg	-	-	< 0.01	< 0.01
Endosulfan II	0.01	mg/kg	-	-	< 0.01	< 0.01
Endosulfan sulphate	0.01	mg/kg	-	-	< 0.01	< 0.01
Endrin	0.01	mg/kg	-	-	< 0.01	< 0.01
Endrin aldehyde	0.01	mg/kg	-	-	< 0.01	< 0.01
Endrin ketone	0.01	mg/kg	-	-	< 0.01	< 0.01
g-HCH (Lindane)	0.01	mg/kg	-	-	< 0.01	< 0.01
Heptachlor	0.01	mg/kg	-	-	< 0.01	< 0.01
Heptachlor epoxide	0.01	mg/kg	-	-	< 0.01	< 0.01
Hexachlorobenzene	0.01	mg/kg	-	-	< 0.01	< 0.01
Methoxychlor	0.01	mg/kg	-	-	< 0.01	< 0.01
Toxaphene	0.5	mg/kg	-	-	< 0.5	< 0.5
trans-Chlordane	0.01	mg/kg	-	-	< 0.01	< 0.01
Dibutylchlorendate (surr.)	1	%	-	-	78	85
Tetrachloro-m-xylene (surr.)	1	%	-	-		

Client Sample ID			S05 0.1	S06 0.2	S07 0.2	S08 0.2
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			K23-Au0053411	K23-Au0053412	K23-Au0053413	K23-Au0053414
Date Sampled			Aug 15, 2023	Aug 15, 2023	Aug 15, 2023	Aug 15, 2023
Test/Reference	LOR	Unit				
Metals M8 (NZ MfE)						
Arsenic	0.1	mg/kg	5.4	3.3	4.0	2.6
Cadmium	0.01	mg/kg	0.67	0.28	0.20	0.33
Chromium	0.1	mg/kg	9.1	8.2	9.5	8.1
Copper	0.1	mg/kg	26	10	10	10
Lead	0.1	mg/kg	84	26	15	12
Mercury	0.01	mg/kg	0.06	0.06	0.09	0.11
Nickel	0.1	mg/kg	3.6	2.2	3.4	2.5
Zinc	5	mg/kg	110	160	76	140
Sample Properties						
% Moisture	1	%	36	37	29	31

Client Sample ID			S05 0.1	S06 0.2	S07 0.2	S08 0.2
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			K23-Au0053411	K23-Au0053412	K23-Au0053413	K23-Au0053414
Date Sampled			Aug 15, 2023	Aug 15, 2023	Aug 15, 2023	Aug 15, 2023
Test/Reference	LOR	Unit				
Organochlorine Pesticides (NZ MfE)						
2.4'-DDD	0.01	mg/kg	< 0.01	-	-	-
2.4'-DDE	0.01	mg/kg	< 0.01	-	-	-
2.4'-DDT	0.01	mg/kg	< 0.01	-	-	-
4.4'-DDD	0.01	mg/kg	< 0.01	-	-	-
4.4'-DDE	0.01	mg/kg	< 0.01	-	-	-
4.4'-DDT	0.01	mg/kg	< 0.01	-	-	-
DDT + DDE + DDD (Total)*	0.01	mg/kg	< 0.01	-	-	-
a-HCH	0.01	mg/kg	< 0.01	-	-	-
Aldrin	0.01	mg/kg	< 0.01	-	-	-
b-HCH	0.01	mg/kg	< 0.01	-	-	-
Chlordanes - Total	0.01	mg/kg	< 0.01	-	-	-
cis-Chlordane	0.01	mg/kg	< 0.01	-	-	-
d-HCH	0.01	mg/kg	< 0.01	-	-	-
Dieldrin	0.01	mg/kg	< 0.01	-	-	-
Endosulfan I	0.01	mg/kg	< 0.01	-	-	-
Endosulfan II	0.01	mg/kg	< 0.01	-	-	-
Endosulfan sulphate	0.01	mg/kg	< 0.01	-	-	-
Endrin	0.01	mg/kg	< 0.01	-	-	-
Endrin aldehyde	0.01	mg/kg	< 0.01	-	-	-
Endrin ketone	0.01	mg/kg	< 0.01	-	-	-
g-HCH (Lindane)	0.01	mg/kg	< 0.01	-	-	-
Heptachlor	0.01	mg/kg	< 0.01	-	-	-
Heptachlor epoxide	0.01	mg/kg	< 0.01	-	-	-
Hexachlorobenzene	0.01	mg/kg	< 0.01	-	-	-
Methoxychlor	0.01	mg/kg	< 0.01	-	-	-
Toxaphene	0.5	mg/kg	< 0.5	-	-	-
trans-Chlordane	0.01	mg/kg	< 0.01	-	-	-
Dibutylchlorendate (surr.)	1	%	82	-	-	-
Tetrachloro-m-xylene (surr.)	1	%		-	-	-

Client Sample ID			S09 0.2	S10 0.2	S12 0.2	S13 0.2
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			K23-Au0053415	K23-Au0053416	K23-Au0053417	K23-Au0053418
Date Sampled			Aug 15, 2023	Aug 15, 2023	Aug 15, 2023	Aug 15, 2023
Test/Reference	LOR	Unit				
Metals M8 (NZ MfE)						
Arsenic	0.1	mg/kg	3.3	1.5	2.4	1.9
Cadmium	0.01	mg/kg	0.18	0.09	0.26	0.17
Chromium	0.1	mg/kg	8.4	4.2	4.5	5.3
Copper	0.1	mg/kg	11	2.4	13	4.5
Lead	0.1	mg/kg	25	7.7	44	9.1
Mercury	0.01	mg/kg	0.10	0.07	0.18	0.16
Nickel	0.1	mg/kg	3.9	1.0	24	2.1
Zinc	5	mg/kg	62	57	100	15
Sample Properties						
% Moisture	1	%	41	21	28	43

Client Sample ID			S14 0.0-0.3	S15 0.0-0.25	S16 0.0-0.25	S17 0.0-0.3
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			K23-Au0053419	K23-Au0053420	K23-Au0053421	K23-Au0053422
Date Sampled			Aug 15, 2023	Aug 15, 2023	Aug 15, 2023	Aug 15, 2023
Test/Reference	LOR	Unit				
Metals M8 (NZ MfE)						
Arsenic	0.1	mg/kg	50	3.8	5.4	7.5
Cadmium	0.01	mg/kg	3.2	0.11	0.23	0.45
Chromium	0.1	mg/kg	130	9.2	8.9	7.0
Copper	0.1	mg/kg	96	12	15	18
Lead	0.1	mg/kg	410	54	110	210
Mercury	0.01	mg/kg	0.13	0.14	0.14	0.09
Nickel	0.1	mg/kg	16	6.3	5.7	3.3
Zinc	5	mg/kg	290	95	140	140
Sample Properties						
% Moisture	1	%	32	28	33	39

Client Sample ID			S18 0.0-0.25	S19 0.0-0.2	S20 0.0-0.15	S21 0.0-0.15
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			K23-Au0053423	K23-Au0053424	K23-Au0053425	K23-Au0053426
Date Sampled			Aug 15, 2023	Aug 15, 2023	Aug 15, 2023	Aug 15, 2023
Test/Reference	LOR	Unit				
Metals M8 (NZ MfE)						
Arsenic	0.1	mg/kg	9.2	8.0	7.2	6.4
Cadmium	0.01	mg/kg	0.51	0.32	0.28	0.22
Chromium	0.1	mg/kg	8.7	14	16	9.3
Copper	0.1	mg/kg	150	33	34	29
Lead	0.1	mg/kg	280	670	470	350
Mercury	0.01	mg/kg	0.14	0.16	0.13	0.13
Nickel	0.1	mg/kg	4.4	8.6	14	6.0
Zinc	5	mg/kg	150	120	180	94
Sample Properties						
% Moisture	1	%	43	27	30	32

Client Sample ID			S22 0.0-0.2	S23 0.0-0.2	S24 0.0-0.35	S25 0.0-0.2
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			K23-Au0053427	K23-Au0053428	K23-Au0053429	K23-Au0053430
Date Sampled			Aug 15, 2023	Aug 15, 2023	Aug 15, 2023	Aug 15, 2023
Test/Reference	LOR	Unit				
Metals M8 (NZ MfE)						
Arsenic	0.1	mg/kg	24	9.1	8.5	24
Cadmium	0.01	mg/kg	0.20	0.67	0.17	0.14
Chromium	0.1	mg/kg	19	12	25	21
Copper	0.1	mg/kg	34	39	33	17
Lead	0.1	mg/kg	190	760	67	27
Mercury	0.01	mg/kg	0.16	0.26	0.05	0.10
Nickel	0.1	mg/kg	14	17	35	4.3
Zinc	5	mg/kg	330	350	100	40
Sample Properties						
% Moisture	1	%	38	29	25	22

Client Sample ID			S26 0.0-0.2	S27 0.0-0.3	S28 0.0-0.2	S29 0.0-0.2
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			K23-Au0053431	K23-Au0053432	K23-Au0053433	K23-Au0053434
Date Sampled			Aug 15, 2023	Aug 15, 2023	Aug 15, 2023	Aug 15, 2023
Test/Reference	LOR	Unit				
Metals M8 (NZ MfE)						
Arsenic	0.1	mg/kg	25	9.3	2.9	1.9
Cadmium	0.01	mg/kg	0.19	0.14	0.06	0.02
Chromium	0.1	mg/kg	21	15	5.4	3.1
Copper	0.1	mg/kg	51	21	7.2	3.1
Lead	0.1	mg/kg	150	55	25	9.4
Mercury	0.01	mg/kg	0.03	0.09	0.04	0.05
Nickel	0.1	mg/kg	4.9	7.4	2.8	1.2
Zinc	5	mg/kg	170	91	48	12
Sample Properties						
% Moisture	1	%	34	28	35	22

Client Sample ID			S37 0.3	S38 0.1	S39 (STOCKPILE)	S40 (STOCKPILE)
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			K23-Au0053435	K23-Au0053436	K23-Au0053437	K23-Au0053438
Date Sampled			Aug 15, 2023	Aug 15, 2023	Aug 15, 2023	Aug 15, 2023
Test/Reference	LOR	Unit				
Polycyclic Aromatic Hydrocarbons (NZ MfE)						
Acenaphthene	0.03	mg/kg	< 0.03	< 0.03	-	-
Acenaphthylene	0.03	mg/kg	< 0.03	< 0.03	-	-
Anthracene	0.03	mg/kg	0.07	< 0.03	-	-
Benz(a)anthracene	0.03	mg/kg	0.04	0.05	-	-
Benzo(a)pyrene	0.03	mg/kg	0.03	0.06	-	-
Benzo(a)pyrene TEQ (lower bound)*	0.03	mg/kg	0.04	0.07	-	-
Benzo(a)pyrene TEQ (medium bound)*	0.03	mg/kg	0.06	0.09	-	-
Benzo(a)pyrene TEQ (upper bound)*	0.03	mg/kg	0.08	0.11	-	-
Benzo(b&j)fluoranthene[N07]	0.03	mg/kg	0.05	< 0.03	-	-
Benzo(g.h.i)perylene	0.03	mg/kg	< 0.03	0.04	-	-
Benzo(k)fluoranthene	0.03	mg/kg	0.03	0.03	-	-
Chrysene	0.03	mg/kg	0.03	0.06	-	-
Dibenz(a.h)anthracene	0.03	mg/kg	< 0.03	< 0.03	-	-
Fluoranthene	0.03	mg/kg	0.07	0.08	-	-
Fluorene	0.03	mg/kg	< 0.03	< 0.03	-	-
Indeno(1.2.3-cd)pyrene	0.03	mg/kg	< 0.03	< 0.03	-	-
Naphthalene	0.1	mg/kg	< 0.1	< 0.1	-	-
Phenanthrene	0.03	mg/kg	0.05	0.03	-	-
Pyrene	0.03	mg/kg	0.07	0.10	-	-
Total PAH*	0.1	mg/kg	0.4	0.5	-	-
p-Terphenyl-d14 (surr.)	1	%	81	83	-	-
2-Fluorobiphenyl (surr.)	1	%	92	89	-	-
Metals M8 (NZ MfE)						
Arsenic	0.1	mg/kg	2.1	1.3	1.4	14
Cadmium	0.01	mg/kg	0.04	0.02	0.04	0.12
Chromium	0.1	mg/kg	5.6	3.9	5.3	39
Copper	0.1	mg/kg	6.0	3.4	5.8	33
Lead	0.1	mg/kg	46	19	7.3	62
Mercury	0.01	mg/kg	0.03	0.08	0.05	0.19

Client Sample ID			S37 0.3	S38 0.1	S39 (STOCKPILE)	S40 (STOCKPILE)
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			K23-Au0053435	K23-Au0053436	K23-Au0053437	K23-Au0053438
Date Sampled			Aug 15, 2023	Aug 15, 2023	Aug 15, 2023	Aug 15, 2023
Test/Reference	LOR	Unit				
Metals M8 (NZ MfE)						
Nickel	0.1	mg/kg	1.6	2.3	2.5	18
Zinc	5	mg/kg	110	22	11	110
Sample Properties						
% Moisture	1	%	33	26	33	25
Semivolatile Organics						
1-Chloronaphthalene	0.5	mg/kg	-	-	-	< 0.5
Total PAH*	0.1	mg/kg	-	-	-	8.2
1-Naphthylamine	0.5	mg/kg	-	-	-	< 0.5
1.2-Dichlorobenzene	0.5	mg/kg	-	-	-	< 0.5
1.2.3-Trichlorobenzene	0.5	mg/kg	-	-	-	< 0.5
1.2.3.4-Tetrachlorobenzene	0.5	mg/kg	-	-	-	< 0.5
1.2.3.5-Tetrachlorobenzene	0.5	mg/kg	-	-	-	< 0.5
1.2.4-Trichlorobenzene	0.5	mg/kg	-	-	-	< 0.5
1.2.4.5-Tetrachlorobenzene	0.5	mg/kg	-	-	-	< 0.5
1.3-Dichlorobenzene	0.5	mg/kg	-	-	-	< 0.5
1.3.5-Trichlorobenzene	0.5	mg/kg	-	-	-	< 0.5
1.4-Dichlorobenzene	0.5	mg/kg	-	-	-	< 0.5
2-Chloronaphthalene	0.5	mg/kg	-	-	-	< 0.5
2-Chlorophenol	0.5	mg/kg	-	-	-	< 0.5
2-Fluorobiphenyl (surr.)	1	%	-	-	-	75
2-Methyl-4.6-dinitrophenol	5	mg/kg	-	-	-	< 5
2-Methylnaphthalene	0.5	mg/kg	-	-	-	< 0.5
2-Methylphenol (o-Cresol)	0.2	mg/kg	-	-	-	< 0.2
2-Naphthylamine	0.5	mg/kg	-	-	-	< 0.5
2-Nitroaniline	0.5	mg/kg	-	-	-	< 0.5
2-Nitrophenol	1	mg/kg	-	-	-	< 1
2-Picoline	0.5	mg/kg	-	-	-	< 0.5
2.3.4.6-Tetrachlorophenol	5	mg/kg	-	-	-	< 5
2.4-Dichlorophenol	0.5	mg/kg	-	-	-	< 0.5
2.4-Dimethylphenol	0.5	mg/kg	-	-	-	< 0.5
2.4-Dinitrophenol	5	mg/kg	-	-	-	< 5
2.4-Dinitrotoluene	0.5	mg/kg	-	-	-	< 0.5
2.4.5-Trichlorophenol	1	mg/kg	-	-	-	< 1
2.4.6-Tribromophenol (surr.)	1	%	-	-	-	56
2.4.6-Trichlorophenol	1	mg/kg	-	-	-	< 1
2.6-Dichlorophenol	0.5	mg/kg	-	-	-	< 0.5
2.6-Dinitrotoluene	0.5	mg/kg	-	-	-	< 0.5
3&4-Methylphenol (m&p-Cresol)	0.4	mg/kg	-	-	-	< 0.4
3-Methylcholanthrene	0.5	mg/kg	-	-	-	< 0.5
3.3'-Dichlorobenzidine	0.5	mg/kg	-	-	-	< 0.5
4-Aminobiphenyl	0.5	mg/kg	-	-	-	< 0.5
4-Bromophenyl phenyl ether	0.5	mg/kg	-	-	-	< 0.5
4-Chloro-3-methylphenol	1	mg/kg	-	-	-	< 1
4-Chlorophenyl phenyl ether	0.5	mg/kg	-	-	-	< 0.5
4-Nitrophenol	5	mg/kg	-	-	-	< 5
4.4'-DDD	0.01	mg/kg	-	-	-	< 0.01
4.4'-DDE	0.01	mg/kg	-	-	-	< 0.01
4.4'-DDT	0.01	mg/kg	-	-	-	< 0.01

Client Sample ID			S37 0.3	S38 0.1	S39 (STOCKPILE)	S40 (STOCKPILE)
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			K23-Au0053435	K23-Au0053436	K23-Au0053437	K23-Au0053438
Date Sampled			Aug 15, 2023	Aug 15, 2023	Aug 15, 2023	Aug 15, 2023
Test/Reference	LOR	Unit				
Semivolatile Organics						
7.12-Dimethylbenz(a)anthracene	0.5	mg/kg	-	-	-	< 0.5
a-HCH	0.01	mg/kg	-	-	-	< 0.01
Acenaphthene	0.03	mg/kg	-	-	-	< 0.03
Acenaphthylene	0.03	mg/kg	-	-	-	< 0.03
Acetophenone	0.5	mg/kg	-	-	-	< 0.5
Aldrin	0.01	mg/kg	-	-	-	< 0.01
Aniline	0.5	mg/kg	-	-	-	< 0.5
Anthracene	0.03	mg/kg	-	-	-	0.09
b-HCH	0.01	mg/kg	-	-	-	< 0.01
Benz(a)anthracene	0.03	mg/kg	-	-	-	0.73
Benzo(a)pyrene	0.03	mg/kg	-	-	-	0.97
Benzo(a)pyrene TEQ (lower bound)*	0.03	mg/kg	-	-	-	1.2
Benzo(a)pyrene TEQ (medium bound)*	0.03	mg/kg	-	-	-	1.2
Benzo(a)pyrene TEQ (upper bound)*	0.03	mg/kg	-	-	-	1.2
Benzo(b&j)fluoranthene[N07]	0.03	mg/kg	-	-	-	0.50
Benzo(g.h.i)perylene	0.03	mg/kg	-	-	-	0.60
Benzo(k)fluoranthene	0.03	mg/kg	-	-	-	0.40
Benzyl chloride	0.5	mg/kg	-	-	-	< 0.5
Bis(2-chloroethoxy)methane	0.5	mg/kg	-	-	-	< 0.5
Bis(2-chloroisopropyl)ether	0.5	mg/kg	-	-	-	< 0.5
Bis(2-ethylhexyl)phthalate	0.5	mg/kg	-	-	-	< 0.5
Butyl benzyl phthalate	0.5	mg/kg	-	-	-	< 0.5
Chrysene	0.03	mg/kg	-	-	-	0.78
d-HCH	0.01	mg/kg	-	-	-	< 0.01
Di-n-butyl phthalate	0.5	mg/kg	-	-	-	< 0.5
Di-n-octyl phthalate	0.5	mg/kg	-	-	-	< 0.5
Dibenz(a.h)anthracene	0.03	mg/kg	-	-	-	< 0.03
Dibenz(a.j)acridine	0.5	mg/kg	-	-	-	< 0.5
Dibenzofuran	0.5	mg/kg	-	-	-	< 0.5
Dieldrin	0.01	mg/kg	-	-	-	< 0.01
Diethyl phthalate	0.5	mg/kg	-	-	-	< 0.5
Dimethyl phthalate	0.5	mg/kg	-	-	-	< 0.5
Dimethylaminoazobenzene	0.5	mg/kg	-	-	-	< 0.5
Diphenylamine	0.5	mg/kg	-	-	-	< 0.5
Endosulfan I	0.01	mg/kg	-	-	-	< 0.01
Endosulfan II	0.01	mg/kg	-	-	-	< 0.01
Endosulfan sulphate	0.01	mg/kg	-	-	-	< 0.01
Endrin	0.01	mg/kg	-	-	-	< 0.01
Endrin aldehyde	0.01	mg/kg	-	-	-	< 0.01
Endrin ketone	0.01	mg/kg	-	-	-	< 0.01
Fluoranthene	0.03	mg/kg	-	-	-	1.5
Fluorene	0.03	mg/kg	-	-	-	0.04
g-HCH (Lindane)	0.01	mg/kg	-	-	-	< 0.01
Heptachlor	0.01	mg/kg	-	-	-	< 0.01
Heptachlor epoxide	0.01	mg/kg	-	-	-	< 0.01
Hexachlorobenzene	0.01	mg/kg	-	-	-	< 0.01
Hexachlorobutadiene	0.5	mg/kg	-	-	-	< 0.5
Hexachlorocyclopentadiene	0.5	mg/kg	-	-	-	< 0.5

Client Sample ID			S37 0.3	S38 0.1	S39 (STOCKPILE)	S40 (STOCKPILE)
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			K23-Au0053435	K23-Au0053436	K23-Au0053437	K23-Au0053438
Date Sampled			Aug 15, 2023	Aug 15, 2023	Aug 15, 2023	Aug 15, 2023
Test/Reference	LOR	Unit				
Semivolatile Organics						
Hexachloroethane	0.5	mg/kg	-	-	-	< 0.5
Indeno(1.2.3-cd)pyrene	0.03	mg/kg	-	-	-	0.37
Methoxychlor	0.01	mg/kg	-	-	-	< 0.01
N-Nitrosodibutylamine	0.5	mg/kg	-	-	-	< 0.5
N-Nitrosodipropylamine	0.5	mg/kg	-	-	-	< 0.5
N-Nitrosopiperidine	0.5	mg/kg	-	-	-	< 0.5
Naphthalene	0.1	mg/kg	-	-	-	< 0.1
Nitrobenzene	0.5	mg/kg	-	-	-	< 0.5
Nitrobenzene-d5 (surr.)	1	%	-	-	-	75
Pentachlorobenzene	0.5	mg/kg	-	-	-	< 0.5
Pentachloronitrobenzene	0.5	mg/kg	-	-	-	< 0.5
Pentachlorophenol	1	mg/kg	-	-	-	< 1
Phenanthrene	0.03	mg/kg	-	-	-	0.42
Phenol	0.5	mg/kg	-	-	-	< 0.5
Phenol-d6 (surr.)	1	%	-	-	-	78
Pronamide	0.5	mg/kg	-	-	-	< 0.5
Pyrene	0.03	mg/kg	-	-	-	1.8
Trifluralin	0.5	mg/kg	-	-	-	< 0.5

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Polycyclic Aromatic Hydrocarbons (NZ MfE)	Auckland	Aug 23, 2023	14 Days
- Method: LTM-ORG-2130 PAH and Phenols in Soil and Water by GC MSMS			
Metals M8 (NZ MfE)	Auckland	Aug 23, 2023	28 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			
Organochlorine Pesticides (NZ MfE)	Auckland	Aug 22, 2023	14 Days
- Method: LTM-ORG-2220 OCP & PCB in Soil and Water by GCMSMS			
Semivolatile Organics	Auckland	Aug 23, 2023	14 Days
- Method: LTM-ORG-2190 SVOC in Water & Soil by GC-MS			
% Moisture	Auckland	Aug 22, 2023	14 Days
- Method: LTM-GEN-7080 Moisture Content in Soil by Gravimetry			

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Melbourne	Geelong	Sydney	Canberra	Brisbane	Newcastle
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NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	Site# 25079 & 25289
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NATA# 2377
Site# 2370

Company Name: ENGEO Ltd - NI
Address: 8 Greydene Place
Takapuna
Auckland 0622

Project Name: 10 SINTON ROAD
Project ID: 23849.000.002

Order No.:
Report #: 1018885
Phone: 0011 64 9 9722 205
Fax:

Received: Aug 18, 2023 1:44 PM
Due: Aug 25, 2023
Priority: 5 Day
Contact Name: Claire Davies

Eurofins Analytical Services Manager : Katyana Gausel

Sample Detail						Asbestos - AS4964	HOLD	Moisture Set	Organochlorine Pesticides (NZ MfE)	Metals M8 (NZ MfE)	Polycyclic Aromatic Hydrocarbons (NZ MfE)	Asbestos in Soils (NZ GAMAS)	Semivolatile Organics
Auckland Laboratory - IANZ# 1327							X	X	X	X	X		X
Christchurch Laboratory - IANZ# 1290						X						X	
Tauranga Laboratory - IANZ# 1402													
External Laboratory													
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**								
1	S01 0.1	Aug 15, 2023		Soil	K23-Au0053407			X		X	X		
2	S02 0.1	Aug 15, 2023		Soil	K23-Au0053408			X		X	X		
3	S03 0.1	Aug 15, 2023		Soil	K23-Au0053409			X	X	X			
4	S04 0.1	Aug 15, 2023		Soil	K23-Au0053410			X	X	X			
5	S05 0.1	Aug 15, 2023		Soil	K23-Au0053411			X	X	X			
6	S06 0.2	Aug 15, 2023		Soil	K23-Au0053412	X		X		X			
7	S07 0.2	Aug 15, 2023		Soil	K23-Au0053413	X		X		X			
8	S08 0.2	Aug 15, 2023		Soil	K23-Au0053414	X		X		X			
9	S09 0.2	Aug 15, 2023		Soil	K23-Au0053415	X		X		X			
10	S10 0.2	Aug 15, 2023		Soil	K23-Au0053416	X		X		X			
11	S12 0.2	Aug 15, 2023		Soil	K23-Au0053417	X		X		X			

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Auckland Laboratory - IANZ# 1327							X	X	X	X	X		X
Christchurch Laboratory - IANZ# 1290						X						X	
Tauranga Laboratory - IANZ# 1402													
12	S13 0.2	Aug 15, 2023		Soil	K23-Au0053418	X		X		X			
13	S14 0.0-0.3	Aug 15, 2023		Soil	K23-Au0053419	X		X		X			
14	S15 0.0-0.25	Aug 15, 2023		Soil	K23-Au0053420	X		X		X			
15	S16 0.0-0.25	Aug 15, 2023		Soil	K23-Au0053421	X		X		X			
16	S17 0.0-0.3	Aug 15, 2023		Soil	K23-Au0053422	X		X		X			
17	S18 0.0-0.25	Aug 15, 2023		Soil	K23-Au0053423	X		X		X			
18	S19 0.0-0.2	Aug 15, 2023		Soil	K23-Au0053424			X		X		X	
19	S20 0.0-0.15	Aug 15, 2023		Soil	K23-Au0053425			X		X		X	
20	S21 0.0-0.15	Aug 15, 2023		Soil	K23-Au0053426			X		X		X	
21	S22 0.0-0.2	Aug 15, 2023		Soil	K23-Au0053427			X		X		X	
22	S23 0.0-0.2	Aug 15, 2023		Soil	K23-Au0053428			X		X		X	
23	S24 0.0-0.35	Aug 15, 2023		Soil	K23-Au0053429	X		X		X			
24	S25 0.0-0.2	Aug 15, 2023		Soil	K23-Au0053430			X		X		X	
25	S26 0.0-0.2	Aug 15, 2023		Soil	K23-Au0053431			X		X		X	

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Auckland Laboratory - IANZ# 1327							X	X	X	X	X		X
Christchurch Laboratory - IANZ# 1290						X						X	
Tauranga Laboratory - IANZ# 1402													
26	S27 0.0-0.3	Aug 15, 2023		Soil	K23-Au0053432			X		X		X	
27	S28 0.0-0.2	Aug 15, 2023		Soil	K23-Au0053433			X		X		X	
28	S29 0.0-0.2	Aug 15, 2023		Soil	K23-Au0053434			X		X		X	
29	S37 0.3	Aug 15, 2023		Soil	K23-Au0053435			X		X	X	X	
30	S38 0.1	Aug 15, 2023		Soil	K23-Au0053436			X		X	X	X	
31	S39 (STOCKPILE)	Aug 15, 2023		Soil	K23-Au0053437	X		X		X			
32	S40 (STOCKPILE)	Aug 15, 2023		Soil	K23-Au0053438			X		X		X	X
33	S01 0.4	Aug 15, 2023		Soil	K23-Au0053439		X						
34	S02 0.4	Aug 15, 2023		Soil	K23-Au0053440		X						
35	S03 0.3	Aug 15, 2023		Soil	K23-Au0053441		X						
36	S03 0.6	Aug 15, 2023		Soil	K23-Au0053442		X						
37	S04 0.4	Aug 15, 2023		Soil	K23-Au0053443		X						

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NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	Site# 25079 & 25289
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Auckland Laboratory - IANZ# 1327							X	X	X	X	X		X
Christchurch Laboratory - IANZ# 1290						X						X	
Tauranga Laboratory - IANZ# 1402													
38	S05 0.4	Aug 15, 2023		Soil	K23-Au0053444		X						
39	S06 0.4	Aug 15, 2023		Soil	K23-Au0053445		X						
40	S07 0.4	Aug 15, 2023		Soil	K23-Au0053446		X						
41	S08 0.4	Aug 15, 2023		Soil	K23-Au0053447		X						
42	S09 0.5	Aug 15, 2023		Soil	K23-Au0053448		X						
43	S10 0.5	Aug 15, 2023		Soil	K23-Au0053449		X						
44	S11 0.2	Aug 15, 2023		Soil	K23-Au0053450		X						
45	S11 0.5	Aug 15, 2023		Soil	K23-Au0053451		X						
46	S12 0.5	Aug 15, 2023		Soil	K23-Au0053452		X						
47	S13 0.4	Aug 15, 2023		Soil	K23-Au0053453		X						
48	S14 0.3-0.5	Aug 15, 2023		Soil	K23-Au0053454		X						
49	S15 0.25-0.4	Aug 15, 2023		Soil	K23-Au0053455		X						
50	S16 0.25-0.5	Aug 15, 2023		Soil	K23-Au0053456		X						
51	S17 0.3-0.5	Aug 15, 2023		Soil	K23-Au0053457		X						

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Auckland Laboratory - IANZ# 1327							X	X	X	X	X		X
Christchurch Laboratory - IANZ# 1290						X						X	
Tauranga Laboratory - IANZ# 1402													
52	S18 0.25-0.4	Aug 15, 2023		Soil	K23-Au0053458		X						
53	S19 0.2-0.45	Aug 15, 2023		Soil	K23-Au0053459		X						
54	S20 0.15-0.35	Aug 15, 2023		Soil	K23-Au0053460		X						
55	S21 0.15-0.35	Aug 15, 2023		Soil	K23-Au0053461		X						
56	S22 0.2-0.45	Aug 15, 2023		Soil	K23-Au0053462		X						
57	S23 0.2-0.45	Aug 15, 2023		Soil	K23-Au0053463		X						
58	S24 0.35-0.5	Aug 15, 2023		Soil	K23-Au0053464		X						
59	S25 0.2-0.4	Aug 15, 2023		Soil	K23-Au0053465		X						
60	S26 0.2-0.4	Aug 15, 2023		Soil	K23-Au0053466		X						
61	S27 0.3-0.45	Aug 15, 2023		Soil	K23-Au0053467		X						
62	S28 0.2-0.4	Aug 15, 2023		Soil	K23-Au0053468		X						
63	S29 0.2-0.4	Aug 15, 2023		Soil	K23-Au0053469		X						
64	S30 0.1	Aug 15, 2023		Soil	K23-Au0053470		X						
65	S30 0.4	Aug 15, 2023		Soil	K23-Au0053471		X						

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Auckland Laboratory - IANZ# 1327							X	X	X	X	X		X
Christchurch Laboratory - IANZ# 1290						X						X	
Tauranga Laboratory - IANZ# 1402													
66	S31 0.1	Aug 15, 2023		Soil	K23-Au0053472		X						
67	S31 0.4	Aug 15, 2023		Soil	K23-Au0053473		X						
68	S32 0.1	Aug 15, 2023		Soil	K23-Au0053474		X						
69	S32 0.4	Aug 15, 2023		Soil	K23-Au0053475		X						
70	S33 0.1	Aug 15, 2023		Soil	K23-Au0053476		X						
71	S33 0.4	Aug 15, 2023		Soil	K23-Au0053477		X						
72	S34 0.1	Aug 15, 2023		Soil	K23-Au0053478		X						
73	S34 0.4	Aug 15, 2023		Soil	K23-Au0053479		X						
74	S35 0.1	Aug 15, 2023		Soil	K23-Au0053480		X						
75	S35 0.4	Aug 15, 2023		Soil	K23-Au0053481		X						
76	S36 0.1	Aug 15, 2023		Soil	K23-Au0053482		X						
77	S36 0.3	Aug 15, 2023		Soil	K23-Au0053483		X						
78	PACM	Aug 15, 2023		Building Materials	K23-Au0053484		X						

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Auckland Laboratory - IANZ# 1327		X	X	X	X	X		X
Christchurch Laboratory - IANZ# 1290	X						X	
Tauranga Laboratory - IANZ# 1402								
Test Counts	14	46	32	3	32	4	13	1

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follow guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013. They are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry weight basis unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion unless otherwise stated.
4. For CEC results where the sample's origin is unknown or environmentally contaminated, the results should be used advisedly.
5. Actual LORs are matrix dependent. Quoted LORs may be raised where sample extracts are diluted due to interferences.
6. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
7. SVOC analysis on waters is performed on homogenised, unfiltered samples unless noted otherwise.
8. Samples were analysed on an 'as received' basis.
9. Information identified in this report with blue colour indicates data provided by customers that may have an impact on the results.
10. This report replaces any interim results previously issued.

Holding Times

Please refer to the 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours before sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and despite any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling; therefore, compliance with these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether, the holding time is 7 days; however, for all other VOCs, such as BTEX or C6-10 TRH, the holding time is 14 days.

Units

mg/kg: milligrams per kilogram | **mg/L:** milligrams per litre | **µg/L:** micrograms per litre

ppm: parts per million | **ppb:** parts per billion | **%:** Percentage

org/100 mL: Organisms per 100 millilitres | **NTU:** Nephelometric Turbidity Units | **MPN/100 mL:** Most Probable Number of organisms per 100 millilitres

CFU: Colony forming unit

Terms

APHA	American Public Health Association
CEC	Cation Exchange Capacity
COC	Chain of Custody
CP	Client Parent - QC was performed on samples pertaining to this report
CRM	Certified Reference Material (ISO17034) - reported as percent recovery.
Dry	Where moisture has been determined on a solid sample, the result is expressed on a dry weight basis.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
LOR	Limit of Reporting.
LCS	Laboratory Control Sample - reported as percent recovery.
Method Blank	In the case of solid samples, these are performed on laboratory-certified clean sands and in the case of water samples, these are performed on de-ionised water.
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC represents the sequence or batch that client samples were analysed within.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
SRA	Sample Receipt Advice
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
TBTO	Tributyltin oxide (*bis*-tributyltin oxide) - individual tributyltin compounds cannot be identified separately in the environment; however free tributyltin was measured, and its values were converted stoichiometrically into tributyltin oxide for comparison with regulatory limits.
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Toxic Equivalency Quotient or Total Equivalence
QSM	US Department of Defense Quality Systems Manual Version 5.4
US EPA	United States Environmental Protection Agency
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC - Acceptance Criteria

The acceptance criteria should be used as a guide only and may be different when site-specific Sampling Analysis and Quality Plan (SAQP) have been implemented.

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30%; however the following acceptance guidelines are equally applicable: Results <10 times the LOR: No Limit

Results between 10-20 times the LOR: RPD must lie between 0-50%

Results >20 times the LOR: RPD must lie between 0-30%

NOTE: pH duplicates are reported as a range, not as RPD

Surrogate Recoveries: Recoveries must lie between 20-130% for Speciated Phenols & 50-150% for PFAS. SVOCs recoveries 20 – 150%

PFAS field samples that contain surrogate recoveries above the QC limit designated in QSM 5.4, where no positive PFAS results have been reported, have been reviewed, and no data was affected.

QC Data General Comments

1. Where a result is reported as less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown are not data from your samples.
3. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore, laboratory analysis is unlikely to be completed within holding time.Analysis will begin as soon as possible after sample receipt.
4. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of recovery, the term "INT" appears against that analyte.
5. For Matrix Spikes and LCS results, a dash "-" in the report means that the specific analyte was not added to the QC sample.
6. Duplicate RPDs are calculated from raw analytical data; thus, it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Polycyclic Aromatic Hydrocarbons (NZ MfE)							
Acenaphthene	mg/kg	< 0.03			0.03	Pass	
Acenaphthylene	mg/kg	< 0.03			0.03	Pass	
Anthracene	mg/kg	< 0.03			0.03	Pass	
Benz(a)anthracene	mg/kg	< 0.03			0.03	Pass	
Benzo(a)pyrene	mg/kg	< 0.03			0.03	Pass	
Benzo(b&j)fluoranthene	mg/kg	< 0.03			0.03	Pass	
Benzo(g.h.i)perylene	mg/kg	< 0.03			0.03	Pass	
Benzo(k)fluoranthene	mg/kg	< 0.03			0.03	Pass	
Chrysene	mg/kg	< 0.03			0.03	Pass	
Dibenz(a.h)anthracene	mg/kg	< 0.03			0.03	Pass	
Fluoranthene	mg/kg	< 0.03			0.03	Pass	
Fluorene	mg/kg	< 0.03			0.03	Pass	
Indeno(1.2.3-cd)pyrene	mg/kg	< 0.03			0.03	Pass	
Naphthalene	mg/kg	< 0.1			0.1	Pass	
Phenanthrene	mg/kg	< 0.03			0.03	Pass	
Pyrene	mg/kg	< 0.03			0.03	Pass	
Method Blank							
Metals M8 (NZ MfE)							
Arsenic	mg/kg	< 0.1			0.1	Pass	
Cadmium	mg/kg	0.01			0.01	Pass	
Chromium	mg/kg	< 0.1			0.1	Pass	
Copper	mg/kg	< 0.1			0.1	Pass	
Lead	mg/kg	< 0.1			0.1	Pass	
Mercury	mg/kg	< 0.01			0.01	Pass	
Nickel	mg/kg	< 0.1			0.1	Pass	
Zinc	mg/kg	< 5			5	Pass	
Method Blank							
Organochlorine Pesticides (NZ MfE)							
2.4'-DDD	mg/kg	< 0.01			0.01	Pass	
2.4'-DDE	mg/kg	< 0.01			0.01	Pass	
2.4'-DDT	mg/kg	< 0.01			0.01	Pass	
4.4'-DDD	mg/kg	< 0.01			0.01	Pass	
4.4'-DDE	mg/kg	< 0.01			0.01	Pass	
4.4'-DDT	mg/kg	< 0.01			0.01	Pass	
a-HCH	mg/kg	< 0.01			0.01	Pass	
Aldrin	mg/kg	< 0.01			0.01	Pass	
b-HCH	mg/kg	< 0.01			0.01	Pass	
Chlordanes - Total	mg/kg	-			0.01	N/A	
cis-Chlordane	mg/kg	< 0.01			0.01	Pass	
d-HCH	mg/kg	< 0.01			0.01	Pass	
Dieldrin	mg/kg	< 0.01			0.01	Pass	
Endosulfan I	mg/kg	< 0.01			0.01	Pass	
Endosulfan II	mg/kg	< 0.01			0.01	Pass	
Endosulfan sulphate	mg/kg	< 0.01			0.01	Pass	
Endrin	mg/kg	< 0.01			0.01	Pass	
Endrin aldehyde	mg/kg	< 0.01			0.01	Pass	
Endrin ketone	mg/kg	< 0.01			0.01	Pass	
g-HCH (Lindane)	mg/kg	< 0.01			0.01	Pass	
Heptachlor	mg/kg	< 0.01			0.01	Pass	
Heptachlor epoxide	mg/kg	< 0.01			0.01	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Hexachlorobenzene	mg/kg	< 0.01			0.01	Pass	
Methoxychlor	mg/kg	< 0.01			0.01	Pass	
Toxaphene	mg/kg	< 0.5			0.5	Pass	
trans-Chlordane	mg/kg	< 0.01			0.01	Pass	
Method Blank							
Semivolatile Organics							
1-Chloronaphthalene	mg/kg	< 0.5			0.5	Pass	
1-Naphthylamine	mg/kg	< 0.5			0.5	Pass	
1.2-Dichlorobenzene	mg/kg	< 0.5			0.5	Pass	
1.2.3-Trichlorobenzene	mg/kg	< 0.5			0.5	Pass	
1.2.3.4-Tetrachlorobenzene	mg/kg	< 0.5			0.5	Pass	
1.2.3.5-Tetrachlorobenzene	mg/kg	< 0.5			0.5	Pass	
1.2.4-Trichlorobenzene	mg/kg	< 0.5			0.5	Pass	
1.2.4.5-Tetrachlorobenzene	mg/kg	< 0.5			0.5	Pass	
1.3-Dichlorobenzene	mg/kg	< 0.5			0.5	Pass	
1.3.5-Trichlorobenzene	mg/kg	< 0.5			0.5	Pass	
1.4-Dichlorobenzene	mg/kg	< 0.5			0.5	Pass	
2-Chloronaphthalene	mg/kg	< 0.5			0.5	Pass	
2-Chlorophenol	mg/kg	< 0.5			0.5	Pass	
2-Methyl-4.6-dinitrophenol	mg/kg	< 5			5	Pass	
2-Methylnaphthalene	mg/kg	< 0.5			0.5	Pass	
2-Methylphenol (o-Cresol)	mg/kg	< 0.2			0.2	Pass	
2-Naphthylamine	mg/kg	< 0.5			0.5	Pass	
2-Nitroaniline	mg/kg	< 0.5			0.5	Pass	
2-Nitrophenol	mg/kg	< 1			1	Pass	
2-Picoline	mg/kg	< 0.5			0.5	Pass	
2.3.4.6-Tetrachlorophenol	mg/kg	< 5			5	Pass	
2.4-Dichlorophenol	mg/kg	< 0.5			0.5	Pass	
2.4-Dimethylphenol	mg/kg	< 0.5			0.5	Pass	
2.4-Dinitrophenol	mg/kg	< 5			5	Pass	
2.4-Dinitrotoluene	mg/kg	< 0.5			0.5	Pass	
2.4.5-Trichlorophenol	mg/kg	< 1			1	Pass	
2.4.6-Trichlorophenol	mg/kg	< 1			1	Pass	
2.6-Dichlorophenol	mg/kg	< 0.5			0.5	Pass	
2.6-Dinitrotoluene	mg/kg	< 0.5			0.5	Pass	
3&4-Methylphenol (m&p-Cresol)	mg/kg	< 0.4			0.4	Pass	
3-Methylcholanthrene	mg/kg	< 0.5			0.5	Pass	
3.3'-Dichlorobenzidine	mg/kg	< 0.5			0.5	Pass	
4-Aminobiphenyl	mg/kg	< 0.5			0.5	Pass	
4-Bromophenyl phenyl ether	mg/kg	< 0.5			0.5	Pass	
4-Chloro-3-methylphenol	mg/kg	< 1			1	Pass	
4-Chlorophenyl phenyl ether	mg/kg	< 0.5			0.5	Pass	
4-Nitrophenol	mg/kg	< 5			5	Pass	
4.4'-DDD	mg/kg	< 0.01			0.01	Pass	
4.4'-DDE	mg/kg	< 0.01			0.01	Pass	
4.4'-DDT	mg/kg	< 0.01			0.01	Pass	
7.12-Dimethylbenz(a)anthracene	mg/kg	< 0.5			0.5	Pass	
a-HCH	mg/kg	< 0.01			0.01	Pass	
Acenaphthene	mg/kg	< 0.03			0.03	Pass	
Acenaphthylene	mg/kg	< 0.03			0.03	Pass	
Acetophenone	mg/kg	< 0.5			0.5	Pass	
Aldrin	mg/kg	< 0.01			0.01	Pass	
Aniline	mg/kg	< 0.5			0.5	Pass	
Anthracene	mg/kg	< 0.03			0.03	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
b-HCH	mg/kg	< 0.01			0.01	Pass	
Benz(a)anthracene	mg/kg	< 0.03			0.03	Pass	
Benzo(a)pyrene	mg/kg	< 0.03			0.03	Pass	
Benzo(b&j)fluoranthene	mg/kg	< 0.03			0.03	Pass	
Benzo(g.h.i)perylene	mg/kg	< 0.03			0.03	Pass	
Benzo(k)fluoranthene	mg/kg	< 0.03			0.03	Pass	
Benzyl chloride	mg/kg	< 0.5			0.5	Pass	
Bis(2-chloroethoxy)methane	mg/kg	< 0.5			0.5	Pass	
Bis(2-chloroisopropyl)ether	mg/kg	< 0.5			0.5	Pass	
Bis(2-ethylhexyl)phthalate	mg/kg	< 0.5			0.5	Pass	
Butyl benzyl phthalate	mg/kg	< 0.5			0.5	Pass	
Chrysene	mg/kg	< 0.03			0.03	Pass	
d-HCH	mg/kg	< 0.01			0.01	Pass	
Di-n-butyl phthalate	mg/kg	< 0.5			0.5	Pass	
Di-n-octyl phthalate	mg/kg	< 0.5			0.5	Pass	
Dibenz(a.h)anthracene	mg/kg	< 0.03			0.03	Pass	
Dibenz(a.j)acridine	mg/kg	< 0.5			0.5	Pass	
Dibenzofuran	mg/kg	< 0.5			0.5	Pass	
Dieldrin	mg/kg	< 0.01			0.01	Pass	
Diethyl phthalate	mg/kg	< 0.5			0.5	Pass	
Dimethyl phthalate	mg/kg	< 0.5			0.5	Pass	
Dimethylaminoazobenzene	mg/kg	< 0.5			0.5	Pass	
Diphenylamine	mg/kg	< 0.5			0.5	Pass	
Endosulfan I	mg/kg	< 0.01			0.01	Pass	
Endosulfan II	mg/kg	< 0.01			0.01	Pass	
Endosulfan sulphate	mg/kg	< 0.01			0.01	Pass	
Endrin	mg/kg	< 0.01			0.01	Pass	
Endrin aldehyde	mg/kg	< 0.01			0.01	Pass	
Endrin ketone	mg/kg	< 0.01			0.01	Pass	
Fluoranthene	mg/kg	< 0.03			0.03	Pass	
Fluorene	mg/kg	< 0.03			0.03	Pass	
g-HCH (Lindane)	mg/kg	< 0.01			0.01	Pass	
Heptachlor	mg/kg	< 0.01			0.01	Pass	
Heptachlor epoxide	mg/kg	< 0.01			0.01	Pass	
Hexachlorobenzene	mg/kg	< 0.01			0.01	Pass	
Hexachlorobutadiene	mg/kg	< 0.5			0.5	Pass	
Hexachlorocyclopentadiene	mg/kg	< 0.5			0.5	Pass	
Hexachloroethane	mg/kg	< 0.5			0.5	Pass	
Indeno(1.2.3-cd)pyrene	mg/kg	< 0.03			0.03	Pass	
Methoxychlor	mg/kg	< 0.01			0.01	Pass	
N-Nitrosodibutylamine	mg/kg	< 0.5			0.5	Pass	
N-Nitrosodipropylamine	mg/kg	< 0.5			0.5	Pass	
N-Nitrosopiperidine	mg/kg	< 0.5			0.5	Pass	
Naphthalene	mg/kg	< 0.1			0.1	Pass	
Nitrobenzene	mg/kg	< 0.5			0.5	Pass	
Pentachlorobenzene	mg/kg	< 0.5			0.5	Pass	
Pentachloronitrobenzene	mg/kg	< 0.5			0.5	Pass	
Pentachlorophenol	mg/kg	< 1			1	Pass	
Phenanthrene	mg/kg	< 0.03			0.03	Pass	
Phenol	mg/kg	< 0.5			0.5	Pass	
Pronamide	mg/kg	< 0.5			0.5	Pass	
Pyrene	mg/kg	< 0.03			0.03	Pass	
Trifluralin	mg/kg	< 0.5			0.5	Pass	
LCS - % Recovery							

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Polycyclic Aromatic Hydrocarbons (NZ MfE)							
Acenaphthene	%	111			70-130	Pass	
Acenaphthylene	%	115			70-130	Pass	
Anthracene	%	98			70-130	Pass	
Benz(a)anthracene	%	114			70-130	Pass	
Benzo(a)pyrene	%	101			70-130	Pass	
Benzo(b&j)fluoranthene	%	86			70-130	Pass	
Benzo(g.h.i)perylene	%	114			70-130	Pass	
Benzo(k)fluoranthene	%	118			70-130	Pass	
Chrysene	%	119			70-130	Pass	
Dibenz(a.h)anthracene	%	104			70-130	Pass	
Fluoranthene	%	93			70-130	Pass	
Fluorene	%	108			70-130	Pass	
Indeno(1.2.3-cd)pyrene	%	106			70-130	Pass	
Naphthalene	%	116			70-130	Pass	
Phenanthrene	%	104			70-130	Pass	
Pyrene	%	101			70-130	Pass	
LCS - % Recovery							
Metals M8 (NZ MfE)							
Arsenic	%	98			80-120	Pass	
Cadmium	%	98			80-120	Pass	
Chromium	%	93			80-120	Pass	
Copper	%	93			80-120	Pass	
Lead	%	95			80-120	Pass	
Mercury	%	93			80-120	Pass	
Nickel	%	93			80-120	Pass	
Zinc	%	87			80-120	Pass	
LCS - % Recovery							
Organochlorine Pesticides (NZ MfE)							
2.4'-DDD	%	107			70-130	Pass	
2.4'-DDE	%	94			70-130	Pass	
2.4'-DDT	%	99			70-130	Pass	
4.4'-DDD	%	111			70-130	Pass	
4.4'-DDE	%	70			70-130	Pass	
4.4'-DDT	%	73			70-130	Pass	
a-HCH	%	76			70-130	Pass	
Aldrin	%	85			70-130	Pass	
b-HCH	%	71			70-130	Pass	
Chlordanes - Total	%	77			70-130	Pass	
cis-Chlordane	%	98			70-130	Pass	
d-HCH	%	92			70-130	Pass	
Dieldrin	%	75			70-130	Pass	
Endosulfan I	%	86			70-130	Pass	
Endosulfan II	%	93			70-130	Pass	
Endosulfan sulphate	%	86			70-130	Pass	
Endrin	%	70			70-130	Pass	
Endrin aldehyde	%	81			70-130	Pass	
Endrin ketone	%	83			70-130	Pass	
g-HCH (Lindane)	%	72			70-130	Pass	
Heptachlor	%	86			70-130	Pass	
Heptachlor epoxide	%	75			70-130	Pass	
Hexachlorobenzene	%	76			70-130	Pass	
Methoxychlor	%	75			70-130	Pass	
Toxaphene	%	106			70-130	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
trans-Chlordane	%	97			70-130	Pass	
LCS - % Recovery							
Semivolatile Organics							
1-Chloronaphthalene	%	97			70-130	Pass	
1-Naphthylamine	%	79			70-130	Pass	
1.2-Dichlorobenzene	%	91			70-130	Pass	
1.2.3-Trichlorobenzene	%	91			70-130	Pass	
1.2.3.4-Tetrachlorobenzene	%	87			70-130	Pass	
1.2.3.5-Tetrachlorobenzene	%	87			70-130	Pass	
1.2.4-Trichlorobenzene	%	94			70-130	Pass	
1.2.4.5-Tetrachlorobenzene	%	87			70-130	Pass	
1.3-Dichlorobenzene	%	94			70-130	Pass	
1.3.5-Trichlorobenzene	%	91			70-130	Pass	
1.4-Dichlorobenzene	%	96			70-130	Pass	
2-Chloronaphthalene	%	79			70-130	Pass	
2-Chlorophenol	%	84			25-130	Pass	
2-Methyl-4.6-dinitrophenol	%	91			25-130	Pass	
2-Methylnaphthalene	%	92			70-130	Pass	
2-Methylphenol (o-Cresol)	%	82			25-130	Pass	
2-Nitroaniline	%	88			70-130	Pass	
2-Nitrophenol	%	117			25-130	Pass	
2-Picoline	%	97			70-130	Pass	
2.3.4.6-Tetrachlorophenol	%	77			70-130	Pass	
2.4-Dichlorophenol	%	84			25-130	Pass	
2.4-Dimethylphenol	%	75			25-130	Pass	
2.4-Dinitrophenol	%	114			25-130	Pass	
2.4-Dinitrotoluene	%	91			70-130	Pass	
2.4.5-Trichlorophenol	%	77			25-130	Pass	
2.4.6-Trichlorophenol	%	76			25-130	Pass	
2.6-Dichlorophenol	%	73			25-130	Pass	
2.6-Dinitrotoluene	%	98			70-130	Pass	
3&4-Methylphenol (m&p-Cresol)	%	80			25-130	Pass	
3-Methylcholanthrene	%	123			70-130	Pass	
3.3'-Dichlorobenzidine	%	104			70-130	Pass	
4-Aminobiphenyl	%	83			70-130	Pass	
4-Bromophenyl phenyl ether	%	83			70-130	Pass	
4-Chloro-3-methylphenol	%	73			25-130	Pass	
4-Chlorophenyl phenyl ether	%	87			70-130	Pass	
4.4'-DDD	%	120			70-130	Pass	
4.4'-DDE	%	91			70-130	Pass	
7.12-Dimethylbenz(a)anthracene	%	126			70-130	Pass	
a-HCH	%	102			70-130	Pass	
Acenaphthene	%	76			70-130	Pass	
Acenaphthylene	%	77			70-130	Pass	
Acetophenone	%	89			70-130	Pass	
Aniline	%	100			70-130	Pass	
b-HCH	%	98			70-130	Pass	
Benz(a)anthracene	%	78			70-130	Pass	
Benzo(a)pyrene	%	72			70-130	Pass	
Benzo(b&j)fluoranthene	%	78			70-130	Pass	
Benzo(g.h.i)perylene	%	78			70-130	Pass	
Benzo(k)fluoranthene	%	70			70-130	Pass	
Benzyl chloride	%	90			70-130	Pass	
Bis(2-chloroethoxy)methane	%	93			70-130	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Bis(2-chloroisopropyl)ether	%	101			70-130	Pass	
Bis(2-ethylhexyl)phthalate	%	78			70-130	Pass	
Butyl benzyl phthalate	%	128			70-130	Pass	
Chrysene	%	81			70-130	Pass	
Di-n-butyl phthalate	%	89			70-130	Pass	
Di-n-octyl phthalate	%	85			70-130	Pass	
Dibenz(a.h)anthracene	%	74			70-130	Pass	
Dibenz(a.j)acridine	%	71			70-130	Pass	
Dibenzofuran	%	89			70-130	Pass	
Dieldrin	%	92			70-130	Pass	
Diethyl phthalate	%	92			70-130	Pass	
Dimethyl phthalate	%	92			70-130	Pass	
Dimethylaminoazobenzene	%	127			70-130	Pass	
Diphenylamine	%	76			70-130	Pass	
Endrin	%	85			70-130	Pass	
Endrin ketone	%	120			70-130	Pass	
Fluoranthene	%	70			70-130	Pass	
Fluorene	%	73			70-130	Pass	
g-HCH (Lindane)	%	95			70-130	Pass	
Heptachlor	%	115			70-130	Pass	
Heptachlor epoxide	%	93			70-130	Pass	
Hexachlorobenzene	%	84			70-130	Pass	
Hexachlorobutadiene	%	88			70-130	Pass	
Hexachlorocyclopentadiene	%	94			70-130	Pass	
Hexachloroethane	%	92			70-130	Pass	
Indeno(1.2.3-cd)pyrene	%	72			70-130	Pass	
Methoxychlor	%	78			70-130	Pass	
N-Nitrosodibutylamine	%	96			70-130	Pass	
N-Nitrosodipropylamine	%	101			70-130	Pass	
N-Nitrosopiperidine	%	96			70-130	Pass	
Naphthalene	%	81			70-130	Pass	
Nitrobenzene	%	97			70-130	Pass	
Pentachlorobenzene	%	87			70-130	Pass	
Pentachloronitrobenzene	%	96			70-130	Pass	
Pentachlorophenol	%	78			25-130	Pass	
Phenol	%	83			25-130	Pass	
Pronamide	%	82			70-130	Pass	
Pyrene	%	70			70-130	Pass	
Trifluralin	%	97			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Polycyclic Aromatic Hydrocarbons (NZ MfE)				Result 1					
Anthracene	K23-Au0045632	NCP	%	72			70-130	Pass	
Spike - % Recovery									
Polycyclic Aromatic Hydrocarbons (NZ MfE)				Result 1					
Acenaphthene	K23-Au0053408	CP	%	101			70-130	Pass	
Acenaphthylene	K23-Au0053408	CP	%	105			70-130	Pass	
Benz(a)anthracene	K23-Au0053408	CP	%	101			70-130	Pass	
Benzo(a)pyrene	K23-Au0053408	CP	%	114			70-130	Pass	
Benzo(b&j)fluoranthene	K23-Au0053408	CP	%	115			70-130	Pass	
Benzo(g.h.i)perylene	K23-Au0053408	CP	%	120			70-130	Pass	
Benzo(k)fluoranthene	K23-Au0053408	CP	%	84			70-130	Pass	
Chrysene	K23-Au0053408	CP	%	116			70-130	Pass	
Dibenz(a.h)anthracene	K23-Au0053408	CP	%	116			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Fluoranthene	K23-Au0053408	CP	%	84			70-130	Pass	
Fluorene	K23-Au0053408	CP	%	89			70-130	Pass	
Indeno(1.2.3-cd)pyrene	K23-Au0053408	CP	%	113			70-130	Pass	
Naphthalene	K23-Au0053408	CP	%	107			70-130	Pass	
Phenanthrene	K23-Au0053408	CP	%	72			70-130	Pass	
Pyrene	K23-Au0053408	CP	%	90			70-130	Pass	
Spike - % Recovery									
Organochlorine Pesticides (NZ MfE)				Result 1					
2.4'-DDD	K23-Au0035644	NCP	%	89			70-130	Pass	
2.4'-DDE	K23-Au0035644	NCP	%	78			70-130	Pass	
2.4'-DDT	K23-Au0035644	NCP	%	83			70-130	Pass	
4.4'-DDD	K23-Au0035644	NCP	%	117			70-130	Pass	
4.4'-DDE	K23-Au0035644	NCP	%	76			70-130	Pass	
4.4'-DDT	Z23-Au0014481	NCP	%	117			70-130	Pass	
a-HCH	K23-Au0035644	NCP	%	84			70-130	Pass	
Aldrin	K23-Au0035644	NCP	%	72			70-130	Pass	
b-HCH	K23-Au0035644	NCP	%	85			70-130	Pass	
cis-Chlordane	K23-Au0035644	NCP	%	83			70-130	Pass	
d-HCH	K23-Au0035644	NCP	%	76			70-130	Pass	
Dieldrin	K23-Au0035644	NCP	%	92			70-130	Pass	
Endosulfan I	K23-Au0035644	NCP	%	71			70-130	Pass	
Endosulfan II	K23-Au0035644	NCP	%	78			70-130	Pass	
Endosulfan sulphate	K23-Au0035644	NCP	%	71			70-130	Pass	
Endrin	K23-Au0035644	NCP	%	80			70-130	Pass	
Endrin ketone	K23-Au0035644	NCP	%	99			70-130	Pass	
g-HCH (Lindane)	K23-Au0035644	NCP	%	81			70-130	Pass	
Heptachlor	K23-Au0035644	NCP	%	96			70-130	Pass	
Heptachlor epoxide	K23-Au0035644	NCP	%	82			70-130	Pass	
Hexachlorobenzene	K23-Au0035644	NCP	%	86			70-130	Pass	
Methoxychlor	K23-Au0035644	NCP	%	75			70-130	Pass	
trans-Chlordane	K23-Au0035644	NCP	%	83			70-130	Pass	
Spike - % Recovery									
Metals M8 (NZ MfE)				Result 1					
Arsenic	K23-Au0053413	CP	%	101			75-125	Pass	
Chromium	K23-Au0053413	CP	%	105			75-125	Pass	
Copper	K23-Au0053413	CP	%	119			75-125	Pass	
Lead	K23-Au0053413	CP	%	114			75-125	Pass	
Mercury	K23-Au0053413	CP	%	120			75-125	Pass	
Nickel	K23-Au0053413	CP	%	108			75-125	Pass	
Zinc	K23-Au0053413	CP	%	112			75-125	Pass	
Spike - % Recovery									
Metals M8 (NZ MfE)				Result 1					
Arsenic	K23-Au0053423	CP	%	96			75-125	Pass	
Chromium	K23-Au0053423	CP	%	102			75-125	Pass	
Lead	K23-Au0053423	CP	%	115			75-125	Pass	
Nickel	K23-Au0053423	CP	%	106			75-125	Pass	
Zinc	K23-Au0053423	CP	%	110			75-125	Pass	
Spike - % Recovery									
Metals M8 (NZ MfE)				Result 1					
Arsenic	K23-Au0053433	CP	%	94			75-125	Pass	
Chromium	K23-Au0053433	CP	%	97			75-125	Pass	
Copper	K23-Au0053433	CP	%	110			75-125	Pass	
Lead	K23-Au0053433	CP	%	104			75-125	Pass	
Nickel	K23-Au0053433	CP	%	109			75-125	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Semivolatile Organics				Result 1					
1-Chloronaphthalene	K23-Au0028713	NCP	%	98			70-130	Pass	
1.2-Dichlorobenzene	K23-Au0028713	NCP	%	97			70-130	Pass	
1.2.3-Trichlorobenzene	K23-Au0028713	NCP	%	95			70-130	Pass	
1.2.3.4-Tetrachlorobenzene	K23-Au0028713	NCP	%	91			70-130	Pass	
1.2.3.5-Tetrachlorobenzene	K23-Au0028713	NCP	%	90			70-130	Pass	
1.2.4-Trichlorobenzene	K23-Au0028713	NCP	%	97			70-130	Pass	
1.2.4.5-Tetrachlorobenzene	K23-Au0028713	NCP	%	92			70-130	Pass	
1.3-Dichlorobenzene	K23-Au0028713	NCP	%	98			70-130	Pass	
1.3.5-Trichlorobenzene	K23-Au0028713	NCP	%	96			70-130	Pass	
1.4-Dichlorobenzene	K23-Au0028713	NCP	%	97			70-130	Pass	
2-Chloronaphthalene	K23-Au0028713	NCP	%	85			70-130	Pass	
2-Chlorophenol	K23-Au0028713	NCP	%	84			70-130	Pass	
2-Methylnaphthalene	K23-Au0028713	NCP	%	95			70-130	Pass	
2-Methylphenol (o-Cresol)	K23-Au0028713	NCP	%	74			70-130	Pass	
2-Nitrophenol	K23-Au0028713	NCP	%	97			70-130	Pass	
2.4-Dinitrophenol	K23-Au0028713	NCP	%	126			70-130	Pass	
3&4-Methylphenol (m&p-Cresol)	K23-Au0028713	NCP	%	76			70-130	Pass	
4-Bromophenyl phenyl ether	K23-Au0028713	NCP	%	75			70-130	Pass	
4-Chlorophenyl phenyl ether	K23-Au0028713	NCP	%	84			70-130	Pass	
7.12-Dimethylbenz(a)anthracene	K23-Au0029976	NCP	%	70			70-130	Pass	
Acetophenone	K23-Au0028713	NCP	%	93			70-130	Pass	
Benzyl chloride	K23-Au0028713	NCP	%	91			70-130	Pass	
Bis(2-chloroethoxy)methane	K23-Au0028713	NCP	%	92			70-130	Pass	
Bis(2-chloroisopropyl)ether	K23-Au0028713	NCP	%	103			70-130	Pass	
Bis(2-ethylhexyl)phthalate	K23-Au0028713	NCP	%	72			70-130	Pass	
Butyl benzyl phthalate	K23-Au0028713	NCP	%	111			70-130	Pass	
Di-n-butyl phthalate	K23-Au0028713	NCP	%	80			70-130	Pass	
Di-n-octyl phthalate	K23-Au0028713	NCP	%	72			70-130	Pass	
Dibenzofuran	K23-Au0028713	NCP	%	89			70-130	Pass	
Diethyl phthalate	K23-Au0028713	NCP	%	84			70-130	Pass	
Dimethyl phthalate	K23-Au0028713	NCP	%	71			70-130	Pass	
Hexachlorobutadiene	K23-Au0028713	NCP	%	89			70-130	Pass	
Hexachlorocyclopentadiene	K23-Au0028713	NCP	%	79			70-130	Pass	
Hexachloroethane	K23-Au0028713	NCP	%	89			70-130	Pass	
N-Nitrosodibutylamine	K23-Au0028713	NCP	%	74			70-130	Pass	
N-Nitrosodipropylamine	K23-Au0028713	NCP	%	93			70-130	Pass	
N-Nitrosopiperidine	K23-Au0028713	NCP	%	92			70-130	Pass	
Nitrobenzene	K23-Au0028713	NCP	%	98			70-130	Pass	
Pentachlorobenzene	K23-Au0028713	NCP	%	84			70-130	Pass	
Pentachloronitrobenzene	K23-Au0028713	NCP	%	87			70-130	Pass	
Phenol	K23-Au0028713	NCP	%	80			70-130	Pass	
Trifluralin	K23-Au0028713	NCP	%	84			70-130	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
Polycyclic Aromatic Hydrocarbons (NZ MfE)				Result 1	Result 2	RPD			
Acenaphthene	K23-Au0053407	CP	mg/kg	< 0.03	< 0.03	<1	30%	Pass	
Acenaphthylene	K23-Au0053407	CP	mg/kg	< 0.03	< 0.03	<1	30%	Pass	
Anthracene	K23-Au0053407	CP	mg/kg	< 0.03	< 0.03	<1	30%	Pass	
Benz(a)anthracene	K23-Au0053407	CP	mg/kg	< 0.03	< 0.03	<1	30%	Pass	
Benzo(a)pyrene	K23-Au0053407	CP	mg/kg	< 0.03	< 0.03	<1	30%	Pass	
Benzo(b&j)fluoranthene	K23-Au0053407	CP	mg/kg	< 0.03	< 0.03	<1	30%	Pass	
Benzo(g.h.i)perylene	K23-Au0053407	CP	mg/kg	< 0.03	< 0.03	<1	30%	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
Polycyclic Aromatic Hydrocarbons (NZ MfE)				Result 1	Result 2	RPD			
Benzo(k)fluoranthene	K23-Au0053407	CP	mg/kg	< 0.03	< 0.03	<1	30%	Pass	
Chrysene	K23-Au0053407	CP	mg/kg	< 0.03	< 0.03	<1	30%	Pass	
Dibenz(a.h)anthracene	K23-Au0053407	CP	mg/kg	< 0.03	< 0.03	<1	30%	Pass	
Fluoranthene	K23-Au0053407	CP	mg/kg	< 0.03	< 0.03	<1	30%	Pass	
Fluorene	K23-Au0053407	CP	mg/kg	< 0.03	< 0.03	<1	30%	Pass	
Indeno(1.2.3-cd)pyrene	K23-Au0053407	CP	mg/kg	< 0.03	< 0.03	<1	30%	Pass	
Naphthalene	K23-Au0053407	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Phenanthrene	K23-Au0053407	CP	mg/kg	< 0.03	< 0.03	<1	30%	Pass	
Pyrene	K23-Au0053407	CP	mg/kg	< 0.03	< 0.03	<1	30%	Pass	
Duplicate									
Metals M8 (NZ MfE)				Result 1	Result 2	RPD			
Arsenic	K23-Au0053412	CP	mg/kg	3.3	3.5	6.9	30%	Pass	
Cadmium	K23-Au0053412	CP	mg/kg	0.28	0.30	6.6	30%	Pass	
Chromium	K23-Au0053412	CP	mg/kg	8.2	9.0	9.1	30%	Pass	
Copper	K23-Au0053412	CP	mg/kg	10	12	13	30%	Pass	
Lead	K23-Au0053412	CP	mg/kg	26	28	7.7	30%	Pass	
Mercury	K23-Au0053412	CP	mg/kg	0.06	0.09	45	30%	Fail	Q15
Nickel	K23-Au0053412	CP	mg/kg	2.2	2.7	19	30%	Pass	
Zinc	K23-Au0053412	CP	mg/kg	160	180	9.3	30%	Pass	
Duplicate									
Sample Properties				Result 1	Result 2	RPD			
% Moisture	K23-Au0053412	CP	%	37	39	7.3	30%	Pass	
Duplicate									
Sample Properties				Result 1	Result 2	RPD			
% Moisture	K23-Au0053418	CP	%	43	41	3.8	30%	Pass	
Duplicate									
Metals M8 (NZ MfE)				Result 1	Result 2	RPD			
Arsenic	K23-Au0053422	CP	mg/kg	7.5	9.8	26	30%	Pass	
Cadmium	K23-Au0053422	CP	mg/kg	0.45	0.55	19	30%	Pass	
Chromium	K23-Au0053422	CP	mg/kg	7.0	9.0	25	30%	Pass	
Copper	K23-Au0053422	CP	mg/kg	18	24	27	30%	Pass	
Lead	K23-Au0053422	CP	mg/kg	210	270	23	30%	Pass	
Mercury	K23-Au0053422	CP	mg/kg	0.09	0.14	37	30%	Fail	Q15
Nickel	K23-Au0053422	CP	mg/kg	3.3	4.2	26	30%	Pass	
Zinc	K23-Au0053422	CP	mg/kg	140	170	20	30%	Pass	
Duplicate									
Sample Properties				Result 1	Result 2	RPD			
% Moisture	K23-Au0053428	CP	%	29	28	2.5	30%	Pass	
Duplicate									
Metals M8 (NZ MfE)				Result 1	Result 2	RPD			
Arsenic	K23-Au0053432	CP	mg/kg	9.3	9.8	5.9	30%	Pass	
Cadmium	K23-Au0053432	CP	mg/kg	0.14	0.15	5.8	30%	Pass	
Chromium	K23-Au0053432	CP	mg/kg	15	15	2.0	30%	Pass	
Copper	K23-Au0053432	CP	mg/kg	21	20	3.7	30%	Pass	
Lead	K23-Au0053432	CP	mg/kg	55	54	3.2	30%	Pass	
Mercury	K23-Au0053432	CP	mg/kg	0.09	0.08	16	30%	Pass	
Nickel	K23-Au0053432	CP	mg/kg	7.4	7.7	3.4	30%	Pass	
Zinc	K23-Au0053432	CP	mg/kg	91	88	3.0	30%	Pass	

Duplicate									
Polycyclic Aromatic Hydrocarbons (NZ MfE)				Result 1	Result 2	RPD			
Acenaphthene	K23-Au0053436	CP	mg/kg	< 0.03	< 0.03	<1	30%	Pass	
Acenaphthylene	K23-Au0053436	CP	mg/kg	< 0.03	< 0.03	<1	30%	Pass	
Anthracene	K23-Au0053436	CP	mg/kg	< 0.03	< 0.03	<1	30%	Pass	
Benz(a)anthracene	K23-Au0053436	CP	mg/kg	0.05	0.04	33	30%	Fail	Q15
Benzo(a)pyrene	K23-Au0053436	CP	mg/kg	0.06	0.04	31	30%	Fail	Q15
Benzo(b&j)fluoranthene	K23-Au0053436	CP	mg/kg	< 0.03	< 0.03	<1	30%	Pass	
Benzo(g.h.i)perylene	K23-Au0053436	CP	mg/kg	0.04	< 0.03	49	30%	Fail	Q15
Benzo(k)fluoranthene	K23-Au0053436	CP	mg/kg	0.03	< 0.03	12	30%	Pass	
Chrysene	K23-Au0053436	CP	mg/kg	0.06	0.05	30	30%	Pass	
Dibenz(a.h)anthracene	K23-Au0053436	CP	mg/kg	< 0.03	< 0.03	<1	30%	Pass	
Fluoranthene	K23-Au0053436	CP	mg/kg	0.08	0.07	14	30%	Pass	
Fluorene	K23-Au0053436	CP	mg/kg	< 0.03	< 0.03	<1	30%	Pass	
Indeno(1.2.3-cd)pyrene	K23-Au0053436	CP	mg/kg	< 0.03	< 0.03	<1	30%	Pass	
Naphthalene	K23-Au0053436	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Phenanthrene	K23-Au0053436	CP	mg/kg	0.03	0.05	40	30%	Fail	Q15
Pyrene	K23-Au0053436	CP	mg/kg	0.10	0.08	22	30%	Pass	
Duplicate									
Organochlorine Pesticides (NZ MfE)				Result 1	Result 2	RPD			
2.4'-DDD	K23-Au0053436	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
2.4'-DDE	K23-Au0053436	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
2.4'-DDT	K23-Au0053436	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
4.4'-DDD	K23-Au0053436	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
4.4'-DDE	K23-Au0053436	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
4.4'-DDT	K23-Au0053436	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
a-HCH	K23-Au0053436	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
Aldrin	K23-Au0053436	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
b-HCH	K23-Au0053436	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
cis-Chlordane	K23-Au0053436	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
d-HCH	K23-Au0053436	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
Dieldrin	K23-Au0053436	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
Endosulfan I	K23-Au0053436	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
Endosulfan II	K23-Au0053436	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
Endosulfan sulphate	K23-Au0053436	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
Endrin	K23-Au0053436	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
Endrin aldehyde	K23-Au0053436	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
Endrin ketone	K23-Au0053436	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
g-HCH (Lindane)	K23-Au0053436	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
Heptachlor	K23-Au0053436	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
Heptachlor epoxide	K23-Au0053436	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
Hexachlorobenzene	K23-Au0053436	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
Methoxychlor	K23-Au0053436	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
Toxaphene	K23-Au0053436	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
trans-Chlordane	K23-Au0053436	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
Duplicate									
Semivolatile Organics				Result 1	Result 2	RPD			
1-Chloronaphthalene	K23-Au0053436	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1-Naphthylamine	K23-Au0053436	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.2-Dichlorobenzene	K23-Au0053436	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.2.3-Trichlorobenzene	K23-Au0053436	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.2.3.4-Tetrachlorobenzene	K23-Au0053436	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.2.3.5-Tetrachlorobenzene	K23-Au0053436	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.2.4-Trichlorobenzene	K23-Au0053436	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.2.4.5-Tetrachlorobenzene	K23-Au0053436	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.3-Dichlorobenzene	K23-Au0053436	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	

Duplicate									
Semivolatile Organics				Result 1	Result 2	RPD			
1.3.5-Trichlorobenzene	K23-Au0053436	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.4-Dichlorobenzene	K23-Au0053436	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
2-Chloronaphthalene	K23-Au0053436	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
2-Chlorophenol	K23-Au0053436	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
2-Methyl-4.6-dinitrophenol	K23-Au0053436	CP	mg/kg	< 5	< 5	<1	30%	Pass	
2-Methylnaphthalene	K23-Au0053436	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
2-Methylphenol (o-Cresol)	K23-Au0053436	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
2-Naphthylamine	K23-Au0053436	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
2-Nitroaniline	K23-Au0053436	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
2-Nitrophenol	K23-Au0053436	CP	mg/kg	< 1	< 1	<1	30%	Pass	
2-Picoline	K23-Au0053436	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
2.3.4.6-Tetrachlorophenol	K23-Au0053436	CP	mg/kg	< 5	< 5	<1	30%	Pass	
2.4-Dichlorophenol	K23-Au0053436	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
2.4-Dimethylphenol	K23-Au0053436	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
2.4-Dinitrophenol	K23-Au0053436	CP	mg/kg	< 5	< 5	<1	30%	Pass	
2.4-Dinitrotoluene	K23-Au0053436	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
2.4.5-Trichlorophenol	K23-Au0053436	CP	mg/kg	< 1	< 1	<1	30%	Pass	
2.4.6-Trichlorophenol	K23-Au0053436	CP	mg/kg	< 1	< 1	<1	30%	Pass	
2.6-Dichlorophenol	K23-Au0053436	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
2.6-Dinitrotoluene	K23-Au0053436	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
3&4-Methylphenol (m&p-Cresol)	K23-Au0053436	CP	mg/kg	< 0.4	< 0.4	<1	30%	Pass	
3-Methylcholanthrene	K23-Au0053436	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
3.3'-Dichlorobenzidine	K23-Au0053436	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
4-Aminobiphenyl	K23-Au0053436	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
4-Bromophenyl phenyl ether	K23-Au0053436	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
4-Chloro-3-methylphenol	K23-Au0053436	CP	mg/kg	< 1	< 1	<1	30%	Pass	
4-Chlorophenyl phenyl ether	K23-Au0053436	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
4-Nitrophenol	K23-Au0053436	CP	mg/kg	< 5	< 5	<1	30%	Pass	
7.12-Dimethylbenz(a)anthracene	K23-Au0053436	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Acetophenone	K23-Au0053436	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Aniline	K23-Au0053436	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzyl chloride	K23-Au0053436	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Bis(2-chloroethoxy)methane	K23-Au0053436	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Bis(2-chloroisopropyl)ether	K23-Au0053436	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Bis(2-ethylhexyl)phthalate	K23-Au0053436	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Butyl benzyl phthalate	K23-Au0053436	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Di-n-butyl phthalate	K23-Au0053436	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Di-n-octyl phthalate	K23-Au0053436	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Dibenz(a.j)acridine	K23-Au0053436	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Dibenzofuran	K23-Au0053436	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Diethyl phthalate	K23-Au0053436	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Dimethyl phthalate	K23-Au0053436	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Dimethylaminoazobenzene	K23-Au0053436	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Diphenylamine	K23-Au0053436	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Hexachlorobutadiene	K23-Au0053436	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Hexachlorocyclopentadiene	K23-Au0053436	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Hexachloroethane	K23-Au0053436	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
N-Nitrosodibutylamine	K23-Au0053436	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
N-Nitrosodipropylamine	K23-Au0053436	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
N-Nitrosopiperidine	K23-Au0053436	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Nitrobenzene	K23-Au0053436	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Pentachlorobenzene	K23-Au0053436	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Pentachloronitrobenzene	K23-Au0053436	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Pentachlorophenol	K23-Au0053436	CP	mg/kg	< 1	< 1	<1	30%	Pass	

Duplicate									
Semivolatile Organics				Result 1	Result 2	RPD			
Phenol	K23-Au0053436	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Pronamide	K23-Au0053436	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Trifluralin	K23-Au0053436	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Duplicate									
Sample Properties				Result 1	Result 2	RPD			
% Moisture	K23-Au0053438	CP	%	25	24	1.5	30%	Pass	
Duplicate									
Semivolatile Organics				Result 1	Result 2	RPD			
1-Chloronaphthalene	K23-Au0050878	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1-Naphthylamine	K23-Au0050878	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.2-Dichlorobenzene	K23-Au0050878	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.2.3-Trichlorobenzene	K23-Au0050878	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.2.3.4-Tetrachlorobenzene	K23-Au0050878	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.2.3.5-Tetrachlorobenzene	K23-Au0050878	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.2.4-Trichlorobenzene	K23-Au0050878	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.2.4.5-Tetrachlorobenzene	K23-Au0050878	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.3-Dichlorobenzene	K23-Au0050878	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.3.5-Trichlorobenzene	K23-Au0050878	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.4-Dichlorobenzene	K23-Au0050878	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
2-Chloronaphthalene	K23-Au0050878	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
2-Chlorophenol	K23-Au0050878	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
2-Methyl-4.6-dinitrophenol	K23-Au0050878	NCP	mg/kg	< 5	< 5	<1	30%	Pass	
2-Methylnaphthalene	K23-Au0050878	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
2-Methylphenol (o-Cresol)	K23-Au0050878	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
2-Naphthylamine	K23-Au0050878	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
2-Nitroaniline	K23-Au0050878	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
2-Nitrophenol	K23-Au0050878	NCP	mg/kg	< 1	< 1	<1	30%	Pass	
2-Picoline	K23-Au0050878	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
2.3.4.6-Tetrachlorophenol	K23-Au0050878	NCP	mg/kg	< 5	< 5	<1	30%	Pass	
2.4-Dichlorophenol	K23-Au0050878	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
2.4-Dimethylphenol	K23-Au0050878	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
2.4-Dinitrophenol	K23-Au0050878	NCP	mg/kg	< 5	< 5	<1	30%	Pass	
2.4-Dinitrotoluene	K23-Au0050878	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
2.4.5-Trichlorophenol	K23-Au0050878	NCP	mg/kg	< 1	< 1	<1	30%	Pass	
2.4.6-Trichlorophenol	K23-Au0050878	NCP	mg/kg	< 1	< 1	<1	30%	Pass	
2.6-Dichlorophenol	K23-Au0050878	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
2.6-Dinitrotoluene	K23-Au0050878	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
3&4-Methylphenol (m&p-Cresol)	K23-Au0050878	NCP	mg/kg	< 0.4	< 0.4	<1	30%	Pass	
3-Methylcholanthrene	K23-Au0050878	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
3.3'-Dichlorobenzidine	K23-Au0050878	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
4-Aminobiphenyl	K23-Au0050878	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
4-Bromophenyl phenyl ether	K23-Au0050878	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
4-Chloro-3-methylphenol	K23-Au0050878	NCP	mg/kg	< 1	< 1	<1	30%	Pass	
4-Chlorophenyl phenyl ether	K23-Au0050878	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
4-Nitrophenol	K23-Au0050878	NCP	mg/kg	< 5	< 5	<1	30%	Pass	
7.12-Dimethylbenz(a)anthracene	K23-Au0050878	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Acetophenone	K23-Au0050878	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Aniline	K23-Au0050878	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzyl chloride	K23-Au0050878	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Bis(2-chloroethoxy)methane	K23-Au0050878	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Bis(2-chloroisopropyl)ether	K23-Au0050878	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Bis(2-ethylhexyl)phthalate	K23-Au0050878	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Butyl benzyl phthalate	K23-Au0050878	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Di-n-butyl phthalate	K23-Au0050878	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	

Duplicate									
Semivolatile Organics				Result 1	Result 2	RPD			
Di-n-octyl phthalate	K23-Au0050878	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Dibenz(a.j)acridine	K23-Au0050878	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Dibenzofuran	K23-Au0050878	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Diethyl phthalate	K23-Au0050878	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Dimethyl phthalate	K23-Au0050878	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Dimethylaminoazobenzene	K23-Au0050878	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Diphenylamine	K23-Au0050878	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Hexachlorobutadiene	K23-Au0050878	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Hexachlorocyclopentadiene	K23-Au0050878	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Hexachloroethane	K23-Au0050878	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
N-Nitrosodibutylamine	K23-Au0050878	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
N-Nitrosodipropylamine	K23-Au0050878	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
N-Nitrosopiperidine	K23-Au0050878	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Nitrobenzene	K23-Au0050878	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Pentachlorobenzene	K23-Au0050878	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Pentachloronitrobenzene	K23-Au0050878	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Pentachlorophenol	K23-Au0050878	NCP	mg/kg	< 1	< 1	<1	30%	Pass	
Phenol	K23-Au0050878	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Pronamide	K23-Au0050878	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Trifluralin	K23-Au0050878	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	

Comments

This report has been revised (V2) to correct sample conditions record from "not chilled" to "chilled".

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
N07	Please note:- These two PAH isomers closely co-elute using the most contemporary analytical methods and both the reported concentration (and the TEQ) apply specifically to the total of the two co-eluting PAHs
Q15	The RPD reported passes Eurofins Environment Testing's QC - Acceptance Criteria as defined in the Internal Quality Control Review and Glossary page of this report.

Authorised by:

Katyana Gausel	Analytical Services Manager
Raymond Siu	Senior Analyst-Metal
Raymond Siu	Senior Analyst-Organic
Sophie Bush	Senior Analyst-Asbestos

Roopesh Rangarajan
Senior Organics Chemist (Key Technical Personnel)

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates IANZ accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

Certificate of Analysis

eurofins | Environment Testing

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

ENGEO Ltd
8 Greydene Place
Takapuna
Auckland 0622

Attention:	Claire Davies
Report	1018885-AID
Project Name	10 SINTON ROAD
Project ID	23849.000.002
Received Date	Aug 18, 2023
Date Reported	Aug 25, 2023

Methodology:

Asbestos Fibre Identification	Conducted in accordance with the Australian Standard AS 4964 – 2004: Method for the Qualitative Identification of Asbestos in Bulk Samples and in-house Method LTM-ASB-8020 by polarised light microscopy (PLM) and dispersion staining (DS) techniques. *NOTE: Positive Trace Analysis results indicate the sample contains detectable respirable fibres.*
Unknown Mineral Fibres	Mineral fibres of unknown type, as determined by PLM with DS, may require another analytical technique, such as Electron Microscopy, to confirm unequivocal identity. *NOTE: While Actinolite, Anthophyllite and Tremolite asbestos may be detected by PLM with DS, due to variability in the optical properties of these materials, AS4964 requires that these are reported as UMF unless confirmed by an independent technique.*
Subsampling Soil Samples	The whole sample submitted is first dried and then passed through a 10mm sieve followed by a 2mm sieve. All fibrous matter greater than 10mm, greater than 2mm as well as the material passing through the 2mm sieve are retained and analysed for the presence of asbestos. If the sub 2mm fraction is greater than approximately 30 to 60g then a sub-sampling routine based on ISO 3082:2009(E) is employed. *NOTE: Depending on the nature and size of the soil sample, the sub-2 mm residue material may need to be sub-sampled for trace analysis, in accordance with AS 4964-2004.*
Bonded asbestos-containing material (ACM)	The material is first examined and any fibres isolated for identification by PLM and DS. Where required, interfering matrices may be removed by disintegration using a range of heat, chemical or physical treatments, possibly in combination.The resultant material is then further examined in accordance with AS 4964 - 2004. *NOTE: Even after disintegration it may be difficult to detect the presence of asbestos in some asbestos-containing bulk materials using PLM and DS. This is due to the low grade or small length or diameter of the asbestos fibres present in the material, or to the fact that very fine fibres have been distributed intimately throughout the materials. Vinyl/asbestos floor tiles, some asbestos-containing sealants and mastics, asbestos-containing epoxy resins and some ore samples are examples of these types of material, which are difficult to analyse.*
Limit of Reporting	The performance limitation of the AS 4964 (2004) method for non-homogeneous samples is around 0.1 g/kg (equivalent to 0.01% (w/w)). Where no asbestos is found by PLM and DS, including Trace Analysis, this is considered to be at the nominal reporting limit of 0.01% (w/w). The NEPM screening level of 0.001% (w/w) is intended as an on-site determination, not a laboratory Limit of Reporting (LOR), per se. Examination of a large sample size (e.g. 500 mL) may improve the likelihood of detecting asbestos, particularly AF, to aid assessment against the NEPM criteria. Gravimetric determinations to this level of accuracy are outside of AS 4964 and hence IANZ Accreditation does not cover the performance of this service (non-IANZ results shown with an asterisk). *NOTE: NATA News March 2014, p.7, states in relation to AS 4964: "This is a qualitative method with a nominal reporting limit of 0.01 % " and that currently in Australia "there is no validated method available for the quantification of asbestos".This report is consistent with the analytical procedures and reporting recommendations in the NEPM and the WA DoH.*

Project Name 10 SINTON ROAD
Project ID 23849.000.002
Date Sampled Aug 15, 2023
Report 1018885-AID

Client Sample ID	Eurofins Sample No.	Date Sampled	Sample Description	Result
S06 0.2	23-Au0053412	Aug 15, 2023	Approximate Sample 134g Sample consisted of: Fine grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.
S07 0.2	23-Au0053413	Aug 15, 2023	Approximate Sample 184g Sample consisted of: Fine grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.
S08 0.2	23-Au0053414	Aug 15, 2023	Approximate Sample 194g Sample consisted of: Fine grained soil and rocks	Chrysotile asbestos detected in weathered fibre cement fragments. Approximate raw weight of asbestos containing material = 0.52g Total estimated asbestos content in the sample = 0.10g* Total estimated asbestos concentration = 0.053% w/w* Organic fibre detected. No trace asbestos detected.
S09 0.2	23-Au0053415	Aug 15, 2023	Approximate Sample 143g Sample consisted of: Fine grained soil and rocks	Chrysotile asbestos detected in the form of loose fibre bundles. Approximate raw weight of asbestos = 0.00070g* Total estimated asbestos content in the sample = 0.00070g* Total estimated asbestos concentration = 0.00049% w/w* No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.
S10 0.2	23-Au0053416	Aug 15, 2023	Approximate Sample 213g Sample consisted of: Fine grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.
S12 0.2	23-Au0053417	Aug 15, 2023	Approximate Sample 194g Sample consisted of: Fine grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.

Client Sample ID	Eurofins Sample No.	Date Sampled	Sample Description	Result
S13 0.2	23-Au0053418	Aug 15, 2023	Approximate Sample 161g Sample consisted of: Fine grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.
S14 0.0-0.3	23-Au0053419	Aug 15, 2023	Approximate Sample 188g Sample consisted of: Fine grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.
S15 0.0-0.25	23-Au0053420	Aug 15, 2023	Approximate Sample 148g Sample consisted of: Fine grained soil and rocks	Chrysotile and amosite asbestos detected in weathered fibre cement fragments and in the form of loose fibre bundles. Approximate raw weight of asbestos containing material = 0.66g* Total estimated asbestos content in the sample = 0.15g* Total estimated asbestos concentration = 0.10% w/w* Organic fibre detected. No trace asbestos detected.
S16 0.0-0.25	23-Au0053421	Aug 15, 2023	Approximate Sample 216g Sample consisted of: Fine grained soil and rocks	Chrysotile, amosite and crocidolite asbestos detected in the form of loose fibre bundles. Approximate raw weight of asbestos = 0.0057g* Total estimated asbestos content in the sample = 0.0057g* Total estimated asbestos concentration = 0.0026% w/w* No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.
S17 0.0-0.3	23-Au0053422	Aug 15, 2023	Approximate Sample 119g Sample consisted of: Fine grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.
S18 0.0-0.25	23-Au0053423	Aug 15, 2023	Approximate Sample 149g Sample consisted of: Fine grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.
S24 0.0-0.35	23-Au0053429	Aug 15, 2023	Approximate Sample 229g Sample consisted of: Fine grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.
S39 (STOCKPILE)	23-Au0053437	Aug 15, 2023	Approximate Sample 491g Sample consisted of: Fine grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Asbestos - LTM-ASB-8020	Christchurch	Aug 22, 2023	Indefinite

eurofins

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email: EnviroSales@eurofins.com

Eurofins Environment Testing NZ Ltd
NZBN: 9429046024954

Auckland	Christchurch	Tauranga
35 O'Rorke Road	43 Detroit Drive	1277 Cameron Road,
Penrose,	Rolleston,	Gate Pa,
Auckland 1061	Christchurch 7675	Tauranga 3112
Tel: +64 9 526 4551	Tel: +64 3 343 5201	Tel: +64 9 525 0568
IANZ# 1327	IANZ# 1290	IANZ# 1402

Eurofins Environment Testing Australia Pty Ltd
ABN: 50 005 085 521

Melbourne	Geelong	Sydney	Canberra	Brisbane	Newcastle
6 Monterey Road	19/8 Lewalan Street	179 Magowar Road	Unit 1,2 Dacre Street	1/21 Smallwood Place	1/2 Frost Drive
Dandenong South	Grovedale	Girraween	Mitchell	Murarrie	Mayfield West NSW 2304
VIC 3175	VIC 3216	NSW 2145	ACT 2911	QLD 4172	Tel: +61 2 4968 8448
Tel: +61 3 8564 5000	Tel: +61 3 8564 5000	Tel: +61 2 9900 8400	Tel: +61 2 6113 8091	Tel: +61 7 3902 4600	NATA# 1261
NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	Site# 25079 & 25289
Site# 1254	Site# 25403	Site# 18217	Site# 25466	Site# 20794	

Eurofins ARL Pty Ltd
ABN: 91 05 0159 898

Perth
46-48 Banksia Road
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WA 6106
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NATA# 2377
Site# 2370

Company Name: ENGEO Ltd - NI
Address: 8 Greydene Place
Takapuna
Auckland 0622

Project Name: 10 SINTON ROAD
Project ID: 23849.000.002

Order No.:
Report #: 1018885
Phone: 0011 64 9 9722 205
Fax:

Received: Aug 18, 2023 1:44 PM
Due: Aug 25, 2023
Priority: 5 Day
Contact Name: Claire Davies

Eurofins Analytical Services Manager : Katyana Gausel

Sample Detail						Asbestos - AS4964	HOLD	Moisture Set	Organochlorine Pesticides (NZ MfE)	Metals M8 (NZ MfE)	Polycyclic Aromatic Hydrocarbons (NZ MfE)	Asbestos in Soils (NZ GAMAS)	Semivolatile Organics
Auckland Laboratory - IANZ# 1327							X	X	X	X	X		X
Christchurch Laboratory - IANZ# 1290						X						X	
Tauranga Laboratory - IANZ# 1402													
External Laboratory													
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**								
1	S01 0.1	Aug 15, 2023		Soil	K23-Au0053407			X		X	X		
2	S02 0.1	Aug 15, 2023		Soil	K23-Au0053408			X		X	X		
3	S03 0.1	Aug 15, 2023		Soil	K23-Au0053409			X	X	X			
4	S04 0.1	Aug 15, 2023		Soil	K23-Au0053410			X	X	X			
5	S05 0.1	Aug 15, 2023		Soil	K23-Au0053411			X	X	X			
6	S06 0.2	Aug 15, 2023		Soil	K23-Au0053412	X		X		X			
7	S07 0.2	Aug 15, 2023		Soil	K23-Au0053413	X		X		X			
8	S08 0.2	Aug 15, 2023		Soil	K23-Au0053414	X		X		X			
9	S09 0.2	Aug 15, 2023		Soil	K23-Au0053415	X		X		X			
10	S10 0.2	Aug 15, 2023		Soil	K23-Au0053416	X		X		X			
11	S12 0.2	Aug 15, 2023		Soil	K23-Au0053417	X		X		X			

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NATA# 2377
Site# 2370

Company Name: ENGEO Ltd - NI
Address: 8 Greydene Place
Takapuna
Auckland 0622

Project Name: 10 SINTON ROAD
Project ID: 23849.000.002

Order No.:
Report #: 1018885
Phone: 0011 64 9 9722 205
Fax:

Received: Aug 18, 2023 1:44 PM
Due: Aug 25, 2023
Priority: 5 Day
Contact Name: Claire Davies

Eurofins Analytical Services Manager : Katyana Gausel

Sample Detail						Asbestos - AS4964	HOLD	Moisture Set	Organochlorine Pesticides (NZ MfE)	Metals M8 (NZ MfE)	Polycyclic Aromatic Hydrocarbons (NZ MfE)	Asbestos in Soils (NZ GAMAS)	Semivolatile Organics
Auckland Laboratory - IANZ# 1327							X	X	X	X	X		X
Christchurch Laboratory - IANZ# 1290						X						X	
Tauranga Laboratory - IANZ# 1402													
12	S13 0.2	Aug 15, 2023		Soil	K23-Au0053418	X		X		X			
13	S14 0.0-0.3	Aug 15, 2023		Soil	K23-Au0053419	X		X		X			
14	S15 0.0-0.25	Aug 15, 2023		Soil	K23-Au0053420	X		X		X			
15	S16 0.0-0.25	Aug 15, 2023		Soil	K23-Au0053421	X		X		X			
16	S17 0.0-0.3	Aug 15, 2023		Soil	K23-Au0053422	X		X		X			
17	S18 0.0-0.25	Aug 15, 2023		Soil	K23-Au0053423	X		X		X			
18	S19 0.0-0.2	Aug 15, 2023		Soil	K23-Au0053424			X		X		X	
19	S20 0.0-0.15	Aug 15, 2023		Soil	K23-Au0053425			X		X		X	
20	S21 0.0-0.15	Aug 15, 2023		Soil	K23-Au0053426			X		X		X	
21	S22 0.0-0.2	Aug 15, 2023		Soil	K23-Au0053427			X		X		X	
22	S23 0.0-0.2	Aug 15, 2023		Soil	K23-Au0053428			X		X		X	
23	S24 0.0-0.35	Aug 15, 2023		Soil	K23-Au0053429	X		X		X			
24	S25 0.0-0.2	Aug 15, 2023		Soil	K23-Au0053430			X		X		X	
25	S26 0.0-0.2	Aug 15, 2023		Soil	K23-Au0053431			X		X		X	

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Auckland Laboratory - IANZ# 1327							X	X	X	X	X		X
Christchurch Laboratory - IANZ# 1290						X						X	
Tauranga Laboratory - IANZ# 1402													
26	S27 0.0-0.3	Aug 15, 2023		Soil	K23-Au0053432			X		X		X	
27	S28 0.0-0.2	Aug 15, 2023		Soil	K23-Au0053433			X		X		X	
28	S29 0.0-0.2	Aug 15, 2023		Soil	K23-Au0053434			X		X		X	
29	S37 0.3	Aug 15, 2023		Soil	K23-Au0053435			X		X	X	X	
30	S38 0.1	Aug 15, 2023		Soil	K23-Au0053436			X		X	X	X	
31	S39 (STOCKPILE)	Aug 15, 2023		Soil	K23-Au0053437	X		X		X			
32	S40 (STOCKPILE)	Aug 15, 2023		Soil	K23-Au0053438			X		X		X	X
33	S01 0.4	Aug 15, 2023		Soil	K23-Au0053439		X						
34	S02 0.4	Aug 15, 2023		Soil	K23-Au0053440		X						
35	S03 0.3	Aug 15, 2023		Soil	K23-Au0053441		X						
36	S03 0.6	Aug 15, 2023		Soil	K23-Au0053442		X						
37	S04 0.4	Aug 15, 2023		Soil	K23-Au0053443		X						

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Auckland Laboratory - IANZ# 1327							X	X	X	X	X		X
Christchurch Laboratory - IANZ# 1290						X						X	
Tauranga Laboratory - IANZ# 1402													
38	S05 0.4	Aug 15, 2023		Soil	K23-Au0053444		X						
39	S06 0.4	Aug 15, 2023		Soil	K23-Au0053445		X						
40	S07 0.4	Aug 15, 2023		Soil	K23-Au0053446		X						
41	S08 0.4	Aug 15, 2023		Soil	K23-Au0053447		X						
42	S09 0.5	Aug 15, 2023		Soil	K23-Au0053448		X						
43	S10 0.5	Aug 15, 2023		Soil	K23-Au0053449		X						
44	S11 0.2	Aug 15, 2023		Soil	K23-Au0053450		X						
45	S11 0.5	Aug 15, 2023		Soil	K23-Au0053451		X						
46	S12 0.5	Aug 15, 2023		Soil	K23-Au0053452		X						
47	S13 0.4	Aug 15, 2023		Soil	K23-Au0053453		X						
48	S14 0.3-0.5	Aug 15, 2023		Soil	K23-Au0053454		X						
49	S15 0.25-0.4	Aug 15, 2023		Soil	K23-Au0053455		X						
50	S16 0.25-0.5	Aug 15, 2023		Soil	K23-Au0053456		X						
51	S17 0.3-0.5	Aug 15, 2023		Soil	K23-Au0053457		X						

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Auckland Laboratory - IANZ# 1327							X	X	X	X	X		X
Christchurch Laboratory - IANZ# 1290						X						X	
Tauranga Laboratory - IANZ# 1402													
52	S18 0.25-0.4	Aug 15, 2023		Soil	K23-Au0053458		X						
53	S19 0.2-0.45	Aug 15, 2023		Soil	K23-Au0053459		X						
54	S20 0.15-0.35	Aug 15, 2023		Soil	K23-Au0053460		X						
55	S21 0.15-0.35	Aug 15, 2023		Soil	K23-Au0053461		X						
56	S22 0.2-0.45	Aug 15, 2023		Soil	K23-Au0053462		X						
57	S23 0.2-0.45	Aug 15, 2023		Soil	K23-Au0053463		X						
58	S24 0.35-0.5	Aug 15, 2023		Soil	K23-Au0053464		X						
59	S25 0.2-0.4	Aug 15, 2023		Soil	K23-Au0053465		X						
60	S26 0.2-0.4	Aug 15, 2023		Soil	K23-Au0053466		X						
61	S27 0.3-0.45	Aug 15, 2023		Soil	K23-Au0053467		X						
62	S28 0.2-0.4	Aug 15, 2023		Soil	K23-Au0053468		X						
63	S29 0.2-0.4	Aug 15, 2023		Soil	K23-Au0053469		X						
64	S30 0.1	Aug 15, 2023		Soil	K23-Au0053470		X						
65	S30 0.4	Aug 15, 2023		Soil	K23-Au0053471		X						

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Auckland Laboratory - IANZ# 1327							X	X	X	X	X		X
Christchurch Laboratory - IANZ# 1290						X						X	
Tauranga Laboratory - IANZ# 1402													
66	S31 0.1	Aug 15, 2023		Soil	K23-Au0053472		X						
67	S31 0.4	Aug 15, 2023		Soil	K23-Au0053473		X						
68	S32 0.1	Aug 15, 2023		Soil	K23-Au0053474		X						
69	S32 0.4	Aug 15, 2023		Soil	K23-Au0053475		X						
70	S33 0.1	Aug 15, 2023		Soil	K23-Au0053476		X						
71	S33 0.4	Aug 15, 2023		Soil	K23-Au0053477		X						
72	S34 0.1	Aug 15, 2023		Soil	K23-Au0053478		X						
73	S34 0.4	Aug 15, 2023		Soil	K23-Au0053479		X						
74	S35 0.1	Aug 15, 2023		Soil	K23-Au0053480		X						
75	S35 0.4	Aug 15, 2023		Soil	K23-Au0053481		X						
76	S36 0.1	Aug 15, 2023		Soil	K23-Au0053482		X						
77	S36 0.3	Aug 15, 2023		Soil	K23-Au0053483		X						
78	PACM	Aug 15, 2023		Building Materials	K23-Au0053484		X						

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Auckland Laboratory - IANZ# 1327		X	X	X	X	X		X
Christchurch Laboratory - IANZ# 1290	X						X	
Tauranga Laboratory - IANZ# 1402								
Test Counts	14	46	32	3	32	4	13	1

Internal Quality Control Review and Glossary General

1. QC data may be available on request.
2. All soil results are reported on a dry basis, unless otherwise stated.
3. Samples were analysed on an 'as received' basis.
4. Information identified on this report with the colour **blue** indicates data provided by customer that may have an impact on the results.
5. This report replaces any interim results previously issued.

Holding Times

Please refer to the most recent version of the 'Sample Preservation and Container Guide' for holding times (QS3001).
If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported. Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

Units

% w/w:	Percentage weight-for-weight basis, e.g. of asbestos in asbestos-containing finds in soil samples (**% w/w**)
F/fld	Airborne fibre filter loading as Fibres (**N**) per Fields counted (**n**)
F/mL	Airborne fibre reported concentration as Fibres per millilitre of air drawn over the sampler membrane (**C**)
g, kg	Mass, e.g. of whole sample (**M**) or asbestos-containing find within the sample (**m**)
g/kg	Concentration in grams per kilogram
L, mL	Volume, e.g. of air as measured in AFM (**V** = **r** x **t**)
L/min	Airborne fibre sampling Flowrate as litres per minute of air drawn over the sampler membrane (**r**)
min	Time (**t**), e.g. of air sample collection period

Calculations

Airborne Fibre Concentration: $C = \left(\frac{A}{a}\right) \times \left(\frac{N}{n}\right) \times \left(\frac{1}{r}\right) \times \left(\frac{1}{t}\right) = K \times \left(\frac{N}{n}\right) \times \left(\frac{1}{V}\right)$

Asbestos Content (as asbestos): $\%\, w/w = \frac{(m \times P_A)}{M}$

Weighted Average (of asbestos): $\%_{WA} = \sum \frac{(m \times P_A)_x}{x}$

Terms

%asbestos	Estimated percentage of asbestos in a given matrix. May be derived from knowledge or experience of the material, informed by HSG264 *Appendix 2*, else assumed to be 15% in accordance with WA DOH *Appendix 2* (**P_A**).
ACM	Asbestos Containing Materials. Asbestos contained within a non-asbestos matrix, typically presented in bonded (non-friable) condition. For the purposes of the NEPM and WA DOH, ACM corresponds to material larger than 7 mm x 7 mm.
AF	Asbestos Fines. Asbestos contamination within a soil sample, as defined by WA DOH. Includes loose fibre bundles and small pieces of friable and non-friable material such as asbestos cement fragments mixed with soil. Considered under the NEPM as equivalent to “non-bonded / friable”.
AFM	Airborne Fibre Monitoring, e.g. by the MFM.
Amosite	Amosite Asbestos Detected. Amosite may also refer to Fibrous Grunerite or Brown Asbestos. Identified in accordance with AS 4964-2004.
AS	Australian Standard.
Asbestos Content (as asbestos)	Total % w/w asbestos content in asbestos-containing finds in a soil sample (**% w/w)**.
Chrysotile	Chrysotile Asbestos Detected. Chrysotile may also refer to Fibrous Serpentine or White Asbestos. Identified in accordance with AS 4964-2004.
COC	Chain of Custody.
Crocidolite	Crocidolite Asbestos Detected. Crocidolite may also refer to Fibrous Riebeckite or Blue Asbestos. Identified in accordance with AS 4964-2004.
Dry	Sample is dried by heating prior to analysis.
DS	Dispersion Staining. Technique required for Unequivocal Identification of asbestos fibres by PLM.
FA	Fibrous Asbestos. Asbestos containing material that is wholly or in part friable, including materials with higher asbestos content with a propensity to become friable with handling, and any material that was previously non-friable and in a severely degraded condition. For the purposes of the NEPM and WA DOH, FA generally corresponds to material larger than 7 mm x 7 mm, although FA may be more difficult to visibly distinguish and may be assessed as AF.
Fibre Count	Total of all fibres (whether asbestos or not) meeting the counting criteria set out in the NOHSC:3003
Fibre ID	Fibre Identification. Unequivocal identification of asbestos fibres according to AS 4964-2004. Includes Chrysotile, Amosite (Grunerite) or Crocidolite asbestos.
Friable	Asbestos-containing materials of any size that may be broken or crumbled by hand pressure. For the purposes of the NEPM, this includes both AF and FA. It is outside of the laboratory’s remit to assess degree of friability.
HSG248	UK HSE HSG248, *Asbestos: The Analysts Guide*, 2nd Edition (2021).
HSG264	UK HSE HSG264, *Asbestos: The Survey Guide* (2012).
ISO (also ISO/IEC)	International Organization for Standardization / International Electrotechnical Commission.
K Factor	Microscope constant (**K**) as derived from the effective filter area of the given AFM membrane used for collecting the sample (**A**) and the projected eyepiece graticule area of the specific microscope used for the analysis (**a**).
LOR	Limit of Reporting.
MFM (also NOHSC:3003)	Membrane Filter Method. As described by the Australian Government National Occupational Health and Safety Commission, *Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres*, 2nd Edition [NOHSC:3003(2005)].
NEPM (also ASC NEPM)	National Environment Protection (Assessment of Site Contamination) Measure, (2013, as amended).
Organic	Organic Fibres Detected. Organic may refer to Natural or Man-Made Polymeric Fibres. Identified in accordance with AS 4964-2004.
PCM	Phase Contrast Microscopy. As used for Fibre Counting according to the MFM.
PLM	Polarised Light Microscopy. As used for Fibre Identification and Trace Analysis according to AS 4964-2004.
Sampling	Unless otherwise stated Eurofins are not responsible for sampling equipment or the sampling process.
SMF	Synthetic Mineral Fibre Detected. SMF may also refer to Man Made Vitreous Fibres. Identified in accordance with AS 4964-2004.
SRA	Sample Receipt Advice.
Trace Analysis	Analytical procedure used to detect the presence of respirable fibres (particularly asbestos) in a given sample matrix.
UK HSE HSG	United Kingdom, Health and Safety Executive, Health and Safety Guidance, publication.
UMF	Unidentified Mineral Fibre Detected. Fibrous minerals that are detected but have not been unequivocally identified by PLM with DS according the AS 4964-2004. May include (but not limited to) Actinolite, Anthophyllite or Tremolite asbestos.
WA DOH	Reference document for the NEPM. Government of Western Australia, *Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia* (updated 2021), including Appendix Four: *Laboratory analysis*
Weighted Average	Combined average % w/w asbestos content of all asbestos-containing finds in the given aliquot or total soil sample (**$\%_{WA}$**).

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	No
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Asbestos Counter/Identifier:

Adelle Black	Senior Analyst-Asbestos
Kate Stuart	Senior Analyst-Asbestos

Authorised by:

Sophie Bush	Senior Analyst-Asbestos

Sophie Bush
Senior Analyst-Asbestos (Key Technical Personnel)

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates ISO/IEC 17025:2017 accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

Certificate of Analysis

eurofins | Environment Testing

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

ENGEO Ltd
8 Greydene Place
Takapuna
Auckland 0622

Attention:	Claire Davies
Report	1018885-AIS-NZ
Project Name	10 SINTON ROAD
Project ID	23849.000.002
Received Date	Aug 18, 2023
Date Reported	Aug 25, 2023

Methodology:

Asbestos Fibre Identification	Conducted in accordance with the Australian Standard AS 4964 – 2004: Method for the Qualitative Identification of Asbestos in Bulk Samples and in-house Method LTM-ASB-8020 by polarised light microscopy (PLM) and dispersion staining (DS) techniques. *NOTE: Positive Trace Analysis results indicate the sample contains detectable respirable fibres.*
Unknown Mineral Fibres	Mineral fibres of unknown type, as determined by PLM with DS, may require another analytical technique, such as Electron Microscopy, to confirm unequivocal identity. *NOTE: While Actinolite, Anthophyllite and Tremolite asbestos may be detected by PLM with DS, due to variability in the optical properties of these materials, AS4964 requires that these are reported as UMF unless confirmed by an independent technique.*
Subsampling Soil Samples	The whole sample submitted is first dried and then passed through a 10mm sieve followed by a 2mm sieve. All fibrous matter greater than 10mm, greater than 2mm as well as the material passing through the 2mm sieve are retained and analysed for the presence of asbestos. If the sub 2mm fraction is greater than approximately 30 to 60g then a sub-sampling routine based on ISO 3082:2009(E) is employed. *NOTE: Depending on the nature and size of the soil sample, the sub-2 mm residue material may need to be sub-sampled for trace analysis, in accordance with AS 4964-2004.*
Bonded asbestos-containing material (ACM)	The material is first examined and any fibres isolated for identification by PLM and DS. Where required, interfering matrices may be removed by disintegration using a range of heat, chemical or physical treatments, possibly in combination.The resultant material is then further examined in accordance with AS 4964 - 2004. *NOTE: Even after disintegration it may be difficult to detect the presence of asbestos in some asbestos-containing bulk materials using PLM and DS. This is due to the low grade or small length or diameter of the asbestos fibres present in the material, or to the fact that very fine fibres have been distributed intimately throughout the materials. Vinyl/asbestos floor tiles, some asbestos-containing sealants and mastics, asbestos-containing epoxy resins and some ore samples are examples of these types of material, which are difficult to analyse.*
Limit of Reporting	The performance limitation of the AS 4964 (2004) method for non-homogeneous samples is around 0.1 g/kg (equivalent to 0.01% (w/w)). Where no asbestos is found by PLM and DS, including Trace Analysis, this is considered to be at the nominal reporting limit of 0.01% (w/w). The NEPM screening level of 0.001% (w/w) is intended as an on-site determination, not a laboratory Limit of Reporting (LOR), per se. Examination of a large sample size (e.g. 500 mL) may improve the likelihood of detecting asbestos, particularly AF, to aid assessment against the NEPM criteria. Gravimetric determinations to this level of accuracy are outside of AS 4964 and hence NATA Accreditation does not cover the performance of this service (non-NATA results shown with an asterisk). *NOTE: NATA News March 2014, p.7, states in relation to AS 4964: "This is a qualitative method with a nominal reporting limit of 0.01 % " and that currently in Australia "there is no validated method available for the quantification of asbestos".This report is consistent with the analytical procedures and reporting recommendations in the NEPM and the WA DoH.*

Client Sample ID			S19 0.0-0.2
Sample Matrix			**Soil**
Eurofins Sample No.			**23-Au0053424**
Date Sampled			**Aug 15, 2023**
Test/Reference	LOR	Unit	
Asbestos in Soils (AS 4964-2004)			
Sample Description	-	Comment	Fine grained soil and rocks
Received Weight	0.1	g	658.42
Total Dry Mass	0.1	g	476.14
Total Analytical Fraction	0.1	g	476.14
Asbestos Detected	-	Yes/No	No
Materials Identified	-	Comment	N/A
Fibres Identified	-	Comment	Organic fibre detected.
Asbestos Content (as asbestos)	0.01	% w/w	< 0.01
Trace Analysis	0.1	g/kg	No trace asbestos detected.
Asbestos in Soils (NZ GAMAS)			
Weight (>10 mm)	0.1	g	0
Weight (<10 mm >2 mm)	0.1	g	0
Weight (<2 mm)	0.1	g	476.14
Asbestos Containing Materials (ACM) >10 mm			
Total ACM (> 10mm)	0.1	g	< 0.1
ACM % asbestos (weighted average)	-	%	N/A
ACM in Soil (as asbestos)	0.01	% w/w	< 0.01
Fibrous Asbestos (FA) >10 mm			
Total FA	0.00001	g	< 0.00001
FA % asbestos (weighted average)	-	%	N/A
FA Asbestos in Soil	0.001	% w/w	< 0.001
Fibrous Asbestos (FA) <10 mm			
Total FA	0.00001	g	< 0.00001
FA % asbestos (weighted average)	-	%	N/A
FA Asbestos in Soil	0.001	% w/w	< 0.001
Asbestos Fines (AF) < 10 mm			
Total AF	0.00001	g	< 0.00001
AF % asbestos (weighted average)	-	%	N/A
AF Asbestos in Soil	0.001	% w/w	< 0.001
Combined AF+FA	0.001	% w/w	< 0.001

Client Sample ID			S20 0.0-0.15
Sample Matrix			**Soil**
Eurofins Sample No.			**23-Au0053425**
Date Sampled			**Aug 15, 2023**
Test/Reference	LOR	Unit	
Asbestos in Soils (AS 4964-2004)			
Sample Description	-	Comment	Fine grained soil and rocks
Received Weight	0.1	g	578.39
Total Dry Mass	0.1	g	398.29
Total Analytical Fraction	0.1	g	398.29
Asbestos Detected	-	Yes/No	Yes
Materials Identified	-	Comment	Loose fibre bundles.
Fibres Identified	-	Comment	Chrysotile asbestos detected. Organic fibres detected.
Asbestos Content (as asbestos)	0.01	% w/w	< 0.01
Trace Analysis	0.1	g/kg	No trace asbestos detected.
Asbestos in Soils (NZ GAMAS)			
Weight (>10 mm)	0.1	g	0
Weight (<10 mm >2 mm)	0.1	g	0
Weight (<2 mm)	0.1	g	398.29
Asbestos Containing Materials (ACM) >10 mm			
Total ACM (> 10mm)	0.1	g	< 0.1
ACM % asbestos (weighted average)	-	%	N/A
ACM in Soil (as asbestos)	0.01	% w/w	< 0.01
Fibrous Asbestos (FA) >10 mm			
Total FA	0.00001	g	< 0.00001
FA % asbestos (weighted average)	-	%	N/A
FA Asbestos in Soil	0.001	% w/w	< 0.001
Fibrous Asbestos (FA) <10 mm			
Total FA	0.00001	g	< 0.00001
FA % asbestos (weighted average)	-	%	N/A
FA Asbestos in Soil	0.001	% w/w	< 0.001
Asbestos Fines (AF) < 10 mm			
Total AF	0.00001	g	0.00205
AF % asbestos (weighted average)	-	%	100
AF Asbestos in Soil	0.001	% w/w	< 0.001
Combined AF+FA	0.001	% w/w	< 0.001

Client Sample ID			S21 0.0-0.15
Sample Matrix			**Soil**
Eurofins Sample No.			**23-Au0053426**
Date Sampled			**Aug 15, 2023**
Test/Reference	LOR	Unit	
Asbestos in Soils (AS 4964-2004)			
Sample Description	-	Comment	Fine grained soil and rocks
Received Weight	0.1	g	674.81
Total Dry Mass	0.1	g	477.18
Total Analytical Fraction	0.1	g	477.18
Asbestos Detected	-	Yes/No	No
Materials Identified	-	Comment	N/A
Fibres Identified	-	Comment	Organic fibre detected.
Asbestos Content (as asbestos)	0.01	% w/w	< 0.01
Trace Analysis	0.1	g/kg	No trace asbestos detected.
Asbestos in Soils (NZ GAMAS)			
Weight (>10 mm)	0.1	g	0
Weight (<10 mm >2 mm)	0.1	g	0
Weight (<2 mm)	0.1	g	477.18
Asbestos Containing Materials (ACM) >10 mm			
Total ACM (> 10mm)	0.1	g	< 0.1
ACM % asbestos (weighted average)	-	%	N/A
ACM in Soil (as asbestos)	0.01	% w/w	< 0.01
Fibrous Asbestos (FA) >10 mm			
Total FA	0.00001	g	< 0.00001
FA % asbestos (weighted average)	-	%	N/A
FA Asbestos in Soil	0.001	% w/w	< 0.001
Fibrous Asbestos (FA) <10 mm			
Total FA	0.00001	g	< 0.00001
FA % asbestos (weighted average)	-	%	N/A
FA Asbestos in Soil	0.001	% w/w	< 0.001
Asbestos Fines (AF) < 10 mm			
Total AF	0.00001	g	< 0.00001
AF % asbestos (weighted average)	-	%	N/A
AF Asbestos in Soil	0.001	% w/w	< 0.001
Combined AF+FA	0.001	% w/w	< 0.001

Client Sample ID			S22 0.0-0.2
Sample Matrix			**Soil**
Eurofins Sample No.			**23-Au0053427**
Date Sampled			**Aug 15, 2023**
Test/Reference	LOR	Unit	
Asbestos in Soils (AS 4964-2004)			
Sample Description	-	Comment	Fine grained soil and rocks
Received Weight	0.1	g	652.96
Total Dry Mass	0.1	g	463.41
Total Analytical Fraction	0.1	g	463.41
Asbestos Detected	-	Yes/No	No
Materials Identified	-	Comment	N/A
Fibres Identified	-	Comment	Organic fibre detected.
Asbestos Content (as asbestos)	0.01	% w/w	< 0.01
Trace Analysis	0.1	g/kg	No trace asbestos detected.
Asbestos in Soils (NZ GAMAS)			
Weight (>10 mm)	0.1	g	0
Weight (<10 mm >2 mm)	0.1	g	0
Weight (<2 mm)	0.1	g	463.41
Asbestos Containing Materials (ACM) >10 mm			
Total ACM (> 10mm)	0.1	g	< 0.1
ACM % asbestos (weighted average)	-	%	N/A
ACM in Soil (as asbestos)	0.01	% w/w	< 0.01
Fibrous Asbestos (FA) >10 mm			
Total FA	0.00001	g	< 0.00001
FA % asbestos (weighted average)	-	%	N/A
FA Asbestos in Soil	0.001	% w/w	< 0.001
Fibrous Asbestos (FA) <10 mm			
Total FA	0.00001	g	< 0.00001
FA % asbestos (weighted average)	-	%	N/A
FA Asbestos in Soil	0.001	% w/w	< 0.001
Asbestos Fines (AF) < 10 mm			
Total AF	0.00001	g	< 0.00001
AF % asbestos (weighted average)	-	%	N/A
AF Asbestos in Soil	0.001	% w/w	< 0.001
Combined AF+FA	0.001	% w/w	< 0.001

Client Sample ID			S23 0.0-0.2
Sample Matrix			**Soil**
Eurofins Sample No.			**23-Au0053428**
Date Sampled			**Aug 15, 2023**
Test/Reference	LOR	Unit	
Asbestos in Soils (AS 4964-2004)			
Sample Description	-	Comment	Fine grained soil and rocks
Received Weight	0.1	g	740.12
Total Dry Mass	0.1	g	583.06
Total Analytical Fraction	0.1	g	583.06
Asbestos Detected	-	Yes/No	No
Materials Identified	-	Comment	N/A
Fibres Identified	-	Comment	Organic fibre detected.
Asbestos Content (as asbestos)	0.01	% w/w	< 0.01
Trace Analysis	0.1	g/kg	No trace asbestos detected.
Asbestos in Soils (NZ GAMAS)			
Weight (>10 mm)	0.1	g	0
Weight (<10 mm >2 mm)	0.1	g	0
Weight (<2 mm)	0.1	g	583.06
Asbestos Containing Materials (ACM) >10 mm			
Total ACM (> 10mm)	0.1	g	< 0.1
ACM % asbestos (weighted average)	-	%	N/A
ACM in Soil (as asbestos)	0.01	% w/w	< 0.01
Fibrous Asbestos (FA) >10 mm			
Total FA	0.00001	g	< 0.00001
FA % asbestos (weighted average)	-	%	N/A
FA Asbestos in Soil	0.001	% w/w	< 0.001
Fibrous Asbestos (FA) <10 mm			
Total FA	0.00001	g	< 0.00001
FA % asbestos (weighted average)	-	%	N/A
FA Asbestos in Soil	0.001	% w/w	< 0.001
Asbestos Fines (AF) < 10 mm			
Total AF	0.00001	g	< 0.00001
AF % asbestos (weighted average)	-	%	N/A
AF Asbestos in Soil	0.001	% w/w	< 0.001
Combined AF+FA	0.001	% w/w	< 0.001

Client Sample ID			S25 0.0-0.2
Sample Matrix			**Soil**
Eurofins Sample No.			**23-Au0053430**
Date Sampled			**Aug 15, 2023**
Test/Reference	LOR	Unit	
Asbestos in Soils (AS 4964-2004)			
Sample Description	-	Comment	Fine grained soil and rocks
Received Weight	0.1	g	804.63
Total Dry Mass	0.1	g	595.74
Total Analytical Fraction	0.1	g	595.74
Asbestos Detected	-	Yes/No	No
Materials Identified	-	Comment	N/A
Fibres Identified	-	Comment	Organic fibre detected.
Asbestos Content (as asbestos)	0.01	% w/w	< 0.01
Trace Analysis	0.1	g/kg	No trace asbestos detected.
Asbestos in Soils (NZ GAMAS)			
Weight (>10 mm)	0.1	g	0
Weight (<10 mm >2 mm)	0.1	g	0
Weight (<2 mm)	0.1	g	595.74
Asbestos Containing Materials (ACM) >10 mm			
Total ACM (> 10mm)	0.1	g	< 0.1
ACM % asbestos (weighted average)	-	%	N/A
ACM in Soil (as asbestos)	0.01	% w/w	< 0.01
Fibrous Asbestos (FA) >10 mm			
Total FA	0.00001	g	< 0.00001
FA % asbestos (weighted average)	-	%	N/A
FA Asbestos in Soil	0.001	% w/w	< 0.001
Fibrous Asbestos (FA) <10 mm			
Total FA	0.00001	g	< 0.00001
FA % asbestos (weighted average)	-	%	N/A
FA Asbestos in Soil	0.001	% w/w	< 0.001
Asbestos Fines (AF) < 10 mm			
Total AF	0.00001	g	< 0.00001
AF % asbestos (weighted average)	-	%	N/A
AF Asbestos in Soil	0.001	% w/w	< 0.001
Combined AF+FA	0.001	% w/w	< 0.001

Client Sample ID			S26 0.0-0.2
Sample Matrix			**Soil**
Eurofins Sample No.			**23-Au0053431**
Date Sampled			**Aug 15, 2023**
Test/Reference	LOR	Unit	
Asbestos in Soils (AS 4964-2004)			
Sample Description	-	Comment	Fine grained soil and rocks
Received Weight	0.1	g	809.94
Total Dry Mass	0.1	g	607.52
Total Analytical Fraction	0.1	g	607.52
Asbestos Detected	-	Yes/No	No
Materials Identified	-	Comment	N/A
Fibres Identified	-	Comment	Organic fibre detected.
Asbestos Content (as asbestos)	0.01	% w/w	< 0.01
Trace Analysis	0.1	g/kg	No trace asbestos detected.
Asbestos in Soils (NZ GAMAS)			
Weight (>10 mm)	0.1	g	0
Weight (<10 mm >2 mm)	0.1	g	0
Weight (<2 mm)	0.1	g	607.52
Asbestos Containing Materials (ACM) >10 mm			
Total ACM (> 10mm)	0.1	g	< 0.1
ACM % asbestos (weighted average)	-	%	N/A
ACM in Soil (as asbestos)	0.01	% w/w	< 0.01
Fibrous Asbestos (FA) >10 mm			
Total FA	0.00001	g	< 0.00001
FA % asbestos (weighted average)	-	%	N/A
FA Asbestos in Soil	0.001	% w/w	< 0.001
Fibrous Asbestos (FA) <10 mm			
Total FA	0.00001	g	< 0.00001
FA % asbestos (weighted average)	-	%	N/A
FA Asbestos in Soil	0.001	% w/w	< 0.001
Asbestos Fines (AF) < 10 mm			
Total AF	0.00001	g	< 0.00001
AF % asbestos (weighted average)	-	%	N/A
AF Asbestos in Soil	0.001	% w/w	< 0.001
Combined AF+FA	0.001	% w/w	< 0.001

Client Sample ID			S27 0.0-0.3
Sample Matrix			**Soil**
Eurofins Sample No.			**23-Au0053432**
Date Sampled			**Aug 15, 2023**
Test/Reference	LOR	Unit	
Asbestos in Soils (AS 4964-2004)			
Sample Description	-	Comment	Fine grained soil and rocks
Received Weight	0.1	g	710.9
Total Dry Mass	0.1	g	499.41
Total Analytical Fraction	0.1	g	499.41
Asbestos Detected	-	Yes/No	Yes
Materials Identified	-	Comment	Loose fibre bundles.
Fibres Identified	-	Comment	Chrysotile asbestos detected. Organic fibres detected.
Asbestos Content (as asbestos)	0.01	% w/w	< 0.01
Trace Analysis	0.1	g/kg	No trace asbestos detected.
Asbestos in Soils (NZ GAMAS)			
Weight (>10 mm)	0.1	g	0
Weight (<10 mm >2 mm)	0.1	g	0
Weight (<2 mm)	0.1	g	499.41
Asbestos Containing Materials (ACM) >10 mm			
Total ACM (> 10mm)	0.1	g	< 0.1
ACM % asbestos (weighted average)	-	%	N/A
ACM in Soil (as asbestos)	0.01	% w/w	< 0.01
Fibrous Asbestos (FA) >10 mm			
Total FA	0.00001	g	< 0.00001
FA % asbestos (weighted average)	-	%	N/A
FA Asbestos in Soil	0.001	% w/w	< 0.001
Fibrous Asbestos (FA) <10 mm			
Total FA	0.00001	g	< 0.00001
FA % asbestos (weighted average)	-	%	N/A
FA Asbestos in Soil	0.001	% w/w	< 0.001
Asbestos Fines (AF) < 10 mm			
Total AF	0.00001	g	0.00266
AF % asbestos (weighted average)	-	%	100
AF Asbestos in Soil	0.001	% w/w	< 0.001
Combined AF+FA	0.001	% w/w	< 0.001

Client Sample ID			S28 0.0-0.2
Sample Matrix			**Soil**
Eurofins Sample No.			**23-Au0053433**
Date Sampled			**Aug 15, 2023**
Test/Reference	LOR	Unit	
Asbestos in Soils (AS 4964-2004)			
Sample Description	-	Comment	Fine grained soil and rocks
Received Weight	0.1	g	710.4
Total Dry Mass	0.1	g	511.61
Total Analytical Fraction	0.1	g	511.61
Asbestos Detected	-	Yes/No	No
Materials Identified	-	Comment	N/A
Fibres Identified	-	Comment	Organic fibre detected.
Asbestos Content (as asbestos)	0.01	% w/w	< 0.01
Trace Analysis	0.1	g/kg	No trace asbestos detected.
Asbestos in Soils (NZ GAMAS)			
Weight (>10 mm)	0.1	g	0
Weight (<10 mm >2 mm)	0.1	g	0
Weight (<2 mm)	0.1	g	511.61
Asbestos Containing Materials (ACM) >10 mm			
Total ACM (> 10mm)	0.1	g	< 0.1
ACM % asbestos (weighted average)	-	%	N/A
ACM in Soil (as asbestos)	0.01	% w/w	< 0.01
Fibrous Asbestos (FA) >10 mm			
Total FA	0.00001	g	< 0.00001
FA % asbestos (weighted average)	-	%	N/A
FA Asbestos in Soil	0.001	% w/w	< 0.001
Fibrous Asbestos (FA) <10 mm			
Total FA	0.00001	g	< 0.00001
FA % asbestos (weighted average)	-	%	N/A
FA Asbestos in Soil	0.001	% w/w	< 0.001
Asbestos Fines (AF) < 10 mm			
Total AF	0.00001	g	< 0.00001
AF % asbestos (weighted average)	-	%	N/A
AF Asbestos in Soil	0.001	% w/w	< 0.001
Combined AF+FA	0.001	% w/w	< 0.001

Client Sample ID			S29 0.0-0.2
Sample Matrix			**Soil**
Eurofins Sample No.			**23-Au0053434**
Date Sampled			**Aug 15, 2023**
Test/Reference	LOR	Unit	
Asbestos in Soils (AS 4964-2004)			
Sample Description	-	Comment	Fine grained soil and rocks
Received Weight	0.1	g	940.7
Total Dry Mass	0.1	g	668.91
Total Analytical Fraction	0.1	g	668.91
Asbestos Detected	-	Yes/No	No
Materials Identified	-	Comment	N/A
Fibres Identified	-	Comment	Organic fibre detected.
Asbestos Content (as asbestos)	0.01	% w/w	< 0.01
Trace Analysis	0.1	g/kg	No trace asbestos detected.
Asbestos in Soils (NZ GAMAS)			
Weight (>10 mm)	0.1	g	0
Weight (<10 mm >2 mm)	0.1	g	0
Weight (<2 mm)	0.1	g	668.91
Asbestos Containing Materials (ACM) >10 mm			
Total ACM (> 10mm)	0.1	g	< 0.1
ACM % asbestos (weighted average)	-	%	N/A
ACM in Soil (as asbestos)	0.01	% w/w	< 0.01
Fibrous Asbestos (FA) >10 mm			
Total FA	0.00001	g	< 0.00001
FA % asbestos (weighted average)	-	%	N/A
FA Asbestos in Soil	0.001	% w/w	< 0.001
Fibrous Asbestos (FA) <10 mm			
Total FA	0.00001	g	< 0.00001
FA % asbestos (weighted average)	-	%	N/A
FA Asbestos in Soil	0.001	% w/w	< 0.001
Asbestos Fines (AF) < 10 mm			
Total AF	0.00001	g	< 0.00001
AF % asbestos (weighted average)	-	%	N/A
AF Asbestos in Soil	0.001	% w/w	< 0.001
Combined AF+FA	0.001	% w/w	< 0.001

Client Sample ID			S37 0.3
Sample Matrix			**Soil**
Eurofins Sample No.			**23-Au0053435**
Date Sampled			**Aug 15, 2023**
Test/Reference	LOR	Unit	
Asbestos in Soils (AS 4964-2004)			
Sample Description	-	Comment	Fine grained soil and rocks
Received Weight	0.1	g	583.86
Total Dry Mass	0.1	g	364.45
Total Analytical Fraction	0.1	g	364.45
Asbestos Detected	-	Yes/No	No
Materials Identified	-	Comment	N/A
Fibres Identified	-	Comment	Organic fibre detected.
Asbestos Content (as asbestos)	0.01	% w/w	< 0.01
Trace Analysis	0.1	g/kg	No trace asbestos detected.
Asbestos in Soils (NZ GAMAS)			
Weight (>10 mm)	0.1	g	0
Weight (<10 mm >2 mm)	0.1	g	0
Weight (<2 mm)	0.1	g	364.45
Asbestos Containing Materials (ACM) >10 mm			
Total ACM (> 10mm)	0.1	g	< 0.1
ACM % asbestos (weighted average)	-	%	N/A
ACM in Soil (as asbestos)	0.01	% w/w	< 0.01
Fibrous Asbestos (FA) >10 mm			
Total FA	0.00001	g	< 0.00001
FA % asbestos (weighted average)	-	%	N/A
FA Asbestos in Soil	0.001	% w/w	< 0.001
Fibrous Asbestos (FA) <10 mm			
Total FA	0.00001	g	< 0.00001
FA % asbestos (weighted average)	-	%	N/A
FA Asbestos in Soil	0.001	% w/w	< 0.001
Asbestos Fines (AF) < 10 mm			
Total AF	0.00001	g	< 0.00001
AF % asbestos (weighted average)	-	%	N/A
AF Asbestos in Soil	0.001	% w/w	< 0.001
Combined AF+FA	0.001	% w/w	< 0.001

Client Sample ID			S38 0.1
Sample Matrix			**Soil**
Eurofins Sample No.			**23-Au0053436**
Date Sampled			**Aug 15, 2023**
Test/Reference	LOR	Unit	
Asbestos in Soils (AS 4964-2004)			
Sample Description	-	Comment	Fine grained soil and rocks
Received Weight	0.1	g	745.67
Total Dry Mass	0.1	g	535.77
Total Analytical Fraction	0.1	g	535.77
Asbestos Detected	-	Yes/No	No
Materials Identified	-	Comment	N/A
Fibres Identified	-	Comment	Organic fibre detected.
Asbestos Content (as asbestos)	0.01	% w/w	< 0.01
Trace Analysis	0.1	g/kg	No trace asbestos detected.
Asbestos in Soils (NZ GAMAS)			
Weight (>10 mm)	0.1	g	0
Weight (<10 mm >2 mm)	0.1	g	0
Weight (<2 mm)	0.1	g	535.77
Asbestos Containing Materials (ACM) >10 mm			
Total ACM (> 10mm)	0.1	g	< 0.1
ACM % asbestos (weighted average)	-	%	N/A
ACM in Soil (as asbestos)	0.01	% w/w	< 0.01
Fibrous Asbestos (FA) >10 mm			
Total FA	0.00001	g	< 0.00001
FA % asbestos (weighted average)	-	%	N/A
FA Asbestos in Soil	0.001	% w/w	< 0.001
Fibrous Asbestos (FA) <10 mm			
Total FA	0.00001	g	< 0.00001
FA % asbestos (weighted average)	-	%	N/A
FA Asbestos in Soil	0.001	% w/w	< 0.001
Asbestos Fines (AF) < 10 mm			
Total AF	0.00001	g	< 0.00001
AF % asbestos (weighted average)	-	%	N/A
AF Asbestos in Soil	0.001	% w/w	< 0.001
Combined AF+FA	0.001	% w/w	< 0.001

Client Sample ID			S40 (STOCKPILE)
Sample Matrix			**Soil**
Eurofins Sample No.			**23-Au0053438**
Date Sampled			**Aug 15, 2023**
Test/Reference	LOR	Unit	
Asbestos in Soils (AS 4964-2004)			
Sample Description	-	Comment	Fine grained soil and rocks
Received Weight	0.1	g	697.83
Total Dry Mass	0.1	g	518.96
Total Analytical Fraction	0.1	g	518.96
Asbestos Detected	-	Yes/No	No
Materials Identified	-	Comment	N/A
Fibres Identified	-	Comment	Organic fibre detected.
Asbestos Content (as asbestos)	0.01	% w/w	< 0.01
Trace Analysis	0.1	g/kg	No trace asbestos detected.
Asbestos in Soils (NZ GAMAS)			
Weight (>10 mm)	0.1	g	0
Weight (<10 mm >2 mm)	0.1	g	255.17
Weight (<2 mm)	0.1	g	263.77
Asbestos Containing Materials (ACM) >10 mm			
Total ACM (> 10mm)	0.1	g	< 0.1
ACM % asbestos (weighted average)	-	%	N/A
ACM in Soil (as asbestos)	0.01	% w/w	< 0.01
Fibrous Asbestos (FA) >10 mm			
Total FA	0.00001	g	< 0.00001
FA % asbestos (weighted average)	-	%	N/A
FA Asbestos in Soil	0.001	% w/w	< 0.001
Fibrous Asbestos (FA) <10 mm			
Total FA	0.00001	g	< 0.00001
FA % asbestos (weighted average)	-	%	N/A
FA Asbestos in Soil	0.001	% w/w	< 0.001
Asbestos Fines (AF) < 10 mm			
Total AF	0.00001	g	< 0.00001
AF % asbestos (weighted average)	-	%	N/A
AF Asbestos in Soil	0.001	% w/w	< 0.001
Combined AF+FA	0.001	% w/w	< 0.001

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
LTM-ASB-8020 Method for the Qualitative Identification of Asbestos in Bulk Samples	Christchurch	Aug 22, 2023	Indefinite

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NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	Site# 25079 & 25289
Site# 1254	Site# 25403	Site# 18217	Site# 25466	Site# 20794	

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Company Name: ENGEO Ltd - NI
Address: 8 Greydene Place
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Auckland 0622

Project Name: 10 SINTON ROAD
Project ID: 23849.000.002

Order No.:
Report #: 1018885
Phone: 0011 64 9 9722 205
Fax:

Received: Aug 18, 2023 1:44 PM
Due: Aug 25, 2023
Priority: 5 Day
Contact Name: Claire Davies

Eurofins Analytical Services Manager : Katyana Gausel

Sample Detail						Asbestos - AS4964	HOLD	Moisture Set	Organochlorine Pesticides (NZ MfE)	Metals M8 (NZ MfE)	Polycyclic Aromatic Hydrocarbons (NZ MfE)	Asbestos in Soils (NZ GAMAS)	Semivolatile Organics
Auckland Laboratory - IANZ# 1327							X	X	X	X	X		X
Christchurch Laboratory - IANZ# 1290						X						X	
Tauranga Laboratory - IANZ# 1402													
External Laboratory													
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**								
1	S01 0.1	Aug 15, 2023		Soil	K23-Au0053407			X		X	X		
2	S02 0.1	Aug 15, 2023		Soil	K23-Au0053408			X		X	X		
3	S03 0.1	Aug 15, 2023		Soil	K23-Au0053409			X	X	X			
4	S04 0.1	Aug 15, 2023		Soil	K23-Au0053410			X	X	X			
5	S05 0.1	Aug 15, 2023		Soil	K23-Au0053411			X	X	X			
6	S06 0.2	Aug 15, 2023		Soil	K23-Au0053412	X		X		X			
7	S07 0.2	Aug 15, 2023		Soil	K23-Au0053413	X		X		X			
8	S08 0.2	Aug 15, 2023		Soil	K23-Au0053414	X		X		X			
9	S09 0.2	Aug 15, 2023		Soil	K23-Au0053415	X		X		X			
10	S10 0.2	Aug 15, 2023		Soil	K23-Au0053416	X		X		X			
11	S12 0.2	Aug 15, 2023		Soil	K23-Au0053417	X		X		X			

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NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	Site# 25079 & 25289
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Auckland Laboratory - IANZ# 1327							X	X	X	X	X		X
Christchurch Laboratory - IANZ# 1290						X						X	
Tauranga Laboratory - IANZ# 1402													
12	S13 0.2	Aug 15, 2023		Soil	K23-Au0053418	X		X		X			
13	S14 0.0-0.3	Aug 15, 2023		Soil	K23-Au0053419	X		X		X			
14	S15 0.0-0.25	Aug 15, 2023		Soil	K23-Au0053420	X		X		X			
15	S16 0.0-0.25	Aug 15, 2023		Soil	K23-Au0053421	X		X		X			
16	S17 0.0-0.3	Aug 15, 2023		Soil	K23-Au0053422	X		X		X			
17	S18 0.0-0.25	Aug 15, 2023		Soil	K23-Au0053423	X		X		X			
18	S19 0.0-0.2	Aug 15, 2023		Soil	K23-Au0053424			X		X		X	
19	S20 0.0-0.15	Aug 15, 2023		Soil	K23-Au0053425			X		X		X	
20	S21 0.0-0.15	Aug 15, 2023		Soil	K23-Au0053426			X		X		X	
21	S22 0.0-0.2	Aug 15, 2023		Soil	K23-Au0053427			X		X		X	
22	S23 0.0-0.2	Aug 15, 2023		Soil	K23-Au0053428			X		X		X	
23	S24 0.0-0.35	Aug 15, 2023		Soil	K23-Au0053429	X		X		X			
24	S25 0.0-0.2	Aug 15, 2023		Soil	K23-Au0053430			X		X		X	
25	S26 0.0-0.2	Aug 15, 2023		Soil	K23-Au0053431			X		X		X	

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NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	Site# 25079 & 25289
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Contact Name: Claire Davies

Eurofins Analytical Services Manager : Katyana Gausel

Sample Detail						Asbestos - AS4964	HOLD	Moisture Set	Organochlorine Pesticides (NZ MfE)	Metals M8 (NZ MfE)	Polycyclic Aromatic Hydrocarbons (NZ MfE)	Asbestos in Soils (NZ GAMAS)	Semivolatile Organics
Auckland Laboratory - IANZ# 1327							X	X	X	X	X		X
Christchurch Laboratory - IANZ# 1290						X						X	
Tauranga Laboratory - IANZ# 1402													
26	S27 0.0-0.3	Aug 15, 2023		Soil	K23-Au0053432			X		X		X	
27	S28 0.0-0.2	Aug 15, 2023		Soil	K23-Au0053433			X		X		X	
28	S29 0.0-0.2	Aug 15, 2023		Soil	K23-Au0053434			X		X		X	
29	S37 0.3	Aug 15, 2023		Soil	K23-Au0053435			X		X	X	X	
30	S38 0.1	Aug 15, 2023		Soil	K23-Au0053436			X		X	X	X	
31	S39 (STOCKPILE)	Aug 15, 2023		Soil	K23-Au0053437	X		X		X			
32	S40 (STOCKPILE)	Aug 15, 2023		Soil	K23-Au0053438			X		X		X	X
33	S01 0.4	Aug 15, 2023		Soil	K23-Au0053439		X						
34	S02 0.4	Aug 15, 2023		Soil	K23-Au0053440		X						
35	S03 0.3	Aug 15, 2023		Soil	K23-Au0053441		X						
36	S03 0.6	Aug 15, 2023		Soil	K23-Au0053442		X						
37	S04 0.4	Aug 15, 2023		Soil	K23-Au0053443		X						

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NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	Site# 25079 & 25289
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Sample Detail						Asbestos - AS4964	HOLD	Moisture Set	Organochlorine Pesticides (NZ MfE)	Metals M8 (NZ MfE)	Polycyclic Aromatic Hydrocarbons (NZ MfE)	Asbestos in Soils (NZ GAMAS)	Semivolatile Organics
Auckland Laboratory - IANZ# 1327							X	X	X	X	X		X
Christchurch Laboratory - IANZ# 1290						X						X	
Tauranga Laboratory - IANZ# 1402													
38	S05 0.4	Aug 15, 2023		Soil	K23-Au0053444		X						
39	S06 0.4	Aug 15, 2023		Soil	K23-Au0053445		X						
40	S07 0.4	Aug 15, 2023		Soil	K23-Au0053446		X						
41	S08 0.4	Aug 15, 2023		Soil	K23-Au0053447		X						
42	S09 0.5	Aug 15, 2023		Soil	K23-Au0053448		X						
43	S10 0.5	Aug 15, 2023		Soil	K23-Au0053449		X						
44	S11 0.2	Aug 15, 2023		Soil	K23-Au0053450		X						
45	S11 0.5	Aug 15, 2023		Soil	K23-Au0053451		X						
46	S12 0.5	Aug 15, 2023		Soil	K23-Au0053452		X						
47	S13 0.4	Aug 15, 2023		Soil	K23-Au0053453		X						
48	S14 0.3-0.5	Aug 15, 2023		Soil	K23-Au0053454		X						
49	S15 0.25-0.4	Aug 15, 2023		Soil	K23-Au0053455		X						
50	S16 0.25-0.5	Aug 15, 2023		Soil	K23-Au0053456		X						
51	S17 0.3-0.5	Aug 15, 2023		Soil	K23-Au0053457		X						

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Sample Detail						Asbestos - AS4964	HOLD	Moisture Set	Organochlorine Pesticides (NZ MfE)	Metals M8 (NZ MfE)	Polycyclic Aromatic Hydrocarbons (NZ MfE)	Asbestos in Soils (NZ GAMAS)	Semivolatile Organics
Auckland Laboratory - IANZ# 1327							X	X	X	X	X		X
Christchurch Laboratory - IANZ# 1290						X						X	
Tauranga Laboratory - IANZ# 1402													
52	S18 0.25-0.4	Aug 15, 2023		Soil	K23-Au0053458		X						
53	S19 0.2-0.45	Aug 15, 2023		Soil	K23-Au0053459		X						
54	S20 0.15-0.35	Aug 15, 2023		Soil	K23-Au0053460		X						
55	S21 0.15-0.35	Aug 15, 2023		Soil	K23-Au0053461		X						
56	S22 0.2-0.45	Aug 15, 2023		Soil	K23-Au0053462		X						
57	S23 0.2-0.45	Aug 15, 2023		Soil	K23-Au0053463		X						
58	S24 0.35-0.5	Aug 15, 2023		Soil	K23-Au0053464		X						
59	S25 0.2-0.4	Aug 15, 2023		Soil	K23-Au0053465		X						
60	S26 0.2-0.4	Aug 15, 2023		Soil	K23-Au0053466		X						
61	S27 0.3-0.45	Aug 15, 2023		Soil	K23-Au0053467		X						
62	S28 0.2-0.4	Aug 15, 2023		Soil	K23-Au0053468		X						
63	S29 0.2-0.4	Aug 15, 2023		Soil	K23-Au0053469		X						
64	S30 0.1	Aug 15, 2023		Soil	K23-Au0053470		X						
65	S30 0.4	Aug 15, 2023		Soil	K23-Au0053471		X						

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NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	Site# 25079 & 25289
Site# 1254	Site# 25403	Site# 18217	Site# 25466	Site# 20794	

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Project Name: 10 SINTON ROAD
Project ID: 23849.000.002

Order No.:
Report #: 1018885
Phone: 0011 64 9 9722 205
Fax:

Received: Aug 18, 2023 1:44 PM
Due: Aug 25, 2023
Priority: 5 Day
Contact Name: Claire Davies

Eurofins Analytical Services Manager : Katyana Gausel

Sample Detail						Asbestos - AS4964	HOLD	Moisture Set	Organochlorine Pesticides (NZ MfE)	Metals M8 (NZ MfE)	Polycyclic Aromatic Hydrocarbons (NZ MfE)	Asbestos in Soils (NZ GAMAS)	Semivolatile Organics
Auckland Laboratory - IANZ# 1327							X	X	X	X	X		X
Christchurch Laboratory - IANZ# 1290						X						X	
Tauranga Laboratory - IANZ# 1402													
66	S31 0.1	Aug 15, 2023		Soil	K23-Au0053472		X						
67	S31 0.4	Aug 15, 2023		Soil	K23-Au0053473		X						
68	S32 0.1	Aug 15, 2023		Soil	K23-Au0053474		X						
69	S32 0.4	Aug 15, 2023		Soil	K23-Au0053475		X						
70	S33 0.1	Aug 15, 2023		Soil	K23-Au0053476		X						
71	S33 0.4	Aug 15, 2023		Soil	K23-Au0053477		X						
72	S34 0.1	Aug 15, 2023		Soil	K23-Au0053478		X						
73	S34 0.4	Aug 15, 2023		Soil	K23-Au0053479		X						
74	S35 0.1	Aug 15, 2023		Soil	K23-Au0053480		X						
75	S35 0.4	Aug 15, 2023		Soil	K23-Au0053481		X						
76	S36 0.1	Aug 15, 2023		Soil	K23-Au0053482		X						
77	S36 0.3	Aug 15, 2023		Soil	K23-Au0053483		X						
78	PACM	Aug 15, 2023		Building Materials	K23-Au0053484		X						

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Site# 1254	Site# 25403	Site# 18217	Site# 25466	Site# 20794	

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Auckland Laboratory - IANZ# 1327		X	X	X	X	X		X
Christchurch Laboratory - IANZ# 1290	X						X	
Tauranga Laboratory - IANZ# 1402								
Test Counts	14	46	32	3	32	4	13	1

Internal Quality Control Review and Glossary General

1. QC data may be available on request.
2. All soil results are reported on a dry basis, unless otherwise stated.
3. Samples were analysed on an 'as received' basis.
4. Information identified on this report with the colour **blue** indicates data provided by customer that may have an impact on the results.
5. This report replaces any interim results previously issued.

Holding Times

Please refer to the most recent version of the 'Sample Preservation and Container Guide' for holding times (QS3001).
If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported. Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

Units

% w/w:	Percentage weight-for-weight basis, e.g. of asbestos in asbestos-containing finds in soil samples (**% w/w**)
F/fld	Airborne fibre filter loading as Fibres (**N**) per Fields counted (**n**)
F/mL	Airborne fibre reported concentration as Fibres per millilitre of air drawn over the sampler membrane (**C**)
g, kg	Mass, e.g. of whole sample (**M**) or asbestos-containing find within the sample (**m**)
g/kg	Concentration in grams per kilogram
L, mL	Volume, e.g. of air as measured in AFM (**V** = **r** x **t**)
L/min	Airborne fibre sampling Flowrate as litres per minute of air drawn over the sampler membrane (**r**)
min	Time (**t**), e.g. of air sample collection period

Calculations

Airborne Fibre Concentration: $C = \left(\frac{A}{a}\right) \times \left(\frac{N}{n}\right) \times \left(\frac{1}{r}\right) \times \left(\frac{1}{t}\right) = K \times \left(\frac{N}{n}\right) \times \left(\frac{1}{V}\right)$

Asbestos Content (as asbestos): $\%\, w/w = \frac{(m \times P_A)}{M}$

Weighted Average (of asbestos): $\%_{WA} = \sum \frac{(m \times P_A)_x}{x}$

Terms

%asbestos	Estimated percentage of asbestos in a given matrix. May be derived from knowledge or experience of the material, informed by HSG264 *Appendix 2*, else assumed to be 15% in accordance with WA DOH *Appendix 2* (**P_A**).
ACM	Asbestos Containing Materials. Asbestos contained within a non-asbestos matrix, typically presented in bonded (non-friable) condition. For the purposes of the NEPM and WA DOH, ACM corresponds to material larger than 7 mm x 7 mm.
AF	Asbestos Fines. Asbestos contamination within a soil sample, as defined by WA DOH. Includes loose fibre bundles and small pieces of friable and non-friable material such as asbestos cement fragments mixed with soil. Considered under the NEPM as equivalent to “non-bonded / friable”.
AFM	Airborne Fibre Monitoring, e.g. by the MFM.
Amosite	Amosite Asbestos Detected. Amosite may also refer to Fibrous Grunerite or Brown Asbestos. Identified in accordance with AS 4964-2004.
AS	Australian Standard.
Asbestos Content (as asbestos)	Total % w/w asbestos content in asbestos-containing finds in a soil sample (**% w/w)**.
Chrysotile	Chrysotile Asbestos Detected. Chrysotile may also refer to Fibrous Serpentine or White Asbestos. Identified in accordance with AS 4964-2004.
COC	Chain of Custody.
Crocidolite	Crocidolite Asbestos Detected. Crocidolite may also refer to Fibrous Riebeckite or Blue Asbestos. Identified in accordance with AS 4964-2004.
Dry	Sample is dried by heating prior to analysis.
DS	Dispersion Staining. Technique required for Unequivocal Identification of asbestos fibres by PLM.
FA	Fibrous Asbestos. Asbestos containing material that is wholly or in part friable, including materials with higher asbestos content with a propensity to become friable with handling, and any material that was previously non-friable and in a severely degraded condition. For the purposes of the NEPM and WA DOH, FA generally corresponds to material larger than 7 mm x 7 mm, although FA may be more difficult to visibly distinguish and may be assessed as AF.
Fibre Count	Total of all fibres (whether asbestos or not) meeting the counting criteria set out in the NOHSC:3003
Fibre ID	Fibre Identification. Unequivocal identification of asbestos fibres according to AS 4964-2004. Includes Chrysotile, Amosite (Grunerite) or Crocidolite asbestos.
Friable	Asbestos-containing materials of any size that may be broken or crumbled by hand pressure. For the purposes of the NEPM, this includes both AF and FA. It is outside of the laboratory’s remit to assess degree of friability.
HSG248	UK HSE HSG248, *Asbestos: The Analysts Guide*, 2nd Edition (2021).
HSG264	UK HSE HSG264, *Asbestos: The Survey Guide* (2012).
ISO (also ISO/IEC)	International Organization for Standardization / International Electrotechnical Commission.
K Factor	Microscope constant (**K**) as derived from the effective filter area of the given AFM membrane used for collecting the sample (**A**) and the projected eyepiece graticule area of the specific microscope used for the analysis (**a**).
LOR	Limit of Reporting.
MFM (also NOHSC:3003)	Membrane Filter Method. As described by the Australian Government National Occupational Health and Safety Commission, *Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres*, 2nd Edition [NOHSC:3003(2005)].
NEPM (also ASC NEPM)	National Environment Protection (Assessment of Site Contamination) Measure, (2013, as amended).
Organic	Organic Fibres Detected. Organic may refer to Natural or Man-Made Polymeric Fibres. Identified in accordance with AS 4964-2004.
PCM	Phase Contrast Microscopy. As used for Fibre Counting according to the MFM.
PLM	Polarised Light Microscopy. As used for Fibre Identification and Trace Analysis according to AS 4964-2004.
Sampling	Unless otherwise stated Eurofins are not responsible for sampling equipment or the sampling process.
SMF	Synthetic Mineral Fibre Detected. SMF may also refer to Man Made Vitreous Fibres. Identified in accordance with AS 4964-2004.
SRA	Sample Receipt Advice.
Trace Analysis	Analytical procedure used to detect the presence of respirable fibres (particularly asbestos) in a given sample matrix.
UK HSE HSG	United Kingdom, Health and Safety Executive, Health and Safety Guidance, publication.
UMF	Unidentified Mineral Fibre Detected. Fibrous minerals that are detected but have not been unequivocally identified by PLM with DS according the AS 4964-2004. May include (but not limited to) Actinolite, Anthophyllite or Tremolite asbestos.
WA DOH	Reference document for the NEPM. Government of Western Australia, *Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia* (updated 2021), including Appendix Four: *Laboratory analysis*
Weighted Average	Combined average % w/w asbestos content of all asbestos-containing finds in the given aliquot or total soil sample (**$\%_{WA}$**).

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	No
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Asbestos Counter/Identifier:

Adelle Black	Senior Analyst-Asbestos
Kate Stuart	Senior Analyst-Asbestos

Authorised by:

Sophie Bush	Senior Analyst-Asbestos

Sophie Bush
Senior Analyst-Asbestos (Key Technical Personnel)

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates ISO/IEC 17025:2017 accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

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Project Number 23849.000.002

Remediation Action Plan

10 Sinton Road, Whenuapai, Auckland

Submitted to:
Cabra Developments Limited
Unit 9B, 30 Foundry Road
Silverdale
Auckland 0932

Contents

Tables

Appendices

ENGEO Document Control:

Report Title	Remediation Action Plan - 10 Sinton Road, Whenuapai			
Project No.	23849.000.002	**Doc ID**	02	
Client	Cabra Developments Limited	**Client Contact**	Duncan Unsworth	
Distribution (PDF)	Duncan Unsworth, Cabra Developments Limited			
Date	**Revision Details / Status**	**Author**	**Reviewer**	**WP**
30/10/2023	Issued to Client	CD	LL	DF

1 Introduction

ENGEO Limited was requested by Cabra Developments Limited to prepare a Remediation Action Plan (RAP) for soil disturbance activities to be carried out at 10 Sinton Road, Whenuapai, Auckland (herein referred to as 'the site'; shown on Figure 1) to support the application for Resource Consent for the development of a residential estate. This work has been carried out in accordance with the signed agreement dated 2 August 2023.

ENGEO completed a preliminary and detailed site investigation (PSI / DSI) for the site in October 2023 (ENGEO, 2023a). The investigation comprised a review of publicly available historical information relating to the site and recovery and analysis of soil samples. The results of analysis of soil samples recovered from the site indicate that potential contaminants of concern are present in soil at concentrations which exceed adopted criteria (discussed further in Section 3.1).

Table 1: Site Summary

Contaminants identified on-site	In the southern portion of the site, the concentration of arsenic, cadmium, lead and asbestos fibres / fibrous exceeds the adopted human health criteria, and the concentration of lead and pyrene (a hydrocarbon) exceeds the adopted environmental criteria.
Scope of Proposed Works	We understand that development of the residential estate will include the demolition of the existing site structures to allow construction of the estate. No cut / fill plans have been provided to ENGEO at the time of writing this report.

This RAP contains:

- A summary of previous investigations completed at the site.
- A summary of the additional investigation works that will be undertaken to delineate the identified contamination 'hotspots' and to inform the need for a long-term discharge consent under the Auckland Unitary Plan (AUP; AC, 2016), if relevant.
- Details of the proposed remediation works (removal of impacted soil and validation sampling).
- Management procedures to assist in:
    - Achieving a safe working environment for relevant personnel.
    - Protecting the environment from contaminants in site discharges during the redevelopment works.

If not already undertaken, a pre-demolition asbestos survey of the site buildings will be required. If the surveys identify asbestos containing material in exterior building surfaces adjacent to exposed ground, soil samples shall be collected from this soil and analysed for asbestos (semi-quantitative). Additionally, if evidence of other actual or potential contamination is identified further testing of this soil may be required.

2 Objectives and Relevance of the RAP

2.1 Objective

The objectives of the RAP are to:

- Support an application for consent under the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (the "NESCS") and the AUP;
- Detail remedial actions for the site based on previous investigation(s);
- Outline requirements for oversight and validation during and following remedial works;
- Outline management for site soils; and
- Outline actions to be undertake if unidentified contamination is encountered.

2.2 Relevance

This document has been prepared in general accordance with the Ministry for the Environment's (MfE's) Contaminated Land Management Guidelines No.1 – Reporting on Contaminated Sites in New Zealand (MfE, 2021) and should be read in conjunction with the PSI / DSI (ENGEO, 2023a) prepared for the site. This RAP has been prepared to fulfil the requirements of a site management plan and a remedial action plan so all relevant information is available in one location, to facilitate implementation on-site.

The information and recommendations provided herein are to augment the processes on-site and are not intended to relieve any contractor with control of the site or person conducting a business or undertaking (PCBU) associated with the site of their responsibility for the health and safety of their workers and contractors. Nor is it intended to relieve contractors undertaking work on the site of their responsibilities under the Health and Safety at Work Act 2015 and subsequent amendments.

The provisions of the RAP are mandatory for all persons entering the site and all contractor and sub-contractor employees who will be involved in implementing the procedures identified in this document.

The contractor shall develop a site-specific health and safety plan to complement this RAP and to address health and safety requirements that may be applicable to their site works.

This RAP is considered suitable to provide controls based on the contamination identified during the previous investigation works (ENGEO, 2023a). If contamination is found that varies from what has been assumed in preparing this RAP, the RAP will need to be updated to account for the changed site understanding. If a revised RAP is prepared, it should be re-distributed to Council and the project team (Table 2) prior to earthworks commencing or as soon as practicable after such contamination is discovered.

Table 2: Assigned Responsibilities for Site Work

Role	Responsibility
Site Owner - Cabra Developments Limited	To distribute this RAP and be responsible for ensuring that the site works are undertaken in accordance with this document and any revisions to this document.
Site Contractor (main contractor / general earthworks) – *to be confirmed*	To distribute the RAP (including updated versions) to employees and subcontractors, and to ensure that the most up-to-date version of the RAP is available on-site at all times. To provide control and oversee the redevelopment works. It is recommended that a designated, suitably trained Site Supervisor is present to oversee the works. The Site Supervisor should address changes to site procedures, as necessary, should unanticipated conditions arise. This also includes ensuring that all site staff and subcontractors are aware of and comply with the procedures and health and safety requirements contained within this document. It is anticipated that this Site Supervisor would represent the main site contractor. Should an incident occur on-site which may result in discharges, the supervisor should take control of the situation and coordinate the efforts of all people on-site to minimise the impact. Worker and public Health and Safety concerns will take precedence over environmental discharges, should it be unsafe to employ controls or emergency measures immediately. As a minimum, the Site Supervisor should have received non-certified training in asbestos identification, safe handling and suitable controls, to ensure that if asbestos / asbestos containing materials (ACMs) are encountered they are identified and appropriately managed. Written evidence of the training shall be kept on record.
Contaminated Land Specialist – ENGEO	A company with Suitably Qualified and Experienced Practitioners (SQEPs) in contaminated land management shall be appointed to liaise with the contractor during the course of the works. A SQEP or their nominated representative from the Contaminated Land Specialist company shall: • Visit the site on at least two occasions during remedial works to assess the controls and procedures on-site, as they relate to this RAP. • Perform the additional investigation and validation works. • Provide environmental support during site works (if required) and prepare an appropriate closure report at the completion of works.

3 Site Information and History

The current site conditions and site setting is summarised in Table 3.

Table 3: Site Setting

Item	Description
Local Setting	The site is located in a rural residential area, on the western side of the intersection of Clarks Road and Sinton Road. A vacant single-storey dwelling, garage, implement shed and granny flat (with associated garage) are positioned near the Sinton Road frontage in the southern portion of the site. The buildings are accessed via two gravel driveways. The northern portion of the site comprises paddocks that are not currently in use. The western and eastern boundaries are defined by shelterbelts.
Geology	The site is mapped by GNS Science as being underlain by Puketoka Formation alluvium comprising pumiceous mud, sand, and gravel with lenses of muddy peat and lignite in the southern portion of the site. The northern portion of the site is mapped as being underlain by East Coast Bays Formation, comprising alternating sandstone and mudstone with variable volcanic content.
Topography	The site slopes gently towards the northwest from RL 18 m to RL 5 m.
Hydrology	The upper end of an overland flow path is mapped in Auckland Council GeoMaps as flowing west through the centre of the site into the Waiarohia Inlet, a tributary of the Waitemata Harbour.
Hydrogeology	A groundwater assessment was not completed as part of this investigation; however, during the geotechnical investigation (ENGEO, 2023b) the ground became saturated at 4.0 m below ground level (bgl) in one hand auger borehole, and standing groundwater, at a depth of 4.9 m bgl was observed in the other. The Geotechnical Investigation Appraisal and Site Walkover completed by CMW Geosciences in 2016 (CMW, 2016) indicates that standing groundwater was observed at a depth between 1.6 m and 3.5 m bgl in seven of the eight hand auger boreholes drilled at the site. Based on the topography of the site, the mapped overland flow path and the nearest watercourse, shallow groundwater likely flows in a west to northwest direction.

3.1 Previous Investigation

ENGEO completed a PSI / DSI at the site in October 2023 (ENGEO, 2023a).

Based on our desktop review and site observations, the site has historically been used as agricultural land. The site has primarily been undeveloped, however former and existing buildings were / are present in the southern portion of the site. Additionally, waste material (brick, plastics, ceramics, and general domestic rubbish) and stockpiles of soil was observed. Due to the historical landuses there was considered to be potential for metals, polycyclic aromatic hydrocarbons (PAHs) and asbestos to contaminate soils.

Findings of the intrusive investigation works are summarised below:

- The development plans have not yet been finalised and therefore the analysis results have been compared to both high-density and standard residential land use criteria:
    - The concentration of asbestos, arsenic or lead in samples collected from four former building footprints (S08, S14, S15, and S16) and two samples collected adjacent to the existing dwelling (S19 and S23) exceeded the adopted health criteria for high-density residential land use.
    - The concentration of asbestos arsenic, cadmium and /or lead in samples collected from five former building footprints (S08, S14, S15, S16 and S18) and seven samples collected adjacent to the existing dwelling and auxiliary buildings (S19 to S23, S25 and S26) exceeded the adopted health criteria for standard residential land use.
- The concentrations of lead in samples collected from two former building footprints (S14 and S18) and four samples collected adjacent to the existing dwelling and auxiliary building (S19 to S21, and S23) exceed the adopted environmental assessment criterion.
- The concentration of pyrene in one of the samples of stockpiled material (S40) in the southern portion of the site exceeded the environmental assessment criterion. It is noted that as the risk-driver for the adopted pyrene criterion is related to soil being in direct contact with groundwater, this material could be re-used on-site but should be placed some distance above the highest level that the groundwater table can reach.
- A soil sample collected from the former building footprints in the central part of the site (S09) detected asbestos, albeit at a concentration that does not present an unacceptable risk to human health. The source of the elevated concentration is likely the use of asbestos containing materials in the construction of the former buildings.

The source of the elevated concentrations is unknown, however is likely associated with the materials used in the construction of the former and existing buildings. The elevated pyrene result identified in one of the stockpile samples was likely present in soil imported to the site. Based on the likely sources of contamination elevated contaminant concentrations are likely limited to shallow soil or stockpiled material.

The summary of results table (extracted from the PSI / DSI (ENGEO, 2023a)) is included in Appendix 1, and a site investigation plan is included as Figure 1.

A conceptual site model was prepared based on the findings of the intrusive investigation and is summarised below.

Table 4: Conceptual Site Model

Potential Source of Contamination	Potential Pathway	Potential Receptor	Acceptable Risk?
Building materials containing asbestos (existing and former) *Asbestos fines and fibrous asbestos (HAIL ID: E1)*	Inhalation of asbestos fibres released from impacted soils / dust	Future site users / site redevelopment workers Surrounding residents	**No** The concentration of asbestos fibres / fibrous asbestos in three former building footprints (S08, S15, and S16) exceeded the human health criterion. Asbestos fibres / fibrous asbestos were detected in two samples collected in soil adjacent to existing buildings; however, the recorded concentrations are below the guidance criteria.
Undocumented fill material and stockpiles *Metals / metalloids, polycyclic aromatic hydrocarbons (PAHs) and asbestos fines and fibrous asbestos (HAIL ID: G3)*	Soil ingestion, inhalation of dust, and / or dermal contact	Future site users / site redevelopment workers Surrounding residents	**Yes** The concentration of contaminants of concern were below human health criteria
	Leaching of contaminants	Surrounding environment	**No** With the exception of one sample, all samples analysed reported concentrations of relevant contaminants of concern below the environmental discharge criteria. The concentration of pyrene in one of the samples of stockpiled material (S40) exceeded the environmental assessment criterion; however, the risk-driver for the adopted pyrene criterion is related to soil being in direct contact with groundwater. Therefore, material can be re-used on-site but should be placed above the high groundwater table.
	Inhalation of asbestos fibres released from impacted soils / dust	Future site users / site redevelopment workers Surrounding residents	**Yes** No asbestos was detected in the samples analysed.

Potential Source of Contamination	Potential Pathway	Potential Receptor	Acceptable Risk?
Potential lead-based paint on former and existing buildings *Lead (HAIL ID: I)*	Soil ingestion, inhalation of dust, and / or dermal contact	Future site users / site redevelopment workers Surrounding residents	**No** The concentration of lead in six samples collected within or adjacent to former / existing building footprints (S14, S18, S19, S20, S21 and S23) exceeded the standard residential human health criterion. Two samples (S19 and S23) also exceeded criteria for high-density residential land use.
	Leaching of contaminants	Surrounding environment	**No** The concentration of lead in six samples collected within or adjacent to former / existing building footprints (S14, S18, S19, S20, S21 and S23) were above the environmental discharge criterion.
Elevated concentration of arsenic and cadmium within former building footprint, and arsenic adjacent to existing dwelling.	Soil ingestion, inhalation of dust, and / or dermal contact	Future site users / site redevelopment workers Surrounding residents	**No** The concentration of lead in four samples collected within or adjacent to former / existing building footprints (S14, S22, S25 and S26) exceeded the standard residential human health criterion. One sample (S14) also exceeded criteria for high-density residential land use.
	Leaching of contaminants	Surrounding environment	**Yes** Concentrations were below environmental assessment criteria.

Note: HAIL IDs refer to activities included on the Hazardous Activities and Industries List (HAIL; MfE, 2011a).

4 Summary of Development Activities Relevant to this RAP

Site Preparation

Site preparation activities include site establishment (i.e., mobilisation, erecting fences, and establishing site security) and set-up of stormwater / silt control measures.

Earthworks

All soil disturbance works including topsoil stripping, excavations for utility installation, construction of building platforms, and foundation excavations.

5 Proposed Additional Investigation Works

The following additional works are proposed:

i. Following demolition of buildings and removal of areas of hard standing a walkover inspection will be undertaken by a SQEP or their representative, working under their supervision, to identify any visual or olfactory evidence of contamination. If areas of potential concern are noted, soil samples will be recovered from those areas for analysis of an appropriate suite of potential contaminants.

ii. Additional delineation is recommended to try to reduce the volume of material requiring off-site disposal as managed fill or landfill. Additional soil sampling will be undertaken around each previous location where remediation is proposed, as listed in Table 5. It is proposed to collect a minimum of four lateral samples, and at least one vertical sample at the original sample location. Samples will be analysed for contaminants of concern, as detailed in Table 5. A portable XRF (X-ray fluorescence) analyser may also be used to screen soil, to assist with delineation and reduce the requirements for laboratory analysis.

5.1 Additional Reporting

If contamination is identified that requires modification to the remedial works or control measures detailed in this RAP, a letter report summarising the results of the additional investigations will be forwarded to Auckland Council, together with any proposed amendments to the RAP required as a result of the findings. In all other cases, the results of the additional investigation works will be included in the Site Validation Report (SVR) as described in Section 10.

6 Remedial Works

6.1 Remediation Options

The remedial objective is to reduce risk to future site users and environmental receptors associated with the presence of elevated concentrations of contaminants in some locations at the site. The following potential remediation options have been identified for this site.

Off-site Disposal

Removal and off-site disposal at an appropriately licensed landfill facility of soil that has been identified as containing concentrations of contaminants either above the adopted human health criteria or the environmental discharge criteria.

Off-site disposal at an appropriately licensed landfill facility permanently removes the risk to human health and environmental receptors associated with the soil identified as containing concentrations of contaminants above the adopted human health criteria or the environmental discharge criteria. This option also has the advantage that there is no requirement for long-term management.

Encapsulation / Capping / Re-use

This remedial strategy is considered to offer a more sustainable approach and can be equally or more protective than disposing of material at a landfill. This option involves the placement of a suitable capping layer over the area where impacted material is proposed to be retained *in situ*. The cap will generally consist of the following placed above the leveled site surface:

Beneath building foundations and external hard surfaced areas:

- Concrete slab;
- Damp proof membrane; and
- Fill material placed and compacted to a specified thickness and specification.

Beneath communal recreational / amenity soft landscaped areas:

- A minimum of 500 mm clean imported soil; and
- A warning layer of geotextile cloth.

This option avoids the cost of transportation and disposal of the material; however, groundwater monitoring may be required around areas identified as exceeding the environmental discharge criteria to verify that contamination hasn't impacted groundwater and to assess the need for a long-term discharge consent associated with the impacted material.

To ensure appropriate long-term management of the site, as-built drawings will need to be prepared. This can be accomplished by surveying the site, prior and post placement of the capping layer. The as-built survey plans will confirm the capping has been placed in accordance with the design and will also provide information regarding the depth to contaminated materials for future site excavation activities.

6.2 Remediation Strategy

As the identified contamination is likely limited to shallow soil, which is likely to be geotechnically unsuitable to remain *in situ*, the preferred remedial strategy is off-site disposal.

6.3 Remediation Volume

Based on the results of the PSI / DSI, an estimate of the soil volume requiring remediation is provided in Table 5. The locations of the remedial areas are presented on Figure 1. Additional delineation is recommended (Section 5) to try to reduce the volume of material requiring off-site disposal as managed fill or landfill. The remedial area may be extended (or reduced) if contamination is found that varies from what is currently known.

Table 5: Remedial Volume Estimation (based on current dataset)

Remedial Area	Sample exceeding relevant criteria	Exceedance	Estimated Area of Impact (m^2) [1]	Estimated Depth of Impact (m below ground level) [2]	Estimated Volume of Impacted Material (m^3)
RA1	S08	Asbestos	650	0.35	195
RA2	S15	Asbestos	125	0.35	43.75
RA3	S14 S16	Arsenic Cadmium Lead Asbestos	130	0.35	45.5
RA4	S18	Lead	115	0.35	40.25
RA5	S19 S20 S21 S22 S23	Arsenic Lead	195	0.35	68.25
RA6	S25 S26	Arsenic	105	0.35	104.65
RA7	S40	Pyrene	*Extent of stockpile*	*0.1 m scrape beneath stockpile*	-

Notes:

[1] Estimated area is likely conservative as the lateral extent of contamination has not been determined. The estimate assumes that impacted soil is limited to the footprint of the former buildings and a 2 m distance from the edge of the existing buildings.

[2] Vertical extent of contamination has been constrained by deeper sample with a concentration below the investigation criteria; however, the impact is considered likely limited to shallow soil. Successful remediation will be confirmed through validation sampling.

6.4 Remediation Controls

Any remedial earthworks shall be completed and validated prior to the bulk topsoil strip to minimise the potential for accidental mixing of impacted soils with non-impacted soils.

Earthworks involving disturbance of soils within the remedial area should be undertaken in accordance with the controls in Section 7. During the remedial works, a Contaminated Land Specialist shall be engaged to visit the site to verify that earthworks are being conducted in accordance with the agreed methodology and controls listed within this document.

6.5 Validation and Oversight

Following removal of impacted soils, a Contaminated Land Specialist shall be engaged to collect validation samples. Samples are to be collected from the base and sidewalls of the remedial areas with a minimum of five samples collected from each area; the planned validation sampling strategy may be amended based on site observations or upon discovery of additional information, however changes to the sampling strategy shall be justified by the Contaminated Land Specialist in the validation report. Samples shall be analysed at an accredited laboratory for contaminants identified in Table 5.

The results shall be assessed against the remedial criteria presented in Table 6. If soil validation sampling indicates that the remaining soils exceed the remedial criteria, the Contaminated Land Specialist will advise further remedial actions to achieve the remedial objectives. If this requires a change to the remedial strategy, then this should be communicated to Auckland Council for approval in advance.

6.6 Assessment Criteria

The remedial criteria have been selected from the lesser of the human health and environmental discharge criteria for each contaminant and are provided in Table 6 below.

Table 6: Adopted Remedial Criteria

Contaminant of Concern	Remedial Goal	Remedial Goal Source
Lead	210 mg / kg	Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health (MfE, 2011b)
Arsenic	20 mg / kg	
Cadmium	3 mg / kg	
Zinc	400 mg / kg	Permitted activity criteria from E30.6.1.4 of the Auckland Unitary Plan (AUP, 2016).
Pyrene	1.3 mg / kg	
Asbestos	0.05 % w/w (ACM) 0.001 % w/w (AF / FA)	New Zealand Guidelines for Assessing and Managing Asbestos in Soil (NZ GAMAS; BRANZ, 2017).

If additional unexpected contamination is encountered during the works, appropriate remedial criteria shall be selected from the Auckland Unitary Plan (AUP, 2016), the Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health (MfE, 2011b) and following MfE Contaminated Land Management Guidelines No. 2 (MfE, 2011c).

7 Site Management Practices and Controls

7.1 Controlled Soil

Concentrations of heavy metals / metalloids (arsenic, cadmium, chromium, copper, lead and zinc) and asbestos that exceed background concentrations but are below the adopted human health and environmental criteria for the site, were recorded in samples collected from soil within or adjacent to the footprints of former and existing buildings in the southern portion of the site and from an isolated location adjacent to the western boundary. In addition, PAH was detected in samples from the stockpiled material in the southern portion of the site and material along the coastal margin. Some earthwork controls, as discussed in this section are needed during disturbance of this material.

The material is not consistent with Auckland Council's definition of cleanfill and would need to be managed on-site and / or be disposed of at an appropriately licenced managed fill or landfill site if it is removed from the site.

7.2 Earthworks Controls

The site management practices in Table 7 shall be implemented during ground-disturbing works in the remedial areas, and areas of controlled soil. The relevance and effectiveness of these protocols shall be reviewed by the Site Supervisor on a daily basis during works in these areas of the site. The Site Controls summary in Appendix 2 provides an overview of controls required. It is anticipated that this will be displayed on-site for contractor reference.

Earthworks outside of the remedial and asbestos impacted fill areas can be managed under controls appropriate for similar earthworks activities on an uncontaminated site, however, care must be taken to identify potential unanticipated contamination (refer to Section 8).

During the works, a SQEP from the Contaminated Land Specialist company, shall visit the site to observe site activities and confirm that the works are being performed in accordance with this RAP. The number of visits required will be subject to the staging and duration of works; however, at least two site visits will be performed.

Table 7: Site Management Practices

General Site Procedures	Contractor staff, subcontractors and visitors shall be inducted before entering the site or commencing work to ensure they are aware of the potential hazards relating to contaminated soil at the site. The following general safety procedures shall be followed by all staff entering or working in the immediate area of the earthworks: • Site workers shall avoid unnecessary contact with site soils. • Hands are to be washed prior to eating, drinking or smoking. All incidents shall be reported to the main contractor's health and safety advisor, or equivalent responsible person on-site.

Personal Protective Equipment (PPE)	To minimise the effects of potential contamination exposure via incidental ingestion of soil, skin contact or inhalation of dust anyone entering the remedial areas should wear the following PPE should in addition to standard PPE requirements for construction sites (e.g., safety boots): • Disposable gloves if contact with soil is unavoidable. • P2 Dust mask and coveralls (coveralls rated type 5, category 3 should be worn in remedial areas containing asbestos-impacted soil). For the remainder of the site the following should be considered over-and-above standard PPE requirements for construction sites (e.g., safety boots): • P2 Dust mask (if visible dust is present). • Work gloves / Coveralls (if contact with soil unavoidable) • Goggles / safety glasses.
Boundary Controls	Security fencing and appropriate warning signs shall be erected around earthworks areas to prevent unauthorised access. Appropriate sediment control measures shall be implemented to minimise sediment runoff from the site. Minimum controls shall include: • A stabilised site entrance to minimise the movement of soil off-site. • Suitable sediment controls (e.g., silt fencing) placed around the perimeter of the works area and stormwater drains where there is a potential for runoff. Set up of clean and dirty areas to minimise tracking potentially impacted soils around the site and off-site. • Machinery used in the remedial areas should be cleaned of loose soil in a designated 'wash down' area (e.g., paved area or area of existing hardfill), including wheel/track washing (if appropriate), prior to leaving site. • Once loose soil has been removed, the cleaned item can be moved to the clean area. Any wastewater generated should not be discharged off-site and should be allowed to drain back into the site. • Imported rock / utilised in the 'wash down area' and / or 'truck loading area' (if relevant) should be disposed of as contaminated material, unless tested.
Stockpiling	Stockpiling of contaminated material shall be avoided. If temporary stockpiling of material is necessary, dust shall be controlled through wetting during the workday. If left overnight, the material shall be covered (e.g., with plastic) and protected by erosion / sediment controls (e.g., bunded). Stockpiles shall be located on an impermeable surface. If this is not possible, the underlying material should be considered potentially contaminated, and shall be managed / disposed of appropriately.

Groundwater	Site Specific Detail	A groundwater assessment was not completed as part of the previous investigation; however, observations during the geotechnical investigation (ENGEO, 2023b) indicates groundwater is variable. Dewatering may be required during earthworks, if dewatering is undertaken, disposal options are as follows.
	Discharge to Land On-site	Groundwater may be discharged to land on-site (either directly or after interim storage on-site), provided it complies with the permitted activity standards outlined in Section E4.6.1 and E4.6.2.5 of the Auckland Unitary Plan (AUP, 2016). These controls include restrictions on any changes to colour or visual clarity, odour emissions or effects on aquatic life.
	Discharge to Stormwater or Surface Water	Approval shall be sought from Auckland Council [for stormwater] or Watercare [for wastewater]) prior to discharge to the stormwater or wastewater network. Note: No free-phase hydrocarbons shall be permitted to be discharged into stormwater system.
Stormwater		Uncontrolled discharge of stormwater from earthworks sites is not permitted. If discharges occur e.g., the on-site erosion and sediment control measures fail, a vacuum truck shall be called to site immediately so that the discharge of stormwater from site is eliminated. It may be necessary to test any such water removed off-site to identify an appropriate disposal site.
Dust		Dust shall be managed in accordance with consent requirements and relevant regulations. The contractor shall consider the following (as appropriate): • Limit vehicle access onto the excavated areas as far as possible. • Dampen surface soil using a water truck or portable water mist sprays. Ensure that the volume of water used does not induce soil erosion, or cause surface ponding or runoff, that could discharge into natural water bodies or stormwater drains. • Use wind screens or avoid work during windy conditions. • Consider use of surfactants or polymers where a reliable source of water is not available. In the unlikely event that unsatisfactory dust emissions emanate from the site on a sustained basis or complaints are received in relation to the works, mitigation of the adverse effects shall be applied in accordance with the hierarchy of control described in the Health and Safety at Work Act 2015 (MBIE, 2015) - eliminate the risk, so far as is reasonably practicable; and if it is not reasonably practicable to eliminate a risk, to minimise those risks so far as is reasonably practicable. If the emission or discharges persist, professional advice shall be sought in order to define appropriate control measures. It is also recommended that consultation with appropriate council representatives be undertaken prior to recommencing works.

Odour	If excavated material is odorous, odour control measures shall be put in place. This could include covering the material with cleanfill, a polythene cover or instituting a deodoriser system.
Soil Disposal and Management	Trucks shall be loaded within the site where runoff and possible spills during loading will be controlled and contained. Loads must be securely covered before leaving site and during off-site transport. Soil must be taken directly to an appropriate soil disposal facility authorised to accept the contaminants present. No loaded trucks should be parked overnight anywhere other than on site or at the disposal facility (following their written agreement). Prior to acceptance, the results of the soil testing may be requested by the receiving facility. Requirements for additional testing and truck lining / soil wrapping should be confirmed with the receiving landfill. Outside the remedial and controlled / managed fill area (Figure 1), soil / fill material being disturbed during redevelopment earthworks is suitable to remain on-site. If off-site disposal is required, such material may comply with the Auckland Council definition of cleanfill material however further testing in the central portion of the rear of the site is required to confirm this.

7.3 Asbestos Controls

The objective of the asbestos controls is, so far as reasonably practicable, to eliminate personal exposure to airborne asbestos fibres on and off-site. The Health and Safety at Work (Asbestos) Regulations 2016 (herein referred to as 'the HSW(A)R') requires that if it is not reasonably practicable to eliminate personal exposure to airborne asbestos, exposure must be minimised so far as is reasonably practicable, through controls such as those described in this section.

The control measures in this document aim to address the Safe Work Practices specified in the ACOP (WorkSafe, 2016), and the NZ GAMAS (BRANZ, 2017), based on the investigations to date. As the NZ GAMAS is referenced in the WorkSafe ACOP, the guideline or higher level of controls are required to be adhered to.

The NZ GAMAS requires varying controls commensurate with the risk level based on the amount of asbestos identified in soil, and if applicable, air. As discussed above, to date asbestos detected in three soil samples collected within the footprint of the former buildings exceeded the human health criterion (0.001 % w/w), and three samples collected in the vicinity of former and existing buildings detected asbestos, albeit at a concentration less than the "all land use" human health criterion (i.e., < 0.001 % w/w). Given the low concentrations of asbestos fibres detected in the soil, and with suitable controls, we anticipate that fibre concentrations within air will not exceed trace levels. Trace level is defined in the HSW(A)R as an average concentration over any eight-hour period of less than 0.01 asbestos fibres per millilitre of air (< 0.01 f/ml).

Based on the range of concentrations of asbestos fibres detected, and in accordance with the NZ GAMAS, remedial earthworks in asbestos-impacted areas are considered as 'asbestos related work'. Work in these areas should be undertaken with the asbestos controls listed in the relevant column of the Asbestos Controls summary in Appendix 3. This table also provides controls for soils with a higher concentration of asbestos in the event that such concentrations are detected during the works.

8 Unanticipated Ground Conditions

Should any unanticipated contaminated material be uncovered during earthworks, works shall stop in that area and a SQEP from the Contaminated Land Specialist contacted to assess the potential risk and advise on what measures should be taken to manage the soil in that area.

Typical indicators of contamination include but are not limited to:

- Buried waste (for example drums or tanks with unknown liquid).
- Odour (petroleum hydrocarbons, solvent).
- Discoloured soil (black, purple, or green staining most common).
- Asbestos containing materials (ACM) as fragments visible to the naked eye.
- Uncontrolled fill material.

Examples of typical indicators of contamination have been provided in Table 8.

Table 8: Typical indicators of contamination

Uncontrolled Filling Building debris may contain asbestos or other contaminants.	
Asbestos Containing Material Intact sheets, gaskets, fabric or pieces thereof, may be mixed with other material	
Separate-phase Hydrocarbons Black liquid, odours, sheen	

9 Documentation

In order to demonstrate that the requirements of this RAP have been adhered to, the documents listed in Table 9 should be forwarded to the Contaminated Land Specialist in the timeframes stipulated in the table. These documents will be included in a completion report for the site (discussed further in Section 11).

Table 9: Contractor Documentation

Prior to Earthworks Commencing	• Written confirmation from the proposed disposal site(s) confirming that they are able to accept excess material from the site and stating which type(s) of material. • For any material that is to be imported to the site as cleanfill on the basis of direct testing, a copy of the analytical laboratory test report must be provided prior to transport.

Within Two Weeks of Earthworks Being Completed (or on an ongoing basis during works)	• Daily site photographs showing the site entrance, the area of work, sediment control measures, other structural control measures and any stockpiles resulting from the works.
	• A site plan showing any areas where site-won controlled material has been reused.
	• Disposal dockets for each load of material that is removed from the site. The dockets should contain the following information:
	  ○ Date and time dispatched.
	  ○ Material description.
	  ○ The volume of material in the load.
	  ○ Haulage contractor details (name, address, contact person, contact telephone number).
	  ○ Truck and trailer registration number.
	  ○ The destination of material.
	• Documentation for all imported fill which shall include:
	  ○ Date and time dispatched.
	  ○ Address of source site.
	  ○ Type and proposed use of material.
	  ○ Weight and / or volume of material carried.
	  ○ Basis for treating the material as cleanfill (e.g., directly tested and confirmed to be cleanfill or directly sourced from a licensed quarry).
	• Information relating to any incidents or complaints and how these were managed.

10 Completion Reporting

A SVR will need to be prepared following remedial earthworks. The SVR should be prepared in accordance with MfE Contaminated Land Management Guideline No. 1 (MfE, 2021) by a Contaminated Land Specialist SQEP or their nominated representative who has monitored the earthworks on-site. The report shall, as a minimum, include the following information:

- A description of the additional investigation works undertaken (if relevant) and the results thereof.
- A summary of the remedial works undertaken, including the location and dimensions of the excavations carried out and the volume of soil excavated and / or capping undertaken.
- Documentation relating to the disposal of contaminated soil / fill and used PPE.
- Documentation relating to the importation of cleanfill (if relevant).
- Results of validation works.
- A statement of whether soils remaining on-site are considered, based on the work undertaken, to present an unacceptable risk to human health or environmental receptors and the need for long term controls or consents.

11 Limitations

i. We have prepared this report in accordance with the brief as provided. This report has been prepared for the use of our client, Cabra Developments Limited, their professional advisers and the relevant Territorial Authorities in relation to the specified project brief described in this report. No liability is accepted for the use of any part of the report for any other purpose or by any other person or entity.

ii. The recommendations in this report are based on the ground conditions indicated from published sources, site assessments and subsurface investigations described in this report based on accepted normal methods of site investigations. Only a limited amount of information has been collected to meet the specific financial and technical requirements of the client's brief and this report does not purport to completely describe all the site characteristics and properties. The nature and continuity of the ground between test locations has been inferred using experience and judgement and it should be appreciated that actual conditions could vary from the assumed model.

iii. Subsurface conditions relevant to construction works should be assessed by contractors who can make their own interpretation of the factual data provided. They should perform any additional tests as necessary for their own purposes.

iv. This Limitation should be read in conjunction with the Engineering NZ/ACENZ Standard Terms of Engagement.

v. This report is not to be reproduced either wholly or in part without our prior written permission.

We trust that this information meets your current requirements. Please do not hesitate to contact the undersigned on (09) 972 2205 if you require any further information.

Report prepared by

Claire Davies, CEnvP

Associate Environmental Consultant

Report reviewed by

Lotta Liddell, CEng CEnv MICE

Senior Environmental Engineer

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The Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011.

Health and Safety at Work Act 2015.

Health and Safety at Work (Asbestos) Regulations 2016.

WorkSafe, 2016. WorkSafe New Zealand. Approved Code of Practice: Management and Removal of Asbestos.

FIGURES

Legend

- Site Boundary
- Environmental Investigation Location
- Approximate footprint of former building(s)
- Remedial Works Area
- Remedial Works Area (Asbestos-Related Works)
- Controlled Soil

0 25 m 50 m

ENGEO

Produced by **Datanest.earth**

Title: Soil Management Areas		
Client: Cabra Developments Limited		
Project: 10 Sinton Road, Whenuapai	Drawn: CD	Figure No.: 1 Size: A3
Date: 10-10-2023	Checked: LL	
Proj No.: 23849.000.001_03	Scale: 1:1292	Version: 1.0

APPENDIX 1:

Soil Results

Table A: Comparison of Soil Results to Assessment Criteria

				Heavy Metals/Metalloids								Polycyclic Aromatic Hydrocarbons									Organochlorine Pesticides	Semi-volatile Organic Compounds (excl OCPs / PAHs)	Asbestos	
Investigation Location	Depth (m bgl)	Sample ID	Date	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc	Acenaphthene	Acenaphthylene	Anthracene	Benzo[a]pyrene (middle bound)	Benzo(g.h.i)perylene	Fluorene	Naphthalene	Phenanthrene	Pyrene			Asbestos Containing Material (ACM)	Asbestos Fines / Friable Asbestos (AF/FA)
S01	0.1	S01 0.1	15-Aug-23	1.6	0.15	5.8	3.5	11	0.15	2.3	14	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	nt	nt	nt	nt
S02	0.1	S02 0.1	15-Aug-23	1.6	0.12	6	2.2	8.1	0.17	2.7	8.1	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	nt	nt	nt	nt
S03	0.1	S03 0.1	15-Aug-23	0.8	0.14	4.8	2.6	8.8	0.12	1.5	11	nt	nt	nt	nt	nt	nt	nt	nt	nt	<LOR	nt	nt	nt
S04	0.1	S04 0.1	15-Aug-23	0.7	0.1	4.3	1.8	6.7	0.05	1.7	8	nt	nt	nt	nt	nt	nt	nt	nt	nt	<LOR	nt	nt	nt
S05	0.1	S05 0.1	15-Aug-23	5.4	**0.67**	9.1	26	**84**	0.06	3.6	110	nt	nt	nt	nt	nt	nt	nt	nt	nt	<LOR	nt	nt	nt
S06	0.2	S06 0.2	15-Aug-23	3.3	0.28	8.2	10	26	0.06	2.2	160	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	NAD	NAD
S07	0.2	S07 0.2	15-Aug-23	4	0.2	9.5	10	15	0.09	3.4	76	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	NAD	NAD
S08	0.2	S08 0.2	15-Aug-23	2.6	0.33	8.1	10	12	0.11	2.5	140	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	NAD	**0.053**
S09	0.2	S09 0.2	15-Aug-23	3.3	0.18	8.4	11	25	0.1	3.9	62	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	NAD	**0.00049**
S10	0.2	S10 0.2	15-Aug-23	1.5	0.09	4.2	2.4	7.7	0.07	1	57	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	NAD	NAD
S12	0.2	S12 0.2	15-Aug-23	2.4	0.26	4.5	13	44	0.18	24	100	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	NAD	NAD
S13	0.2	S13 0.2	15-Aug-23	1.9	0.17	5.3	4.5	9.1	0.16	2.1	15	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	NAD	NAD
S14	0.0 - 0.3	S14 0.0-0.3	15-Aug-23	**50**	**3.2**	**130**	**96**	410	0.13	16	**290**	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	NAD	NAD
S15	0.0 - 0.25	S15 0.0-0.25	15-Aug-23	3.8	0.11	9.2	12	54	0.14	6.3	95	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	NAD	**0.1**
S16	0.0 - 0.25	S16 0.0-0.25	15-Aug-23	5.4	0.23	8.9	15	**110**	0.14	5.7	140	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	NAD	**0.0026**
S17	0.0 - 0.3	S17 0.0-0.3	15-Aug-23	7.5	0.45	7	18	**210**	0.09	3.3	140	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	NAD	NAD
S18	0.0 - 0.25	S18 0.0-0.25	15-Aug-23	9.2	0.51	8.7	**150**	280	0.14	4.4	150	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	NAD	NAD
S19	0.0 - 0.2	S19 0.0-0.2	15-Aug-23	8	0.32	14	33	670	0.16	8.6	120	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	NAD	NAD
S20	0.0 - 0.15	S20 0.0-0.15	15-Aug-23	7.2	0.28	16	34	470	0.13	14	180	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	NAD	<0.001
S21	0.0 - 0.15	S21 0.0-0.15	15-Aug-23	6.4	0.22	9.3	29	350	0.13	6	94	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	NAD	NAD
S22	0.0 - 0.2	S22 0.0-0.2	15-Aug-23	**24**	0.2	19	34	**190**	0.16	14	**330**	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	NAD	NAD
S23	0.0 - 0.2	S23 0.0-0.2	15-Aug-23	9.1	**0.67**	12	39	760	0.26	17	**350**	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	NAD	NAD
S24	0.0 - 0.35	S24 0.0-0.35	15-Aug-23	8.5	0.17	25	33	**67**	0.05	35	100	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	NAD	NAD
S25	0.0 - 0.2	S25 0.0-0.2	15-Aug-23	**24**	0.14	21	17	27	0.1	4.3	40	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	NAD	NAD
S26	0.0 - 0.2	S26 0.0-0.2	15-Aug-23	**25**	0.19	21	**51**	**150**	0.03	4.9	170	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	NAD	NAD
S27	0.0 - 0.3	S27 0.0-0.3	15-Aug-23	9.3	0.14	15	21	55	0.09	7.4	91	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	NAD	<0.001
S28	0.0 - 0.2	S28 0.0-0.2	15-Aug-23	2.9	0.06	5.4	7.2	25	0.04	2.8	48	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	NAD	NAD
S29	0.0 - 0.2	S29 0.0-0.2	15-Aug-23	1.9	0.02	3.1	3.1	9.4	0.05	1.2	12	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	NAD	NAD
S37	0.3	S37 0.3	15-Aug-23	2.1	0.04	5.6	6	46	0.03	1.6	110	<LOR	<LOR	**0.07**	**0.06**	<LOR	<LOR	<LOR	**0.05**	**0.07**	nt	nt	NAD	NAD
S38	0.1	S38 0.1	15-Aug-23	1.3	0.02	3.9	3.4	19	0.08	2.3	22	<LOR	<LOR	<LOR	**0.09**	**0.04**	<LOR	<LOR	**0.03**	**0.1**	nt	nt	NAD	NAD
S39	Surface	S39 (STOCKPILE)	15-Aug-23	1.4	0.04	5.3	5.8	7.3	0.05	2.5	11	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	NAD	NAD
S40	Surface	S40 (STOCKPILE)	15-Aug-23	**14**	0.12	39	33	62	0.19	18	110	<LOR	<LOR	**0.09**	**1.2**	**0.5**	**0.04**	<LOR	**0.42**	1.8 [12]	<LOR	<LOR	NAD	NAD
Assessment Criteria:																								
Human Health Criteria (High-density Residential) [1]				45	230 [4]	1500 [5]	10000	500	1000	1200 [6]	60000 [6]	3600	-	18000 [11]	24	-	2400 [10]	49 [7]	-	1600 [7]	various	-	0.04 [8]	0.001 [8]
Human Health Criteria (Residential) [1]				20	3 [4]	460 [5]	> 10,000	210	310	400 [6]	7,400 [6]	3600	-	18000 [11]	10	-	2400 [10]	49 [7]	-	1600 [7]	various	-	0.01 [8]	0.001 [8]
Environmental Criteria (Auckland Unitary Plan) [2]				100	7.5	400	325	250	0.75	105	400	-	-	-	20	-	-	0.043 [7]	5 [10]	1.2 [7]	various	-	-	-
Background Criteria (Auckland - Non-Volcanic) [3]				**0.4 - 12**	**< 0.1 - 0.65**	**2 - 55**	**1 - 45**	**< 5 - 65**	**<0.03 - 0.45**	**0.9 - 35**	**9 - 180**	**< LOR**	**< LOR**	**< LOR**	**< LOR**	**< LOR**	**< LOR**	**< LOR**	**< LOR**	**< LOR**	**< LOR**	**< LOR**	**< LOR**	**< LOR**

Notes:
All results and criteria are presented in mg/kg dry weight basis, except asbestos which is reported as %w/w
Full results are included in the laboratory reports
LOR: Limit of Reporting; Results below LOR or background are shown in grey
nt: not tested
- : no applicable criteria
NAD: No Asbestos Detected (Note:' <0.001' indicates asbestos detected, but below the limit of reporting)

1: MfE (2011) Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health (Residential Land Use), or selected in accordance with CLMG No. 2
2: Environmental discharge criteria selected in accordance with Section E30.6.1.4 of the Auckland Unitary Plan (Auckland Council, 2016).
3: Background Ranges of Trace Elements in Auckland Soils (Non-Volcanic Range). Table E30.6.1.4.2 of the AUP (Auckland Council, 2016).
4. Assumes soil pH of 5.
5. Criteria for Chromium VI were conservatively selected.
6. National Environment Protection (Assessment of Site Contamination) Measure (NEPM). Residential A criteria listed.
7. Ministry for the Environment (2011) Petroleum Hydrocarbon Guidelines. Human Health Criteria from Table 4.10 (All Pathways) for Residential land use, Silty Clay and contamination depth < 1m. Criteria for protection of groundwater quality from Table 4.20 for silty clay; contamination depth <1m and groundwater depth 2m.
8. New Zealand Guidelines for the Assessment and Management of Asbestos in Soil (BRANZ, 2017). Commercial and Industrial Land Use.
9. New Zealand Guidelines for the Assessment and Management of Asbestos in Soil (BRANZ, 2017). All Land uses.
10. United States Environmental Protection Authority Regional Screening Levels for Residential Soil (accessed 2023). Default value for TR = 10-6, THQ = 1.0.
11. Canadian Council of Ministers of the Environment Soil Quality Guidelines for the Protection of Environmental and Human Health (Accessed 2022); Residential/Parkland Land use
12. Ministry for the Environment (2011) Petroleum Hydrocarbon Guidelines. Criteria for protection of groundwater quality from Table 4.20 for silty clay; contamination depth <1m and groundwater depth 2m. The concentration of pyrene exceeds the environmental assessment criterion; however, the risk-driver for the adopted pyrene criterion is related to soil being in direct contact with groundwater. Therefore, material can be re-used on-site but should be placed above the high groundwater table.

APPENDIX 2:

Site Controls

Site Controls Relating to Contamination

10 Sinton Road, Whenuapai

SITE SUMMARY

Proposed works	Soil disturbance works associated with a residential development.
Contaminants identified on-site	Metals (arsenic, cadmium, lead), asbestos and hydrocarbons (pyrene) in isolated areas at concentrations above human health and environmental criteria.
Potential Risks to Site Workers	Incidental skin contact, ingestion of soil, or inhalation of dust should be avoided / mitigated through use of PPE and welfare measures.

HEALTH & SAFETY

All contractors and visitor shall be **inducted** before entering or commencing work to ensure they are **aware of the potential hazards** relating to contaminated soil at the site.

As a minimum, facilities to wash and dry hands prior to eating, drinking or vaping / smoking should be provided.

PPE / RPE *to minimise the effects of potential contamination exposure.* Along with standard PPE requirements for construction sites (e.g., safety boots) the following should be used in the remedial areas should wear the following PPE should in addition to standard PPE requirements for construction sites (e.g. safety boots):

- ☐ Disposable gloves if contact with soil is unavoidable.
- ☐ P2 Dust mask and coveralls (coveralls rated type 5, category 3 should be worn in remedial areas containing asbestos-impacted soil).

In other areas the following should be considered:

- ☐ P2 Dust mask (if visible dust is present).
- ☐ Work gloves / Coveralls (if contact with soil unavoidable)
- ☐ Goggles / safety glasses (if visible dust is present)

ADDITIONAL OVERSIGHT BY SQEP

- ☐ Observation and testing of soil / sub-base following removal of building platforms / hardstand.
- ☐ Delineation and validation sampling.

UNEXPECTED DISCOVERY

Works shall be immediately stopped and the Contaminated Land Specialist contacted should any areas of potential contamination be discovered during works. Typical indicators of contamination are asbestos containing material, staining, odorous material, visible sheen on water.

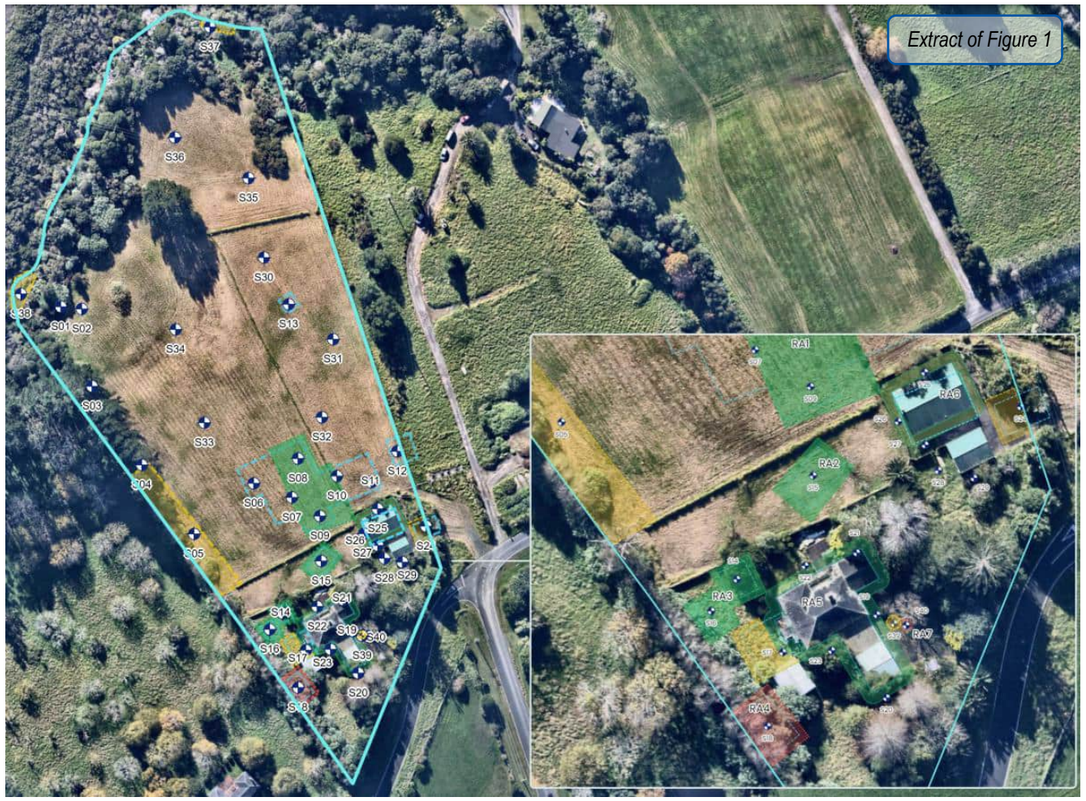
REMEDIAL WORKS AREA (RA4 AND RA7)

Remediation of soils in accordance with the RAP is required due to exceedance of assessment criteria.

- ☐ Likely limited to surface material; to a depth of 0.35 m (constrained by deeper native soil) in RA4, and the extent of stockpile and upper 100mm of underlying soil in RA7
- ☐ Additional delineation recommended.

CONTROLLED SOIL *Soil is suitable to remain on-site however contaminant concentrations for disposal purposes exceed cleanfill criteria*

Non-shaded areas are considered likely **CLEANFILL** with no specific management requirements.



ASBESTOS IMPACTED SOIL (RA1, RA2, RA3, RA5 and RA6)

- ☐ Contractor License Required: not required, but appropriate management is required.
- ☐ Physical barriers must be in place to prevent unauthorised access. Warning signs must be present that clearly show that asbestos related works are underway.
- ☐ Decontamination facilities: Basic disposable decontamination tent and boot wash (Asbestos Related Works Area).
- ☐ Spray mist water via localised points. Addition of surfactants and polymers, or cover with polythene if left overnight, or if a source of water is not readily available.
- ☐ Asbestos Air Monitoring: Not required.
- ☐ Decontamination of vehicles: Visual assessment by a competent person or SQEP.
- ☐ All disposable PPE / materials used during remediation of asbestos impacted soil should be double bagged in 200 micron HDPE plastic bags within the decontamination area. The bag should be labelled "Asbestos Hazard".
- ☐ This soil is considered hazardous and the controls stated in the Land Transport Rules should be adopted.

DAILY SITE CHECK *(take photographs to record check)*

- ☐ **Security fencing** and appropriate **warning signs** are in place.
- ☐ **Sediment control measures** in good condition and working as designed.
- ☐ Check site entrance and adjacent public road for silt / sediment deposition.
- ☐ Check integrity of stockpile controls (if applicable).
- ☐ Check excavations to see if **perched groundwater or surface water** requires removal. Approval from local authority is required to discharge to local network – refer to RAP.

GENERAL SITE CONTROLS

- ☐ Dust shall be managed in accordance with consent requirements and relevant regulations.
- ☐ If excavated material is **odorous**, odour control measures shall be put in place.
- ☐ If **perched groundwater or surface water** is encountered the controls in the RAP shall be implemented.
- ☐ If **temporary stockpiling of non-cleanfill material** is necessary, dust shall be controlled through wetting during the workday. If left overnight, the material shall be covered (e.g., with plastic) and protected by erosion / sediment controls (e.g., bunded).
- ☐ Stockpiles of non-cleanfill material shall be located either on an impermeable surface, or the underlying material should be considered potentially contaminated, and shall be managed in accordance with the RAP.
- ☐ Clean and dirty areas should be managed to prevent tracking potentially impacted soils around the site and off-site.
- ☐ Wastewater generated, or rock / soil utilised in a truck loading area should be disposed of as contaminated material, unless tested.

RECORD KEEPING

- ☐ Daily photographs to be made available on request.
- ☐ Disposal dockets for all material should be forwarded to the Contaminated Land Specialist.
- ☐ Fill imported to site shall meet the Auckland Council definition of cleanfill.
- ☐ The location of any contaminated soils retained on-site shall be recorded on as built drawings.

OFF-SITE DISPOSAL OF CONTAMINATED SOIL

- ☐ Trucks shall be loaded in a location within the site where runoff and possible spills during loading will be controlled and contained. Loads must be securely covered prior to leaving site and during off-site transport. Soil must be taken to an appropriate soil disposal facility authorised to accept the contaminants identified.
- ☐ Prior to acceptance the results of the soil testing may be requested by the receiving facility.
- ☐ Requirements for additional testing and truck lining / soil wrapping should be confirmed with the receiving landfill.
- ☐ Further testing may be required to assess whether deeper material is cleanfill / managed fill.

ENGEO

For details of the controls refer to the current site-specific RAP prepared by ENGEO. All site staff and subcontractors are aware of and comply with the procedures and health and safety requirements contained within this document.

APPENDIX 3:

Asbestos Controls

10 Sinton Road
Asbestos Controls

Scenario (NZ GAMAS 2017 definitions)	Control Measure Objectives	Unlicensed Asbestos Work	Asbestos-related Work	Class B: non-friable	Class A: friable	*Source Guideline Reference*
FA/AF % w/w in soil		≤ 0.001	> 0.001	> 0.01	> 1	
ACM % w/w		≤ 0.01%	> 0.01	> 1	-	
Scale, soil volume		≤ NESCS	> NESCS	-	-	
Asbestos in air		< 0.01 f/mL in air	< 0.01 f/mL in air	≥ 0.01 f/mL in air	≥ 0.01 f/mL in air	
REMOVAL WORKS RESPONSIBILITIES						
Remedial Works Supervision / Oversight	OBJECTIVE: *Undertake work by persons who have adequate knowledge and experience to assess the risks and implement appropriate control measures*	A Suitably Qualified and Experienced Practitioner (Contaminated Land – refer to NESCS)		Class B Supervisor	Class A Supervisor	*ACOP*
WorkSafe Notification		Not required		Notification five days before earthworks are to be undertaken		*ACOP*
Contractor License Requirements		Not required		Class B License	Class A License	*ACOP*
Training/Certification Requirements		Non-certified training in asbestos identification, safe handling and suitable controls. A copy of the training shall be kept on record.		Certified training for workers. Certified, competent supervisors.	Certified training for workers. Certified, competent supervisors. Certified safety management system.	*Figure 17 ACOP*
SITE SET-UP						
Boundary Controls	OBJECTIVE: *Prevent unauthorised access into works areas and accidental transport of contaminated soils on boots, clothing, equipment, skin, or in air / dust.*	Physical barriers must be in place to prevent unauthorised access.	Physical barriers must be in place to prevent unauthorised access. Warning signs must be present that clearly show that asbestos related works are underway.	Physical barriers must be in place to prevent unauthorised access. Polythene sheeting may be necessary to prevent spread of airborne fibres outside of works area. Warning signs must be present that clearly show that asbestos removal works are underway.	Physical barriers must be in place to prevent unauthorised access. Consider use of solid hoarding placed at a suitable distance beyond the works area, or full enclosure. Warning signs must be present that clearly show that asbestos removal works are underway.	*ACOP*
Personal Decontamination Facilities		Educate site workers to minimise contact with soil. Provide a boot wash and lidded and plastic lined bin for secure disposal of used PPE.	Basic disposable decontamination tent and boot wash.		Basic disposable wet decontamination tent or trailer.	*NZ GAMAS Table 6*
Dust / Asbestos Fibre Suppression	OBJECTIVE: *Minimise the release of asbestos fibres from soils.*	Minimise the size of the earthworks areas and time exposed to the elements. Stabilise exposed earth surfaces as soon as possible following works.				
		Spray mist water via localised points. Consider use of surfactants or polymers where a reliable source of water is not available. Consider implementing additional controls (as per Class B works) if sensitive receptors nearby (such as adjacent to busy centres, schools).		Spray mist water via localised points. Addition of surfactants and polymers where the location is sensitive (such as adjacent to busy centres, schools) or if a source of water is not readily available. Consider temporary cover of contaminated areas awaiting remediation.		*NZ GAMAS Table 6*

10 Sinton Road
Asbestos Controls

Scenario (NZ GAMAS 2017 definitions)		Control Measure Objectives	Unlicensed Asbestos Work	Asbestos-related Work	Class B: non-friable	Class A: friable	*Source Guideline Reference*
FA/AF % w/w in soil			≤ 0.001	> 0.001	> 0.01	> 1	
ACM % w/w			≤ 0.01%	> 0.01	> 1	-	
Scale, soil volume			≤ NESCS	> NESCS	-	-	
Asbestos in air			< 0.01 f/mL in air	< 0.01 f/mL in air	≥ 0.01 f/mL in air	≥ 0.01 f/mL in air	
OCCUPATIONAL HEALTH AND SAFETY							
Personal Protective Equipment & Respiratory Protective Equipment		OBJECTIVE: *Minimise workers exposure to asbestos fibres.* *Reduce accidental transport of asbestos contaminated soils off site on workers clothing, boots.*	Educate site workers to minimise contact with soil; to clean equipment and to undertake activities in a manner that reduces dust. Disposable P2 dust mask recommended.	Disposable coveralls rated type 5, category 3, nitrile gloves Steel toe capped gumboots are preferred as these can be readily washed down. Disposable overshoes can be used to prevent contamination of laces.	Half-face P3 respirator with particulate filter. Consider increasing to full-face if friable ACM present.	Full-face P3 respirator with particulate filter. Consider increasing to power-assisted if required.	*NZ GAMAS Table 6* *NZ GAMAS Table 6* *Refer to Part C section 14 of the ACOP and AS/NZS 1715:2009 for more information*
Contractor Health Monitoring		OBJECTIVE: *Mitigate risks to workers from the potentially harmful effects of asbestos through the workplace.*	The contractor must ensure that worker health monitoring is undertaken in accordance with the Asbestos Regulations Clause 15 and 16.		In accordance with the Asbestos Regulations Clause 15 and 16, a PCBU must ensure that health monitoring is provided to workers involved in more than four weeks of Class B work in any twelve-month period. Refer ACOP Section 16	In accordance with the Asbestos Regulations Clause 15 and 16, a PCBU must ensure that health monitoring is provided to workers involved in Class A work. Refer ACOP Section 16	*ACOP* *Section 16*
MONITORING PROCEDURES							
Air Monitoring	**Responsibility**	OBJECTIVE: *Provide a clear expectation of who is responsible for undertaking monitoring, and that the person has the appropriate skills and knowledge to do so.* *To provide verification that works have been safely undertaken.* *To provide early warning of potentially harmful levels of exposure.* *To identify when asbestos is present in air at a concentration that presents an*	SQEP / Competent Person		Independent Licensed Asbestos Assessor OR Independent Competent Person as defined within Section 30.4 of the ACOP	Independent Licensed Asbestos Assessor	*Section 30.4 of the ACOP*
	Requirement		Air monitoring is not required for Unlicensed Asbestos works, or Asbestos Related works (as defined under the NZ GAMAS) however it is recommended where possible to provide assurances regarding cross contamination and protection of workers.		If the SQEP or competent person considers that the trace level of 0.01 f/ml may be exceeded, then air monitoring must be undertaken.	Air monitoring must be conducted before and during Class A asbestos removal work.	*NZ GAMAS Section 5.5*

10 Sinton Road
Asbestos Controls

Scenario (NZ GAMAS 2017 definitions)		Control Measure Objectives	Unlicensed Asbestos Work	Asbestos-related Work	Class B: non-friable	Class A: friable	*Source Guideline Reference*
FA/AF % w/w in soil			≤ 0.001	> 0.001	> 0.01	> 1	
ACM % w/w			≤ 0.01%	> 0.01	> 1	-	
Scale, soil volume			≤ NESCS	> NESCS	-	-	
Asbestos in air			< 0.01 f/mL in air	< 0.01 f/mL in air	≥ 0.01 f/mL in air	≥ 0.01 f/mL in air	
	Compliance	*unacceptable risk to site workers and surrounding receptors.* *Undertake works by persons who have been trained to manage the risks associated with asbestos.* *Implement additional control measures when necessary.*	If the concentration exceeds 0.01 f/ml then works are Class B or Class A works under the NZ GAMAS definition.		All results shall be below 0.01 fibres / ml. < 0.01 f/ml – continue with works > 0.01 f/ml – investigate the cause and implement additional controls > 0.02 f/ml – stop works and investigate, notify WorkSafe >0.1 f/ml – Remedial works required. PCBUs with management or control of workplace are to ensure that exposure of a person at the workplace to airborne asbestos is eliminated so far as is reasonably practicable.		*Section 30 of the ACOP*
SITE CONTROLS							
Vehicle Decontamination	**Vehicle assessment before demobilisation from site**	OBJECTIVE: *Minimise the potential for accidental transport of contaminated soils or asbestos fibres out of the works areas on, or in vehicles.*	Minimise vehicle transport onto site areas containing asbestos soils, or in locations where asbestos fibres may be present in air. Visual assessment.		Visual (plus swab samples if friable ACM is elsewhere on-site – lagging, insulation, etc).	Visual plus swab samples, air sampling should be undertaken inside the cab.	*NZ GAMAS Table 7*
	Vehicle assessment completed by		Competent person or SQEP.		Independent licensed assessor or independent competent person (meeting the requirements of regulation 41(3) under the Asbestos Regulations).	Independent licensed assessor.	*NZ GAMAS Table 7*
	Truck/excavator air conditioning	OBJECTIVE: *To prevent the contamination of internal spaces of equipment where people work.* *To avoid worker exposure to asbestos fibres.*	Standard air conditioning.		HEPA filter system fitted for all occupied vehicles where friable ACM on-site.	HEPA filter system fitted for all occupied vehicles, filter replaced or clean down with HEPA vacuum cleaner post work.	*NZ GAMAS Table 7*
MANAGEMENT OF CONTAMINATED MATERIAL							
Stockpiles of impacted soils		OBJECTIVE: *To minimise the release of asbestos fibres into air.*	Stockpiles should be avoided where possible to ensure that exposed areas of soil are minimised. All temporary stockpiled asbestos contaminated material which is created and not proposed to be immediately moved should be covered. Stockpiles shall be located on an impermeable surface within an area protected by erosion and sediment controls. Consider covering stockpiles with polythene.				*NZ GAMAS Section 6.6*

10 Sinton Road
Asbestos Controls

Scenario (NZ GAMAS 2017 definitions)	Control Measure Objectives	Unlicensed Asbestos Work	Asbestos-related Work	Class B: non-friable	Class A: friable	*Source Guideline Reference*
FA/AF % w/w in soil		≤ 0.001	> 0.001	> 0.01	> 1	
ACM % w/w		≤ 0.01%	> 0.01	> 1	-	
Scale, soil volume		≤ NESCS	> NESCS	-	-	
Asbestos in air		< 0.01 f/mL in air	< 0.01 f/mL in air	≥ 0.01 f/mL in air	≥ 0.01 f/mL in air	
Used PPE	*Asbestos contaminated material is to be appropriately transported and disposed in a location where the material presents no unacceptable human health risk.*	All disposable PPE used during remediation of asbestos impacted soil should be placed in a 200 micron HDPE plastic bag within the decontamination area. The bag should be taped closed (in a goose neck fashion) after each item is added and kept damp via the addition of water. Once full, the bag should be double bagged (200 micron HDPE) and labelled “Asbestos hazard – wear respirator and protective clothing while handling contents”.				*NZ GAMAS Section 6.6*
Contaminated Soil	*To track the movement of contaminated materials.*	The location of any soils retained on-site shall be recorded on as built drawings. The receiving facility should be contacted in advance of the soil disposal to verify the requirements for receiving the wastes. Trucks shall have their loads securely covered during off-site transport of material. Waste manifests should be completed and retained for all off-site disposal of soils. Site records shall be cross checked against receipts of soil disposal from the receiving facility. The bins / skips or trucks shall be loaded within the site where runoff and possible spills during loading will be controlled and contained.				*NZ GAMAS Section 6.6*
		Special waste bins / skips or trucks, approved for the transport of ACM to the appointed licensed landfill facility shall be placed on-site. The bins / skips or trucks will be lined / wrapped in accordance with requirements of receiving facility. It is recommended that any soil which contains asbestos in concentrations >0.001% w/w is considered hazardous and the controls stated in the Land Transport Rules adopted. For asbestos soil waste in significant quantities, hazard label signage should be displayed on the vehicles transporting the soil for disposal.	Special waste bins / skips or trucks, approved for the transport of ACM to the appointed licensed landfill facility shall be placed on-site. The bins / skips or trucks will be lined with 200 micron sealed plastic. It is recommended that any soil which contains asbestos in concentrations >0.001% w/w is considered hazardous and the controls stated in the Land Transport Rules adopted. For asbestos soil waste in significant quantities, hazard label signage should be displayed on the vehicles transporting the soil for disposal.		
Contaminated Water		Water used for cleaning asbestos-contaminated equipment (including vehicles) shall be placed into a drum or skip and disposed of at an appropriately licensed facility. If excessive water is applied, ponding or runoff may occur which could permit the transport and accumulation of asbestos fines outside of the site. Water from the work area should be retained inside the boundary of the site and wash water directed back into excavations and the site.				*NZ GAMAS Section 6.6*

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Project Number 23849.000.005

Preliminary and Detailed Environmental Site Investigation

14 Sinton Road, Hobsonville, Auckland

Submitted to:
Cabra Developments Limited
Unit 9B, 30 Foundry Road
Silverdale
Auckland 0932

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Appendices

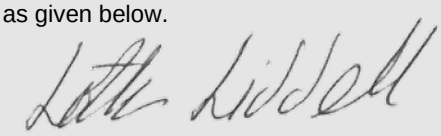
ENGEO Document Control:

Report Title	Preliminary and Detailed Environmental Site Investigation - 14 Sinton Road, Hobsonville			
Project No.	23849.000.005	**Doc ID**	02	
Client	Cabra Developments Limited	**Client Contact**	Duncan Unsworth	
Distribution (PDF)	Duncan Unsworth, Cabra Developments Limited			
Date	**Revision Details / Status**	**Author**	**Reviewer**	**WP**
15/03/2024	Issued to Client	CD	LL	HO

SQEP Certifying Statement

I certify that the site has been assessed in accordance with current New Zealand Regulations and guidance documents and that this report has been prepared in general accordance with the Ministry for the Environment's Contaminated Land Management Guidelines No. 1: Reporting on Contaminated Sites in New Zealand, 2021.

I am considered by ENGEO Limited to be a suitably qualified and experienced practitioner (SQEP) able to certify reports pursuant to the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011, based on the company's definition of a SQEP as given below.



Lotta Liddell

15 March 2024

ENGEO Limited requires that a SQEP has the following Qualifications / Experience:

- *Tertiary science or engineering qualification relevant to environmental assessment.*
- *A minimum of 10 years of relevant experience.*
- *Registration with a professional body that assess and certifies environmental professionals in the competency criteria of training, experience, professional conduct, and ethical behaviour.*

1 Introduction

ENGEO Ltd was requested by Cabra Developments Limited to undertake an environmental investigation of the property at 14 Sinton Road, Hobsonville, Auckland (herein referred to as 'the site'; shown in attached Figure 1). This work has been carried out in accordance with the signed agreement dated 20 November 2023. The purpose of the assessment is to support a Resource Consent application for the proposed redevelopment of the site.

We have been provided with a draft masterplan for the property which indicates that redevelopment comprises demolition of the existing buildings to allow construction of a residential subdivision.

This environmental investigation has been undertaken to satisfy the requirements of the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (the "NESCS"). This investigation provides information regarding the presence of land contaminants that may pose a risk to future site users and site redevelopment workers. The results of this investigation have been used to evaluate whether management of soil is necessary prior to site redevelopment, and to assess the requirement for resource consent under the NESCS.

This investigation also addresses the requirements of regional regulations covering discharges to the environment from contaminated sites during and post-redevelopment works; namely, the Auckland Unitary Plan (AUP; Auckland Council, 2016).

This investigation was undertaken in general accordance with the Ministry for the Environment (MfE) Contaminated Land Management Guidelines (CLMG) No. 1: Reporting on Contaminated Sites in New Zealand (MfE, 2021a) and CLMG No 5: Site Investigation and Analysis of Soils (MfE, 2021b). The investigation was supervised, and the report reviewed and approved by a suitably qualified and experienced contaminated land practitioner in accordance with national environmental regulations for soil contamination. A geotechnical assessment was undertaken concurrently (ENGEO, 2024).

1.1 Objectives of the Assessment

The objective of the preliminary site investigation (PSI) was to gather information relating to current and historical potentially contaminating activities at the site. The works comprised review of historical site information and review / assessment of information gathered during the site walkover undertaken on 11 December 2023.

The intrusive investigation (Detailed Site Investigation; DSI) was undertaken to assess:

- The type, extent, and concentration of contaminants of potential concern identified during the desktop assessment (PSI).
- Whether the identified contaminants of concern pose a potential unacceptable risk to human health or identified environmental receptors and soil is suitable to remain on-site.

Note: Whilst this investigation provides an assessment of the site under contaminated land regulations (i.e., the NESCS and the AUP), the results can be used for disposal characterisation purposes. However, additional testing may be required or recommended to fully inform disposal options for excess site material.

2 Site Information

Site information is summarised in Table 1.

Table 1: Site Information

Item	Description
Legal Description	LOT 8 DP 57408
Current Land Use	The majority of the site is grassed. A dwelling, double garage, minor dwelling, and semi-enclosed workshop are present in the southeastern portion of the site.
Proposed Land Use	Residential
Site Area	2.3674 hectares
Territorial Authority	Auckland Council
Zoning (AUP)	Future Urban Zone
Geology	The site is mapped by GNS Science (GNS, 2024) as being underlain by Puketoka Formation alluvium in the south-eastern portion of the site, comprising pumiceous mud, sand, and gravel with lenses of muddy peat and lignite. The north-western portion of the site is mapped as being underlain by East Coast Bays Formation, comprising alternating sandstone and mudstone with variable volcanic content and interbedded volcaniclastic grits.
Topography	The site gently slopes to the northwest from RL 18 m to RL 5 m.
Hydrology	The closest body of surface water to the site is the Waiarohia Inlet, a tributary of the Waitemata Harbour, which is located adjacent to the northwestern site boundary. Overland flow paths leading to the Waiarohia Inlet are mapped in Auckland Council GeoMaps along the northern and southern boundaries. Flow paths originating on the site flow into these main flow paths on the boundary or directly northwest to the Waiarohia Inlet.
Hydrogeology	A groundwater assessment was not completed as part of this investigation; however, during the geotechnical investigation standing groundwater was encountered in all nine hand auger boreholes, at a depth between 1.1 m to 2.6 m below ground level (bgl). Based on the topography of the site, the mapped overland flow path and the nearest watercourse, shallow groundwater likely flows in a west to northwest direction.

3 Site History

ENGEO reviewed aerial photographs, property file documentation and Auckland Council's response to a contamination enquiry. Relevant information obtained during this review is summarised below.

3.1 Aerial Photographs

Aerial photographs dating from 1940 to 2023 have been reviewed (refer to Appendix 1). The aerial photographs were sourced from Auckland Council GeoMaps, Retrolens, and Nearmaps. Relevant visible features on the site and surrounding area are summarised in Table 2.

Table 2: Aerial Photograph Summary

Date	Description
1940	The site is located on the edge of the Waiarohia Inlet. The north-western boundary of the site is not clearly defined as this end of the site comprises what appears to be lower lying ground associated with the adjacent inlet. The site and surrounding area comprise agricultural land. The majority of the site itself appears to be used for grazing.
1950	No significant changes to the site or surrounding area are observed.
1963	No significant changes to the site are observed; however, some of the vegetation along the coastal margin appears to have been cleared. Construction on the property at 10 Sinton Road is observed; however, no other significant changes to the surrounding area are noted.
1968	The western approximately quarter of the site appears to be divided into crop areas, and two buildings have been constructed in the eastern portion of site. The neighbouring property to the south (16 Sinton Road) may be subject to horticultural activity or arable farming.
1972	A small feature (possibly a shed) has been constructed in the western corner of site, near the coastal margin. A second feature (likely a shed) has been constructed adjacent to the to northern site boundary to the north of the buildings in the eastern portion of the site. No significant changes to the surrounding area are observed. The neighbouring property to the south may no longer be used for horticultural / arable purposes.
1975	A rectangular shaped building has been constructed in the southern corner of the site with a smaller building to the south. Two small buildings have been constructed approximately at the centre of the site. No significant changes to the surrounding area are observed.
1978	A smaller building has been constructed to the south of the two original buildings (first observed in the 1968 aerial photograph). Fences appear to have been erected in the eastern approximately quarter of site, and a small area to the northeast of the original buildings may be being utilised as an orchard. Residential development is observed on neighbouring properties. No other significant changes to the surrounding area are observed.
1980	No significant changes to the site or surrounding area are observed.

Date	Description
1988	The site has been divided into four distinct areas using shelterbelts. The southern and western three of these areas appear to be subject to horticultural activity. One of the smaller buildings observed in the 1980 aerial photograph is no longer observed. Horticultural activity is observed on neighbouring land to the south, and further southeast.
1996	Image quality is poor and does not allow for a detailed interpretation; however, a swimming pool (currently remains on-site) to the north of the dwelling has been installed, and some of the areas of cropping may have been cleared. Three brown circular features may represent stockpiled material (likely vegetation based on the land use). No significant changes to the surrounding area are observed.
2000	The potential stockpiles are no longer observed. With the exception of three rows of planting in the northern portion of the site, the balance of the horticultural areas appears to have been cleared. Horticultural activity is observed on neighbouring land to the north.
2006	No significant changes to the site or surrounding area are observed.
2008	The shelter belts at the site have been removed. Areas of bare ground (potential as a result of vegetation removal) are observed across the site. An area of vegetation along the coastal margin has been cleared and a stockpile adjacent to this area likely comprises stripped material. The southern-most original building is no longer observed. A building has been constructed to the north of the rectangular building in the southern portion of the site, and to the west of the remaining original building. Two smaller mounds in the southern portion of the site, to the north of the rectangular building, appear to be associated with clearing the access roads. The building at the centre of the site has been removed. No significant changes to the surrounding area are observed.
2010 / 2011	The cleared area on the coastal margin has been planted and access roads are now grassed. The stockpile in the northern portion of the site has been removed. The access roads around the buildings in the southern portion have been sealed. No significant changes to the surrounding area are observed.
2012	No significant changes to the site or surrounding area are observed.
2017	No significant changes to the site or surrounding area are observed.
2018	No significant changes to the site or surrounding area are observed.
2019	With the exception of a small rectangular feature in the southern portion of the site, no other significant changes to the site or surrounding area are observed.
2020	The small rectangular building is no longer observed, no other significant changes to the site or surrounding area are observed.
2023	No significant changes to the site or surrounding area are observed.

3.2 Property File Review

The property file held by Auckland Council was reviewed on 4 December 2023. A summary of the information potentially relevant to this investigation is provided in Table 3 below.

Table 3: Property File Summary

Date	Description
1968	A building permit application lists another street address; however, the lot no. is correct and the correct site address is handwritten on a different version of the application. Drawings show the interior and exterior of a dwelling. An inset site layout plan indicates that the building was proposed to be positioned in the southwest portion of site. The appended specification of 'work to be done and material to be employed' includes asbestos cement roofing.
1973	A drawing associated with a building permit application for a proposed stable block shows the building in a similar position to the existing workshop. The roofing is noted to be 'fibrolite'.
1976	Building permit application for a new garage to the south of the existing garage in the southwest portion of site. Details indicate that the building is timber framed and metal clad.
1983	Building permit application for additions to the existing dwelling (appear to be to the eastern side of the dwelling).
1995	Drainage drawings for construction of the swimming pool indicate that an open stormwater drain is present along the eastern boundary. An existing septic tank is shown to the west of the dwelling and garage. The plans indicate this tank is to be replaced by a new septic system located northwest of the buildings.
1995	A letter prepared by Diprose Consultants Limited (Civil and Structural Engineers) states that the land is in pasture. The investigation completed by Diprose included an excavation at a proposed effluent area. Topsoil was encountered to a depth of 200 – 300 mm, soils contained 'more clay particles and become firmer below this depth'.
1997	Resource Consent document for the extension of the existing dwelling. The document indicates that the dwelling is within '10m of a horticultural activity on an adjoining site' (12 Sinton Road is noted to be planted with a crop of chestnut trees). The land use on site is pasture. A submission from the neighbouring property at 12 Sinton Road opposes the extension due to potential exposure to spray drift from the property. Information from a Horticultural Consultant at the Ministry of Agriculture and Fisheries Horticultural Research Station indicates the 'either no spraying or a limited spray' is needed for these crops, 'sprays would be used rarely and would generally be considered safe'.
2003	Drawings indicated that a portion of the existing dwelling was relocated, and extensions constructed to connect the two separated buildings.
2007	A Waitakere City Council 'Onsite Wastewater System Tank Pump Out Customer Report' states that the irrigation field is not working and is flooding. A site plan indicates that the two buildings to the south of dwelling are both garages.

Date	Description
2007	A site layout plan included in a Rodney District Council document shows the location of a septic tank, textile tank and irrigation field (20 metres wide x 30 metres long) to the northwest of the existing buildings, approximately 8 metres from the western boundary. The plan also shows a 'New Garage' immediately west of the existing house, and a 'New Minor Dwelling' to the southwest of these buildings. The existing shed is also shown to the southeast of the minor dwelling.
2007	A site drainage plan indicates that two small sheds to the northwest of the existing dwelling will be removed as part of works associated with construction of the minor dwelling and garage.
2007	Environmental Site Investigation prepared by Environmental and Earth Sciences Limited on 9 August 2007. The report states that Waitakere City Council's review of horticultural sites indicates that 'the site has been previously utilised for orchards and market gardening'. A summary of a discussion with the current site owners indicated that the site was used for grazing for the previous 14 years; however, 20 – 30 apple trees were removed when they purchased the property. The soil investigation included collection and analysis of four composite surface soil samples (one from each quarter of the property) and two discrete surface soil samples; one at the eastern entrance of the small central shed, and from the northern entrance of the larger shed. Investigation locations were spread across the site to assess the potential impact from former horticultural activities. Samples were analysed for arsenic, copper, lead, and organochlorine pesticides (OCPs). All results were below regional background concentrations, with the exception of the sample collected adjacent to the large shed, which concentrations of copper and OCPs above background concentrations. The results were below the human health and environmental criteria adopted in the report.
2008	An extract of a (granted) land use consent document for the construction of a new minor dwelling with carport and a new garage, and removal of existing garage buildings. The document indicates that an Environmental Site Investigation for the site was prepared by Environmental and Earth Sciences Limited on 9 August 2007. Consent Condition 9 required that 'no soil shall be removed from the site'.
2019	Letter from Auckland Council to Danqiong Zhang regarding a Building Consent issued a year prior (reference BCO10067629). The letter indicates that Council is not aware of works being undertaken as per the consent.

3.3 Auckland Council Site Contamination Enquiry

The Site Contamination Enquiry responses prepared by Auckland Council for the neighbouring properties at 10 and 16 Sinton Road (dated 15 August 2023 and 14 August respectively) were reviewed for information relevant to the site on 28 November 2023 (Appendix 2).

Auckland Council's records identify the sites at 12, 14, and 16 Sinton Road as possibly having been subject to an activity included on the MfE Hazardous Activities and Industries List (HAIL; MfE, 2011a). No details of the nature of activities at 14 Sinton Road are included in the response, however based on the aerial review (Section 3.1) we consider it is likely related to historical horticultural activities.

In preparing the response, Auckland Council reviewed records within 200 m of the site for pollution incidents, bores, contaminated site and air discharges, closed landfills and identified HAIL activities. A summary of records is provided in Table 4 however the features discussed in these records are not considered to present a significant potential risk to the proposed redevelopment activities.

Table 4: Site Contamination Enquiry Response Summary

Date	Description
-	Council's records identify 'HAIL sites' at the following addresses. No details of the nature of activities are included in the response, however based on the aerial review (Section 3.1) we consider it is likely related to historical horticultural activities. • 6, 12, 14, and 16 Sinton Road • 15 Clarks Lane • 20 – 26 and 34 Kauri Road • 174 Brigham Creek Road • Brigham Creek Road (address not specified)
2014	A discharge of 10 – 200 L of concrete wastewater was discharged at 118 Hobsonville Road. Dead eels and fish were observed in an associated watercourse.
1980s – 2010	• Three consents (Note: either cancelled or expired) relating to damming a tributary of the Waiarohia Inlet and use of water for irrigation of pasture and crops at 6 Sinton Road. An additional proposed consent for this site relates to works within the watercourse to form an access track. • Consent to construct a groundwater borehole for the extraction of groundwater for irrigation of pasture and an orchard at a property on Sinton Road. • Cancelled consent to take water from a dam for industrial use at a property on Brigham Creek Road. • Authorisation to construct 15 groundwater wells for geological, geotechnical and groundwater purposes. Property not identified. • Consent to discharge wastewater from a residential property at 21 Kauri Road. • Proposed wastewater discharge consent and comprehensive stormwater Discharge Consent held by Watercare Services Limited and Auckland Council.

4 Current Site Conditions

The site walkover and intrusive investigation works were completed on 11 December 2023 by ENGEO environmental scientists.

Observations of conditions present at the site are summarised in Table 5. Photographs taken during the site visit are included in Appendix 3.

Table 5: Current Site Conditions

Site Conditions	Comments
Overview	The site is located on the northwestern side of Sinton Road. A single-storey dwelling, double garage, minor dwelling, and semi-enclosed workshop are positioned near the Sinton Road frontage in the southern portion of the site. The dwellings and garage buildings are accessed via a sealed driveway, and the workshop by a gravel driveway. The balance of the site comprises paddocks. The northern and southern boundaries are defined by shelterbelts, the northwest boundary by a vegetated coastal margin and the southwestern boundary by Sinton Road.
Surrounding Land Use	The site is bound by Sinton Road to the southeast, lifestyle blocks and residential dwellings to the north and south, and by the Waiarohia Inlet to the northwest. Horticultural activity is observed in the wider area.
Site Building(s)	The cladding, soffits, and gable ends to the main dwelling appeared to comprise potential asbestos containing material (PACM), whilst the garage was metal clad. PACM was also identified on the gable ends and soffits to the garage. Roofing material on both buildings comprised corrugated metal sheeting. A minor dwelling present to the southwest of the main dwelling was metal clad with corrugated metal roofing and PACM soffits. The workshop is constructed of PACM and concrete blocks with PACM soffits and gable ends. The site buildings were observed to be in fairly good condition (refer Appendix 3).
Potential Sources of Contamination	One fragment of PACM was observed on the concrete driveway adjacent to exterior of the workshop; however, due to its location on the concrete driveway it is not considered likely to have resulted in significant contamination of surrounding soil. Potential fill material comprising a dark brown-grey silty clay intermixed with sandy silt was observed within a cleared area in the southeast portion of the site, in the approximate footprint of a former building. No building debris was observed. The ground surface beneath the areas in the northeast which may have been subject to stockpiling were investigated using a hand auger; however, there were no indicators of potential contamination (e.g. staining, fill material, building debris etc).
Potential for On - Or - Off - Site Migration of Contaminants	Whilst overland flow may form a pollution pathway towards the northwest, it is more likely that, most rainfall will infiltrate the ground due to the lack of significant hardstanding areas at the site. Contaminant transport (if relevant) would therefore more likely be into the ground and then via groundwater flow, rather than surface water flow.
Other Information of Note	There was no evidence of building debris was observed at the surface in the vicinity of the former buildings.
Limitations	The northern site boundary is lined with trees / shrubs. Minimal access around this area may result in limitations regarding visibility of potential contamination.

5 Potential HAIL Activities

If current or historical activities included on the HAIL (MfE, 2011a) are identified at a site the NESCS may apply. Based on the information reviewed as part of this environmental investigation and observations during the site walkovers, the following activities listed on the HAIL may have been historically and / or may currently be occurring at the site:

- HAIL ID A10: *Persistent pesticide bulk storage or use including sport turfs, market gardens, orchards, glass houses or spray sheds* – Due to the majority of the site being used as horticultural land, it is possible that persistent pesticides were applied. The concentration of copper and OCPs in one sample collected adjacent to the workshop during the previous investigation exceeded background concentrations (Environmental and Earth Sciences Limited; summarised in Table 3), indicating that pesticides have likely been stored and applied to portions of the site.

- HAIL ID E1: *Asbestos products manufacture or disposal including sites with buildings containing asbestos products known to be in a deteriorated condition* – Due to the age of the current and former site buildings, it is possible that asbestos products were present within building materials used at the site. Construction materials containing asbestos may result in contamination of adjacent soils due to cutting of asbestos-containing building material (e.g., for service installation), weathering of exterior building material and / or demolition. Potential asbestos containing material (PACM) were noted on several existing buildings at the sitehowever these were considered to be in good condition at the time of the site visit.

- HAIL G3: Fill Sites – An isolated area in a former building footprint appears to have been subject to filling.

- HAIL ID I: *Any other land that has been subject to the intentional or accidental release of a hazardous substance in sufficient quantity that it could be a risk to human health or the environment* –

    - It is possible that lead-based paint[1], may have been used on buildings at the site, which has the potential to contaminate surrounding soils during maintenance activities (e.g., for service installation) and / or weathering of exterior building material.

    - It is possible that isolated areas of soil contamination have occurred during burning of piles of vegetation historically and currently.

The PSI indicates that horticultural activity occurred on neighbouring land. It is possible that application of agrichemicals at that site may have resulted in spray drift onto the site (i.e. potentially HAIL ID H). It is considered that potential impacts will be assessed though the investigation of HAIL ID A10 on the study site.

[1] BRANZ (https://www.maintainingmyhome.org.nz/maintenance-guides/health-and-safety/lead-paint/) states that the use of white lead in paint was banned in 1979, however some special-purpose paints may still contain red lead. WorkSafe recommends that if a building was built in the 1980s or earlier, it is best to presume that it has been painted with lead-based paint. (Guidelines for the Management of Lead-based Paint, Revised September 2013 by the Ministry of Health and the Ministry of Business, Innovation and Employment).

6 Preliminary Conceptual Site Model

A preliminary conceptual site model (CSM) has been developed to assess the potential exposure pathways present at the site. A contamination conceptual site model consists of three primary components. For a contaminant to present a risk to human health or an environmental receptor, all three components are required to be present and connected. The three components of a conceptual site model are:

- Source of contamination.
- An exposure route, where the receptor and contaminants come into contact (e.g. ingestion, inhalation, dermal contact, groundwater migration).
- Receptor(s) that may be exposed to and are sensitive to the contaminants.

The preliminary CSM based on the findings of the desktop investigation and observations during the walkover is summarised in Table 6.

Table 6: Preliminary Conceptual Site Model

Potential Source of Contamination	Primary Contaminants of Concern	Possible Extent of Contamination	Potential Pathway	Potential Receptor
Potential persistent pesticide application in horticultural areas *(HAIL ID: A10)*	Metals / metalloids and organochlorine pesticides (OCPs)	Shallow soil in the footprint of horticultural areas	Soil ingestion, inhalation of dust, and / or dermal contact	Future site users / site redevelopment workers Surrounding residents
			Leaching of contaminants	Surrounding environment
Building materials containing asbestos (former) *(HAIL ID: E1)*	Asbestos fines and fibrous asbestos	Shallow soil within and adjacent to the current and former building footprints	Inhalation of asbestos fibres released from impacted soils / dust	Future site users / site redevelopment workers Surrounding residents
Potential undocumented filling in former building footprint *(HAIL ID: G3)*	Metals / metalloids, polycyclic aromatic hydrocarbons (PAHs) and asbestos fines and fibrous asbestos	Fill material	Soil ingestion, inhalation of dust, and / or dermal contact	Future site users / site redevelopment workers Surrounding residents
			Leaching of contaminants	Surrounding environment

Potential Source of Contamination	Primary Contaminants of Concern	Possible Extent of Contamination	Potential Pathway	Potential Receptor
Potential lead-based paint on former and existing buildings *(HAIL ID: I)*	Lead	Shallow soil adjacent to current buildings and in the vicinity of the former building footprints	Soil ingestion, inhalation of dust, and / or dermal contact	Future site users / site redevelopment workers Surrounding residents
			Leaching of contaminants into surface / shallow groundwater	Surrounding environment
Potential burning of piles of vegetation on-site *(HAIL ID: I)*	Metals / metalloids and polycyclic aromatic hydrocarbons (PAHs)	Shallow soil in the footprint of piles	Soil ingestion, produce ingestion, inhalation of dust, and / or dermal contact	Future site users / site redevelopment workers Surrounding residents
			Leaching of contaminants	Surrounding environment

7 Intrusive Investigation

ENGEO completed an intrusive investigation at the site on 11 December 2023. Additional investigation work was undertaken on 24 January 2024.

7.1 Methodology

A judgmental sampling approach was adopted to investigate potential HAIL activities at the site (as indicated in Figure 1). Based on the potential sources of contamination identified, contamination (if present) was expected to be in shallow surface soils and / or fill material; therefore, the investigation comprised shallow hand augers and test pits to a maximum depth of 1.0 m.

A summary of the investigation for each area of concern is provided in Table 7. Refer to Figure 2 for investigation locations.

Table 7: Investigation Summary

Area of Concern	Investigation Rationale	Investigation Location
Former horticultural areas	Assess impact to surface soil as a result of historical horticultural activity.	CS01 to CS06 S23 to S25
Potential burning of piles of vegetation in northeast quadrant	Assess impact to surface soil as a result of stockpiling unknown material.	S07 to S09
Former Buildings	Shallow sampling within and / or adjacent to the building footprint where the age of construction, or materials used in construction (i.e., PACM and / or paint) indicated the potential for contamination, and where storage of agrichemicals may have occurred.	S10 to S16
Existing Buildings		S17 to S18 and S21 – S22*
Fill material identified in former building footprint	Assess potential impact as a result of placement of fill material.	S16

Note: * Samples were not collected from S19 and S20.

Fieldwork and sampling were undertaken in general accordance with the procedures for the appropriate handling of potentially contaminated soils as described in the MfE Contaminated Land Management Guidelines No. 5: Site Investigation and Analysis of Soils (MfE, 2021b). The following was undertaken during the investigation:

- All soil samples were screened for visual and olfactory evidence of contamination.
- Samples were given a unique sample ID to identify the depth and location from where they were collected on-site.
- Samples were placed into laboratory-supplied sample containers using a new pair of nitrile gloves for each sample. The containers were capped, labelled with a unique identifier, and placed into an insulated container and kept cool prior to transport to Hill Laboratories under a standard chain of custody.
- Prior to the collection of each sample, handheld equipment was decontaminated using potable water, Decon 90 solution, and distilled water.

7.2 Ground Conditions

With the exception of one location, topsoil was encountered to a depth of between 0.2 m and 0.4 m bgl across the site. Topsoil was underlain by what was inferred to be native soil.

Fill material comprising silty clay intermixed with sandy silt; dark brownish grey with reddish-brown and orange-brown streaks was encountered to a depth of 0.8 m bgl at location S16.

No visual or olfactory evidence of contamination was noted during soil sampling. Refer to Figure 1 for sample locations.

The material types represented by each sample collected during the intrusive investigation are summarised in the soil results summary table included in Appendix 4. For further details of ground conditions at the site reference should be made to the geotechnical investigation report (ENGEO, 2023).

7.3 Assessment Criteria

Analytical results were assessed to determine consenting requirements and options for disposal of any soil which may be taken off-site.

Human Health Criteria

The following criteria were used to assess the risk to future site users:

- Development plans have not been finalised, therefore the soil contaminant standards from the Methodology for Deriving Contaminants in Soil to Protect Human Health ("the Methodology"; MfE, 2011b) for standard residential and high-density residential land use have been selected based on the anticipated land use.
- The soil guideline values for standard residential and high-density residential land use from the New Zealand Guidelines for Assessing and Managing Asbestos in Soil (GAMAS; BRANZ, 2017).
- In accordance with Contaminated Land Management Guidelines No.2 – Hierarchy and Application in New Zealand of Environmental Guideline Values (CLMG 2; MfE, 2011c) for contaminants not listed above.

As discussed in Section 3.2.1 of the Methodology (MfE, 2011), the NESCS does not assess a maintenance or excavation worker exposure scenario as the risks to those workers is more appropriately managed under New Zealand health and safety legislation. Therefore, potential risks to contractors responsible for carrying out the earthworks and future maintenance are not further assessed.

Surrounding populations are considered to be adequately protected on the basis that the risks to future site users is acceptable.

Environmental Criteria

In the Auckland region, potential discharges to the environment from land containing elevated concentrations of contaminants are managed through the AUP (Auckland Council, 2016). The permitted activity criteria in the AUP have been adopted as environmental criteria for this report.

Background Criteria

Natural background concentrations are derived from:

- Background Concentration of Inorganic Elements in Soils from the Auckland Region (AC, 2001), using the concentrations for non-volcanic soils.
- The laboratory limit of reporting (LOR) where no natural background concentration for a given contaminant is available, or where the natural background limit is below the limit of reporting. The exception to this is asbestos where the recorded presence of asbestos below the LOR is also considered an exceedance of the natural background concentration.

7.4 Soil Analysis Results

The soil results summary table included in Appendix 4 compares soil contaminant concentrations in the samples tested with the adopted investigation criteria. Full analytical laboratory reports are included in Appendix 5. Soil sample locations are shown in Figure 2.

One (S23) of the three samples collected from the area previously identified to be potentially impacted by pesticides recorded a concentration of OCPs which exceeded the adopted environmental criteria.

All of the remaining chemical and asbestos testing results were below human health and environmental assessment criteria. Additionally, concentrations were all below regional background concentrations.

7.5 Quality Assurance and Quality Control

The quality assurance / quality control (QA / QC) procedures undertaken during the works included:

- Each soil sample was given a unique identification number.
- All samples were placed directly into a cooled container prior to transport to Eurofins laboratory under ENGEO standard chain of custody.
- Sampling equipment was decontaminated using a triple wash method (as previously stated) between each sample location.

Eurofins are accredited by International Accreditation New Zealand (IANZ) for the analyses performed. Additionally, Eurofins are accredited to AS-4964-2004: *Method for Qualitative Identification of Asbestos in Bulk Storage* for the analysis of suspected asbestos in soil samples, and to the international standards NZ ISO/IEC 17207:2018 *General requirements for the competence testing and calibration laboratories* in accordance with the GAMAS (BRANZ, 2017).

Our review of the laboratory QA reports indicates that there were exceedances of acceptable recovery range, however these were not considered by the laboratory to significantly impact the results.

7.6 Conceptual Site Model

The preliminary CSM from Section 6 has been updated based on the findings of the intrusive investigation and is summarised in Table 8.

Table 8: Conceptual Site Model

Potential Source of Contamination	Potential Pathway	Potential Receptor	Acceptable Risk?
Potential persistent pesticide application in horticultural areas *Metals / metalloids and OCPs (HAIL ID: A10)*	Soil ingestion, inhalation of dust, and / or dermal contact	Future site users / site redevelopment workers Surrounding residents	**Yes** The concentration of contaminants of concern were below human health criteria.
	Leaching of contaminants	Surrounding environment	**No** The concentration of copper and OCPs in one sample collected adjacent to the workshop during the previous investigation exceeded background concentrations (Environmental and Earth Sciences Limited; summarised in Table 3). One of the three samples collected during ENGEO's investigation recorded a concentration of OCPs which exceeded the adopted environmental criteria. These results indicate that pesticides may have been stored at this location or potentially stockpiled material contained OCPs.
Potential lead-based paint on former and existing buildings *Lead (HAIL ID: I)*	Soil ingestion, inhalation of dust, and / or dermal contact	Future site users / site redevelopment workers Surrounding residents	**Yes** No building / demolition material was identified in the soil, and the concentrations of contaminants of concern were below human health and environmental assessment criteria.
	Leaching of contaminants	Surrounding environment	
Potential undocumented filling in former building footprint *Metals / metalloids, PAHs, and asbestos fines and fibrous asbestos (HAIL ID G3)*	Soil ingestion, inhalation of dust, and / or dermal contact	Future site users / site redevelopment workers Surrounding residents	**Yes** No building / demolition material were identified in the soil, and the concentrations of contaminants of concern were below human health and environmental assessment criteria.
	Leaching of contaminants	Surrounding environment	

Potential Source of Contamination	Potential Pathway	Potential Receptor	Acceptable Risk?
Building materials containing asbestos (former) *Asbestos fines and fibrous asbestos (HAIL ID: E1)*	Inhalation of asbestos fibres released from impacted soils / dust	Future site users / site redevelopment workers Surrounding residents	**Yes** One fragment of PACM was observed on the concrete driveway adjacent to exterior of the workshop; however, is not considered to have resulted in contamination of surrounding soil. No other visual signs of contamination were identified in the soil, and no asbestos was detected in the soil samples analysed.
Potential burning of piles on-site *Metals / metalloids and PAHs (HAIL ID: I)*	Soil ingestion, inhalation of dust, and / or dermal contact	Future site users / site redevelopment workers Surrounding residents	**Yes** No visual signs of contamination were identified in the soil, and the concentrations of contaminants of concern were below human health and environmental assessment criteria.
	Leaching of contaminants	Surrounding environment	

8 Regulatory Context

In Auckland, soil disturbance and change of land use on sites with potentially contaminated soils are covered by:

- Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (NESCS, 2011).
- Auckland Unitary Plan (AUP, 2016).

8.1 The NESCS

The intent of the NESCS is to protect the human health of the site's end users and the surrounding populations.

8.1.1 Applicability

The NESCS may apply to specific activities on sites where an activity on the HAIL (MfE, 2011a) has, or is more likely than not to have occurred. The activities to which the NESCS applies are listed in Table 10, which is based on the template provided in the Users' Guide: National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health ("the Users' Guide"; MfE, 2012). This table and the results of analysis of soil samples from the site (refer to Section 7.4) confirms the NESCS applies to the site.

Table 9: Applicability of NESCS

NESCS Checklist	
Is an activity described on the HAIL currently being undertaken on the piece of land to which this application applies?	No
Has an activity described on the HAIL ever been undertaken on the piece of land to which this application applies?	Yes
Is it more likely than not that an activity described on the HAIL is being or has been undertaken on the piece of land to which this application applies?	Yes
If 'Yes' to any of the above, then the NES for Assessing and Managing Contaminants in Soil to Protect Human Health may apply. Check the five activities to which the NES applies:	
Is the activity you propose to undertake removing or replacing a fuel storage system or parts of it?	No
Is the activity you propose to undertake sampling soil?	No
Is the activity you propose to undertake disturbing soil?	Yes
Is the activity you propose to undertake subdividing land?	Unknown
Is the activity you propose to undertake changing the use of the land?	Yes
If also 'Yes' to any of the above activities, then the NES for Assessing and Managing Contaminants in Soil to Protect Human Health is likely to apply.	

8.1.2 Consenting Requirements

ENGEO has not been provided with proposed soil disturbance or disposal volumes for bulk earthworks are the site.

We note that it is intended that remediation of the area of soil identified as impacted by pesticides (vicinity of S23) will be undertaken before bulk earthworks commence. It is estimated that these works will comprise excavation and disposal off-site at an appropriately licensed facility of approximately 15 m^3 of soil. Based on the area of the "piece of land" (approximately 23,674 m^2, the NESCS allows 1,183 m^3 of soil to be disturbed as a Permitted Activity, and for 236 m^3 of soil to be removed for disposal per year. Table 10 demonstrates compliance with the conditions for a permitted activity consent for these remedial works.

Once the remediation works have been carried out, we consider that, based on Regulation 5(9) of the NESCS, the NESCS will no longer apply as the DSI shows that the concentrations of contaminants reported for the remainder of the site are at, or below, background concentrations.

Table 10: NESCS Permitted Activity Criteria

Permitted activity criteria for soil disturbance (Regulation 8(3))	
(a) controls to minimise the exposure of humans to mobilised contaminants must: (i) be in place when the activity begins. (ii) be effective while the activity is done. be effective until the soil is reinstated to an erosion-resistant state.	Meets criterion.
(b) the soil must be reinstated to an erosion-resistant state within 1 month after the serving of the purpose for which the activity was done.	Likely to meet criterion.
(c) the volume of the disturbance of the soil of the piece of land must be no more than 25 m^3 per 500 m^2.	*Meets criterion.* *Permitted disturbance volume = 1,183 m^3 ((811/500) x 25). The proposed remediation works comprise approximately 15 m^3 of soil disturbance*
(d) soil must not be taken away in the course of the activity, except that: (i) for the purpose of laboratory analysis, any amount of soil may be taken away as samples. for all other purposes combined, a maximum of 5 m^3 per 500 m^2 of soil may be taken away per year.	*Meets criterion.* *Permitted removal volume = 236 m^3 ((811/500) x 5). The proposed works comprise approximately 15 m^3 of soil removal*
(e) soil taken away in the course of the activity must be disposed of at a facility authorised to receive soil of that kind.	Meets criterion. Controls will be outlined in the Remedial Action Plan.
(f) the duration of the activity must be no longer than two months.	Meets criterion. The disturbance of the contaminated soils is likely to be limited to less than two weeks.
(g) the integrity of a structure designed to contain contaminated soil or other contaminated materials must not be compromised.	Meets criterion. No such containment structure is present on-site.

If subdivision is proposed, we consider this would be a permitted activity as demonstrated in Table 11.

Table 11: NESCS Permitted Activity Criteria, NESCS, 2011

Permitted activity criteria for subdividing or changing land use (Clause 8(4))	
(a) a preliminary site investigation of the land or piece of land must exist.	Meets criterion. A PSI and DSI (this report) have been prepared for the site.
(b) the report on the preliminary site investigation must state that it is highly unlikely that there will be a risk to human health if the activity is done to the piece of land.	Meets criterion. All chemical analysis and asbestos testing results were below the adopted human health criteria.
(c) the report must be accompanied by a relevant site plan to which the report is referenced.	Meets criterion. Site plans are attached as Figure 1 and 2.
(d) the consent authority must have the report and the plan.	Meets criterion. We understand this PSI and DSI will be submitted to Auckland Council

8.2 Regional Plan

8.2.1 Consenting Requirements

The AUP (AC, 2016) sets out consent requirements for managing discharges to the environment from land containing elevated concentrations of contaminants.

The concentration of total DDT in one sample of soil from the site exceeds the relevant regional environmental discharge criterion. The volume of soil containing DDT at a concentration above the permitted activity (environmental) criterion is estimated to be 15 m^3 based on the data set. Given this volume is significantly below the volume requiring consent under rule E30.6.1.2 of the AUP (i.e. 200 m^3), no consent relating to land contamination under the AUP is considered to be required as long as the standards in Rule 30.6.1.2 are complied with.

9 Conclusions

The concentration of copper and OCPs in one sample collected during the previous investigation completed by Environmental and Earth Sciences (summarised in Table 3) exceeded background concentration. The results of the additional intrusive investigation in this area identified that the adopted environmental assessment criteria for DDT was exceeded in one location in this vicinity. Based on this information we consider that it is possible that pesticides were stored or used in this area, and / or was present in soil stockpiled in this area historically. With the exception of this area of the site, concentrations of potential contaminants of concern were below regional background concentrations.

We understand that remediation of the impacted material (approximately 15 m^3) will be carried out prior to bulk earthworks at the site.

Based on the volume of impacted soil we consider that the remediation works:

- Will be a permitted activity under the NESCS as the permitted disturbance volume, removal volume and / or time frame specified in Regulation 8 of the NESCS are likely to be complied with.
- Will be a permitted activity under Section E30 of the AUP as long as the standards in Rule 30.6.1.2 are complied with.

Once the remediation works have been carried out, we consider that, based on Regulation 5(9) of the NESCS, the NESCS will no longer apply as the DSI shows that the concentrations of contaminants reported for the remainder of the site are at, or below, background concentrations. We also consider that Section E30 of the AUP will no longer apply as soil at the site will not be considered 'contaminated land or land containing elevated levels of contaminants'.

10 Recommendations

10.1 Additional Assessment

It should be noted that the buildings on the site were constructed prior to 2000. The Health and Safety at Work (Asbestos) Regulations 2016 state if a building constructed or installed prior to January 2000 requires demolition or refurbishment, an asbestos survey must be undertaken by a competent person. If asbestos is in a damaged or deteriorated condition, or becomes damaged during demolition, friable asbestos fibres can potentially contaminate the surrounding soils. ENGEO recommends that an asbestos survey is completed prior to the demolition of the buildings present on-site for which building surveys are not available.

10.2 Remediation Action Plan

It is recommended that the remedial earthworks be managed in accordance with the Remediation Action Plan (RAP) that has been prepared for the site. Standard construction site procedures are considered appropriate for the balance of earthworks.

10.3 Closure Reporting

Council may request that following completion of earthworks, a completion report should be prepared to document the works, to confirm that remedial works have been undertaken in general accordance with the RAP.

10.4 Disposal Options

The objective of this investigation was to satisfy the requirements of the NESCS and AUP, however the results can be used to inform disposal options. The findings of this investigation indicate that apart from the area proposed for remediation, soils at the site are likely to be considered "cleanfill" for disposal purposes (AUP, 2016).

11 Limitations

i. We have prepared this report in accordance with the brief as provided. This report has been prepared for the use of our client, Cabra Developments Limited, their professional advisers, and the relevant Territorial Authorities in relation to the specified project brief described in this report. No liability is accepted for the use of any part of the report for any other purpose or by any other person or entity.

ii. The recommendations in this report are based on the ground conditions indicated from published sources, site assessments and subsurface investigations described in this report based on accepted normal methods of site investigations. Only a limited amount of information has been collected to meet the specific financial and technical requirements of the client's brief and this report does not purport to completely describe all the site characteristics and properties. The nature and continuity of the ground between test locations has been inferred using experience and judgement and it should be appreciated that actual conditions could vary from the assumed model.

iii. Subsurface conditions relevant to construction works should be assessed by contractors who can make their own interpretation of the factual data provided. They should perform any additional tests as necessary for their own purposes.

iv. This Limitation should be read in conjunction with the Engineering NZ/ACENZ Standard Terms of Engagement.

v. This report is not to be reproduced either wholly or in part without our prior written permission.

We trust that this information meets your current requirements. Please do not hesitate to contact the undersigned on (09) 972 2205 if you require any further information.

Report prepared by

Claire Davies, CEnvP

Associate Environmental Consultant

Report reviewed by

Lotta Liddell, CEng CEnv MICE

Senior Environmental Engineer

12 References

AC, 2001. Auckland Regional Council. (2001). Background Concentration of Inorganic Elements in Soils from the Auckland Region, Auckland Regional Council, Technical Publication No. 153.

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FIGURES

Legend

- Site Boundary
- Existing building constructed prior to 2000 (Potential HAIL I / E1)
- Footprint of former building (Potential HAIL I / E1)
- Approx. extent of potential burn pile (Potential HAIL I)
- Former horticultural area (HAIL A10)

0 10 m 20 m

ENGEO

Produced by **Datanest.earth**

Title: Site Location and Key Features		
Client: Cabra Developments Limited		Size: A3
Project: 14 Sinton Road, Hobsonville	Drawn: CD	Figure No.: 1
Date: 28-11-2023	Checked: LL	
Proj No: 23849.000.005	Scale: 1:937	Version: 1.0

Legend

- Site Boundary
- Investigation Location
- Approximate location of previous 'hot spot' (Environmental and Earth Sciences Limited)
- Existing building constructed prior to 2000 (Potential HAIL I / E1)
- Footprint of former building (Potential HAIL I / E1)
- Approx. extent of potential burn pile (Potential HAIL I)
- Former horticultural area (HAIL A10)

0 10 m 20 m

ENGEO

Produced by **Datanest.earth**

Title: Environmental Investigation Location Plan		
Client: Cabra Developments Limited		Size: A3
Project: 14 Sinton Road, Hobsonville	Drawn: CD	Figure No.: 2
Date: 08-01-2024	Checked: LL	
Proj No: 23849.000.005	Scale: 1:804	Version: 1.0

APPENDIX 1:

Aerial Photographs

1940 (Retrolens NZ)

1950 (Retrolens NZ)

1963 (Retrolens NZ)

1968 (Retrolens NZ)

1972 (Retrolens NZ)

1975 (Retrolens NZ)

1978 (Retrolens NZ)

1980 (Retrolens NZ)

1988 (Retrolens NZ)

1996 (Auckland Council GeoMaps)

2000 (Auckland Council GeoMaps)

2006 (Auckland Council GeoMaps)

2008 (Auckland Council GeoMaps)

2010/2011 (Auckland Council GeoMaps)

2012 (Auckland Council GeoMaps)

2017 (Auckland Council Geomaps)

2018 (Nearmaps)

2019 (Nearmaps)

2020 (Nearmaps)

2023 (Nearmaps)

APPENDIX 2:

Site Contamination Enquiry Response

15/08/2023

Engeo Limited
8 Greydene Place
Auckland

Attention: Jack Hammond

Dear Jack,

Site Contamination Enquiry – *10 Sinton Road Hobsonville*

This letter is in response to your enquiry requesting available site contamination information within Auckland Council records for the above site. Please note this report does not constitute a site investigation report; such reports are required to be prepared by a (third-party) Suitably Qualified and Experienced Practitioner.

The following details are based on information available to the Contamination, Air & Noise Team in the Resource Consent Department. The details provided may be from former regional council information, as well as property information held by the former district/city councils. For completeness the relevant property file should also be requested to obtain all historical records and reports via 09 3010101 or online at:

https://www.aucklandcouncil.govt.nz/buying-property/order-property-report/Pages/order-property-file.aspx.

1. Hazardous Activities and Industries List (HAIL) Information

This list published by the Ministry for the Environment (MfE) comprises activities and industries that are considered likely to cause land contamination as a result of hazardous substance use, storage, and/or disposal.

There is no contamination information held within Council's records for the site (Sinton Road Hobsonville).

Please note:

- *If you are demolishing any building that may have asbestos containing materials (ACM) in it, you have obligations under the Health and Safety at Work (Asbestos) Regulations 2016 for the management and removal of asbestos, including the need to engage a Competent Asbestos Surveyor to confirm the presence or absence of any ACM.*
- *Paints used on external parts of properties up until the mid-1970's routinely contained lead, a poison and a persistent environmental pollutant. You are advised to ensure that soils affected by old, peeling or flaking paint are assessed in relation to the proposed use of the property, including high risk use by young children.*

2. Consents and Incidents Information (200m radius of the selected site)

The Council database was searched for records of the following activities within approximately 200 metres of the site and results are displayed in Figure 1 below:

- Pollution Incidents (including air discharges, oil or diesel spills)
- Bores

- Contaminated site and air discharges, and industrial trade process consents
- Closed Landfills
- Air quality permitted activities
- Identified HAIL activities

Figure 1: Selected Consents, Incidents and HAIL activities within approximately 200m of the subject site

Legend:

All Consents
All Applications
All Permitted Activities
All Bores
Closed Landfill (Auckland Council owned)
Closed Landfill (Privately owned)
All Incidents
HAIL activities

Relevant details of any pollution incidents and consents and HAIL activities are appended to this letter (Attachment A). Please refer to the column titled 'Property Address' on the spreadsheet to aid in identifying corresponding data on the map.

For any identified HAIL sites, please refer to the tab "HAIL activities" for more information (Column C and D include HAIL activity details where these are available).

Please note:

The HAIL activity hatching in Figure 1 only reflects whether a site has been identified as a HAIL site (both verified and non-verified) by the Council and the type of HAIL associated with the site. This does not confirm whether the site has been formally investigated or the contamination status of the property (e.g. contaminated, remediated etc.). Additionally, due to limitations within Council's records, the specific HAIL activity is not included in the data for all properties. For further information on any of these known HAIL sites, a subsequent site contamination enquiry can be lodged for the specific property (up to 5 adjacent properties can be covered in one request).

While the Auckland Council has carried out the above search using its best practical endeavours, it does not warrant its completeness or accuracy and disclaims any responsibility or liability in respect of the information. If you or any other person wishes to act or to rely on this information, or make any financial commitment based upon it, it is recommended that you seek appropriate technical and/or professional advice.

If you wish to clarify anything in this letter that relates to this site, please contact contaminatedsites@aucklandcouncil.govt.nz. Any follow up requests for information on other sites must go through the online order process.

Should you wish to request any of the files referenced above and/or listed in the attached spreadsheet for viewing, please contact the Auckland Council Call Centre on 301 0101 and note you are requesting former Auckland Regional Council records (the records department requires three working days' notice to ensure the files will be available).

Please note Auckland Council cost recovers officer's time for all site enquiries. As such an invoice for $128 for the time involved in this enquiry will follow shortly.

Yours Sincerely,

Contamination, Air and Noise Team
Specialist Unit | Resource Consents
Auckland Council

CONSENT_NUMBER	FILE_REFERENCE	CONSENT_HOLDER	BORE_ID	GRANTED_DATE	REVIEW_DATE	EXPIRY_DATE	CONSENT_STATUS	PROCESSING_OFFICER	PURPOSE	WORKS_DESCRIPTION	EASTING	NORTHING	ACTIVITY_STATUS	LAND_USE	LAND_USE_UPDATED	LAND_USE_NOTE	BORE_USE	ACTIVITY_DESCRIPTION	SITE_NAME	SITE_DESCRIPTION	MAIN_AQUIFER	AQUIFER	SUB_AQUIFER1	SUB_AQUIFER2	ENVIRONMENT_REPORTING_AREA	ALW_PLAN_ZONES	TLA	HYDSYS_NUMBER	DATE_DRILLED	TOTAL_DEPTH	GROUND_ELEVATION	STATIC_WATER_LEVEL	STATIC_WATER_DATE	BORE_LOG	AQUIFER_TEST	DIAMETER_FROM	DIAMETER_TO	DIAMETER	CASING_FROM	CASING_TO	CASING_TYPE	CASING_DIAMETER	SCREEN_FROM	SCREEN_TO	SCREEN_TYPE	CONTRACTOR	CONSULTANT	DATE_CREATED	PROPERTY_ADDRESS	LOC_TYP
0			2601								1746420	5926520	Drilled					Drilled pre-1987 for ANDREWS IA &RM by *** DRILLER UNKNOWN ***.			Waitemata	Kumeu Waitemata	Kumeu Zone 3			Kumeu Waitemata			20000101	182				Y		0	182	100	0			100						20170601		Point

CONSENT_NUMBER	FILE_REFERENCE	ACTIVITY	CONSENT_HOLDER	CONSENT_STATUS	GRANTED_DATE	REVIEW_DATE	EXPIRY_DATE	PROCESSING_OFFICER	PURPOSE	WORKS_DESCRIPTION	EASTING	NORTHING	ACTIVITY_ID	ACTIVITY_STATUS	ACTIVITY_DESCRIPTION	SITE_NAME	SITE_DESCRIPTION	DATE_CREATED	PROPERTY_ADDRESS	LOC_TYP	MONITORING_OFFICER	PREVIOUS_INSPECTION_DATE	NEXT_INSPECTION_DATE
4218	AGB23839	Take	IH ANDREWS RM ANDREWS	Replaced	19881109		19881231		To take from a Bore up to 65 cmpd for - Pastoral		1744630	5926520	2185		To take from a Bore up to 65 cmpd for - Pastoral			2/06/2017	SINTON RD HOBSONVILLE Waitakere City	Point		Invalid Date	Invalid Date
5190	XX854571	Dam	WH COLLISTON & CO LTD	Replaced	19860704		19901231		ASSORTED CROPS		1744700	5926680	309	Existing	ASSORTED CROPS		6 SINTON RD, HOBSONVILLE	2/06/2017	6 Sinton Road Hobsonville Waitakere	Point		Invalid Date	Invalid Date
5191	XX854572	Take	WH COLLISTON & CO LTD	Cancelled	19860704		19901231		To take from a Dam up to 160 cmpd for - Pastoral	dam	1744700	5926680	2186		To take from a Dam up to 160 cmpd for - Pastoral		6 Sinton Rd, Hobsonville	2/06/2017	6 SINTON RD HOBSONVILLE Waitakere City	Point		Invalid Date	Invalid Date
6500	AGB861128	Take	IH ANDREWS RM ANDREWS	Expired	19890905		19940531		2.5 hectares of Orchard ******		1744630	5926520	2184				SINTON ROAD, HOBSONVILLE	2/06/2017	SINTON RD HOBSONVILLE Waitakere City	Point		Invalid Date	Invalid Date
9046	XX924671	Dam	Anthony Gerard Koenen & Janet Stephanie Koenen	Expired	19930525	19961231	20060531	_Michelle Daly	To Dam an unnamed tributary of the Waiarohia inlet.	A 6 metre high earth dam, located approximately 25 metres east of Sinton Road, Hobsonville.	1744700	5926680	309	Existing	ASSORTED CROPS		6 SINTON RD, HOBSONVILLE	2/06/2017	6 Sinton Road Hobsonville Waitakere	Point		Invalid Date	Invalid Date
9426	UPWW463	Coastal Structure	Ivan Jujnovich Christine Jujnovich	Expired	19871101		2001 0331	_Harbour's Act Approval	Occupation of part of the CMA with a jetty.	Jetty (29m x 1.5m = 43m2).	1746342	5926926	21599	Constructed	Coastal Structure: Wooden jetty (29m long x 1.5m wide) with round concrete piles. The jetty is in good order. Usable at high tide - 2m of water - dries out at low tide. Foreshore is mangrove and mud. (Previously structure general 654)		Adjacent 21 Rata Road, Waiapomia Creek, Waitemata Harbour.Map Ref: NZMS 260 R11 567887	2/06/2017	Adj 21 Rata Road, Waiapomia Creek, Waitakere City Waitemata Harbour WCC	Point		Invalid Date	Invalid Date
11214	54/27/123	Coastal Structure	United Networks Ltd	Expired	19761208		19960930		licence provides for overhead cables OVER THE WAIAORHIA CREEK.	POWERLINE CROSSING (112M OVER CREEK).	1745500	5927000	20615		(Previously pipeline 868)		WAIAORHIA CREEK, WHENUAPAI, HOBSONVILLE	2/06/2017		Point		Invalid Date	Invalid Date
37561	25655	Stream Work	Anthony Gerard Koenen & Janet Stephanie Koenen	Issued	20150202	20110201	20440136	_Nicola Watson	To authorise works within a watercourse associated with the forming of an access track.		1744700	5926495	21455	Proposed	Works within a watercourse associated with the installation of a culvert to construct an access to the site.	6 Sinton Road	New culvert on man made stream to facilitate vehicle crossing.	2/06/2017	6 Sinton Road Hobsonville Waitakere	Point	Graeme Ridley	Invalid Date	Invalid Date

SAPSiteID	PropertyAddress	HAILCode	HAILDescription	ValidFrom
11132817	12 Sinton Road Hobsonville			1/06/2016
11134008	15 Clarks Lane Hobsonville			1/06/2016
11131581	16 Sinton Road Hobsonville			1/06/2016
11131592	14 Sinton Road Hobsonville			1/06/2016
11143991	Brigham Creek Road Whenuapai			1/06/2016
30003910	Brigham Creek Road Whenuapai			1/06/2016
30003919	Brigham Creek Road Whenuapai			1/06/2016
11134039	6 Sinton Road Hobsonville			1/01/1900
11134039	6 Sinton Road Hobsonville			1/01/1900

14/08/2023

Engeo Limited
8 Greydene Place
Auckland

Attention: Jack Hammond

Dear Jack,

Site Contamination Enquiry – *16 Sinton Road, Hobsonville*

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1. Hazardous Activities and Industries List (HAIL) Information

This list published by the Ministry for the Environment (MfE) comprises activities and industries that are considered likely to cause land contamination as a result of hazardous substance use, storage, and/or disposal.

Council's records indicate this site has possibly been subject to the following activity that fall within the HAIL:

- HAIL Item (A10) - Persistent pesticide bulk storage or use including sport turfs, market gardens, orchards, glass houses or spray sheds.

Aerial image dated 1988, indicates the site has been subject to historic horticultural activities.

Aerial Image 1988.

Please note:

- *If you are demolishing any building that may have asbestos containing materials (ACM) in it, you have obligations under the Health and Safety at Work (Asbestos) Regulations 2016 for the management and removal of asbestos, including the need to engage a Competent Asbestos Surveyor to confirm the presence or absence of any ACM.*
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All Permitted Activities
All Bores
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Closed Landfill (Privately owned)
All Incidents
HAIL activities

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Please note Auckland Council cost recovers officer's time for all site enquiries. As such an invoice for $128 for the time involved in this enquiry will follow shortly.

Yours Sincerely,

Contamination, Air and Noise Team
Specialist Unit | Resource Consents
Auckland Council

PERMITTED_ACTIVITY_ID	FILE_REFERENCE	PERMITTED_ACTIVITY_HOLDER	PERMITTED_ACTIVITY_TYPE	ACTIVITY	CONSENT_STATUS	GRANTED_DATE	REVIEW_DATE	EXPIRY_DATE	PROCESSING_OFFICER	PURPOSE	WORKS_DESCRIPTION	EASTING	NORTHING	ACTIVITY_ID	ACTIVITY_STATUS	ACTIVITY_DESCRIPTION	SITE_NAME	SITE_DESCRIPTION	DATE_CREATED	PROPERTY_ADDRESS	LOC_TYP
29	KRG04280		Small Low Risk Dam	Dam	Assessment Completed					PURPOSE UNKNOWN		1746400	5836200	27		PURPOSE UNKNOWN			2/06/2017		Point
53258	CG13-12-54457*		Bore	Bore	Assessment Completed				Reginald Samuel	To authorise the construction of fifteen bores for geological, geotechnical and groundwater purposes.	The construction of fifteen 70mm bores to a maximum depth of 15-45m. Installation of casing material to an approximate depth of 15-45m.	1746481	5836231	29910	Proposed	To authorise the construction of fifteen bores for geological, geotechnical and groundwater purposes.	Rideracaw Services		2/06/2017		Point

SAPSiteID	PropertyAddress	HAILCode	HAILDescription	ValidFrom
11131521	34 Kauri Road Whenuapai			1/06/2016
11131542	20-26 Kauri Road Whenuapai			1/06/2016
11132817	12 Sinton Road Hobsonville			1/06/2016
11131581	16 Sinton Road Hobsonville			1/06/2016
11131592	14 Sinton Road Hobsonville			1/06/2016
11133220	174 Brigham Creek Road Hobsonville			1/06/2016

CONSENT_NUMBER	FILE_REFERENCE	ACTIVITY	CONSENT_HOLDER	CONSENT_STATUS	GRANTED_DATE	REVIEW_DATE	EXPIRY_DATE	PROCESSING_OFFICER	PURPOSE	WORKS_DESCRIPTION	EASTING	NORTHING	ACTIVITY_ID	ACTIVITY_STATUS	ACTIVITY_DESCRIPTION	SITE_NAME	SITE_DESCRIPTION	DATE_CREATED	PROPERTY_ADDRESS	LOC_TYP	MONITORING_OFFICER	PREVIOUS_INSPECTION_DATE	NEXT_INSPECTION_DATE
46257	26913	Wastewater Discharge	Edwin C Sutherland	Issued	20160726	20170731	20310630	Alan Moore	To discharge up to 1.16 cmpd of treated domestic wastewater to land from a 5 bedroom dwelling.	The key components of the wastewater treatment systems shall be consistent with that described in the application and shall comprise at least the following minimum components, dimensions and standards:a) Wastewater treatment system consisting of: (i)a)A.	1746062.91	5926465.64	21715	Proposed	To discharge up to 1.16 cmpd of treated domestic wastewater to land from a 5 bedroom dwelling	21 Kauri Road		2/04/2017	21 Kauri Road Whenuapai Waitakere	Point	Megan Griffiths	Invalid Date	Invalid Date
4218	AGB31839	Take	Mr ANDREWS RM ANDREWS	Replaced	19841109		19881231		To take from a Bore up to 65 cmpd for - Pastoral		1746420	5926520	2185		To take from a Bore up to 65 cmpd for - Pastoral			2/04/2017	SINTON RD HOBSONVILLE Waitakere City	Point		Invalid Date	Invalid Date
4487	AKB44126	Take	RN NEALE LM NEALE	Cancelled	19851109		19911231		To take from a Dam up to 18 cmpd for - Industrial Use		1746400	5926200	2182		To take from a Dam up to 18 cmpd for - Industrial Use			2/04/2017	BRIGHAMS CK RD HOBSONVILLE Waitakere City	Point		Invalid Date	Invalid Date
4500	AGB86328	Take	Mr ANDREWS RM ANDREWS	Expired	19890905		19940531		2.5 hectares of Orchard.^^^^^		1746420	5926520	2184				SINTON ROAD, HOBSONVILLE	2/04/2017	SINTON RD HOBSONVILLE Waitakere City	Point		Invalid Date	Invalid Date
25692	15806	Comprehensive Stormwater Discharge	Auckland Council	Issued	20080121	20090630	20411231	_Christine Mitchell	To authorise the diversion and discharge of stormwater from the Waiarohia Stream Catchment associated with Plan Change 14 to land and water in accordance with Sections 14(1)(a) and 15(1)(a) and (b) of the Resource Management Act 1991.	As detailed in the Waiarohia Stream Integrated Catchment Management Plan prepared by the Waitakere City Council.	1745966	5926490	20333	Proposed	To divert and discharge stormwater and wastewater overflows, to dam & divert watercourses & to undertake clearance & maintenance of watercourses & otherwise to manage the diversions and discharges of stormwater & wastewater from & within the 510 ha Waiaro	Waiarohia Catchment CMP	Waiarohia Catchment Waitakere City	2/04/2017		Area	Leon Blackburn	2/05/2013	1/03/2014
31896	21446	Wastewater Discharge	Watercare Services Limited	Surrendered	20090505	20100630	20411231	_Christine Mitchell	To authorise the discharge of wastewater to land or water in accordance with Sections 15(1)(a) and (b) of the Resource Management Act 1991 as a result of:â€¢Network overflows during periods of wet weather flow;â€¢Network overflows resulting solely from ne	As proposed in the Waiarohia Integrated Catchment Management Plan (WICMP).	1746000	5926400	20844	Proposed	The catchment area generally described as that land in the Waiarohia Stream Catchment that is bounded by Trig Road to the west, Hobsonville Road to the east and Waiarohia Inlet to the north.	WCC-Waiarohia Catchment WWNetWk		2/04/2017	Waiarohia Catchment Wastewater Network Waitakere City	Point	Patricia Burford	Invalid Date	Invalid Date

CONSENT_NUMBER	FILE_REFERENCE	CONSENT_HOLDER	BORE_ID	GRANTED_DATE	REVIEW_DATE	EXPIRY_DATE	CONSENT_STATUS	PROCESSING_OFFICER	PURPOSE	WORKS_DESCRIPTION	EASTING	NORTHING	ACTIVITY_STATUS	LAND_USE	LAND_USE_UPDATED	LAND_USE_NOTE	BORE_USE	ACTIVITY_DESCRIPTION	SITE_NAME	SITE_DESCRIPTION	MAIN_AQUIFER	AQUIFER	SUB_AQUIFER1	SUB_AQUIFER2	ENVIRONMENT_REPORTING_AREA	ALW_PLAN_ZONES	TLA	HYDSYS_NUMBER	DATE_DRILLED	TOTAL_DEPTH	GROUND_ELEVATION	STATIC_WATER_LEVEL	STATIC_WATER_DATE	BORE_LOG	AQUIFER_TEST	DIAMETER_FROM	DIAMETER_TO	DIAMETER	CASING_FROM	CASING_TO	CASING_TYPE	CASING_DIAMETER	SCREEN_FROM	SCREEN_TO	SCREEN_TYPE	CONTRACTOR	CONSULTANT	DATE_CREATED	PROPERTY_ADDRESS	LOC_TYP
0			2601								1746420	5926520	Drilled					Drilled pre-1987 for ANDREWS IA &RM by *** DRILLER UNKNOWN ***.			Waitemata	Kumeu Waitemata	Kumeu Zone 3			Kumeu Waitemata			20000101	182				Y		0	182	100	0			100						20170601		Point
53258	CS12-12-5643*		29910	20150825			Assessment Completed	Reginald Samuel	To authorise the construction of fifteen bores for geological, geotechnical and groundwater purposes.	The construction of fifteen 70mm bores to a maximum depth of 15-45m. Installation of casing material to an approximate depth of 15-45m.	1746481	5926231	Proposed					To authorise the construction of fifteen bores for geological, geotechnical and groundwater purposes.	Watercare Services																												Tonkin & Taylor Limited	20170601		Point

INCIDENTNUMBER	XCOORD	YCOORD	NZTMXCOORD	NZTMYCOORD	LOCATION	SUBURB	CATCHMENTCODE	POLLUTANTTYPE	RECIEVED	REPORT	INCIDENTTYPE	ACTIONEDBY	IMPACT	VOLUME	PROBLEMFOUND	CULPRITTRACED	RECORDDATE	INVESTIGATIONDATE
14/1335	1746251.39	5926244.92	1746251.39	5926244.92	118 Hobsonville Rd	Hobsonville	5-Oct	Concrete Wastewater	Hotline	Dead Eels and Fish	Water / Land Pollution	Glenn Riddell	Things died	10-200 litres	YES	YES	4/04/2014	4/04/2014

APPENDIX 3:

Site Photographs

Photo 1: Eastern boundary, facing north.

Photo 2: Drainage channel adjacent to the eastern boundary, facing north.

Photo 3: Exterior of the dwelling (eastern side). Cladding comprising potential asbestos containing material (PACM).

Photo 4: Former building footprint in southeast portion of site, and location of fill material.

Photo 5: Minor dwelling in foreground and dwelling in background.

Photo 6: Minor dwelling (left) and workshop (right).

Photo 7: Western side of workshop.

Photo 8: Paddocks across central portion of site.

APPENDIX 4:

Results Summary

Table A: Comparison of Soil Results to Assessment Criteria

				Heavy Metals/Metalloids								Polycyclic Aromatic Hydrocarbons	Organichlorine Pesticides		Asbestos
Sample ID	Sample Depth (m bgl)	Material Type	Date	Arsenic	Cadmium	Chromium	Copper	Laad	Mercury	Nickel	Zinc		All other Organochlorine Pesticides	Total DDT	
Composite of CS01A-CS01C	0.0 - 0.2	Topsoil - dark brown clayey silt with occasional orange / brown streaks / mottling	11-Dec-23	3	0.14	12	21	18.8	0.17	5	22	-	<LOR	<LOR	-
Composite of CS02A-CS02C	0.0 - 0.2 / 0.3	Topsoil - dark brown clayey silt with occasional orange / brown streaks / mottling	11-Dec-23	< 2	0.12	7	14	9.8	0.12	2	13	-	<LOR	<LOR	-
Composite of CS03A-CS03C	0.0 - 0.2	Topsoil - dark brown / grey clayey silt with occasional orange / brown streaks / mottling	11-Dec-23	3	0.18	11	28	19	0.21	4	21	-	<LOR	<LOR	-
Composite of CS04A-CS04C	0.0 - 0.2	Topsoil - dark brown clayey silt with occasional orange / brown streaks / mottling	11-Dec-23	3	0.12	9	16	11.8	0.15	4	30	-	<LOR	<LOR	-
Composite of CS05A-CS05C	0.0 - 0.2	Topsoil - dark brown clayey silt with occasional orange / brown streaks / mottling	11-Dec-23	< 2	< 0.10	5	7	5.2	< 0.10	2	8	-	<LOR	<LOR	-
Composite of CS06A-CS06C	0.0 - 0.2	Topsoil - dark brown clayey silt with occasional black / brown streaks / mottling	11-Dec-23	< 2	0.12	6	6	7.8	< 0.10	< 2	12	-	<LOR	<LOR	-
S07	0.0 -0.2	Topsoil - dark brown clayey silt with minor black streaks.	11-Dec-23	5	0.13	15	18	24	0.18	7	27	<LOR	<LOR	<LOR	-
S08	0.0 -0.2	Topsoil - dark brown clayey silt with orange-brown streaks	11-Dec-23	5	0.15	18	22	27	0.22	10	35	<LOR	<LOR	<LOR	-
S09	0.0 - 0.2	Topsoil - dark brown clayey silt	11-Dec-23	3	0.2	13	24	17.8	0.15	6	24	<LOR	<LOR	<LOR	-
S10	0.0 - 0.2	Topsoil - dark brown clayey silt	11-Dec-23	6	0.1	8	17	39	< 0.10	< 2	28	-	-	-	Asbestos not detected
S11	0.0 - 0.2	Topsoil - dark brown clayey silt with minor sand	11-Dec-23	4	< 0.10	8	5	14.2	< 0.10	5	43	<LOR	<LOR	<LOR	Asbestos not detected
S12	0.0 - 0.2	Topsoil - dark brown clayey silt with minor sand and orange mottling	11-Dec-23	2	< 0.10	7	4	7.4	< 0.10	3	55	<LOR	<LOR	<LOR	Asbestos not detected
S13	0.0 - 0.3	Topsoil - dark brown clayey silt with minor sand and red/ black mottling	11-Dec-23	7	< 0.10	12	7	12	0.14	3	25	-	-	-	Asbestos not detected
	0.3 - 0.5	Native - greyish brown silty clay with minor orange mottling	11-Dec-23	2	< 0.10	6	5	10.8	0.15	3	36	-	-	-	Asbestos not detected
S14	0.0 - 0.2	Topsoil - dark brown clayey silt with minor sand and dark brown / orange mottling	11-Dec-23	< 2	0.17	5	13	15.4	< 0.10	< 2	35	-	-	-	Asbestos not detected
	0.3 - 0.5	Native - light brown clayey silt with minor orange streaks	11-Dec-23	< 2	< 0.10	5	6	11.3	0.17	< 2	18	-	-	-	Asbestos not detected
S15	0.0 - 0.3	Topsoil - dark brown clayey silt with minor sand and red brown mottling	11-Dec-23	< 2	0.11	7	9	12.8	< 0.10	4	23	-	-	-	Asbestos not detected
	0.4 - 0.6	Native - light brown clayey silt with minor orange streaks	11-Dec-23	< 2	< 0.10	4	< 2	5.6	0.11	2	5	-	-	-	Asbestos not detected
S16	0.0 - 0.3	Fill - dark brown grey silty clay intermixed with sandy silt, with reddish-brown and orange brown streaks	11-Dec-23	< 2	< 0.10	7	5	16.8	< 0.10	2	14	<LOR	-	-	Asbestos not detected
S17	0.0 - 0.2	Topsoil - dark brown clayey silt with minor orange streaks	11-Dec-23	4	0.17	8	6	15.4	< 0.10	< 2	55	-	-	-	Asbestos not detected
S18	0.0 - 0.2	Topsoil - dark brown clayey silt with orange streaks	11-Dec-23	< 2	< 0.10	4	2	5.8	< 0.10	< 2	13	-	-	-	Asbestos not detected
S21	0.0 - 0.2	Topsoil: dark brown clayey silt with black and reddish brown mottling	11-Dec-23	3	< 0.10	4	4	8.7	< 0.10	3	48	<LOR	<LOR	<LOR	Asbestos not detected
S22	0.0 - 0.2	Topsoil - dark brown clayey silt with fine sand and black and reddish brown mottling	11-Dec-23	3	< 0.10	9	14	8.5	< 0.10	17	58	<LOR	<LOR	<LOR	Asbestos not detected
S23	0.0 - 0.1	Topsoil - dark brown clayey silt with fine to medium sand	24-Jan-24	4	0.1	9	15	6.8	< 0.10	3	23	-	<LOR	**26**	-
S24	0.0 - 0.1	Topsoil - dark brown clayey silt with fine to medium sand	24-Jan-24	2	0.12	5	13	7.9	< 0.10	2	17	-	<LOR	<LOR	-
S25	0.0 - 0.1	Topsoil - dark brown clayey silt with fine to medium sand	24-Jan-24	3	< 0.10	6	12	5.6	< 0.10	2	10	-	< LOR	<LOR[8]	-
Assessment Criteria:															
Human Health Criteria (High-density Residential) [1]				45	230 [4]	1500 [5]	10000	500	1000	1200 [6]	60000 [6]	various	various	240	various [7]
Human Health Criteria (Residential) [1]				20	3 [4]	460 [5]	> 10,000	210	310	400 [6]	7,400 [6]	various	various	70	various [7]
Environmental Criteria (Auckland Unitary Plan) [2]				100	7.5	400	325	250	0.75	105	400	various	various	12	-
Background Criteria (Auckland - Non-Volcanic) [3]				**0.4 - 12**	**< 0.1 - 0.65**	**2 - 55**	**1 - 45**	**< 5 - 65**	**<0.03 - 0.45**	**0.9 - 35**	**9 - 180**	**< LOR**	**< LOR**	**< LOR**	**< LOR**

Notes:
All results and criteria are presented in mg/kg dry weight basis, except asbestos which is reported as %w/w
Full results are included in the laboratory reports
LOR: Limit of Reporting; Results below LOR or background are shown in grey text
- : not analysed

1: MfE (2011) Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health (Standard and High-density Residential Land Use), or selected in accordance with CLMG No. 2
2: Environmental discharge criteria selected in accordance with Section E30.6.1.4 of the Auckland Unitary Plan (Auckland Council, 2016).
3: Background Ranges of Trace Elements in Auckland Soils (Non-Volcanic Range). Table E30.6.1.4.2 of the AUP (Auckland Council, 2016).
4. Assumes soil pH of 5.
5. Criteria for Chromium VI were conservatively selected.
6. National Environment Protection (Assessment of Site Contamination) Measure (NEPM). Residential A and B criteria listed.
7. New Zealand Guidelines for the Assessment and Management of Asbestos in Soil (BRANZ, 2017).
8. Whist the Total DDT isomers recorded were below the LOR, it should be noted that a detectable concentration of DDD and DDT were recorded.

APPENDIX 5:

Analytical Reports and Chain of Custody Documentation

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Private Bag 3205
Hamilton 3240 New Zealand

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Certificate of Analysis

Client:	Engeo Limited	**Lab No:**	3426536 SPv1
Contact:	C Davies	**Date Received:**	11-Dec-2023
	C/- Engeo Limited	**Date Reported:**	19-Dec-2023
	PO Box 305136	**Quote No:**	82742
	Triton Plaza	**Order No:**	
	Auckland 0757	**Client Reference:**	23849.000.005
		Submitted By:	Lucas Brydon

Sample Type: Soil

Sample Name:		S10 @ 0.0-0.2 11-Dec-2023	S11 @ 0.0-0.2 11-Dec-2023	S12 @ 0.0-0.2 11-Dec-2023	S13 @ 0.0-0.2 11-Dec-2023	S13 @ 0.3-0.5 11-Dec-2023
Lab Number:		3426536.1	3426536.3	3426536.5	3426536.7	3426536.8
Individual Tests						
Dry Matter	g/100g as rcvd	-	77	79	-	-
Heavy Metals with Mercury, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	6	4	2	7	2
Total Recoverable Cadmium	mg/kg dry wt	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	8	8	7	12	6
Total Recoverable Copper	mg/kg dry wt	17	5	4	7	5
Total Recoverable Lead	mg/kg dry wt	39	14.2	7.4	12.0	10.8
Total Recoverable Mercury	mg/kg dry wt	< 0.10	< 0.10	< 0.10	0.14	0.15
Total Recoverable Nickel	mg/kg dry wt	< 2	5	3	3	3
Total Recoverable Zinc	mg/kg dry wt	28	43	55	25	36
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	-	< 0.013	< 0.013	-	-
alpha-BHC	mg/kg dry wt	-	< 0.013	< 0.013	-	-
beta-BHC	mg/kg dry wt	-	< 0.013	< 0.013	-	-
delta-BHC	mg/kg dry wt	-	< 0.013	< 0.013	-	-
gamma-BHC (Lindane)	mg/kg dry wt	-	< 0.013	< 0.013	-	-
cis-Chlordane	mg/kg dry wt	-	< 0.013	< 0.013	-	-
trans-Chlordane	mg/kg dry wt	-	< 0.013	< 0.013	-	-
2,4'-DDD	mg/kg dry wt	-	< 0.013	< 0.013	-	-
4,4'-DDD	mg/kg dry wt	-	< 0.013	< 0.013	-	-
2,4'-DDE	mg/kg dry wt	-	< 0.013	< 0.013	-	-
4,4'-DDE	mg/kg dry wt	-	< 0.013	< 0.013	-	-
2,4'-DDT	mg/kg dry wt	-	< 0.013	< 0.013	-	-
4,4'-DDT	mg/kg dry wt	-	< 0.013	< 0.013	-	-
Total DDT Isomers	mg/kg dry wt	-	< 0.08	< 0.08	-	-
Dieldrin	mg/kg dry wt	-	< 0.013	< 0.013	-	-
Endosulfan I	mg/kg dry wt	-	< 0.013	< 0.013	-	-
Endosulfan II	mg/kg dry wt	-	< 0.013	< 0.013	-	-
Endosulfan sulphate	mg/kg dry wt	-	< 0.013	< 0.013	-	-
Endrin	mg/kg dry wt	-	< 0.013	< 0.013	-	-
Endrin aldehyde	mg/kg dry wt	-	< 0.013	< 0.013	-	-
Endrin ketone	mg/kg dry wt	-	< 0.013	< 0.013	-	-
Heptachlor	mg/kg dry wt	-	< 0.013	< 0.013	-	-
Heptachlor epoxide	mg/kg dry wt	-	< 0.013	< 0.013	-	-
Hexachlorobenzene	mg/kg dry wt	-	< 0.013	< 0.013	-	-
Methoxychlor	mg/kg dry wt	-	< 0.013	< 0.013	-	-

Sample Type: Soil						
Sample Name:		S10 @ 0.0-0.2 11-Dec-2023	S11 @ 0.0-0.2 11-Dec-2023	S12 @ 0.0-0.2 11-Dec-2023	S13 @ 0.0-0.2 11-Dec-2023	S13 @ 0.3-0.5 11-Dec-2023
Lab Number:		3426536.1	3426536.3	3426536.5	3426536.7	3426536.8
Polycyclic Aromatic Hydrocarbons Screening in Soil*						
Total of Reported PAHs in Soil	mg/kg dry wt	-	< 0.4	< 0.4	-	-
1-Methylnaphthalene	mg/kg dry wt	-	< 0.013	< 0.013	-	-
2-Methylnaphthalene	mg/kg dry wt	-	< 0.013	< 0.013	-	-
Acenaphthylene	mg/kg dry wt	-	< 0.013	< 0.013	-	-
Acenaphthene	mg/kg dry wt	-	< 0.013	< 0.013	-	-
Anthracene	mg/kg dry wt	-	< 0.013	< 0.013	-	-
Benzo[a]anthracene	mg/kg dry wt	-	< 0.013	< 0.013	-	-
Benzo[a]pyrene (BAP)	mg/kg dry wt	-	< 0.013	< 0.013	-	-
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	-	< 0.031	< 0.031	-	-
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	-	< 0.031	< 0.031	-	-
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	-	< 0.013	< 0.013	-	-
Benzo[e]pyrene	mg/kg dry wt	-	< 0.013	< 0.013	-	-
Benzo[g,h,i]perylene	mg/kg dry wt	-	< 0.013	< 0.013	-	-
Benzo[k]fluoranthene	mg/kg dry wt	-	< 0.013	< 0.013	-	-
Chrysene	mg/kg dry wt	-	< 0.013	< 0.013	-	-
Dibenzo[a,h]anthracene	mg/kg dry wt	-	< 0.013	< 0.013	-	-
Fluoranthene	mg/kg dry wt	-	< 0.013	< 0.013	-	-
Fluorene	mg/kg dry wt	-	< 0.013	< 0.013	-	-
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	-	< 0.013	< 0.013	-	-
Naphthalene	mg/kg dry wt	-	< 0.07	< 0.07	-	-
Perylene	mg/kg dry wt	-	< 0.013	< 0.013	-	-
Phenanthrene	mg/kg dry wt	-	< 0.013	< 0.013	-	-
Pyrene	mg/kg dry wt	-	< 0.013	< 0.013	-	-

Sample Name:		S14 @ 0.0-0.2 11-Dec-2023	S14 @ 0.3-0.5 11-Dec-2023	S15 @ 0.0-0.3 11-Dec-2023	S15 @ 0.4-0.6 11-Dec-2023	S16 @ 0.0-0.3 11-Dec-2023
Lab Number:		3426536.9	3426536.10	3426536.11	3426536.12	3426536.13
Individual Tests						
Dry Matter	g/100g as rcvd	-	-	-	-	77
Heavy Metals with Mercury, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	< 2	< 2	< 2	< 2	< 2
Total Recoverable Cadmium	mg/kg dry wt	0.17	< 0.10	0.11	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	5	5	7	4	7
Total Recoverable Copper	mg/kg dry wt	13	6	9	< 2	5
Total Recoverable Lead	mg/kg dry wt	15.4	11.3	12.8	5.6	16.8
Total Recoverable Mercury	mg/kg dry wt	< 0.10	0.17	< 0.10	0.11	< 0.10
Total Recoverable Nickel	mg/kg dry wt	< 2	< 2	4	2	2
Total Recoverable Zinc	mg/kg dry wt	35	18	23	5	14
Polycyclic Aromatic Hydrocarbons Screening in Soil*						
Total of Reported PAHs in Soil	mg/kg dry wt	-	-	-	-	< 0.4
1-Methylnaphthalene	mg/kg dry wt	-	-	-	-	< 0.013
2-Methylnaphthalene	mg/kg dry wt	-	-	-	-	< 0.013
Acenaphthylene	mg/kg dry wt	-	-	-	-	< 0.013
Acenaphthene	mg/kg dry wt	-	-	-	-	< 0.013
Anthracene	mg/kg dry wt	-	-	-	-	< 0.013
Benzo[a]anthracene	mg/kg dry wt	-	-	-	-	< 0.013
Benzo[a]pyrene (BAP)	mg/kg dry wt	-	-	-	-	< 0.013
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	-	-	-	-	< 0.031
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	-	-	-	-	< 0.031
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	-	-	-	-	< 0.013
Benzo[e]pyrene	mg/kg dry wt	-	-	-	-	< 0.013

Sample Type: Soil						
Sample Name:		S14 @ 0.0-0.2 11-Dec-2023	S14 @ 0.3-0.5 11-Dec-2023	S15 @ 0.0-0.3 11-Dec-2023	S15 @ 0.4-0.6 11-Dec-2023	S16 @ 0.0-0.3 11-Dec-2023
Lab Number:		3426536.9	3426536.10	3426536.11	3426536.12	3426536.13
Polycyclic Aromatic Hydrocarbons Screening in Soil*						
Benzo[g,h,i]perylene	mg/kg dry wt	-	-	-	-	< 0.013
Benzo[k]fluoranthene	mg/kg dry wt	-	-	-	-	< 0.013
Chrysene	mg/kg dry wt	-	-	-	-	< 0.013
Dibenzo[a,h]anthracene	mg/kg dry wt	-	-	-	-	< 0.013
Fluoranthene	mg/kg dry wt	-	-	-	-	< 0.013
Fluorene	mg/kg dry wt	-	-	-	-	< 0.013
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	-	-	-	-	< 0.013
Naphthalene	mg/kg dry wt	-	-	-	-	< 0.07
Perylene	mg/kg dry wt	-	-	-	-	< 0.013
Phenanthrene	mg/kg dry wt	-	-	-	-	< 0.013
Pyrene	mg/kg dry wt	-	-	-	-	< 0.013

Sample Name:		S17 @ 0.0-0.2 11-Dec-2023	S18 @ 0.0-0.2 11-Dec-2023	S21 @ 0.0-0.2 11-Dec-2023	S22 @ 0.0-0.2 11-Dec-2023	S07 0.0-0.2
Lab Number:		3426536.15	3426536.17	3426536.18	3426536.20	3426536.59
Individual Tests						
Dry Matter	g/100g as rcvd	-	-	76	83	68
Heavy Metals with Mercury, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	4	< 2	3	3	5
Total Recoverable Cadmium	mg/kg dry wt	0.17	< 0.10	< 0.10	< 0.10	0.13
Total Recoverable Chromium	mg/kg dry wt	8	4	4	9	15
Total Recoverable Copper	mg/kg dry wt	6	2	4	14	18
Total Recoverable Lead	mg/kg dry wt	15.4	5.8	8.7	8.5	24
Total Recoverable Mercury	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	0.18
Total Recoverable Nickel	mg/kg dry wt	< 2	< 2	3	17	7
Total Recoverable Zinc	mg/kg dry wt	55	13	48	58	27
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	-	-	< 0.013	< 0.012	< 0.015
alpha-BHC	mg/kg dry wt	-	-	< 0.013	< 0.012	< 0.015
beta-BHC	mg/kg dry wt	-	-	< 0.013	< 0.012	< 0.015
delta-BHC	mg/kg dry wt	-	-	< 0.013	< 0.012	< 0.015
gamma-BHC (Lindane)	mg/kg dry wt	-	-	< 0.013	< 0.012	< 0.015
cis-Chlordane	mg/kg dry wt	-	-	< 0.013	< 0.012	< 0.015
trans-Chlordane	mg/kg dry wt	-	-	< 0.013	< 0.012	< 0.015
2,4'-DDD	mg/kg dry wt	-	-	< 0.013	< 0.012	< 0.015
4,4'-DDD	mg/kg dry wt	-	-	< 0.013	< 0.012	< 0.015
2,4'-DDE	mg/kg dry wt	-	-	< 0.013	< 0.012	< 0.015
4,4'-DDE	mg/kg dry wt	-	-	< 0.013	< 0.012	< 0.015
2,4'-DDT	mg/kg dry wt	-	-	< 0.013	< 0.012	< 0.015
4,4'-DDT	mg/kg dry wt	-	-	< 0.013	< 0.012	< 0.015
Total DDT Isomers	mg/kg dry wt	-	-	< 0.08	< 0.07	< 0.09
Dieldrin	mg/kg dry wt	-	-	< 0.013	< 0.012	< 0.015
Endosulfan I	mg/kg dry wt	-	-	< 0.013	< 0.012	< 0.015
Endosulfan II	mg/kg dry wt	-	-	< 0.013	< 0.012	< 0.015
Endosulfan sulphate	mg/kg dry wt	-	-	< 0.013	< 0.012	< 0.015
Endrin	mg/kg dry wt	-	-	< 0.013	< 0.012	< 0.015
Endrin aldehyde	mg/kg dry wt	-	-	< 0.013	< 0.012	< 0.015
Endrin ketone	mg/kg dry wt	-	-	< 0.013	< 0.012	< 0.015
Heptachlor	mg/kg dry wt	-	-	< 0.013	< 0.012	< 0.015
Heptachlor epoxide	mg/kg dry wt	-	-	< 0.013	< 0.012	< 0.015
Hexachlorobenzene	mg/kg dry wt	-	-	< 0.013	< 0.012	< 0.015
Methoxychlor	mg/kg dry wt	-	-	< 0.013	< 0.012	< 0.015
Polycyclic Aromatic Hydrocarbons Screening in Soil*						
Total of Reported PAHs in Soil	mg/kg dry wt	-	-	< 0.4	< 0.3	< 0.4
1-Methylnaphthalene	mg/kg dry wt	-	-	< 0.013	< 0.012	< 0.015

Sample Type: Soil						
Sample Name:		S17 @ 0.0-0.2 11-Dec-2023	S18 @ 0.0-0.2 11-Dec-2023	S21 @ 0.0-0.2 11-Dec-2023	S22 @ 0.0-0.2 11-Dec-2023	S07 0.0-0.2
Lab Number:		3426536.15	3426536.17	3426536.18	3426536.20	3426536.59
Polycyclic Aromatic Hydrocarbons Screening in Soil*						
2-Methylnaphthalene	mg/kg dry wt	-	-	< 0.013	< 0.012	< 0.015
Acenaphthylene	mg/kg dry wt	-	-	< 0.013	< 0.012	< 0.015
Acenaphthene	mg/kg dry wt	-	-	< 0.013	< 0.012	< 0.015
Anthracene	mg/kg dry wt	-	-	< 0.013	< 0.012	< 0.015
Benzo[a]anthracene	mg/kg dry wt	-	-	< 0.013	< 0.012	< 0.015
Benzo[a]pyrene (BAP)	mg/kg dry wt	-	-	< 0.013	< 0.012	< 0.015
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	-	-	< 0.032	< 0.028	< 0.036
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	-	-	< 0.031	< 0.028	< 0.036
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	-	-	< 0.013	< 0.012	< 0.015
Benzo[e]pyrene	mg/kg dry wt	-	-	< 0.013	< 0.012	< 0.015
Benzo[g,h,i]perylene	mg/kg dry wt	-	-	< 0.013	< 0.012	< 0.015
Benzo[k]fluoranthene	mg/kg dry wt	-	-	< 0.013	< 0.012	< 0.015
Chrysene	mg/kg dry wt	-	-	< 0.013	< 0.012	< 0.015
Dibenzo[a,h]anthracene	mg/kg dry wt	-	-	< 0.013	< 0.012	< 0.015
Fluoranthene	mg/kg dry wt	-	-	< 0.013	< 0.012	< 0.015
Fluorene	mg/kg dry wt	-	-	< 0.013	< 0.012	< 0.015
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	-	-	< 0.013	< 0.012	< 0.015
Naphthalene	mg/kg dry wt	-	-	< 0.07	< 0.06	< 0.08
Perylene	mg/kg dry wt	-	-	< 0.013	< 0.012	< 0.015
Phenanthrene	mg/kg dry wt	-	-	< 0.013	< 0.012	< 0.015
Pyrene	mg/kg dry wt	-	-	< 0.013	< 0.012	< 0.015

Sample Name:		S08 0.0-0.2	S09 0.0-0.2	Composite of CS01-A @ 0.0-0.2, CS01-B @ 0.0-0.2, CS01-C @ 0.0-0.2	Composite of CS02-A @ 0.0-0.3, CS02-B @ 0.0-0.2, CS02-C @ 0.0-0.2	Composite of CS03-A @ 0.0-0.2, CS03-B @ 0.0-0.2, CS03-C @ 0.0-0.2
Lab Number:		3426536.61	3426536.63	3426536.65	3426536.66	3426536.67
Individual Tests						
Dry Matter	g/100g as rcvd	64	68	72	75	71
Heavy Metals with Mercury, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	5	3	3	< 2	3
Total Recoverable Cadmium	mg/kg dry wt	0.15	0.20	0.14	0.12	0.18
Total Recoverable Chromium	mg/kg dry wt	18	13	12	7	11
Total Recoverable Copper	mg/kg dry wt	22	24	21	14	28
Total Recoverable Lead	mg/kg dry wt	27	17.8	18.8	9.8	19.0
Total Recoverable Mercury	mg/kg dry wt	0.22	0.15	0.17	0.12	0.21
Total Recoverable Nickel	mg/kg dry wt	10	6	5	2	4
Total Recoverable Zinc	mg/kg dry wt	35	24	22	13	21
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	< 0.016	< 0.015	< 0.014	< 0.013	< 0.014
alpha-BHC	mg/kg dry wt	< 0.016	< 0.015	< 0.014	< 0.013	< 0.014
beta-BHC	mg/kg dry wt	< 0.016	< 0.015	< 0.014	< 0.013	< 0.014
delta-BHC	mg/kg dry wt	< 0.016	< 0.015	< 0.014	< 0.013	< 0.014
gamma-BHC (Lindane)	mg/kg dry wt	< 0.016	< 0.015	< 0.014	< 0.013	< 0.014
cis-Chlordane	mg/kg dry wt	< 0.016	< 0.015	< 0.014	< 0.013	< 0.014
trans-Chlordane	mg/kg dry wt	< 0.016	< 0.015	< 0.014	< 0.013	< 0.014
2,4'-DDD	mg/kg dry wt	< 0.016	< 0.015	< 0.014	< 0.013	< 0.014
4,4'-DDD	mg/kg dry wt	< 0.016	< 0.015	< 0.014	< 0.013	< 0.014
2,4'-DDE	mg/kg dry wt	< 0.016	< 0.015	< 0.014	< 0.013	< 0.014
4,4'-DDE	mg/kg dry wt	< 0.016	< 0.015	< 0.014	< 0.013	< 0.014
2,4'-DDT	mg/kg dry wt	< 0.016	< 0.015	< 0.014	< 0.013	< 0.014
4,4'-DDT	mg/kg dry wt	< 0.016	< 0.015	< 0.014	< 0.013	< 0.014

Sample Type: Soil						
Sample Name:		S08 0.0-0.2	S09 0.0-0.2	Composite of CS01-A @ 0.0-0.2, CS01-B @ 0.0-0.2, CS01-C @ 0.0-0.2	Composite of CS02-A @ 0.0-0.3, CS02-B @ 0.0-0.2, CS02-C @ 0.0-0.2	Composite of CS03-A @ 0.0-0.2, CS03-B @ 0.0-0.2, CS03-C @ 0.0-0.2
Lab Number:		3426536.61	3426536.63	3426536.65	3426536.66	3426536.67
Organochlorine Pesticides Screening in Soil						
Total DDT Isomers	mg/kg dry wt	< 0.10	< 0.09	< 0.09	< 0.08	< 0.09
Dieldrin	mg/kg dry wt	< 0.016	< 0.015	< 0.014	< 0.013	< 0.014
Endosulfan I	mg/kg dry wt	< 0.016	< 0.015	< 0.014	< 0.013	< 0.014
Endosulfan II	mg/kg dry wt	< 0.016	< 0.015	< 0.014	< 0.013	< 0.014
Endosulfan sulphate	mg/kg dry wt	< 0.016	< 0.015	< 0.014	< 0.013	< 0.014
Endrin	mg/kg dry wt	< 0.016	< 0.015	< 0.014	< 0.013	< 0.014
Endrin aldehyde	mg/kg dry wt	< 0.016	< 0.015	< 0.014	< 0.013	< 0.014
Endrin ketone	mg/kg dry wt	< 0.016	< 0.015	< 0.014	< 0.013	< 0.014
Heptachlor	mg/kg dry wt	< 0.016	< 0.015	< 0.014	< 0.013	< 0.014
Heptachlor epoxide	mg/kg dry wt	< 0.016	< 0.015	< 0.014	< 0.013	< 0.014
Hexachlorobenzene	mg/kg dry wt	< 0.016	< 0.015	< 0.014	< 0.013	< 0.014
Methoxychlor	mg/kg dry wt	< 0.016	< 0.015	< 0.014	< 0.013	< 0.014
Polycyclic Aromatic Hydrocarbons Screening in Soil*						
Total of Reported PAHs in Soil	mg/kg dry wt	< 0.4	< 0.4	-	-	-
1-Methylnaphthalene	mg/kg dry wt	< 0.016	< 0.015	-	-	-
2-Methylnaphthalene	mg/kg dry wt	< 0.016	< 0.015	-	-	-
Acenaphthylene	mg/kg dry wt	< 0.016	< 0.015	-	-	-
Acenaphthene	mg/kg dry wt	< 0.016	< 0.015	-	-	-
Anthracene	mg/kg dry wt	< 0.016	< 0.015	-	-	-
Benzo[a]anthracene	mg/kg dry wt	< 0.016	< 0.015	-	-	-
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.016	< 0.015	-	-	-
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	< 0.037	< 0.036	-	-	-
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	< 0.037	< 0.036	-	-	-
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.016	< 0.015	-	-	-
Benzo[e]pyrene	mg/kg dry wt	< 0.016	< 0.015	-	-	-
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.016	< 0.015	-	-	-
Benzo[k]fluoranthene	mg/kg dry wt	< 0.016	< 0.015	-	-	-
Chrysene	mg/kg dry wt	< 0.016	< 0.015	-	-	-
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.016	< 0.015	-	-	-
Fluoranthene	mg/kg dry wt	< 0.016	< 0.015	-	-	-
Fluorene	mg/kg dry wt	< 0.016	< 0.015	-	-	-
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.016	< 0.015	-	-	-
Naphthalene	mg/kg dry wt	< 0.08	< 0.08	-	-	-
Perylene	mg/kg dry wt	< 0.016	< 0.015	-	-	-
Phenanthrene	mg/kg dry wt	< 0.016	< 0.015	-	-	-
Pyrene	mg/kg dry wt	< 0.016	< 0.015	-	-	-

Sample Name:		Composite of CS04-A @ 0.0-0.2, CS04-B @ 0.0-0.2, CS04-C @ 0.0-0.2	Composite of CS05-A @ 0.0-0.2, CS05-B @ 0.0-0.2, CS05-C @ 0.0-0.2	Composite of CS06-A @ 0.0-0.2, CS06-B @ 0.0-0.2, CS06-C @ 0.0-0.2
Lab Number:		3426536.68	3426536.69	3426536.70
Individual Tests				
Dry Matter	g/100g as rcvd	74	79	77
Heavy Metals with Mercury, Screen Level				
Total Recoverable Arsenic	mg/kg dry wt	3	< 2	< 2
Total Recoverable Cadmium	mg/kg dry wt	0.12	< 0.10	0.12
Total Recoverable Chromium	mg/kg dry wt	9	5	6
Total Recoverable Copper	mg/kg dry wt	16	7	6
Total Recoverable Lead	mg/kg dry wt	11.8	5.2	7.8
Total Recoverable Mercury	mg/kg dry wt	0.15	< 0.10	< 0.10
Total Recoverable Nickel	mg/kg dry wt	4	2	< 2

Sample Type: Soil				
Sample Name:		Composite of CS04-A @ 0.0-0.2, CS04-B @ 0.0-0.2, CS04-C @ 0.0-0.2	Composite of CS05-A @ 0.0-0.2, CS05-B @ 0.0-0.2, CS05-C @ 0.0-0.2	Composite of CS06-A @ 0.0-0.2, CS06-B @ 0.0-0.2, CS06-C @ 0.0-0.2
Lab Number:		3426536.68	3426536.69	3426536.70
Heavy Metals with Mercury, Screen Level				
Total Recoverable Zinc	mg/kg dry wt	30	8	12
Organochlorine Pesticides Screening in Soil				
Aldrin	mg/kg dry wt	< 0.014	< 0.013	< 0.013
alpha-BHC	mg/kg dry wt	< 0.014	< 0.013	< 0.013
beta-BHC	mg/kg dry wt	< 0.014	< 0.013	< 0.013
delta-BHC	mg/kg dry wt	< 0.014	< 0.013	< 0.013
gamma-BHC (Lindane)	mg/kg dry wt	< 0.014	< 0.013	< 0.013
cis-Chlordane	mg/kg dry wt	< 0.014	< 0.013	< 0.013
trans-Chlordane	mg/kg dry wt	< 0.014	< 0.013	< 0.013
2,4'-DDD	mg/kg dry wt	< 0.014	< 0.013	< 0.013
4,4'-DDD	mg/kg dry wt	< 0.014	< 0.013	< 0.013
2,4'-DDE	mg/kg dry wt	< 0.014	< 0.013	< 0.013
4,4'-DDE	mg/kg dry wt	< 0.014	< 0.013	< 0.013
2,4'-DDT	mg/kg dry wt	< 0.014	< 0.013	< 0.013
4,4'-DDT	mg/kg dry wt	< 0.014	< 0.013	< 0.013
Total DDT Isomers	mg/kg dry wt	< 0.08	< 0.08	< 0.08
Dieldrin	mg/kg dry wt	< 0.014	< 0.013	< 0.013
Endosulfan I	mg/kg dry wt	< 0.014	< 0.013	< 0.013
Endosulfan II	mg/kg dry wt	< 0.014	< 0.013	< 0.013
Endosulfan sulphate	mg/kg dry wt	< 0.014	< 0.013	< 0.013
Endrin	mg/kg dry wt	< 0.014	< 0.013	< 0.013
Endrin aldehyde	mg/kg dry wt	< 0.014	< 0.013	< 0.013
Endrin ketone	mg/kg dry wt	< 0.014	< 0.013	< 0.013
Heptachlor	mg/kg dry wt	< 0.014	< 0.013	< 0.013
Heptachlor epoxide	mg/kg dry wt	< 0.014	< 0.013	< 0.013
Hexachlorobenzene	mg/kg dry wt	< 0.014	< 0.013	< 0.013
Methoxychlor	mg/kg dry wt	< 0.014	< 0.013	< 0.013

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively simple matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request. Unless otherwise indicated, analyses were performed at Hill Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%.	-	1, 3, 5, 7-13, 15, 17-18, 20, 59, 61, 63, 65-70
Total of Reported PAHs in Soil	Sonication extraction, GC-MS/MS analysis. In-house based on US EPA 8270.	0.03 mg/kg dry wt	3, 5, 13, 18, 20, 59, 61, 63
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1, 3, 5, 7-13, 15, 17-18, 20, 59, 61, 63, 65-70
Organochlorine Pesticides Screening in Soil	Sonication extraction, GC-ECD analysis. Tested on as received sample. In-house based on US EPA 8081.	0.010 - 0.06 mg/kg dry wt	3, 5, 18, 20, 59, 61, 63, 65-70
Polycyclic Aromatic Hydrocarbons Screening in Soil*	Sonication extraction, GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8270.	0.010 - 0.05 mg/kg dry wt	3, 5, 13, 18, 20, 59, 61, 63
Dry Matter	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	3, 5, 13, 18, 20, 59, 61, 63, 65-70

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Composite Environmental Solid Samples*	Individual sample fractions mixed together to form a composite fraction.	-	23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, 55, 57
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	BaP Potency Equivalence calculated from; Benzo(a)anthracene x 0.1 + Benzo(b)fluoranthene x 0.1 + Benzo(j)fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Benzo(a)pyrene x 1.0 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Fluoranthene x 0.01 + Indeno(1,2,3-c,d)pyrene x 0.1. Ministry for the Environment. 2011. Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health. Wellington: Ministry for the Environment.	0.024 mg/kg dry wt	3, 5, 13, 18, 20, 59, 61, 63
Benzo[a]pyrene Toxic Equivalence (TEF)*	Benzo[a]pyrene Toxic Equivalence (TEF) calculated from; Benzo[a]pyrene x 1.0 + Benzo(a)anthracene x 0.1 + Benzo(b) fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Indeno(1,2,3-c,d)pyrene x 0.1. Guidelines for assessing and managing contaminated gasworks sites in New Zealand (GMG) (MfE, 1997).	0.024 mg/kg dry wt	3, 5, 13, 18, 20, 59, 61, 63

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Testing was completed between 14-Dec-2023 and 19-Dec-2023. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

This certificate of analysis must not be reproduced, except in full, without the written consent of the signatory.

Kim Harrison MSc
Client Services Manager - Environmental

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Certificate of Analysis

Client:	Engeo Limited	**Lab No:**	3426546	A2Pv1
Contact:	C Davies	**Date Received:**	11-Dec-2023	
	C/- Engeo Limited	**Date Reported:**	19-Dec-2023	
	PO Box 305136	**Quote No:**	82742	
	Triton Plaza	**Order No:**		
	Auckland 0757	**Client Reference:**	23849.000.005	
		Submitted By:	Nandhini R	

Sample Type: Soil

Sample Name	Lab Number	As Received Weight Presence / Absence Testing (g)	Dry Weight Presence / Absence Testing (g)	<2mm Subsample Weight Presence / Absence Testing (g dry wt)	Asbestos Presence / Absence from Presence / Absence Testing	Description of Asbestos Form Presence / Absence Testing
S10@ 0.0-0.2	3426546.1	136.7	97.6	20.8	Asbestos NOT detected.	-
S11@ 0.0-0.2	3426546.3	144.1	112.7	56.3	Asbestos NOT detected.	-
S12@ 0.0-0.2	3426546.5	156.4	126.2	53.8	Asbestos NOT detected.	-
S13@ 0.0-0.2	3426546.7	94.4	74.4	38.2	Asbestos NOT detected.	-
S13@ 0.3-0.5	3426546.8	176.7	133.4	20.1	Asbestos NOT detected.	-
S14@ 0.0-0.2	3426546.9	143.2	93.7	54.3	Asbestos NOT detected.	-
S14@ 0.3-0.5	3426546.10	162.2	118.4	55.0	Asbestos NOT detected.	-
S15@ 0.0-0.3	3426546.11	163.3	129.7	51.6	Asbestos NOT detected.	-
S15@ 0.4-0.6	3426546.12	138.8	112.9	33.2	Asbestos NOT detected.	-
S16@ 0.0-0.3	3426546.13	153.9	121.8	36.9	Asbestos NOT detected.	-
S17@ 0.0-0.2	3426546.15	164.1	129.0	50.6	Asbestos NOT detected.	-
S18@ 0.0-0.2	3426546.17	157.7	129.1	55.4	Asbestos NOT detected.	-
S21@ 0.0-0.2	3426546.18	163.8	111.4	51.2	Asbestos NOT detected.	-
S22@ 0.0-0.2	3426546.20	172.4	145.8	56.7	Asbestos NOT detected.	-

Glossary of Terms

- Loose fibres (Minor) - One or two fibres/fibre bundles identified during analysis by stereo microscope/PLM.
- Loose fibres (Major) - Three or more fibres/fibre bundles identified during analysis by stereo microscope/PLM.
- ACM Debris (Minor) - One or two small (<2mm) pieces of material attached to fibres identified during analysis by stereo microscope/PLM.
- ACM Debris (Major) - Large (>2mm) piece, or more than three small (<2mm) pieces of material attached to fibres identified during analysis by stereo microscope/PLM.
- Unknown Mineral Fibres - Mineral fibres of unknown type detected by polarised light microscopy including dispersion staining. The fibres detected may or may not be asbestos fibres. To confirm the identities, another independent analytical technique may be required.
- Trace - Trace levels of asbestos, as defined by AS4964-2004.

For further details, please contact the Asbestos Team.

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively simple matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request.
Unless otherwise indicated, analyses were performed at Hill Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Soil

Test	Method Description	Default Detection Limit	Sample No
Asbestos in Soil			
As Received Weight Presence / Absence Testing	Measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g	1, 3, 5, 7-13, 15, 17-18, 20
Dry Weight Presence / Absence Testing	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g	1, 3, 5, 7-13, 15, 17-18, 20

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
<2mm Subsample Weight Presence / Absence Testing	Sample dried at 100 to 105°C, weight of <2mm sample fraction taken for asbestos identification if less than entire fraction. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	-	1, 3, 5, 7-13, 15, 17-18, 20
Asbestos Presence / Absence from Presence / Absence Testing	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0.01%	1, 3, 5, 7-13, 15, 17-18, 20
Description of Asbestos Form Presence / Absence Testing	Description of asbestos form and/or shape if present.	-	1, 3, 5, 7-13, 15, 17-18, 20

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Testing was completed on 19-Dec-2023. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

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Quality Assurance Report

Client:	Engeo Limited	**Lab No:**	3426536	QCPv1
Contact:	C Davies	**Date Received:**	11-Dec-2023	
	C/- Engeo Limited	**Date Reported:**	19-Dec-2023	
	PO Box 305136	**Quote No:**	82742	
	Triton Plaza	**Order No:**		
	Auckland 0757	**Client Reference:**	23849.000.005	
		Submitted By:	Lucas Brydon	

Sample Specific QCs

Organochlorine Pesticides Screening in Soil

		3426536.3	Control Limits	Outside Limit (Yes/No)
2,4,5,6-tetrachloro-m-xylene	%	71	40 – 120	No

Polycyclic Aromatic Hydrocarbons Screening in Soil

		3426536.3	Control Limits	Outside Limit (Yes/No)
1-methylnaphthalene-d10	%	68	65 – 130	No
Benzo[a]pyrene-d12	%	69	70 – 140	**Yes** #1
Fluoranthene-d10	%	72	66 – 130	No

Organochlorine Pesticides Screening in Soil

		3426536.5	Control Limits	Outside Limit (Yes/No)
2,4,5,6-tetrachloro-m-xylene	%	92	40 – 120	No

Polycyclic Aromatic Hydrocarbons Screening in Soil

		3426536.5	Control Limits	Outside Limit (Yes/No)
1-methylnaphthalene-d10	%	95	65 – 130	No
Benzo[a]pyrene-d12	%	97	70 – 140	No
Fluoranthene-d10	%	98	66 – 130	No

Polycyclic Aromatic Hydrocarbons Screening in Soil

		3426536.13	Control Limits	Outside Limit (Yes/No)
1-methylnaphthalene-d10	%	92	65 – 130	No
Benzo[a]pyrene-d12	%	100	70 – 140	No
Fluoranthene-d10	%	101	66 – 130	No

Organochlorine Pesticides Screening in Soil

		3426536.18	Control Limits	Outside Limit (Yes/No)
2,4,5,6-tetrachloro-m-xylene	%	82	40 – 120	No

Polycyclic Aromatic Hydrocarbons Screening in Soil

		3426536.18	Control Limits	Outside Limit (Yes/No)
1-methylnaphthalene-d10	%	74	65 – 130	No
Benzo[a]pyrene-d12	%	75	70 – 140	No
Fluoranthene-d10	%	89	66 – 130	No

Organochlorine Pesticides Screening in Soil

		3426536.20	Control Limits	Outside Limit (Yes/No)
2,4,5,6-tetrachloro-m-xylene	%	82	40 – 120	No

Polycyclic Aromatic Hydrocarbons Screening in Soil

		3426536.20	Control Limits	Outside Limit (Yes/No)
1-methylnaphthalene-d10	%	97	65 – 130	No
Benzo[a]pyrene-d12	%	100	70 – 140	No

Polycyclic Aromatic Hydrocarbons Screening in Soil				
		3426536.20	**Control Limits**	**Outside Limit (Yes/No)**
Fluoranthene-d10	%	102	66 – 130	No

Organochlorine Pesticides Screening in Soil				
		3426536.59	**Control Limits**	**Outside Limit (Yes/No)**
2,4,5,6-tetrachloro-m-xylene	%	98	40 – 120	No

Polycyclic Aromatic Hydrocarbons Screening in Soil				
		3426536.59	**Control Limits**	**Outside Limit (Yes/No)**
1-methylnaphthalene-d10	%	94	65 – 130	No
Benzo[a]pyrene-d12	%	100	70 – 140	No
Fluoranthene-d10	%	104	66 – 130	No

Organochlorine Pesticides Screening in Soil				
		3426536.61	**Control Limits**	**Outside Limit (Yes/No)**
2,4,5,6-tetrachloro-m-xylene	%	93	40 – 120	No

Polycyclic Aromatic Hydrocarbons Screening in Soil				
		3426536.61	**Control Limits**	**Outside Limit (Yes/No)**
1-methylnaphthalene-d10	%	91	65 – 130	No
Benzo[a]pyrene-d12	%	93	70 – 140	No
Fluoranthene-d10	%	96	66 – 130	No

Organochlorine Pesticides Screening in Soil				
		3426536.63	**Control Limits**	**Outside Limit (Yes/No)**
2,4,5,6-tetrachloro-m-xylene	%	97	40 – 120	No

Polycyclic Aromatic Hydrocarbons Screening in Soil				
		3426536.63	**Control Limits**	**Outside Limit (Yes/No)**
1-methylnaphthalene-d10	%	91	65 – 130	No
Benzo[a]pyrene-d12	%	94	70 – 140	No
Fluoranthene-d10	%	97	66 – 130	No

Organochlorine Pesticides Screening in Soil				
		3426536.65	**Control Limits**	**Outside Limit (Yes/No)**
2,4,5,6-tetrachloro-m-xylene	%	99	40 – 120	No

Organochlorine Pesticides Screening in Soil				
		3426536.66	**Control Limits**	**Outside Limit (Yes/No)**
2,4,5,6-tetrachloro-m-xylene	%	94	40 – 120	No

Organochlorine Pesticides Screening in Soil				
		3426536.67	**Control Limits**	**Outside Limit (Yes/No)**
2,4,5,6-tetrachloro-m-xylene	%	101	40 – 120	No

Organochlorine Pesticides Screening in Soil				
		3426536.68	**Control Limits**	**Outside Limit (Yes/No)**
2,4,5,6-tetrachloro-m-xylene	%	96	40 – 120	No

Organochlorine Pesticides Screening in Soil				
		3426536.69	**Control Limits**	**Outside Limit (Yes/No)**
2,4,5,6-tetrachloro-m-xylene	%	95	40 – 120	No

Organochlorine Pesticides Screening in Soil				
		3426536.70	**Control Limits**	**Outside Limit (Yes/No)**
2,4,5,6-tetrachloro-m-xylene	%	97	40 – 120	No

Blank QCs

Blank 1 PrepWS xsSHOC - Organochlorine Pesticides Soil Analysis: 7799.1

		Results	Control Limits	Outside Limit (Yes/No)
Aldrin	mg/kg dry wt	< 0.010 ± 0.0030	0.0 – 0.0100	No
alpha-BHC	mg/kg dry wt	< 0.010 ± 0.0030	0.0 – 0.0100	No
beta-BHC	mg/kg dry wt	< 0.010 ± 0.0028	0.0 – 0.0100	No
delta-BHC	mg/kg dry wt	< 0.010 ± 0.0029	0.0 – 0.0100	No
gamma-BHC (Lindane)	mg/kg dry wt	< 0.010 ± 0.0031	0.0 – 0.0100	No
cis-Chlordane	mg/kg dry wt	< 0.010 ± 0.0030	0.0 – 0.0100	No
trans-Chlordane	mg/kg dry wt	< 0.010 ± 0.0030	0.0 – 0.0100	No
2,4'-DDD	mg/kg dry wt	< 0.010 ± 0.0029	0.0 – 0.0100	No
4,4'-DDD	mg/kg dry wt	< 0.010 ± 0.0024	0.0 – 0.0100	No
2,4'-DDE	mg/kg dry wt	< 0.010 ± 0.0030	0.0 – 0.0100	No
4,4'-DDE	mg/kg dry wt	< 0.010 ± 0.0023	0.0 – 0.0100	No
2,4'-DDT	mg/kg dry wt	< 0.010 ± 0.0021	0.0 – 0.0100	No
4,4'-DDT	mg/kg dry wt	< 0.010 ± 0.0017	0.0 – 0.0100	No
Dieldrin	mg/kg dry wt	< 0.010 ± 0.0026	0.0 – 0.0100	No
Endosulfan I	mg/kg dry wt	< 0.010 ± 0.0029	0.0 – 0.0100	No
Endosulfan II	mg/kg dry wt	< 0.010 ± 0.0026	0.0 – 0.0100	No
Endosulfan sulphate	mg/kg dry wt	< 0.010 ± 0.0013	0.0 – 0.0100	No
Endrin	mg/kg dry wt	< 0.010 ± 0.00048	0.0 – 0.0100	No
Endrin aldehyde	mg/kg dry wt	< 0.010 ± 0.0019	0.0 – 0.0100	No
Endrin ketone	mg/kg dry wt	< 0.010 ± 0.0024	0.0 – 0.0100	No
Heptachlor	mg/kg dry wt	< 0.010 ± 0.0029	0.0 – 0.0100	No
Heptachlor epoxide	mg/kg dry wt	< 0.010 ± 0.0031	0.0 – 0.0100	No
Hexachlorobenzene	mg/kg dry wt	< 0.010 ± 0.0029	0.0 – 0.0100	No
Methoxychlor	mg/kg dry wt	< 0.010 ± 0.00048	0.0 – 0.0100	No

Blank 1 PrepWS xsSHOC - WS: Polycyclic Aromatic Hydrocarbons Soil Analysis: 15453.1

		Results	Control Limits	Outside Limit (Yes/No)
1-Methylnaphthalene	mg/kg dry wt	< 0.010 ± 0.032	0.0 – 0.0100	No
2-Methylnaphthalene	mg/kg dry wt	< 0.010 ± 0.032	0.0 – 0.0100	No
Acenaphthylene	mg/kg dry wt	< 0.010 ± 0.0066	0.0 – 0.0100	No
Acenaphthene	mg/kg dry wt	< 0.010 ± 0.0060	0.0 – 0.0100	No
Anthracene	mg/kg dry wt	< 0.010 ± 0.0060	0.0 – 0.0100	No
Benzo[a]anthracene	mg/kg dry wt	< 0.010 ± 0.0062	0.0 – 0.0100	No
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.010 ± 0.0066	0.0 – 0.0100	No
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.010 ± 0.0064	0.0 – 0.0100	No
Benzo[e]pyrene	mg/kg dry wt	< 0.010 ± 0.0066	0.0 – 0.0100	No
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.010 ± 0.0064	0.0 – 0.0100	No
Benzo[k]fluoranthene	mg/kg dry wt	< 0.010 ± 0.0066	0.0 – 0.0100	No
Chrysene	mg/kg dry wt	< 0.010 ± 0.0066	0.0 – 0.0100	No
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.010 ± 0.0066	0.0 – 0.0100	No
Fluoranthene	mg/kg dry wt	< 0.010 ± 0.0066	0.0 – 0.0100	No
Fluorene	mg/kg dry wt	< 0.010 ± 0.0066	0.0 – 0.0100	No
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.010 ± 0.0066	0.0 – 0.0100	No
Naphthalene	mg/kg dry wt	< 0.05 ± 0.032	0.0 – 0.050	No

Blank 1 PrepWS xsSHOC - WS: Polycyclic Aromatic Hydrocarbons Soil Analysis: 15453.1				
		Results	Control Limits	Outside Limit (Yes/No)
Perylene	mg/kg dry wt	< 0.010 ± 0.0066	0.0 – 0.0100	No
Phenanthrene	mg/kg dry wt	< 0.010 ± 0.0067	0.0 – 0.0100	No
Pyrene	mg/kg dry wt	< 0.010 ± 0.0066	0.0 – 0.0100	No

Blank 1 PrepWS xsSHOC - WS: Polycyclic Aromatic Hydrocarbons Soil Analysis: 15454.1				
		Results	Control Limits	Outside Limit (Yes/No)
1-Methylnaphthalene	mg/kg dry wt	< 0.010 ± 0.032	0.0 – 0.0100	No
2-Methylnaphthalene	mg/kg dry wt	< 0.010 ± 0.032	0.0 – 0.0100	No
Acenaphthylene	mg/kg dry wt	< 0.010 ± 0.0066	0.0 – 0.0100	No
Acenaphthene	mg/kg dry wt	< 0.010 ± 0.0060	0.0 – 0.0100	No
Anthracene	mg/kg dry wt	< 0.010 ± 0.0060	0.0 – 0.0100	No
Benzo[a]anthracene	mg/kg dry wt	< 0.010 ± 0.0062	0.0 – 0.0100	No
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.010 ± 0.0066	0.0 – 0.0100	No
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.010 ± 0.0064	0.0 – 0.0100	No
Benzo[e]pyrene	mg/kg dry wt	< 0.010 ± 0.0066	0.0 – 0.0100	No
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.010 ± 0.0064	0.0 – 0.0100	No
Benzo[k]fluoranthene	mg/kg dry wt	< 0.010 ± 0.0066	0.0 – 0.0100	No
Chrysene	mg/kg dry wt	< 0.010 ± 0.0066	0.0 – 0.0100	No
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.010 ± 0.0067	0.0 – 0.0100	No
Fluoranthene	mg/kg dry wt	< 0.010 ± 0.0066	0.0 – 0.0100	No
Fluorene	mg/kg dry wt	< 0.010 ± 0.0067	0.0 – 0.0100	No
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.010 ± 0.0066	0.0 – 0.0100	No
Naphthalene	mg/kg dry wt	< 0.05 ± 0.031	0.0 – 0.050	No
Perylene	mg/kg dry wt	< 0.010 ± 0.0066	0.0 – 0.0100	No
Phenanthrene	mg/kg dry wt	< 0.010 ± 0.0067	0.0 – 0.0100	No
Pyrene	mg/kg dry wt	< 0.010 ± 0.0066	0.0 – 0.0100	No

Digest Blank 1 PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9728.16				
		Results	Control Limits	Outside Limit (Yes/No)
Total Recoverable Arsenic	mg/kg dry wt	< 2 ± 1.3	-2.0 – 2.0	No
Total Recoverable Cadmium	mg/kg dry wt	< 0.10 ± 0.066	-0.100 – 0.100	No
Total Recoverable Chromium	mg/kg dry wt	< 2 ± 1.3	-2.0 – 2.0	No
Total Recoverable Copper	mg/kg dry wt	< 2 ± 1.4	-2.0 – 2.0	No
Total Recoverable Lead	mg/kg dry wt	< 0.4 ± 0.26	-0.40 – 0.40	No
Total Recoverable Mercury	mg/kg dry wt	< 0.10 ± 0.066	-0.100 – 0.100	No
Total Recoverable Nickel	mg/kg dry wt	< 2 ± 1.4	-2.0 – 2.0	No
Total Recoverable Zinc	mg/kg dry wt	< 4 ± 2.7	-4.0 – 4.0	No

Digest Blank 2 PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9728.59				
		Results	Control Limits	Outside Limit (Yes/No)
Total Recoverable Arsenic	mg/kg dry wt	< 2 ± 1.3	-2.0 – 2.0	No
Total Recoverable Cadmium	mg/kg dry wt	< 0.10 ± 0.066	-0.100 – 0.100	No
Total Recoverable Chromium	mg/kg dry wt	< 2 ± 1.3	-2.0 – 2.0	No
Total Recoverable Copper	mg/kg dry wt	< 2 ± 1.4	-2.0 – 2.0	No
Total Recoverable Lead	mg/kg dry wt	< 0.4 ± 0.26	-0.40 – 0.40	No
Total Recoverable Mercury	mg/kg dry wt	< 0.10 ± 0.065	-0.100 – 0.100	No
Total Recoverable Nickel	mg/kg dry wt	< 2 ± 1.4	-2.0 – 2.0	No

Digest Blank 2 PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9728.59				
		Results	Control Limits	Outside Limit (Yes/No)
Total Recoverable Zinc	mg/kg dry wt	< 4 ± 2.7	-4.0 – 4.0	No

50x Manual Dilution Digest Blank PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9728.74				
		Results	Control Limits	Outside Limit (Yes/No)
Total Recoverable Arsenic	mg/kg dry wt	< 2 ± 1.3	-2.0 – 2.0	No
Total Recoverable Cadmium	mg/kg dry wt	< 0.10 ± 0.066	-0.100 – 0.100	No
Total Recoverable Chromium	mg/kg dry wt	< 2 ± 1.3	-2.0 – 2.0	No
Total Recoverable Copper	mg/kg dry wt	< 2 ± 1.4	-2.0 – 2.0	No
Total Recoverable Lead	mg/kg dry wt	< 0.4 ± 0.26	-0.40 – 0.40	No
Total Recoverable Mercury	mg/kg dry wt	< 0.10 ± 0.065	-0.100 – 0.100	No
Total Recoverable Nickel	mg/kg dry wt	< 2 ± 1.4	-2.0 – 2.0	No
Total Recoverable Zinc	mg/kg dry wt	< 4 ± 2.7	-4.0 – 4.0	No

Digest Blank 1 PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9732.16				
		Results	Control Limits	Outside Limit (Yes/No)
Total Recoverable Arsenic	mg/kg dry wt	< 2 ± 1.3	-2.0 – 2.0	No
Total Recoverable Cadmium	mg/kg dry wt	< 0.10 ± 0.066	-0.100 – 0.100	No
Total Recoverable Chromium	mg/kg dry wt	< 2 ± 1.3	-2.0 – 2.0	No
Total Recoverable Copper	mg/kg dry wt	< 2 ± 1.4	-2.0 – 2.0	No
Total Recoverable Lead	mg/kg dry wt	< 0.4 ± 0.26	-0.40 – 0.40	No
Total Recoverable Mercury	mg/kg dry wt	< 0.10 ± 0.065	-0.100 – 0.100	No
Total Recoverable Nickel	mg/kg dry wt	< 2 ± 1.4	-2.0 – 2.0	No
Total Recoverable Zinc	mg/kg dry wt	< 4 ± 2.7	-4.0 – 4.0	No

Digest Blank 2 PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9732.50				
		Results	Control Limits	Outside Limit (Yes/No)
Total Recoverable Arsenic	mg/kg dry wt	< 2 ± 1.3	-2.0 – 2.0	No
Total Recoverable Cadmium	mg/kg dry wt	< 0.10 ± 0.066	-0.100 – 0.100	No
Total Recoverable Chromium	mg/kg dry wt	< 2 ± 1.3	-2.0 – 2.0	No
Total Recoverable Copper	mg/kg dry wt	< 2 ± 1.4	-2.0 – 2.0	No
Total Recoverable Lead	mg/kg dry wt	< 0.4 ± 0.27	-0.40 – 0.40	No
Total Recoverable Mercury	mg/kg dry wt	< 0.10 ± 0.065	-0.100 – 0.100	No
Total Recoverable Nickel	mg/kg dry wt	< 2 ± 1.4	-2.0 – 2.0	No
Total Recoverable Zinc	mg/kg dry wt	< 4 ± 2.7	-4.0 – 4.0	No

50x Manual Dilution Digest Blank PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9732.75				
		Results	Control Limits	Outside Limit (Yes/No)
Total Recoverable Arsenic	mg/kg dry wt	< 2 ± 1.3	-2.0 – 2.0	No
Total Recoverable Cadmium	mg/kg dry wt	< 0.10 ± 0.066	-0.100 – 0.100	No
Total Recoverable Chromium	mg/kg dry wt	< 2 ± 1.3	-2.0 – 2.0	No
Total Recoverable Copper	mg/kg dry wt	< 2 ± 1.4	-2.0 – 2.0	No
Total Recoverable Lead	mg/kg dry wt	< 0.4 ± 0.26	-0.40 – 0.40	No
Total Recoverable Mercury	mg/kg dry wt	< 0.10 ± 0.065	-0.100 – 0.100	No
Total Recoverable Nickel	mg/kg dry wt	< 2 ± 1.4	-2.0 – 2.0	No
Total Recoverable Zinc	mg/kg dry wt	< 4 ± 2.7	-4.0 – 4.0	No

Digest Blank 1 PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9733.16				
		Results	Control Limits	Outside Limit (Yes/No)
Total Recoverable Arsenic	mg/kg dry wt	< 2 ± 1.3	-2.0 – 2.0	No
Total Recoverable Cadmium	mg/kg dry wt	< 0.10 ± 0.066	-0.100 – 0.100	No

Digest Blank 1 PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9733.16				
		Results	Control Limits	Outside Limit (Yes/No)
Total Recoverable Chromium	mg/kg dry wt	< 2 ± 1.3	-2.0 – 2.0	No
Total Recoverable Copper	mg/kg dry wt	< 2 ± 1.4	-2.0 – 2.0	No
Total Recoverable Lead	mg/kg dry wt	< 0.4 ± 0.26	-0.40 – 0.40	No
Total Recoverable Mercury	mg/kg dry wt	< 0.10 ± 0.065	-0.100 – 0.100	No
Total Recoverable Nickel	mg/kg dry wt	< 2 ± 1.4	-2.0 – 2.0	No
Total Recoverable Zinc	mg/kg dry wt	< 4 ± 2.7	-4.0 – 4.0	No

Digest Blank 2 PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9733.36				
		Results	Control Limits	Outside Limit (Yes/No)
Total Recoverable Arsenic	mg/kg dry wt	< 2 ± 1.3	-2.0 – 2.0	No
Total Recoverable Cadmium	mg/kg dry wt	< 0.10 ± 0.066	-0.100 – 0.100	No
Total Recoverable Chromium	mg/kg dry wt	< 2 ± 1.3	-2.0 – 2.0	No
Total Recoverable Copper	mg/kg dry wt	< 2 ± 1.4	-2.0 – 2.0	No
Total Recoverable Lead	mg/kg dry wt	< 0.4 ± 0.26	-0.40 – 0.40	No
Total Recoverable Mercury	mg/kg dry wt	< 0.10 ± 0.065	-0.100 – 0.100	No
Total Recoverable Nickel	mg/kg dry wt	< 2 ± 1.4	-2.0 – 2.0	No
Total Recoverable Zinc	mg/kg dry wt	< 4 ± 2.7	-4.0 – 4.0	No

Blank 1 PrepWS xsSHOC - Organochlorine Pesticides Soil Analysis: 7802.1				
		Results	Control Limits	Outside Limit (Yes/No)
Aldrin	mg/kg dry wt	< 0.010 ± 0.0030	0.0 – 0.0100	No
alpha-BHC	mg/kg dry wt	< 0.010 ± 0.0030	0.0 – 0.0100	No
beta-BHC	mg/kg dry wt	< 0.010 ± 0.0028	0.0 – 0.0100	No
delta-BHC	mg/kg dry wt	< 0.010 ± 0.0029	0.0 – 0.0100	No
gamma-BHC (Lindane)	mg/kg dry wt	< 0.010 ± 0.0031	0.0 – 0.0100	No
cis-Chlordane	mg/kg dry wt	< 0.010 ± 0.0030	0.0 – 0.0100	No
trans-Chlordane	mg/kg dry wt	< 0.010 ± 0.0030	0.0 – 0.0100	No
2,4'-DDD	mg/kg dry wt	< 0.010 ± 0.0029	0.0 – 0.0100	No
4,4'-DDD	mg/kg dry wt	< 0.010 ± 0.0024	0.0 – 0.0100	No
2,4'-DDE	mg/kg dry wt	< 0.010 ± 0.0030	0.0 – 0.0100	No
4,4'-DDE	mg/kg dry wt	< 0.010 ± 0.0023	0.0 – 0.0100	No
2,4'-DDT	mg/kg dry wt	< 0.010 ± 0.0021	0.0 – 0.0100	No
4,4'-DDT	mg/kg dry wt	< 0.010 ± 0.0017	0.0 – 0.0100	No
Dieldrin	mg/kg dry wt	< 0.010 ± 0.0026	0.0 – 0.0100	No
Endosulfan I	mg/kg dry wt	< 0.010 ± 0.0029	0.0 – 0.0100	No
Endosulfan II	mg/kg dry wt	< 0.010 ± 0.0026	0.0 – 0.0100	No
Endosulfan sulphate	mg/kg dry wt	< 0.010 ± 0.0013	0.0 – 0.0100	No
Endrin	mg/kg dry wt	< 0.010 ± 0.00048	0.0 – 0.0100	No
Endrin aldehyde	mg/kg dry wt	< 0.010 ± 0.0019	0.0 – 0.0100	No
Endrin ketone	mg/kg dry wt	< 0.010 ± 0.0024	0.0 – 0.0100	No
Heptachlor	mg/kg dry wt	< 0.010 ± 0.0029	0.0 – 0.0100	No
Heptachlor epoxide	mg/kg dry wt	< 0.010 ± 0.0031	0.0 – 0.0100	No
Hexachlorobenzene	mg/kg dry wt	< 0.010 ± 0.0029	0.0 – 0.0100	No
Methoxychlor	mg/kg dry wt	< 0.010 ± 0.00048	0.0 – 0.0100	No

Blank 1 PrepWS xsSHOC - Organochlorine Pesticides Soil Analysis: 7804.1				
		Results	Control Limits	Outside Limit (Yes/No)
Aldrin	mg/kg dry wt	< 0.010 ± 0.0030	0.0 – 0.0100	No
alpha-BHC	mg/kg dry wt	< 0.010 ± 0.0030	0.0 – 0.0100	No
beta-BHC	mg/kg dry wt	< 0.010 ± 0.0028	0.0 – 0.0100	No
delta-BHC	mg/kg dry wt	< 0.010 ± 0.0029	0.0 – 0.0100	No
gamma-BHC (Lindane)	mg/kg dry wt	< 0.010 ± 0.0031	0.0 – 0.0100	No
cis-Chlordane	mg/kg dry wt	< 0.010 ± 0.0030	0.0 – 0.0100	No
trans-Chlordane	mg/kg dry wt	< 0.010 ± 0.0030	0.0 – 0.0100	No
2,4'-DDD	mg/kg dry wt	< 0.010 ± 0.0029	0.0 – 0.0100	No
4,4'-DDD	mg/kg dry wt	< 0.010 ± 0.0024	0.0 – 0.0100	No
2,4'-DDE	mg/kg dry wt	< 0.010 ± 0.0030	0.0 – 0.0100	No
4,4'-DDE	mg/kg dry wt	< 0.010 ± 0.0023	0.0 – 0.0100	No
2,4'-DDT	mg/kg dry wt	< 0.010 ± 0.0021	0.0 – 0.0100	No
4,4'-DDT	mg/kg dry wt	< 0.010 ± 0.0017	0.0 – 0.0100	No
Dieldrin	mg/kg dry wt	< 0.010 ± 0.0026	0.0 – 0.0100	No
Endosulfan I	mg/kg dry wt	< 0.010 ± 0.0029	0.0 – 0.0100	No
Endosulfan II	mg/kg dry wt	< 0.010 ± 0.0026	0.0 – 0.0100	No
Endosulfan sulphate	mg/kg dry wt	< 0.010 ± 0.0018	0.0 – 0.0100	No
Endrin	mg/kg dry wt	< 0.010 ± 0.00048	0.0 – 0.0100	No
Endrin aldehyde	mg/kg dry wt	< 0.010 ± 0.0019	0.0 – 0.0100	No
Endrin ketone	mg/kg dry wt	< 0.010 ± 0.0024	0.0 – 0.0100	No
Heptachlor	mg/kg dry wt	< 0.010 ± 0.0029	0.0 – 0.0100	No
Heptachlor epoxide	mg/kg dry wt	< 0.010 ± 0.0031	0.0 – 0.0100	No
Hexachlorobenzene	mg/kg dry wt	< 0.010 ± 0.0029	0.0 – 0.0100	No
Methoxychlor	mg/kg dry wt	< 0.010 ± 0.00048	0.0 – 0.0100	No

Blank 1 PrepWS xsSHOC - WS: Polycyclic Aromatic Hydrocarbons Soil Analysis: 15455.1				
		Results	Control Limits	Outside Limit (Yes/No)
1-Methylnaphthalene	mg/kg dry wt	< 0.010 ± 0.032	0.0 – 0.0100	No
2-Methylnaphthalene	mg/kg dry wt	< 0.010 ± 0.032	0.0 – 0.0100	No
Acenaphthylene	mg/kg dry wt	< 0.010 ± 0.0066	0.0 – 0.0100	No
Acenaphthene	mg/kg dry wt	< 0.010 ± 0.0060	0.0 – 0.0100	No
Anthracene	mg/kg dry wt	< 0.010 ± 0.0060	0.0 – 0.0100	No
Benzo[a]anthracene	mg/kg dry wt	< 0.010 ± 0.0062	0.0 – 0.0100	No
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.010 ± 0.0066	0.0 – 0.0100	No
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.010 ± 0.0064	0.0 – 0.0100	No
Benzo[e]pyrene	mg/kg dry wt	< 0.010 ± 0.0066	0.0 – 0.0100	No
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.010 ± 0.0064	0.0 – 0.0100	No
Benzo[k]fluoranthene	mg/kg dry wt	< 0.010 ± 0.0066	0.0 – 0.0100	No
Chrysene	mg/kg dry wt	< 0.010 ± 0.0066	0.0 – 0.0100	No
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.010 ± 0.0066	0.0 – 0.0100	No
Fluoranthene	mg/kg dry wt	< 0.010 ± 0.0066	0.0 – 0.0100	No
Fluorene	mg/kg dry wt	< 0.010 ± 0.0066	0.0 – 0.0100	No
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.010 ± 0.0066	0.0 – 0.0100	No
Naphthalene	mg/kg dry wt	< 0.05 ± 0.031	0.0 – 0.050	No
Perylene	mg/kg dry wt	< 0.010 ± 0.0066	0.0 – 0.0100	No

Blank 1 PrepWS xsSHOC - WS: Polycyclic Aromatic Hydrocarbons Soil Analysis: 15455.1				
		Results	**Control Limits**	**Outside Limit (Yes/No)**
Phenanthrene	mg/kg dry wt	< 0.010 ± 0.0067	0.0 – 0.0100	No
Pyrene	mg/kg dry wt	< 0.010 ± 0.0066	0.0 – 0.0100	No

Digest Blank 1 PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9735.16				
		Results	**Control Limits**	**Outside Limit (Yes/No)**
Total Recoverable Arsenic	mg/kg dry wt	< 2 ± 1.3	-2.0 – 2.0	No
Total Recoverable Cadmium	mg/kg dry wt	< 0.10 ± 0.066	-0.100 – 0.100	No
Total Recoverable Chromium	mg/kg dry wt	< 2 ± 1.3	-2.0 – 2.0	No
Total Recoverable Copper	mg/kg dry wt	< 2 ± 1.4	-2.0 – 2.0	No
Total Recoverable Lead	mg/kg dry wt	< 0.4 ± 0.26	-0.40 – 0.40	No
Total Recoverable Mercury	mg/kg dry wt	< 0.10 ± 0.066	-0.100 – 0.100	No
Total Recoverable Nickel	mg/kg dry wt	< 2 ± 1.4	-2.0 – 2.0	No
Total Recoverable Zinc	mg/kg dry wt	< 4 ± 2.7	-4.0 – 4.0	No

Digest Blank 2 PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9735.44				
		Results	**Control Limits**	**Outside Limit (Yes/No)**
Total Recoverable Arsenic	mg/kg dry wt	< 2 ± 1.3	-2.0 – 2.0	No
Total Recoverable Cadmium	mg/kg dry wt	< 0.10 ± 0.066	-0.100 – 0.100	No
Total Recoverable Chromium	mg/kg dry wt	< 2 ± 1.3	-2.0 – 2.0	No
Total Recoverable Copper	mg/kg dry wt	< 2 ± 1.4	-2.0 – 2.0	No
Total Recoverable Lead	mg/kg dry wt	< 0.4 ± 0.26	-0.40 – 0.40	No
Total Recoverable Mercury	mg/kg dry wt	< 0.10 ± 0.065	-0.100 – 0.100	No
Total Recoverable Nickel	mg/kg dry wt	< 2 ± 1.4	-2.0 – 2.0	No
Total Recoverable Zinc	mg/kg dry wt	< 4 ± 2.7	-4.0 – 4.0	No

Digest Blank 1 PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9738.16				
		Results	**Control Limits**	**Outside Limit (Yes/No)**
Total Recoverable Arsenic	mg/kg dry wt	< 2 ± 1.3	-2.0 – 2.0	No
Total Recoverable Cadmium	mg/kg dry wt	< 0.10 ± 0.066	-0.100 – 0.100	No
Total Recoverable Chromium	mg/kg dry wt	< 2 ± 1.3	-2.0 – 2.0	No
Total Recoverable Copper	mg/kg dry wt	< 2 ± 1.4	-2.0 – 2.0	No
Total Recoverable Lead	mg/kg dry wt	< 0.4 ± 0.26	-0.40 – 0.40	No
Total Recoverable Mercury	mg/kg dry wt	< 0.10 ± 0.065	-0.100 – 0.100	No
Total Recoverable Nickel	mg/kg dry wt	< 2 ± 1.4	-2.0 – 2.0	No
Total Recoverable Zinc	mg/kg dry wt	< 4 ± 2.7	-4.0 – 4.0	No

Digest Blank 2 PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9738.32				
		Results	**Control Limits**	**Outside Limit (Yes/No)**
Total Recoverable Arsenic	mg/kg dry wt	< 2 ± 1.3	-2.0 – 2.0	No
Total Recoverable Cadmium	mg/kg dry wt	< 0.10 ± 0.066	-0.100 – 0.100	No
Total Recoverable Chromium	mg/kg dry wt	< 2 ± 1.3	-2.0 – 2.0	No
Total Recoverable Copper	mg/kg dry wt	< 2 ± 1.4	-2.0 – 2.0	No
Total Recoverable Lead	mg/kg dry wt	< 0.4 ± 0.26	-0.40 – 0.40	No
Total Recoverable Mercury	mg/kg dry wt	< 0.10 ± 0.065	-0.100 – 0.100	No
Total Recoverable Nickel	mg/kg dry wt	< 2 ± 1.4	-2.0 – 2.0	No
Total Recoverable Zinc	mg/kg dry wt	< 4 ± 2.7	-4.0 – 4.0	No

50x Manual Dilution Digest Blank PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9738.69				
		Results	**Control Limits**	**Outside Limit (Yes/No)**
Total Recoverable Arsenic	mg/kg dry wt	< 2 ± 1.3	-2.0 – 2.0	No

50x Manual Dilution Digest Blank PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9738.69				
		Results	Control Limits	Outside Limit (Yes/No)
Total Recoverable Cadmium	mg/kg dry wt	< 0.10 ± 0.066	-0.100 – 0.100	No
Total Recoverable Chromium	mg/kg dry wt	< 2 ± 1.3	-2.0 – 2.0	No
Total Recoverable Copper	mg/kg dry wt	< 2 ± 1.4	-2.0 – 2.0	No
Total Recoverable Lead	mg/kg dry wt	< 0.4 ± 0.26	-0.40 – 0.40	No
Total Recoverable Mercury	mg/kg dry wt	< 0.10 ± 0.065	-0.100 – 0.100	No
Total Recoverable Nickel	mg/kg dry wt	< 2 ± 1.4	-2.0 – 2.0	No
Total Recoverable Zinc	mg/kg dry wt	< 4 ± 2.7	-4.0 – 4.0	No

Blank 1 PrepWS xsSHOC - WS: Polycyclic Aromatic Hydrocarbons Soil Analysis: 15456.1				
		Results	Control Limits	Outside Limit (Yes/No)
1-Methylnaphthalene	mg/kg dry wt	< 0.010 ± 0.032	0.0 – 0.0100	No
2-Methylnaphthalene	mg/kg dry wt	< 0.010 ± 0.032	0.0 – 0.0100	No
Acenaphthylene	mg/kg dry wt	< 0.010 ± 0.0066	0.0 – 0.0100	No
Acenaphthene	mg/kg dry wt	< 0.010 ± 0.0060	0.0 – 0.0100	No
Anthracene	mg/kg dry wt	< 0.010 ± 0.0060	0.0 – 0.0100	No
Benzo[a]anthracene	mg/kg dry wt	< 0.010 ± 0.0062	0.0 – 0.0100	No
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.010 ± 0.0066	0.0 – 0.0100	No
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.010 ± 0.0064	0.0 – 0.0100	No
Benzo[e]pyrene	mg/kg dry wt	< 0.010 ± 0.0066	0.0 – 0.0100	No
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.010 ± 0.0064	0.0 – 0.0100	No
Benzo[k]fluoranthene	mg/kg dry wt	< 0.010 ± 0.0066	0.0 – 0.0100	No
Chrysene	mg/kg dry wt	< 0.010 ± 0.0066	0.0 – 0.0100	No
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.010 ± 0.0066	0.0 – 0.0100	No
Fluoranthene	mg/kg dry wt	< 0.010 ± 0.0066	0.0 – 0.0100	No
Fluorene	mg/kg dry wt	< 0.010 ± 0.0067	0.0 – 0.0100	No
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.010 ± 0.0066	0.0 – 0.0100	No
Naphthalene	mg/kg dry wt	< 0.05 ± 0.031	0.0 – 0.050	No
Perylene	mg/kg dry wt	< 0.010 ± 0.0066	0.0 – 0.0100	No
Phenanthrene	mg/kg dry wt	< 0.010 ± 0.0066	0.0 – 0.0100	No
Pyrene	mg/kg dry wt	< 0.010 ± 0.0066	0.0 – 0.0100	No

Digest Blank 1 PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9741.16				
		Results	Control Limits	Outside Limit (Yes/No)
Total Recoverable Arsenic	mg/kg dry wt	< 2 ± 1.3	-2.0 – 2.0	No
Total Recoverable Cadmium	mg/kg dry wt	< 0.10 ± 0.066	-0.100 – 0.100	No
Total Recoverable Chromium	mg/kg dry wt	< 2 ± 1.3	-2.0 – 2.0	No
Total Recoverable Copper	mg/kg dry wt	< 2 ± 1.4	-2.0 – 2.0	No
Total Recoverable Lead	mg/kg dry wt	< 0.4 ± 0.26	-0.40 – 0.40	No
Total Recoverable Mercury	mg/kg dry wt	< 0.10 ± 0.065	-0.100 – 0.100	No
Total Recoverable Nickel	mg/kg dry wt	< 2 ± 1.4	-2.0 – 2.0	No
Total Recoverable Zinc	mg/kg dry wt	< 4 ± 2.7	-4.0 – 4.0	No

Digest Blank 2 PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9741.47				
		Results	Control Limits	Outside Limit (Yes/No)
Total Recoverable Arsenic	mg/kg dry wt	< 2 ± 1.3	-2.0 – 2.0	No
Total Recoverable Cadmium	mg/kg dry wt	< 0.10 ± 0.066	-0.100 – 0.100	No
Total Recoverable Chromium	mg/kg dry wt	< 2 ± 1.3	-2.0 – 2.0	No

Digest Blank 2 PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9741.47				
		Results	Control Limits	Outside Limit (Yes/No)
Total Recoverable Copper	mg/kg dry wt	< 2 ± 1.4	-2.0 – 2.0	No
Total Recoverable Lead	mg/kg dry wt	< 0.4 ± 0.26	-0.40 – 0.40	No
Total Recoverable Mercury	mg/kg dry wt	< 0.10 ± 0.065	-0.100 – 0.100	No
Total Recoverable Nickel	mg/kg dry wt	< 2 ± 1.4	-2.0 – 2.0	No
Total Recoverable Zinc	mg/kg dry wt	< 4 ± 2.7	-4.0 – 4.0	No

QC Spike QCs

LCS OC/PAH PrepWS xsSHOC - Organochlorine Pesticides Soil Analysis: 7799.2				
		Results	Control Limits	Outside Limit (Yes/No)
Aldrin	%	84 ± 26	80 – 121	No
alpha-BHC	%	83 ± 25	76 – 121	No
beta-BHC	%	79 ± 31	75 – 113	No
delta-BHC	%	84 ± 29	74 – 114	No
gamma-BHC (Lindane)	%	84 ± 24	78 – 116	No
cis-Chlordane	%	82 ± 27	78 – 118	No
trans-Chlordane	%	81 ± 25	76 – 121	No
2,4'-DDD	%	85 ± 31	75 – 114	No
4,4'-DDD	%	88 ± 43	75 – 120	No
2,4'-DDE	%	86 ± 28	73 – 118	No
4,4'-DDE	%	83 ± 42	73 – 116	No
2,4'-DDT	%	89 ± 47	70 – 124	No
4,4'-DDT	%	81 ± 47	65 – 120	No
Dieldrin	%	87 ± 39	84 – 124	No
Endosulfan I	%	87 ± 32	81 – 120	No
Endosulfan II	%	80 ± 36	72 – 117	No
Endosulfan sulphate	%	88 ± 55	76 – 120	No
Endrin	%	84 ± 56	78 – 124	No
Endrin aldehyde	%	92 ± 52	84 – 127	No
Endrin ketone	%	87 ± 42	69 – 115	No
Heptachlor	%	80 ± 28	74 – 120	No
Heptachlor epoxide	%	82 ± 23	79 – 119	No
Hexachlorobenzene	%	80 ± 28	77 – 116	No
Methoxychlor	%	90 ± 60	70 – 125	No

LCS OC/PAH xsSHOC - WS: Polycyclic Aromatic Hydrocarbons Soil Analysis: 15453.2				
		Results	Control Limits	Outside Limit (Yes/No)
1-Methylnaphthalene	%	102 ± 25	78 – 122	No
2-Methylnaphthalene	%	95 ± 24	72 – 117	No
Acenaphthylene	%	108.0 ± 9.8	75 – 118	No
Acenaphthene	%	110 ± 32	84 – 119	No
Anthracene	%	105 ± 32	79 – 121	No
Benzo[a]anthracene	%	104 ± 28	81 – 123	No
Benzo[a]pyrene (BAP)	%	105.0 ± 8.0	76 – 123	No
Benzo[b]fluoranthene + Benzo[j]fluoranthene	%	101 ± 21	80 – 121	No
Benzo[e]pyrene	%	91.0 ± 7.0	78 – 110	No
Benzo[g,h,i]perylene	%	98 ± 17	80 – 124	No
Benzo[k]fluoranthene	%	102 ± 13	79 – 121	No

LCS OC/PAH xsSHOC - WS: Polycyclic Aromatic Hydrocarbons Soil Analysis: 15453.2				
		Results	Control Limits	Outside Limit (Yes/No)
Chrysene	%	104 ± 16	83 – 121	No
Dibenzo[a,h]anthracene	%	101 ± 13	78 – 124	No
Fluoranthene	%	105 ± 11	81 – 122	No
Fluorene	%	110 ± 13	86 – 122	No
Indeno(1,2,3-c,d)pyrene	%	96.0 ± 8.9	83 – 123	No
Naphthalene	%	108 ± 27	84 – 118	No
Perylene	%	92.0 ± 7.0	76 – 107	No
Phenanthrene	%	104 ± 15	84 – 120	No
Pyrene	%	104 ± 14	79 – 123	No

LCS OC/PAH xsSHOC - WS: Polycyclic Aromatic Hydrocarbons Soil Analysis: 15454.2				
		Results	Control Limits	Outside Limit (Yes/No)
1-Methylnaphthalene	%	92 ± 23	78 – 122	No
2-Methylnaphthalene	%	87 ± 22	72 – 117	No
Acenaphthylene	%	101.0 ± 9.1	75 – 118	No
Acenaphthene	%	104 ± 30	84 – 119	No
Anthracene	%	96 ± 29	79 – 121	No
Benzo[a]anthracene	%	102 ± 27	81 – 123	No
Benzo[a]pyrene (BAP)	%	102.0 ± 7.8	76 – 123	No
Benzo[b]fluoranthene + Benzo[j]fluoranthene	%	100 ± 21	80 – 121	No
Benzo[e]pyrene	%	89.0 ± 6.8	78 – 110	No
Benzo[g,h,i]perylene	%	103 ± 18	80 – 124	No
Benzo[k]fluoranthene	%	99 ± 13	79 – 121	No
Chrysene	%	98 ± 15	83 – 121	No
Dibenzo[a,h]anthracene	%	106 ± 14	78 – 124	No
Fluoranthene	%	100 ± 11	81 – 122	No
Fluorene	%	108 ± 13	86 – 122	No
Indeno(1,2,3-c,d)pyrene	%	103.0 ± 9.5	83 – 123	No
Naphthalene	%	101 ± 25	84 – 118	No
Perylene	%	90.0 ± 6.9	76 – 107	No
Phenanthrene	%	100 ± 15	84 – 120	No
Pyrene	%	103 ± 14	79 – 123	No

LCS OC/PAH PrepWS xsSHOC - Organochlorine Pesticides Soil Analysis: 7802.2				
		Results	Control Limits	Outside Limit (Yes/No)
Aldrin	%	87 ± 27	80 – 121	No
alpha-BHC	%	84 ± 26	76 – 121	No
beta-BHC	%	83 ± 32	75 – 113	No
delta-BHC	%	80 ± 28	74 – 114	No
gamma-BHC (Lindane)	%	83 ± 24	78 – 116	No
cis-Chlordane	%	90 ± 29	78 – 118	No
trans-Chlordane	%	91 ± 28	76 – 121	No
2,4'-DDD	%	96 ± 35	75 – 114	No
4,4'-DDD	%	105 ± 51	75 – 120	No
2,4'-DDE	%	88 ± 29	73 – 118	No
4,4'-DDE	%	92 ± 47	73 – 116	No
2,4'-DDT	%	107 ± 56	70 – 124	No

LCS OC/PAH PrepWS xsSHOC - Organochlorine Pesticides Soil Analysis: 7802.2				
		Results	**Control Limits**	**Outside Limit (Yes/No)**
4,4'-DDT	%	112 ± 65	65 – 120	No
Dieldrin	%	99 ± 44	84 – 124	No
Endosulfan I	%	93 ± 34	81 – 120	No
Endosulfan II	%	94 ± 42	72 – 117	No
Endosulfan sulphate	%	111 ± 69	76 – 120	No
Endrin	%	140 ± 93	78 – 124	**Yes** [#2]
Endrin aldehyde	%	100 ± 57	84 – 127	No
Endrin ketone	%	77 ± 37	69 – 115	No
Heptachlor	%	78 ± 27	74 – 120	No
Heptachlor epoxide	%	80 ± 23	79 – 119	No
Hexachlorobenzene	%	79 ± 27	77 – 116	No
Methoxychlor	%	150 ± 100	70 – 125	**Yes** [#2]

LCS OC/PAH PrepWS xsSHOC - Organochlorine Pesticides Soil Analysis: 7803.2				
		Results	**Control Limits**	**Outside Limit (Yes/No)**
Aldrin	%	89 ± 27	80 – 121	No
alpha-BHC	%	87 ± 27	76 – 121	No
beta-BHC	%	88 ± 34	75 – 113	No
delta-BHC	%	88 ± 30	74 – 114	No
gamma-BHC (Lindane)	%	87 ± 25	78 – 116	No
cis-Chlordane	%	87 ± 28	78 – 118	No
trans-Chlordane	%	87 ± 27	76 – 121	No
2,4'-DDD	%	88 ± 32	75 – 114	No
4,4'-DDD	%	85 ± 41	75 – 120	No
2,4'-DDE	%	90 ± 29	73 – 118	No
4,4'-DDE	%	83 ± 42	73 – 116	No
2,4'-DDT	%	94 ± 49	70 – 124	No
4,4'-DDT	%	89 ± 52	65 – 120	No
Dieldrin	%	94 ± 42	84 – 124	No
Endosulfan I	%	90 ± 33	81 – 120	No
Endosulfan II	%	84 ± 37	72 – 117	No
Endosulfan sulphate	%	89 ± 56	76 – 120	No
Endrin	%	91 ± 61	78 – 124	No
Endrin aldehyde	%	96 ± 54	84 – 127	No
Endrin ketone	%	82 ± 40	69 – 115	No
Heptachlor	%	76 ± 26	74 – 120	No
Heptachlor epoxide	%	83 ± 24	79 – 119	No
Hexachlorobenzene	%	84 ± 29	77 – 116	No
Methoxychlor	%	87 ± 58	70 – 125	No

LCS OC/PAH PrepWS xsSHOC - Organochlorine Pesticides Soil Analysis: 7804.2				
		Results	**Control Limits**	**Outside Limit (Yes/No)**
Aldrin	%	87 ± 27	80 – 121	No
alpha-BHC	%	90 ± 28	76 – 121	No
beta-BHC	%	81 ± 31	75 – 113	No
delta-BHC	%	77 ± 27	74 – 114	No
gamma-BHC (Lindane)	%	83 ± 24	78 – 116	No

LCS OC/PAH PrepWS xsSHOC - Organochlorine Pesticides Soil Analysis: 7804.2				
		Results	**Control Limits**	**Outside Limit (Yes/No)**
cis-Chlordane	%	81 ± 26	78 – 118	No
trans-Chlordane	%	82 ± 25	76 – 121	No
2,4'-DDD	%	86 ± 31	75 – 114	No
4,4'-DDD	%	83 ± 40	75 – 120	No
2,4'-DDE	%	86 ± 28	73 – 118	No
4,4'-DDE	%	75 ± 38	73 – 116	No
2,4'-DDT	%	63 ± 33	70 – 124	**Yes** [#3]
4,4'-DDT	%	46 ± 27	65 – 120	**Yes** [#3]
Dieldrin	%	88 ± 39	84 – 124	No
Endosulfan I	%	85 ± 31	81 – 120	No
Endosulfan II	%	76 ± 34	72 – 117	No
Endosulfan sulphate	%	79 ± 49	76 – 120	No
Endrin	%	83 ± 55	78 – 124	No
Endrin aldehyde	%	85 ± 48	84 – 127	No
Endrin ketone	%	71 ± 35	69 – 115	No
Heptachlor	%	81 ± 28	74 – 120	No
Heptachlor epoxide	%	85 ± 24	79 – 119	No
Hexachlorobenzene	%	83 ± 29	77 – 116	No
Methoxychlor	%	55 ± 37	70 – 125	**Yes** [#3]

LCS OC/PAH xsSHOC - WS: Polycyclic Aromatic Hydrocarbons Soil Analysis: 15455.2				
		Results	**Control Limits**	**Outside Limit (Yes/No)**
1-Methylnaphthalene	%	84 ± 21	78 – 122	No
2-Methylnaphthalene	%	73 ± 18	72 – 117	No
Acenaphthylene	%	105.0 ± 9.5	75 – 118	No
Acenaphthene	%	109 ± 31	84 – 119	No
Anthracene	%	100 ± 31	79 – 121	No
Benzo[a]anthracene	%	104 ± 28	81 – 123	No
Benzo[a]pyrene (BAP)	%	105.0 ± 8.0	76 – 123	No
Benzo[b]fluoranthene + Benzo[j]fluoranthene	%	99 ± 21	80 – 121	No
Benzo[e]pyrene	%	88.0 ± 6.7	78 – 110	No
Benzo[g,h,i]perylene	%	96 ± 17	80 – 124	No
Benzo[k]fluoranthene	%	103 ± 13	79 – 121	No
Chrysene	%	104 ± 16	83 – 121	No
Dibenzo[a,h]anthracene	%	96 ± 13	78 – 124	No
Fluoranthene	%	107 ± 11	81 – 122	No
Fluorene	%	114 ± 14	86 – 122	No
Indeno(1,2,3-c,d)pyrene	%	91.0 ± 8.4	83 – 123	No
Naphthalene	%	108 ± 27	84 – 118	No
Perylene	%	92.0 ± 7.0	76 – 107	No
Phenanthrene	%	101 ± 15	84 – 120	No
Pyrene	%	102 ± 14	79 – 123	No

LCS OC/PAH xsSHOC - WS: Polycyclic Aromatic Hydrocarbons Soil Analysis: 15456.2				
		Results	**Control Limits**	**Outside Limit (Yes/No)**
1-Methylnaphthalene	%	93 ± 23	78 – 122	No
2-Methylnaphthalene	%	90 ± 22	72 – 117	No

LCS OC/PAH xsSHOC - WS: Polycyclic Aromatic Hydrocarbons Soil Analysis: 15456.2				
		Results	Control Limits	Outside Limit (Yes/No)
Acenaphthylene	%	101.0 ± 9.1	75 – 118	No
Acenaphthene	%	104 ± 30	84 – 119	No
Anthracene	%	91 ± 28	79 – 121	No
Benzo[a]anthracene	%	97 ± 26	81 – 123	No
Benzo[a]pyrene (BAP)	%	97.0 ± 7.4	76 – 123	No
Benzo[b]fluoranthene + Benzo[j]fluoranthene	%	94 ± 20	80 – 121	No
Benzo[e]pyrene	%	84.0 ± 6.4	78 – 110	No
Benzo[g,h,i]perylene	%	97 ± 17	80 – 124	No
Benzo[k]fluoranthene	%	94 ± 12	79 – 121	No
Chrysene	%	95 ± 15	83 – 121	No
Dibenzo[a,h]anthracene	%	98 ± 13	78 – 124	No
Fluoranthene	%	94.0 ± 9.5	81 – 122	No
Fluorene	%	106 ± 13	86 – 122	No
Indeno(1,2,3-c,d)pyrene	%	95.0 ± 8.8	83 – 123	No
Naphthalene	%	104 ± 26	84 – 118	No
Perylene	%	85.0 ± 6.5	76 – 107	No
Phenanthrene	%	95 ± 14	84 – 120	No
Pyrene	%	100 ± 13	79 – 123	No

Sample Spike QCs

Spike OC/PAH PrepWS xsSHOC - Organochlorine Pesticides Soil Analysis: 7799.8				
		Results	Control Limits	Outside Limit (Yes/No)
Aldrin	%	88 ± 27	83 – 122	No
alpha-BHC	%	86 ± 26	80 – 122	No
beta-BHC	%	81 ± 31	79 – 114	No
delta-BHC	%	87 ± 30	76 – 118	No
gamma-BHC (Lindane)	%	86 ± 25	80 – 117	No
cis-Chlordane	%	85 ± 28	80 – 120	No
trans-Chlordane	%	83 ± 25	79 – 121	No
2,4'-DDD	%	89 ± 33	74 – 120	No
4,4'-DDD	%	93 ± 45	75 – 125	No
2,4'-DDE	%	89 ± 29	74 – 119	No
4,4'-DDE	%	85 ± 43	76 – 120	No
2,4'-DDT	%	96 ± 50	72 – 126	No
4,4'-DDT	%	87 ± 51	63 – 123	No
Dieldrin	%	90 ± 40	86 – 126	No
Endosulfan I	%	88 ± 32	83 – 120	No
Endosulfan II	%	85 ± 38	72 – 119	No
Endosulfan sulphate	%	94 ± 59	78 – 124	No
Endrin	%	88 ± 59	82 – 126	No
Endrin aldehyde	%	99 ± 56	84 – 131	No
Endrin ketone	%	95 ± 46	70 – 119	No
Heptachlor	%	84 ± 29	79 – 123	No
Heptachlor epoxide	%	84 ± 24	81 – 119	No
Hexachlorobenzene	%	82 ± 28	77 – 119	No
Methoxychlor	%	100 ± 67	71 – 133	No

Spike OC/PAH PrepWS xsSHOC - Organochlorine Pesticides Soil Analysis: 7802.20				
		Results	**Control Limits**	**Outside Limit (Yes/No)**
Aldrin	%	89 ± 27	83 – 122	No
alpha-BHC	%	86 ± 26	80 – 122	No
beta-BHC	%	82 ± 32	79 – 114	No
delta-BHC	%	83 ± 29	76 – 118	No
gamma-BHC (Lindane)	%	84 ± 24	80 – 117	No
cis-Chlordane	%	91 ± 30	80 – 120	No
trans-Chlordane	%	93 ± 28	79 – 121	No
2,4'-DDD	%	99 ± 36	74 – 120	No
4,4'-DDD	%	110 ± 53	75 – 125	No
2,4'-DDE	%	89 ± 29	74 – 119	No
4,4'-DDE	%	90 ± 46	76 – 120	No
2,4'-DDT	%	86 ± 45	72 – 126	No
4,4'-DDT	%	79 ± 46	63 – 123	No
Dieldrin	%	97 ± 43	86 – 126	No
Endosulfan I	%	92 ± 34	83 – 120	No
Endosulfan II	%	89 ± 40	72 – 119	No
Endosulfan sulphate	%	106 ± 66	78 – 124	No
Endrin	%	139 ± 92	82 – 126	**Yes** [#4]
Endrin aldehyde	%	94 ± 53	84 – 131	No
Endrin ketone	%	77 ± 37	70 – 119	No
Heptachlor	%	93 ± 32	79 – 123	No
Heptachlor epoxide	%	80 ± 23	81 – 119	**Yes** [#4]
Hexachlorobenzene	%	81 ± 28	77 – 119	No
Methoxychlor	%	132 ± 88	71 – 133	No

Spike OC PrepWS xsSHOC - Organochlorine Pesticides Soil Analysis: 7803.24				
		Results	**Control Limits**	**Outside Limit (Yes/No)**
Aldrin	%	92 ± 28	83 – 122	No
alpha-BHC	%	89 ± 27	80 – 122	No
beta-BHC	%	89 ± 34	79 – 114	No
delta-BHC	%	87 ± 30	76 – 118	No
gamma-BHC (Lindane)	%	88 ± 25	80 – 117	No
cis-Chlordane	%	90 ± 29	80 – 120	No
trans-Chlordane	%	89 ± 27	79 – 121	No
2,4'-DDD	%	93 ± 34	74 – 120	No
4,4'-DDD	%	93 ± 45	75 – 125	No
2,4'-DDE	%	91 ± 30	74 – 119	No
4,4'-DDE	%	93 ± 47	76 – 120	No
2,4'-DDT	%	93 ± 49	72 – 126	No
4,4'-DDT	%	91 ± 53	63 – 123	No
Dieldrin	%	97 ± 43	86 – 126	No
Endosulfan I	%	91 ± 33	83 – 120	No
Endosulfan II	%	89 ± 40	72 – 119	No
Endosulfan sulphate	%	94 ± 59	78 – 124	No
Endrin	%	94 ± 63	82 – 126	No
Endrin aldehyde	%	105 ± 59	84 – 131	No

Spike OC PrepWS xsSHOC - Organochlorine Pesticides Soil Analysis: 7803.24				
		Results	Control Limits	Outside Limit (Yes/No)
Endrin ketone	%	90 ± 44	70 – 119	No
Heptachlor	%	84 ± 29	79 – 123	No
Heptachlor epoxide	%	89 ± 25	81 – 119	No
Hexachlorobenzene	%	85 ± 29	77 – 119	No
Methoxychlor	%	98 ± 65	71 – 133	No

Spike OC/PAH PrepWS xsSHOC - Organochlorine Pesticides Soil Analysis: 7804.25				
		Results	Control Limits	Outside Limit (Yes/No)
Aldrin	%	88 ± 27	83 – 122	No
alpha-BHC	%	89 ± 27	80 – 122	No
beta-BHC	%	83 ± 32	79 – 114	No
delta-BHC	%	83 ± 29	76 – 118	No
gamma-BHC (Lindane)	%	85 ± 24	80 – 117	No
cis-Chlordane	%	87 ± 28	80 – 120	No
trans-Chlordane	%	86 ± 26	79 – 121	No
2,4'-DDD	%	86 ± 31	74 – 120	No
4,4'-DDD	%	82 ± 40	75 – 125	No
2,4'-DDE	%	90 ± 29	74 – 119	No
4,4'-DDE	%	85 ± 43	76 – 120	No
2,4'-DDT	%	98 ± 51	72 – 126	No
4,4'-DDT	%	92 ± 54	63 – 123	No
Dieldrin	%	93 ± 41	86 – 126	No
Endosulfan I	%	90 ± 33	83 – 120	No
Endosulfan II	%	83 ± 37	72 – 119	No
Endosulfan sulphate	%	89 ± 56	78 – 124	No
Endrin	%	92 ± 61	82 – 126	No
Endrin aldehyde	%	93 ± 53	84 – 131	No
Endrin ketone	%	81 ± 39	70 – 119	No
Heptachlor	%	87 ± 30	79 – 123	No
Heptachlor epoxide	%	88 ± 25	81 – 119	No
Hexachlorobenzene	%	82 ± 28	77 – 119	No
Methoxychlor	%	95 ± 63	71 – 133	No

Spike PAH xsSHOC - WS: Polycyclic Aromatic Hydrocarbons Soil Analysis: 15456.22				
		Results	Control Limits	Outside Limit (Yes/No)
1-Methylnaphthalene	%	81 ± 20	77 – 126	No
2-Methylnaphthalene	%	76 ± 19	71 – 121	No
Acenaphthylene	%	89.0 ± 8.1	75 – 120	No
Acenaphthene	%	91 ± 26	84 – 121	No
Anthracene	%	80 ± 25	80 – 122	No
Benzo[a]anthracene	%	86 ± 23	81 – 126	No
Benzo[a]pyrene (BAP)	%	85.0 ± 6.5	77 – 125	No
Benzo[b]fluoranthene + Benzo[j]fluoranthene	%	83 ± 17	79 – 125	No
Benzo[e]pyrene	%	75.0 ± 5.8	77 – 115	**Yes** [#5]
Benzo[g,h,i]perylene	%	85 ± 15	77 – 129	No
Benzo[k]fluoranthene	%	83 ± 11	81 – 123	No
Chrysene	%	84 ± 13	83 – 125	No

Spike PAH xsSHOC - WS: Polycyclic Aromatic Hydrocarbons Soil Analysis: 15456.22				
		Results	**Control Limits**	**Outside Limit (Yes/No)**
Dibenzo[a,h]anthracene	%	87 ± 12	78 – 128	No
Fluoranthene	%	84.0 ± 8.5	78 – 127	No
Fluorene	%	93 ± 11	86 – 125	No
Indeno(1,2,3-c,d)pyrene	%	84.0 ± 7.8	80 – 129	No
Naphthalene	%	92 ± 23	84 – 120	No
Perylene	%	77.0 ± 5.9	78 – 110	**Yes** [#5]
Phenanthrene	%	84 ± 12	82 – 123	No
Pyrene	%	88 ± 12	76 – 128	No

Reference Material QCs

QC A7 PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9728.17				
		Results	**Control Limits**	**Outside Limit (Yes/No)**
Total Recoverable Arsenic	mg/kg dry wt	12.1 ± 2.3	9.4 – 13.9	No
Total Recoverable Lead	mg/kg dry wt	12.8 ± 2.0	10.0 – 14.8	No

QC A6 PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9728.19				
		Results	**Control Limits**	**Outside Limit (Yes/No)**
Total Recoverable Arsenic	mg/kg dry wt	5.1 ± 1.6	4.2 – 6.1	No
Total Recoverable Cadmium	mg/kg dry wt	0.326 ± 0.080	0.25 – 0.37	No
Total Recoverable Chromium	mg/kg dry wt	9.3 ± 2.0	7.0 – 10.8	No
Total Recoverable Copper	mg/kg dry wt	12.9 ± 2.2	10.5 – 14.5	No
Total Recoverable Lead	mg/kg dry wt	20.3 ± 3.1	13.2 – 30	No
Total Recoverable Mercury	mg/kg dry wt	< 0.10 ± 0.067	0.060 – 0.160	No
Total Recoverable Nickel	mg/kg dry wt	4.0 ± 1.5	2.8 – 5.1	No
Total Recoverable Zinc	mg/kg dry wt	62.7 ± 5.2	48 – 72	No

QC A6 PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9728.49				
		Results	**Control Limits**	**Outside Limit (Yes/No)**
Total Recoverable Arsenic	mg/kg dry wt	5.6 ± 1.6	4.2 – 6.1	No
Total Recoverable Cadmium	mg/kg dry wt	0.323 ± 0.079	0.25 – 0.37	No
Total Recoverable Chromium	mg/kg dry wt	9.2 ± 2.0	7.0 – 10.8	No
Total Recoverable Copper	mg/kg dry wt	13.2 ± 2.3	10.5 – 14.5	No
Total Recoverable Lead	mg/kg dry wt	21.2 ± 3.2	13.2 – 30	No
Total Recoverable Mercury	mg/kg dry wt	0.097 ± 0.067	0.060 – 0.160	No
Total Recoverable Nickel	mg/kg dry wt	4.0 ± 1.5	2.8 – 5.1	No
Total Recoverable Zinc	mg/kg dry wt	62.6 ± 5.2	48 – 72	No

QC A6 PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9728.65				
		Results	**Control Limits**	**Outside Limit (Yes/No)**
Total Recoverable Arsenic	mg/kg dry wt	5.2 ± 1.6	4.2 – 6.1	No
Total Recoverable Cadmium	mg/kg dry wt	0.337 ± 0.081	0.25 – 0.37	No
Total Recoverable Chromium	mg/kg dry wt	9.0 ± 1.9	7.0 – 10.8	No
Total Recoverable Copper	mg/kg dry wt	13.1 ± 2.3	10.5 – 14.5	No
Total Recoverable Lead	mg/kg dry wt	21.5 ± 3.3	13.2 – 30	No
Total Recoverable Mercury	mg/kg dry wt	< 0.10 ± 0.067	0.060 – 0.160	No
Total Recoverable Nickel	mg/kg dry wt	3.9 ± 1.5	2.8 – 5.1	No
Total Recoverable Zinc	mg/kg dry wt	60.9 ± 5.1	48 – 72	No

QC A7 PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9728.75				
		Results	**Control Limits**	**Outside Limit (Yes/No)**
Total Recoverable Arsenic	mg/kg dry wt	11.0 ± 2.1	9.4 – 13.9	No
Total Recoverable Lead	mg/kg dry wt	11.6 ± 1.8	10.0 – 14.8	No

QC A6 PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9728.77				
		Results	**Control Limits**	**Outside Limit (Yes/No)**
Total Recoverable Arsenic	mg/kg dry wt	4.7 ± 1.5	4.2 – 6.1	No
Total Recoverable Cadmium	mg/kg dry wt	0.308 ± 0.078	0.25 – 0.37	No
Total Recoverable Chromium	mg/kg dry wt	9.0 ± 2.0	7.0 – 10.8	No
Total Recoverable Copper	mg/kg dry wt	12.3 ± 2.2	10.5 – 14.5	No
Total Recoverable Lead	mg/kg dry wt	18.8 ± 2.9	13.2 – 30	No
Total Recoverable Mercury	mg/kg dry wt	0.128 ± 0.068	0.060 – 0.160	No
Total Recoverable Nickel	mg/kg dry wt	3.7 ± 1.4	2.8 – 5.1	No
Total Recoverable Zinc	mg/kg dry wt	58.3 ± 4.9	48 – 72	No

QC A7 PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9732.17				
		Results	**Control Limits**	**Outside Limit (Yes/No)**
Total Recoverable Arsenic	mg/kg dry wt	11.6 ± 2.2	9.4 – 13.9	No
Total Recoverable Lead	mg/kg dry wt	12.3 ± 1.9	10.0 – 14.8	No

QC A6 PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9732.19				
		Results	**Control Limits**	**Outside Limit (Yes/No)**
Total Recoverable Arsenic	mg/kg dry wt	5.3 ± 1.6	4.2 – 6.1	No
Total Recoverable Cadmium	mg/kg dry wt	0.270 ± 0.076	0.25 – 0.37	No
Total Recoverable Chromium	mg/kg dry wt	9.5 ± 2.0	7.0 – 10.8	No
Total Recoverable Copper	mg/kg dry wt	13.5 ± 2.3	10.5 – 14.5	No
Total Recoverable Lead	mg/kg dry wt	22.3 ± 3.4	13.2 – 30	No
Total Recoverable Mercury	mg/kg dry wt	0.133 ± 0.069	0.060 – 0.160	No
Total Recoverable Nickel	mg/kg dry wt	4.0 ± 1.5	2.8 – 5.1	No
Total Recoverable Zinc	mg/kg dry wt	66.3 ± 5.4	48 – 72	No

QC A6 PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9732.41				
		Results	**Control Limits**	**Outside Limit (Yes/No)**
Total Recoverable Arsenic	mg/kg dry wt	7.3 ± 1.7	4.2 – 6.1	**Yes** [#6]
Total Recoverable Cadmium	mg/kg dry wt	0.339 ± 0.081	0.25 – 0.37	No
Total Recoverable Chromium	mg/kg dry wt	8.3 ± 1.9	7.0 – 10.8	No
Total Recoverable Copper	mg/kg dry wt	13.0 ± 2.2	10.5 – 14.5	No
Total Recoverable Lead	mg/kg dry wt	22.6 ± 3.4	13.2 – 30	No
Total Recoverable Mercury	mg/kg dry wt	0.127 ± 0.068	0.060 – 0.160	No
Total Recoverable Nickel	mg/kg dry wt	4.7 ± 1.5	2.8 – 5.1	No
Total Recoverable Zinc	mg/kg dry wt	81.3 ± 6.3	48 – 72	**Yes** [#6]

QC A6 PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9732.66				
		Results	**Control Limits**	**Outside Limit (Yes/No)**
Total Recoverable Arsenic	mg/kg dry wt	5.3 ± 1.6	4.2 – 6.1	No
Total Recoverable Cadmium	mg/kg dry wt	0.304 ± 0.078	0.25 – 0.37	No
Total Recoverable Chromium	mg/kg dry wt	9.8 ± 2.0	7.0 – 10.8	No
Total Recoverable Copper	mg/kg dry wt	12.7 ± 2.2	10.5 – 14.5	No
Total Recoverable Lead	mg/kg dry wt	21.0 ± 3.2	13.2 – 30	No
Total Recoverable Mercury	mg/kg dry wt	0.151 ± 0.070	0.060 – 0.160	No
Total Recoverable Nickel	mg/kg dry wt	4.4 ± 1.5	2.8 – 5.1	No

QC A6 PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9732.66				
		Results	**Control Limits**	**Outside Limit (Yes/No)**
Total Recoverable Zinc	mg/kg dry wt	60.5 ± 5.1	48 – 72	No

QC A7 PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9732.76				
		Results	**Control Limits**	**Outside Limit (Yes/No)**
Total Recoverable Arsenic	mg/kg dry wt	10.9 ± 2.1	9.4 – 13.9	No
Total Recoverable Lead	mg/kg dry wt	11.6 ± 1.8	10.0 – 14.8	No

QC A6 PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9732.78				
		Results	**Control Limits**	**Outside Limit (Yes/No)**
Total Recoverable Arsenic	mg/kg dry wt	5.2 ± 1.6	4.2 – 6.1	No
Total Recoverable Cadmium	mg/kg dry wt	0.294 ± 0.077	0.25 – 0.37	No
Total Recoverable Chromium	mg/kg dry wt	9.1 ± 2.0	7.0 – 10.8	No
Total Recoverable Copper	mg/kg dry wt	12.3 ± 2.2	10.5 – 14.5	No
Total Recoverable Lead	mg/kg dry wt	20.9 ± 3.2	13.2 – 30	No
Total Recoverable Mercury	mg/kg dry wt	0.123 ± 0.068	0.060 – 0.160	No
Total Recoverable Nickel	mg/kg dry wt	3.7 ± 1.4	2.8 – 5.1	No
Total Recoverable Zinc	mg/kg dry wt	60.4 ± 5.1	48 – 72	No

QC A7 PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9733.17				
		Results	**Control Limits**	**Outside Limit (Yes/No)**
Total Recoverable Arsenic	mg/kg dry wt	10.7 ± 2.1	9.4 – 13.9	No
Total Recoverable Lead	mg/kg dry wt	11.5 ± 1.8	10.0 – 14.8	No

QC A6 PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9733.19				
		Results	**Control Limits**	**Outside Limit (Yes/No)**
Total Recoverable Arsenic	mg/kg dry wt	5.1 ± 1.6	4.2 – 6.1	No
Total Recoverable Cadmium	mg/kg dry wt	0.319 ± 0.079	0.25 – 0.37	No
Total Recoverable Chromium	mg/kg dry wt	9.7 ± 2.0	7.0 – 10.8	No
Total Recoverable Copper	mg/kg dry wt	13.6 ± 2.3	10.5 – 14.5	No
Total Recoverable Lead	mg/kg dry wt	150 ± 23	13.2 – 30	**Yes** [#6]
Total Recoverable Mercury	mg/kg dry wt	0.120 ± 0.068	0.060 – 0.160	No
Total Recoverable Nickel	mg/kg dry wt	4.4 ± 1.5	2.8 – 5.1	No
Total Recoverable Zinc	mg/kg dry wt	67.4 ± 5.5	48 – 72	No

QC A6 PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9733.52				
		Results	**Control Limits**	**Outside Limit (Yes/No)**
Total Recoverable Arsenic	mg/kg dry wt	5.5 ± 1.6	4.2 – 6.1	No
Total Recoverable Cadmium	mg/kg dry wt	0.318 ± 0.079	0.25 – 0.37	No
Total Recoverable Chromium	mg/kg dry wt	8.8 ± 1.9	7.0 – 10.8	No
Total Recoverable Copper	mg/kg dry wt	12.5 ± 2.2	10.5 – 14.5	No
Total Recoverable Lead	mg/kg dry wt	21.3 ± 3.2	13.2 – 30	No
Total Recoverable Mercury	mg/kg dry wt	0.113 ± 0.068	0.060 – 0.160	No
Total Recoverable Nickel	mg/kg dry wt	3.6 ± 1.4	2.8 – 5.1	No
Total Recoverable Zinc	mg/kg dry wt	64.9 ± 5.3	48 – 72	No

QC A6 PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9733.68				
		Results	**Control Limits**	**Outside Limit (Yes/No)**
Total Recoverable Arsenic	mg/kg dry wt	5.0 ± 1.5	4.2 – 6.1	No
Total Recoverable Cadmium	mg/kg dry wt	0.325 ± 0.080	0.25 – 0.37	No
Total Recoverable Chromium	mg/kg dry wt	9.6 ± 2.0	7.0 – 10.8	No
Total Recoverable Copper	mg/kg dry wt	13.2 ± 2.3	10.5 – 14.5	No

QC A6 PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9733.68				
		Results	Control Limits	Outside Limit (Yes/No)
Total Recoverable Lead	mg/kg dry wt	20.7 ± 3.2	13.2 – 30	No
Total Recoverable Mercury	mg/kg dry wt	0.124 ± 0.068	0.060 – 0.160	No
Total Recoverable Nickel	mg/kg dry wt	4.5 ± 1.5	2.8 – 5.1	No
Total Recoverable Zinc	mg/kg dry wt	62.6 ± 5.2	48 – 72	No

QC A7 PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9735.17				
		Results	Control Limits	Outside Limit (Yes/No)
Total Recoverable Arsenic	mg/kg dry wt	12.2 ± 2.3	9.4 – 13.9	No
Total Recoverable Lead	mg/kg dry wt	12.9 ± 2.0	10.0 – 14.8	No

QC A6 PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9735.19				
		Results	Control Limits	Outside Limit (Yes/No)
Total Recoverable Arsenic	mg/kg dry wt	5.5 ± 1.6	4.2 – 6.1	No
Total Recoverable Cadmium	mg/kg dry wt	0.305 ± 0.078	0.25 – 0.37	No
Total Recoverable Chromium	mg/kg dry wt	8.7 ± 1.9	7.0 – 10.8	No
Total Recoverable Copper	mg/kg dry wt	12.6 ± 2.2	10.5 – 14.5	No
Total Recoverable Lead	mg/kg dry wt	21.0 ± 3.2	13.2 – 30	No
Total Recoverable Mercury	mg/kg dry wt	0.112 ± 0.068	0.060 – 0.160	No
Total Recoverable Nickel	mg/kg dry wt	3.7 ± 1.4	2.8 – 5.1	No
Total Recoverable Zinc	mg/kg dry wt	59.3 ± 5.0	48 – 72	No

QC A6 PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9735.51				
		Results	Control Limits	Outside Limit (Yes/No)
Total Recoverable Arsenic	mg/kg dry wt	5.8 ± 1.6	4.2 – 6.1	No
Total Recoverable Cadmium	mg/kg dry wt	0.317 ± 0.079	0.25 – 0.37	No
Total Recoverable Chromium	mg/kg dry wt	9.6 ± 2.0	7.0 – 10.8	No
Total Recoverable Copper	mg/kg dry wt	12.3 ± 2.2	10.5 – 14.5	No
Total Recoverable Lead	mg/kg dry wt	21.2 ± 3.2	13.2 – 30	No
Total Recoverable Mercury	mg/kg dry wt	< 0.10 ± 0.067	0.060 – 0.160	No
Total Recoverable Nickel	mg/kg dry wt	4.0 ± 1.5	2.8 – 5.1	No
Total Recoverable Zinc	mg/kg dry wt	63.5 ± 5.2	48 – 72	No

QC A6 PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9735.64				
		Results	Control Limits	Outside Limit (Yes/No)
Total Recoverable Arsenic	mg/kg dry wt	5.6 ± 1.6	4.2 – 6.1	No
Total Recoverable Cadmium	mg/kg dry wt	0.321 ± 0.079	0.25 – 0.37	No
Total Recoverable Chromium	mg/kg dry wt	9.0 ± 2.0	7.0 – 10.8	No
Total Recoverable Copper	mg/kg dry wt	12.6 ± 2.2	10.5 – 14.5	No
Total Recoverable Lead	mg/kg dry wt	23.7 ± 3.6	13.2 – 30	No
Total Recoverable Mercury	mg/kg dry wt	0.101 ± 0.067	0.060 – 0.160	No
Total Recoverable Nickel	mg/kg dry wt	3.9 ± 1.4	2.8 – 5.1	No
Total Recoverable Zinc	mg/kg dry wt	63.2 ± 5.2	48 – 72	No

QC A7 PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9738.17				
		Results	Control Limits	Outside Limit (Yes/No)
Total Recoverable Arsenic	mg/kg dry wt	11.7 ± 2.2	9.4 – 13.9	No
Total Recoverable Lead	mg/kg dry wt	13.1 ± 2.0	10.0 – 14.8	No

QC A6 PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9738.19				
		Results	Control Limits	Outside Limit (Yes/No)
Total Recoverable Arsenic	mg/kg dry wt	5.4 ± 1.6	4.2 – 6.1	No

QC A6 PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9738.19				
		Results	**Control Limits**	**Outside Limit (Yes/No)**
Total Recoverable Cadmium	mg/kg dry wt	0.317 ± 0.079	0.25 – 0.37	No
Total Recoverable Chromium	mg/kg dry wt	9.6 ± 2.0	7.0 – 10.8	No
Total Recoverable Copper	mg/kg dry wt	12.7 ± 2.2	10.5 – 14.5	No
Total Recoverable Lead	mg/kg dry wt	20.1 ± 3.1	13.2 – 30	No
Total Recoverable Mercury	mg/kg dry wt	0.113 ± 0.068	0.060 – 0.160	No
Total Recoverable Nickel	mg/kg dry wt	4.1 ± 1.5	2.8 – 5.1	No
Total Recoverable Zinc	mg/kg dry wt	65.4 ± 5.4	48 – 72	No

QC A6 PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9738.45				
		Results	**Control Limits**	**Outside Limit (Yes/No)**
Total Recoverable Arsenic	mg/kg dry wt	5.1 ± 1.6	4.2 – 6.1	No
Total Recoverable Cadmium	mg/kg dry wt	0.315 ± 0.079	0.25 – 0.37	No
Total Recoverable Chromium	mg/kg dry wt	9.0 ± 1.9	7.0 – 10.8	No
Total Recoverable Copper	mg/kg dry wt	12.8 ± 2.2	10.5 – 14.5	No
Total Recoverable Lead	mg/kg dry wt	21.2 ± 3.2	13.2 – 30	No
Total Recoverable Mercury	mg/kg dry wt	0.113 ± 0.068	0.060 – 0.160	No
Total Recoverable Nickel	mg/kg dry wt	4.0 ± 1.5	2.8 – 5.1	No
Total Recoverable Zinc	mg/kg dry wt	59.3 ± 5.0	48 – 72	No

QC A6 PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9738.65				
		Results	**Control Limits**	**Outside Limit (Yes/No)**
Total Recoverable Arsenic	mg/kg dry wt	5.1 ± 1.6	4.2 – 6.1	No
Total Recoverable Cadmium	mg/kg dry wt	0.301 ± 0.078	0.25 – 0.37	No
Total Recoverable Chromium	mg/kg dry wt	9.1 ± 2.0	7.0 – 10.8	No
Total Recoverable Copper	mg/kg dry wt	12.3 ± 2.2	10.5 – 14.5	No
Total Recoverable Lead	mg/kg dry wt	19.5 ± 3.0	13.2 – 30	No
Total Recoverable Mercury	mg/kg dry wt	0.108 ± 0.067	0.060 – 0.160	No
Total Recoverable Nickel	mg/kg dry wt	3.9 ± 1.5	2.8 – 5.1	No
Total Recoverable Zinc	mg/kg dry wt	59.1 ± 5.0	48 – 72	No

QC A7 PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9738.70				
		Results	**Control Limits**	**Outside Limit (Yes/No)**
Total Recoverable Arsenic	mg/kg dry wt	13.6 ± 2.5	9.4 – 13.9	No
Total Recoverable Lead	mg/kg dry wt	15.0 ± 2.3	10.0 – 14.8	**Yes** [#6]

QC A6 PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9738.72				
		Results	**Control Limits**	**Outside Limit (Yes/No)**
Total Recoverable Arsenic	mg/kg dry wt	5.5 ± 1.6	4.2 – 6.1	No
Total Recoverable Cadmium	mg/kg dry wt	0.310 ± 0.078	0.25 – 0.37	No
Total Recoverable Chromium	mg/kg dry wt	9.7 ± 2.0	7.0 – 10.8	No
Total Recoverable Copper	mg/kg dry wt	12.3 ± 2.2	10.5 – 14.5	No
Total Recoverable Lead	mg/kg dry wt	20.6 ± 3.1	13.2 – 30	No
Total Recoverable Mercury	mg/kg dry wt	0.123 ± 0.068	0.060 – 0.160	No
Total Recoverable Nickel	mg/kg dry wt	4.1 ± 1.5	2.8 – 5.1	No
Total Recoverable Zinc	mg/kg dry wt	61.8 ± 5.1	48 – 72	No

QC A7 PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9741.17				
		Results	**Control Limits**	**Outside Limit (Yes/No)**
Total Recoverable Arsenic	mg/kg dry wt	11.5 ± 2.2	9.4 – 13.9	No
Total Recoverable Lead	mg/kg dry wt	13.2 ± 2.0	10.0 – 14.8	No

QC A6 PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9741.19				
		Results	**Control Limits**	**Outside Limit (Yes/No)**
Total Recoverable Arsenic	mg/kg dry wt	5.1 ± 1.6	4.2 – 6.1	No
Total Recoverable Cadmium	mg/kg dry wt	0.305 ± 0.078	0.25 – 0.37	No
Total Recoverable Chromium	mg/kg dry wt	9.0 ± 2.0	7.0 – 10.8	No
Total Recoverable Copper	mg/kg dry wt	12.4 ± 2.2	10.5 – 14.5	No
Total Recoverable Lead	mg/kg dry wt	22.2 ± 3.4	13.2 – 30	No
Total Recoverable Mercury	mg/kg dry wt	0.104 ± 0.067	0.060 – 0.160	No
Total Recoverable Nickel	mg/kg dry wt	3.7 ± 1.4	2.8 – 5.1	No
Total Recoverable Zinc	mg/kg dry wt	60.9 ± 5.1	48 – 72	No

QC A6 PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9741.54				
		Results	**Control Limits**	**Outside Limit (Yes/No)**
Total Recoverable Arsenic	mg/kg dry wt	5.0 ± 1.5	4.2 – 6.1	No
Total Recoverable Cadmium	mg/kg dry wt	0.327 ± 0.080	0.25 – 0.37	No
Total Recoverable Chromium	mg/kg dry wt	9.0 ± 2.0	7.0 – 10.8	No
Total Recoverable Copper	mg/kg dry wt	12.2 ± 2.2	10.5 – 14.5	No
Total Recoverable Lead	mg/kg dry wt	21.4 ± 3.3	13.2 – 30	No
Total Recoverable Mercury	mg/kg dry wt	0.099 ± 0.067	0.060 – 0.160	No
Total Recoverable Nickel	mg/kg dry wt	3.7 ± 1.4	2.8 – 5.1	No
Total Recoverable Zinc	mg/kg dry wt	59.3 ± 5.0	48 – 72	No

QC A6 PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9741.68				
		Results	**Control Limits**	**Outside Limit (Yes/No)**
Total Recoverable Arsenic	mg/kg dry wt	5.0 ± 1.5	4.2 – 6.1	No
Total Recoverable Cadmium	mg/kg dry wt	0.291 ± 0.077	0.25 – 0.37	No
Total Recoverable Chromium	mg/kg dry wt	9.2 ± 2.0	7.0 – 10.8	No
Total Recoverable Copper	mg/kg dry wt	11.7 ± 2.1	10.5 – 14.5	No
Total Recoverable Lead	mg/kg dry wt	19.3 ± 2.9	13.2 – 30	No
Total Recoverable Mercury	mg/kg dry wt	0.134 ± 0.069	0.060 – 0.160	No
Total Recoverable Nickel	mg/kg dry wt	4.0 ± 1.5	2.8 – 5.1	No
Total Recoverable Zinc	mg/kg dry wt	59.8 ± 5.0	48 – 72	No

Analyst's Comments

[#1] The System Monitoring Compound (SMC) recovery was below the acceptable recovery range. The results were accepted as the remaining SMC's were acceptable and the worksheet quality control data was acceptable.

[#2] The laboratory control spike recovery was elevated and above the acceptable recovery range. The corresponding sample results were accepted as there were no positives detected in the samples.

[#3] The Laboratory Control Spike (LCS) recovery for this analyte was below the acceptable recovery range of the method. The corresponding sample result was accepted because the sample spike recovery was within the expected range.

[#4] The sample spike recovery was elevated and above the acceptable recovery range. The corresponding sample results were accepted as there were no positives detected in the sample.

[#5] The sample spike recovery for this analyte was below the acceptable recovery range of the method. The corresponding sample result was accepted because the Laboratory Control Spike (LCS) recovery was within the expected ranges. This indicates that the low sample spike recovery was due to the matrix of the sample.

[#6] The recovery for this analyte was outside the acceptable recovery range of the method. The corresponding sample result was accepted because the related recovery in the other QC material analysed was within the expected range.

Hill Laboratories
TRIED, TESTED AND TRUSTED

ANALYSIS REQUEST

R J Hill Laboratories Limited
28 Duke Street, Hamilton 3204
Private Bag 3205
Hamilton 3240, New Zealand

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T +64 7 858 2000
E mail@hill-labs.co.nz
W www.hill-laboratories.com

Office use only
(Job No)

Quote No	
Primary Contact	Claire Davies
Submitted By	Nandhini R & Lucas Brydon
Client Name	ENGEO
Address	8 Greydene Place, Takapuna, Auckland
Postcode	0622
Phone	*Mobile*
Email	cdavies@engeo.co.nz nr@engeo.co.nz
Charge To	accountspayable@engeo.co.nz
Client Reference	23849.000.005
Order No	

Results To *Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.*

☑ *Email Primary Contact* ☑ *Email Submitter* ☐ *Email Client*
☐ *Email Other*
☐ *Other*

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories	*Date & Time:*	11/12/23; 3.20 pm
	Name:	NR and LB
☐ *Tick if you require COC to be emailed back*	*Signature:*	NR and LB
Received at Hill Laboratories *(Refer to Lab created Job No above)*	*Date & Time:*	
	Name:	
	Signature:	

Condition ☐ *Room Temp* ☐ *Chilled* ☐ *Frozen* Temp:

ADDITIONAL INFORMATION / KNOWN HAZARDS

Semi-quant (SQ) if Presence/absence (P/A) is positive

Priority ☐ **Low** ☑ **Normal** ☐ **High**
☐ **Urgent** (ASAP, extra charge applies, please contact lab first)

Requested Reporting Date: _____

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
1	S01A @ 0.0-0.2	11/12/2023		Soil	
2	S01A@ 0.3-0.5	11/12/2023		Soil	Cold Hold
3	S01B @ 0.0-0.2	11/12/2023		Soil	
4	S01B @ 0.3-0.5	11/12/2023		Soil	Cold Hold
5	S01C @ 0.0-0.2	11/12/2023		Soil	
6	S01C @ 0.3-0.5	11/12/2023		Soil	Cold Hold
7	S01A @ 0.0-0.2; S01B @ 0.0-0.2; S01C @ 0.0-0.2	11/12/2023		Soil	Composite - HM8, OCPs
8	S02A @ 0.0-0.3	11/12/2023		Soil	
9	S02A @ 0.3-0.5	11/12/2023		Soil	Cold Hold
10	S02B @ 0.0-0.2	11/12/2023		Soil	
11	S02B @ 0.3-0.5	11/12/2023		Soil	Cold Hold
12	S02C @ 0.0-0.2	11/12/2023		Soil	

Continued on next page

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
13	S02C @ 0.3-0.5	11/12/23		Soil	Cold Hold
14	S02A @ 0.0-0.3, S02B @ 0.0-0.2, S02C @ 0.0-0.2				Composite - HM8, OCPs
15	S03A @ 0.0-0.2				
16	S03A @ 0.3-0.5				Cold Hold
17	S03B @ 0.0-0.2				
18	S03B @ 0.3-0.5				Cold Hold
19	S03C @ 0.0-0.2				
20	S03C @ 0.3-0.5				Cold Hold
21	S03A @ 0.0-0.2;S03B @ 0.0-0.2; S03C @ 0.0-0.2				Composite - HM8, OCPs
22	S04A @ 0.0-0.2				
23	S04A @ 0.3-0.5				Cold Hold
24	S04B @ 0.0-0.2				
25	S04B @ 0.3-0.5				Cold Hold
26	S04C @ 0.0-0.2				
27	S04C @ 0.3-0.5				Cold Hold
28	S04A @ 0.0-0.2; S04B @ 0.0-0.2; S04C @ 0.0-0.2				Composite - HM8, OCPs
29	S05A @ 0.0-0.2				
30	S05A @ 0.3-0.5				Cold Hold
31	S05B @ 0.0-0.2				
32	S05B @ 0.3-0.5				Cold Hold
33	S05C @ 0.0-0.2				
34	S05C @ 0.3-0.5				Cold Hold
35	S05A @ 0.0-0.2;S05B @ 0.0-0.2; S05C @ 0.0-0.2				Composite - HM8, OCPs
36	S06A @ 0.0-0.2				
37	S06A @ 0.2-0.4				Cold Hold
38	S06B @ 0.0-0.2				
39	S06B @ 0.3-0.5				Cold Hold
40	S06C @ 0.0-0.2				

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
13	S06C @ 0.3-0.5	11/12/23		Soil	Cold Hold
14	S06A @ 0.0-0.2; S06B @ 0.0-0.2; S06C @ 0.0-0.2				Composite - HM8, OCPs
15	S07 @ 0.0-0.2				HM8, PAHs, OCPs
16	S07 @ 0.2-0.4				Cold Hold
17	S08 @ 0.0-0.2				HM8, PAHs, OCPs
18	S08 @ 0.3-0.5				Cold Hold
19	S09 @ 0.0-0.2				HM8, PAHs, OCPs
20	S09 @ 0.2-0.5				Cold Hold
21	S10 @ 0.0-0.2				HM8, P/A
22	S10 @ 0.3-0.5				Cold Hold
23	S11 @ 0.0-0.2				HM8, PAHs, OCPs & P/A
24	S11 @ 0.3-0.5				Cold Hold
25	S12 @ 0.0-0.2				HM8, PAHs, OCPs & P/A
26	S12 @ 0.3-0.5				Cold Hold
27	S13 @ 0.0-0.2				HM8 & P/A
28	S13 @ 0.3-0.5				HM8 & P/A
29	S14 @ 0.0-0.2				HM8 & P/A
30	S14 @ 0.3-0.5				HM8 & P/A
31	S15 @ 0.0-0.3				HM8 & P/A
32	S15 @ 0.4-0.6				HM8 & P/A
33	S16 @ 0.0-0.3				HM8, PAHs, & P/A
34	S16 @ 0.3-0.5				HM8
35	S17 @ 0.0-0.2				HM8 & P/A
36	S17 @ 0.3-0.5				Cold Hold
37	S18 @ 0.0-0.2				HM8 & P/A
38	S18 @ 0.4-0.6				Cold Hold
39	S21 @ 0.0-0.2				HM8, PAHs, OCPs & P/A
40	S21 @ 0.3-0.5				Cold Hold

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
13	S22 @ 0.0-0.2				HM8, PAHs, OCPs & P/A
14	S22 @ 0.3-0.5				Cold Hold
15					
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R J Hill Laboratories Limited
28 Duke Street Frankton 3204
Private Bag 3205
Hamilton 3240 New Zealand

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+64 7 858 2000
mail@hill-labs.co.nz
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Certificate of Analysis

Client:	Engeo Limited	**Lab No:**	3450865 SPv1
Contact:	C Davies	**Date Received:**	24-Jan-2024
	C/- Engeo Limited	**Date Reported:**	31-Jan-2024
	PO Box 305136	**Quote No:**	82742
	Triton Plaza	**Order No:**	23849.000.001
	Auckland 0757	**Client Reference:**	23849.000.001
		Submitted By:	Lucas Brydon

Sample Type: Soil

		Sample Name:	S23 0-0.1 24-Jan-2024	S24 0-0.1 24-Jan-2024	S25 0-0.1 24-Jan-2024
		Lab Number:	3450865.1	3450865.3	3450865.5
Individual Tests					
Dry Matter	g/100g as rcvd		76	81	80
Heavy Metals with Mercury, Screen Level					
Total Recoverable Arsenic	mg/kg dry wt		4	2	3
Total Recoverable Cadmium	mg/kg dry wt		0.10	0.12	< 0.10
Total Recoverable Chromium	mg/kg dry wt		9	5	6
Total Recoverable Copper	mg/kg dry wt		15	13	12
Total Recoverable Lead	mg/kg dry wt		6.8	7.9	5.6
Total Recoverable Mercury	mg/kg dry wt		< 0.10	< 0.10	< 0.10
Total Recoverable Nickel	mg/kg dry wt		3	2	2
Total Recoverable Zinc	mg/kg dry wt		23	17	10
Organochlorine Pesticides Screening in Soil					
Aldrin	mg/kg dry wt		< 0.013	< 0.012	< 0.013
alpha-BHC	mg/kg dry wt		< 0.013	< 0.012	< 0.013
beta-BHC	mg/kg dry wt		< 0.013	< 0.012	< 0.013
delta-BHC	mg/kg dry wt		< 0.013	< 0.012	< 0.013
gamma-BHC (Lindane)	mg/kg dry wt		< 0.013	< 0.012	< 0.013
cis-Chlordane	mg/kg dry wt		< 0.013	< 0.012	< 0.013
trans-Chlordane	mg/kg dry wt		< 0.013	< 0.012	< 0.013
2,4'-DDD	mg/kg dry wt		4.1	< 0.012	< 0.013
4,4'-DDD	mg/kg dry wt		17.6	< 0.012	0.031
2,4'-DDE	mg/kg dry wt		0.014	< 0.012	< 0.013
4,4'-DDE	mg/kg dry wt		0.133	< 0.012	< 0.013
2,4'-DDT	mg/kg dry wt		0.180	< 0.012	< 0.013
4,4'-DDT	mg/kg dry wt		3.8	< 0.012	0.019
Total DDT Isomers	mg/kg dry wt		26	< 0.08	< 0.08
Dieldrin	mg/kg dry wt		< 0.013	< 0.012	< 0.013
Endosulfan I	mg/kg dry wt		< 0.013	< 0.012	< 0.013
Endosulfan II	mg/kg dry wt		< 0.013	< 0.012	< 0.013
Endosulfan sulphate	mg/kg dry wt		< 0.013	< 0.012	< 0.013
Endrin	mg/kg dry wt		< 0.013	< 0.012	< 0.013
Endrin aldehyde	mg/kg dry wt		< 0.013	< 0.012	< 0.013
Endrin ketone	mg/kg dry wt		< 0.013	< 0.012	< 0.013
Heptachlor	mg/kg dry wt		< 0.013	< 0.012	< 0.013
Heptachlor epoxide	mg/kg dry wt		< 0.013	< 0.012	< 0.013
Hexachlorobenzene	mg/kg dry wt		< 0.013	< 0.012	< 0.013
Methoxychlor	mg/kg dry wt		< 0.013	< 0.012	< 0.013

Analyst's Comments

It has been noted that the duplicate for OCP on sample 3450865.1 showed greater variation than would normally be expected. An average of the results has been reported. This may reflect the heterogeneity of the sample.

Appendix No.1 - Chain of Custody

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively simple matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request. Unless otherwise indicated, analyses were performed at Hill Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Soil

Test	Method Description	Default Detection Limit	Sample No
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%.	-	1, 3, 5
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1, 3, 5
Organochlorine Pesticides Screening in Soil	Sonication extraction, GC-ECD analysis. Tested on as received sample. In-house based on US EPA 8081.	0.010 - 0.06 mg/kg dry wt	1, 3, 5
Dry Matter	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	1, 3, 5

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Testing was completed between 25-Jan-2024 and 31-Jan-2024. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

Ara Heron BSc (Tech)
Client Services Manager - Environmental

HillLabs

ANALYSIS REQUEST

R J Hill Laboratories Limited
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Parnell
Auckland 1052, New Zealand

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+64 7 858 2000
mail@hill-labs.co.nz
www.hill-labs.co.nz

Job No: **345 0865**

Date Recv: 24-Jan-24 13:09

Received by: Lya Avila

3134508852

Quote No 23949.000.001 14 Sinton Road

Primary Contact Claire Davies

Submitted By Lucas Boyden

Client Name ENGEO

Address

Postcode

Phone *Mobile*

Email

Charge To

Client Reference 23949.000.001

Order No

Results To *Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.*

☒ *Email Primary Contact* ☐ *Email Submitter* ☐ *Email Client*

☐ *Email Other*

☐ *Other*

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories

Date & Time: 24/1/24 1:00

Name: LB

☐ *Tick if you require COC to be emailed back*

Signature: LB

Samples will be processed at a Hill Labs site with the appropriate testing capability and capacity. Please inform the lab if you wish samples to be retained and analysed at the site of receipt.

Received at Hill Laboratories

Date & Time:

Name:

Signature:

ADDITIONAL INFORMATION

Priority ☐ **Low** ☐ **Normal** ☐ **High**

☐ **Urgent** (ASAP, extra charge applies, please contact lab first)

Requested Reporting Date:

*Please ensure all asbestos samples are **individually double bagged** upon submission to the laboratory.*

No.	Sample Name	Sample Material	Sample Location	Sample Date	Tests Required (if not as per Quote)
1	S23 0-0.1	Soil		24/01	HM8, OCPs
2	S23 0.3-0.4				Cold Hold
3	S24 0-0.1				HM8, OCPs
4	S24 0.3-0.4				Cold Hold
5	S25 0-0.1				HM8, OCPs
6	S25 0.3-0.4				Cold Hold.
7					
8					Temperature On Arrival
9					17.9 °C
10					Temperature was measured on one or more arbitrarily chosen samples in this batch.
11					
12					

Continued on next page

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Project Number 23849.000.005

Remediation Action Plan

14 Sinton Road, Hobsonville, Auckland

Submitted to:
Cabra Developments Limited
Unit 9B, 30 Foundry Road
Silverdale
Auckland 0932

Remediation Action Plan Task Summary

Project Site:	14 Sinton Road, Hobsonville
Scope of Proposed Works	Soil disturbance work associated with remediation of an isolated area of impacted soil.
Contaminants identified on-site	Concentrations of copper and OCPs which exceed environmental criteria and regional background concentrations.

The provisions of the RAP are mandatory during soil disturbing works for all persons entering the remedial works area and all contractor and sub-contractor employees who will be involved in implementing the procedures identified in this document.

Action Required	Section Ref.	Actioned	
		Date	Signature
Prior to Work Commencing			
• Ensure a Contaminated Land Specialist SQEP has been engaged.	Table 1		
• A copy of Appendix 2 is displayed on site	Appendix 2		
• Boundary Controls have been installed	4.1.1		
• Sediment control measures have been installed.	4.1.2		
• Analysis data has been provided to proposed disposal site(s) and written confirmation received from them to confirm they are able to receive the excavated material.	4.1.5		
• Welfare area set up with appropriate decontamination facilities	4.1.6		
• All workers issued with appropriate PPE and trained in its use.	4.2.2		
• Source of water is available for dust suppression.	4.3.2		
• Disposal options for disposal of water have been identified	4.3.4 4.3.5		
• All workers have received training in the actions to take if unanticipated ground conditions are encountered	5		
• A copy of the analytical laboratory test report for any material that is to be imported to the site as cleanfill on the basis of direct testing has been provided to the Contaminated Land Specialist SQEP.	6		

During Works			
• All workers (staff and contractors) and visitors are inducted with respect to the ground conditions on-site, the required PPE, site rules, and accidental discovery procedures.	4.2.1		
• All loads must be securely covered before the truck leaves the site.	4.1.3		
• All excavated material being removed from the site is disposed of to an appropriately licensed facility.	4.1.5		
• If evidence of unexpected ground conditions is observed, work shall be stopped and the Contaminated Land Specialist SQEP contacted to visit the site to assess the area and take samples as necessary.	5		
• All imported material complies with Auckland Council definition of 'cleanfill material'.	6		
Documentation to be Provided to the Contaminated Land Specialist SQEP			
• Daily site photographs showing the site entrance, the area of work, sediment control measures and any stockpiles.	6		
• A plan showing location where any soil is reused on-site.	6		
• Copies of disposal dockets / landfill receipts and confirmation from disposal site that they can accept the material.	6		
• Documentation for imported fill.	6		

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ENGEO Document Control:

Report Title	Remediation Action Plan - 14 Sinton Road, Hobsonville		
Project No.	23849.000.005	**Doc ID**	03
Client	Cabra Developments Limited	**Client Contact**	Duncan Unsworth
Distribution (PDF)	Duncan Unsworth, Cabra Developments Limited		

Date	Revision Details / Status	Author	Reviewer	WP
28/03/2024	Issued to Client	CD	LL	DF

SQEP Certifying Statement

I certify that the site has been assessed in accordance with current New Zealand Regulations and guidance documents and that this report has been prepared in general accordance with the Ministry for the Environment's Contaminated Land Management Guidelines No. 1: Reporting on Contaminated Sites in New Zealand, 2021.

I am considered by ENGEO Limited to be a suitably qualified and experienced practitioner (SQEP) able to certify reports pursuant to the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011, based on the company's definition of a SQEP as given below.

Lotta Liddell

28 March 2024

ENGEO Limited requires that a SQEP has the following Qualifications / Experience:

- *Tertiary science or engineering qualification relevant to environmental assessment.*
- *A minimum of 10 years of relevant experience.*
- *Registration with a professional body that assess and certifies environmental professionals in the competency criteria of training, experience, professional conduct and ethical behaviour.*

1 Introduction

ENGEO Ltd was requested by Cabra Developments Limited to prepare a Remediation Action Plan (RAP) to support remedial earthworks at 14 Sinton Road, Hobsonville (herein referred to as 'the site'; shown on Figure 1). This work has been carried out in accordance with the signed agreement dated 20 November 2023.

This RAP has been prepared to detail the remedial actions for the site based on previous investigations. The purpose of the report is to:

- Provide a summary of previous investigations completed at the site.
- Outline requirements for oversight and validation during and following remedial works.
- Outline monitoring and management procedures to be implemented during soil disturbing works to assist in:
    - achieving a safe working environment for relevant personnel; and
    - protecting the environment from contaminants in site discharges during the redevelopment works.
- Outline actions to be undertake if unidentified contamination is encountered.

1.1 Relevance

This document has been prepared in general accordance with the Ministry for the Environment's (MfE's) Contaminated Land Management Guidelines No.1 – Reporting on Contaminated Sites in New Zealand.

The information and recommendations provided herein are to augment the processes on-site and are not intended to relieve any contractor or the controller of the place of work of their responsibility for the health and safety of their workers and contractors. Nor is it intended to relieve contractors undertaking work on the site of their responsibilities under the Health and Safety at Work Act 2015 and subsequent amendments. It is expected that the contractor will develop a site-specific health and safety plan to complement this RAP and to address other health and safety requirements that may be applicable to their site works.

The provisions of the RAP are mandatory for all persons entering the remedial works area and all contractor and sub-contractor employees who will be involved in implementing the procedures identified in this document.

1.2 Document Review

This RAP is considered suitable to provide controls based on the contamination identified during the previous investigation works. If contamination is found that varies from what has been assumed in preparing this RAP, the RAP will need to be updated to account for the changed site understanding. If a revised RAP is prepared, it should be submitted to Auckland Council for review and approval and re-distributed to the project team (Table 1) as soon as practicable following Councils approval of the document.

1.3 Roles and Responsibilities under this RAP

The roles and responsibilities of various organisations under this RAP are listed in Table 1.

Table 1: Roles and Responsibilities

Role	Responsibility
Site Owner Cabra Developments Ltd	To distribute this RAP and be responsible for ensuring that the site works are undertaken in accordance with this document and any revisions to this document.
Site Contractor (main contractor / general earthworks) *to be confirmed*	To distribute the RAP (including updated versions) to employees and subcontractors, and to ensure that the latest revision of the RAP is available on-site at all times. To provide control and oversight for the ground disturbing works. This also includes ensuring that all site staff and subcontractors are aware of and comply with the procedures and health and safety requirements contained within this document. It is recommended that a designated, suitably trained Site Supervisor is present to oversee the works. The Site Supervisor should implement changes to site procedures, as necessary, if unanticipated conditions arise. It is anticipated that this Site Supervisor would represent the main site contractor. Should an incident occur on-site which may result in discharges, the Site Supervisor should take control of the situation and coordinate the efforts of all parties on-site to minimise the impact. Worker and public Health and Safety concerns will take precedence over environmental discharges, should it be unsafe to employ controls or emergency measures immediately. As a minimum, the Site Supervisor should have received non-certified training in asbestos identification, safe handling and suitable controls, to ensure that, if asbestos / asbestos containing materials (ACMs) are encountered they are identified and appropriately managed. Documentary evidence of the training shall be kept on record.
Contaminated Land Specialist – ENGEO	A Contaminated Land Specialist company with Suitably Qualified and Experienced Practitioners (SQEPs) in contaminated land management shall be appointed to liaise with the contractor during the course of the works. Representatives from the Contaminated Land Specialist company shall: • Visit the site during remedial works to assess the controls and procedures on-site, as they relate to this RAP and to carry out validation works (Section 3.6). • Provide environmental support during remedial works and prepare a completion report (Section 7), if required.

2 Site Description

2.1 Site Location and Layout

The site is located at 14 Sinton Road, Hobsonville (LOT 8 DP 57408). The site layout is shown on Figure 1.

2.2 Previous Investigations

A Preliminary and Detailed Site Investigation (PSI-DSI) for the site was prepared by ENGEO in March 2024[1].

ENGEO are also aware of the following reports (relevant to this report) which have previously been prepared for the site:

- Environmental Earth Sciences. (2007). Environmental site investigation of former horticultural land at 14 Sinton Road, Hobsonville, Auckland (reference 307093.doc).
- ENGEO Limited. (2024). Geotechnical Investigation –14 Sinton Road, Hobsonville, Auckland (reference 23849.000.005_01)

For further details relating to the site and the investigations carried out, reference should be made to these reports.

2.3 Contamination Summary

Based on the information reviewed as part of ENGEO's investigation, and observations during the walkover, the site was historically used as horticultural land, prior to the current use (residential with some animal grazing).

The concentrations of copper and OCPs in one sample collected during the previous investigation completed by Environmental and Earth Sciences (summarised in Table 3) exceeded the relevant background concentrations. An elevated concentration of DDT, which exceeded the adopted environmental assessment criteria, was recorded in one sample from additional intrusive investigation work in this area. Based on this information we consider that it is possible that pesticides were stored in this part of the site, and / or was present in soil stockpiled in this area historically, and we consider that HAIL A10 applies. With the exception of this area of the site, concentrations of potential contaminants of concern in samples analysed from the site were all below regional background concentrations.

The summary results table extracted from the PSI-DSI is included in Appendix 1, and a site investigation plan is included as Figure 1.

For details of the conceptual site model developed for the site, reference should be made to the PSI-DSI report listed above.

[1] ENGEO Limited. (2024). Preliminary and Detailed Site Investigation – 14 Sinton Road, Whenuapai, Auckland (reference 23849.000.005_02)

3 Remedial Works

3.1 Purpose of Remedial Works

The remedial objective is to mitigate risk to environmental receptors.

3.2 Remedial Options

The following options have been identified for this site.

Off-site Disposal

Removal of soil that has been identified as containing contaminants above the adopted environmental discharge limits.

Off-site disposal at an appropriately licensed landfill facility permanently removes the risk to environmental receptors, and the requirement for long-term management.

Encapsulation / Capping

This remedial strategy is considered to offer a more sustainable approach and be equally or more protective than disposing of material at landfill as it minimises disturbance and transport of contaminated material. A suitable capping layer will be placed where impacted material is proposed to be retained *in situ*.

Groundwater monitoring may be required around areas identified as exceeding the environmental discharge criterion to verify that contamination hasn't impacted groundwater and assess the need for a long-term discharge consent.

To ensure appropriate long-term management of the site, as- built drawings are required to be prepared. This will be accomplished by surveying the site prior to, and post, placement of the capping layer. These drawings will confirm an adequate thickness of the capping layer and also provide information regarding depth of contaminated materials for future site excavation activities.

3.3 Remedial Strategy

The remedial strategy selected for the site is removal of soil that has been identified as containing contaminants which exceed the adopted environmental criteria. The location and extents of the proposed remedial works are shown in Figure 2.

3.4 Remedial Methodology

Remedial works shall be completed prior to the bulk topsoil strip to minimise the potential for accidental mixing of impacted soils with non-impacted soils.

Remedial works should be undertaken in accordance with the controls listed in Section 4. During the remedial works, a Contaminated Land Specialist shall be engaged to visit the site to verify that earthworks are being conducted in accordance with the agreed methodology, and controls listed within this document.

3.5 Remedial Volume

Table 2 provides an estimate of the volume of soil requiring remediation, based on the results of the reports listed in Section 2.2. The remedial volume may extend (or reduce) if contamination is found that varies from what is currently known.

Table 2: Estimated Remedial Volume Estimation (based on current dataset)

Sample exceeding relevant criteria	Exceedance	Estimated Area of Impact (m^2)[1,3]	Estimated Depth of Impact (m below ground level)[2,3]	Estimated Volume Exceeding Remedial Goal (m^3)
S23	Total DDT	50	0.3	15

Notes

[1] Lateral extent of contamination has not been fully determined. The estimate assumes that impacted soil is associated with material stockpiled in this are historically.

[2] Vertical extent of contamination has not been assessed. Depth is based on the depth topsoil. Successful remediation (Off-site Disposal) will be confirmed through validation sampling.

3.6 Validation and Oversight

During the remedial works, a representative from the Contaminated Land Specialist company shall visit the site on one occasion to observe remedial earthworks.

Following removal of the impacted soil, a representative from the Contaminated Land Specialist company shall recover validation soil samples from the excavation as follows:

- One sample on each side of the excavation at the depth at which contamination was formerly identified.
- Two samples across the base of the excavation.

This validation sampling strategy may be amended based on site observations or on discovery of additional contamination. Changes to the validation sampling strategy shall be justified by the Contaminated Land Specialist in the validation report.

Samples shall be analysed at an accredited laboratory for metals / metalloids and OCPs. The analysis suite may be added to, based on site observations.

3.7 Assessment Criteria

Table 3 provides the remedial criteria for the site which have been selected from the lesser of the human health and environmental discharge criteria for each contaminant.

Table 3: Adopted Remedial Criteria

Contaminant of Concern	Remedial Goal	Remedial Goal Source
Copper	210 mg / kg	Residential soil contaminant Standard from Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health (MfE, 2011b)
Total DDT	12 mg / kg	Permitted activity criteria from E30.6.1.4 of the Auckland Unitary Plan (AUP)

1 The Auckland Unitary Plan Operative in part - 15 November 2016, Auckland Council

If additional unexpected contamination is encountered during the works, remedial goals shall be referenced from the AUP[2], the MfE's Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health and following the MfE Contaminated Land Management Guidelines No.2: Hierarchy and Application in New Zealand of Environmental Guideline Values published in 2011.

If the results of analysis of soil validation samples indicates that the remaining soils exceed the remedial criteria, the Contaminated Land Specialist will advise further remedial actions to achieve the remedial objectives. If this requires a change to the remedial strategy, then this must be communicated to Auckland Council for approval in advance of work being undertaken.

4 Site Management Practices and Controls

The site management practices in this section shall be implemented during remedial earthworks (shown on Figure 2), unless advised otherwise by the Contaminated Land Specialist. Many of the required control measures are standard construction site procedures; however, the relevance and effectiveness of these protocols shall be reviewed by the Site Supervisor on a daily basis during work at the site. An overview of the controls required is included in Appendix 2. It is anticipated that this will be displayed on-site for contractor reference.

Outside of the remedial works area, contractors can follow standard construction site procedures; however, the relevance and effectiveness of these protocols shall be reviewed by the Site Supervisor on a daily basis during work at the site. If unexpected ground conditions are encountered the procedures in Section 5 should be implemented.

4.1 Site Control Procedures

4.1.1 Boundary Controls

Security fencing and appropriate warning signs should be erected around the remedial earthworks area to prevent unauthorised access.

4.1.2 Sediment Control Measures

Appropriate sediment control measures, designed and installed in accordance with Auckland Council Guideline Document GD2016/005: Erosion and sediment control guide for land disturbing activities in the Auckland Region prepared by Beca Ltd and Southern Skies Environmental for Auckland Council, 2018, shall be implemented to minimise sediment runoff from the site. Minimum controls shall include:

- A stabilised site entrance to minimise the movement of soil off-site.
- Suitable sediment controls (e.g. silt fencing) placed around the perimeter of the works area.
- Protection measures (filter socks, Enviropods etc.) around stormwater drains where there is a potential for runoff.
- Establishment of clean and dirty areas to minimise tracking of potentially impacted soils on and off-site.

4.1.3 Soil Management

During handling of soil in the remedial area (Figure 2) trucks shall be loaded within the area where runoff and possible spills during loading will be controlled and contained. Loads must be securely covered before the truck leaves the site and during transport.

No specific controls are required outside the remedial area.

4.1.4 Stockpiling

If temporary stockpiling of material is necessary, dust shall be controlled through wetting during the workday. If left overnight, the material shall be covered (e.g., with plastic) and protected by erosion / sediment controls (e.g., bunded).

4.1.5 Offsite Disposal

Soil must be taken to an appropriate soil disposal facility authorised to accept the contaminants present.

Prior to acceptance, the results of the soil testing may be requested by the receiving facility. Requirements for additional testing and truck lining / soil wrapping should be confirmed with the receiving facility.

Based on the ground conditions observed and the results of chemical analysis of samples from the site as described in the PSI-DSI report prepared by ENGEO dated March 2024, soil that needs to be removed from outside the remedial area (Figure 2), likely complies with the Auckland Council definition of cleanfill material however the results of the soil testing should be provided to the receiving facility to confirm their acceptance.

4.1.6 Decontamination of Equipment

Any machinery used on-site shall be cleaned of loose soil in a designated 'wash down' area (e.g. paved area or area of existing hardfill) prior to leaving site. Once loose soil has been removed, the cleaned item can be moved to the clean area. Any wastewater generated should not be discharged off-site and should be allowed to drain back into the site.

Imported rock / utilised in the 'wash down area' and / or 'truck loading area' (if relevant) should be disposed of as contaminated material, unless testing of the material demonstrates it is uncontaminated.

4.2 Health and Safety Protection Measures

4.2.1 General

All contractor staff, subcontractors and visitors entering or working in the remedial works area shall:

- Be inducted before entering the site or commencing work to ensure they are aware of the potential hazards relating to contaminated soil at the site.
- Avoid unnecessary contact with site soils.
- Wash their hands in a dedicated welfare area prior to eating, drinking, vaping or smoking.

All health and safety incidents shall be reported to the main contractor's health and safety advisor, or equivalent responsible person on-site as soon as practicable after the event.

4.2.2 Personal Protective Equipment (PPE)

Based on the concentrations of contaminants identified (copper and OCPs) standard PPE requirements for construction sites (e.g. work gloves and safety boots) are considered appropriate to minimise the effects of potential contamination exposure via incidental ingestion of soil, skin contact with soil or inhalation of dust. Additional PPE (P2 Dust masks) should be made available to workers if requested.

4.3 Environmental Management Procedures

4.3.1 General

All environmental incidents (spills, leaks, breaches to sediment control measures etc.) shall be reported to the Site Supervisor as soon as practicable after the incident.

4.3.2 Dust

Dust shall be managed in accordance with consent requirements and relevant regulations. The contractor shall consider the following (as appropriate):

- Limit vehicle access onto the excavated areas as far as possible.
- Dampen surface soil using a water truck or portable water sprays. Ensure that the volume of water used does not induce soil erosion, or cause surface ponding or runoff, that could discharge into natural water bodies or stormwater drains.
- Use wind screens or avoid work during windy conditions.
- Consider use of surfactants or polymers where a reliable source of water is not available.

In the unlikely event that unsatisfactory dust emissions emanate from the site on a sustained basis or complaints are received in relation to the works, mitigation of the adverse effects shall be applied in accordance with the hierarchy of control described in the Health and Safety at Work Act 2015 -eliminate the risk, so far as is reasonably practicable; and if it is not reasonably practicable to eliminate a risk, to minimise those risks so far as is reasonably practicable.

If the emission or discharges persist, professional advice shall be sought in order to define appropriate control measures. It is recommended that consultation with appropriate council representatives also be undertaken prior to recommencing works.

4.3.3 Odour

If excavated material is odorous, odour control measures shall be put in place. This could include covering the material with cleanfill, a polythene cover or instituting a deodoriser system.

4.3.4 Stormwater

Uncontrolled discharge of stormwater from areas of ground disturbing activities shall not be permitted. Mitigation of any unexpected discharges (e.g. breaches of sediment control measures) should be implemented immediately. If the on-site erosion and sediment control measures fail, the discharge shall be stopped / minimised as far as practicable by using measures such as hay bales, bunding or excavation of a temporary storage area and a vacuum truck shall be called to site immediately so that the discharge of stormwater from site is eliminated. If such water is to be removed off-site it may be necessary to test the water to identify an appropriate disposal site.

4.3.5 Groundwater

A groundwater assessment was not completed as part of previous investigations at the site (refer Section 2.2. Based on observations during the geotechnical investigation groundwater is likely present at a depth of between 1.1 and 2.6 m bgl.

If water (surface water or groundwater) needs to be removed, it shall be disposed in one of the following ways.

Discharge to Land On-site

The water may be discharged to land on-site (either directly or after interim storage on-site), provided it complies with the permitted activity standards outlined in Section E4.6.1 and E4.6.2.5 of the AUP[2]. These controls include restrictions on any changes to colour or visual clarity, odour emissions or effects on aquatic life.

Removal Offsite to an Appropriately Licensed Disposal Facility

An appropriately licensed liquid waste contractor shall be engaged to remove the water using a vacuum truck and to dispose of the water at an appropriately licensed disposal facility. It may be necessary to test the water to identify an appropriate disposal site.

[2] The Auckland Unitary Plan Operative in part - 15 November 2016, Auckland Council.

4.4 Additional Controls for Work Involving Asbestos

Based on the findings of the previous investigations carried out on the site it is currently not anticipated that soil impacted by asbestos is present, however care must be taken to identify any potential asbestos containing material (ACM) during earthworks activities. The earthworks contractor shall contact the Contaminated Land Specialist if areas of potential contamination are discovered during works.

If asbestos is identified during the ground disturbing works (e.g. if asbestos cement pipes are encountered), the Contaminated Land Specialist shall assess the appropriate level of asbestos controls to be implemented (refer Appendix 3).

5 Unanticipated Ground Conditions

Should any unanticipated contaminated material be uncovered during earthworks, works shall stop in that area and a SQEP from the Contaminated Land Specialist company shall be called out to assess the potential risk and advise on what measures should be taken to manage the soil in that area.

Typical indicators of contamination include but are not limited to:

- Buried waste (for example drums or tanks with unknown liquid).
- Odour (petroleum hydrocarbons, oil).
- Discoloured soil (black, purple, or green staining most common).
- Asbestos containing materials (ACM) as fragments visible with the naked eye.
- Uncontrolled fill material.

Examples of typical indicators of contamination have been provided in Table 4.

Table 4: Typical indicators of contamination

Uncontrolled Filling Building debris may contain asbestos or other contaminants.	
Asbestos Containing Material Intact sheets or broken into smaller pieces, may be mixed with other material.	
Separate-phase Hydrocarbons Black liquid, odours, sheen	

6 Documentation

In order to demonstrate that the requirements of this RAP have been adhered to, the documents listed in Table 5 should be forwarded to the Contaminated Land Specialist company in the timeframes stipulated.

Table 5: Contractor Documentation

Prior to Earthworks Commencing	• Written confirmation from the proposed disposal site(s) confirming that they are able to accept material from the site. • For any material that is to be imported to the site as cleanfill on the basis of direct testing, a copy of the analytical laboratory test report must be provided prior to transport.

Within Two Weeks of Ground Disturbing Works Being Completed (on site or within an area of site) or on an ongoing basis during works	• Daily site photographs showing the site entrance, the area of work, sediment control measures and any stockpiles resulting from the works.
	• **Disposal dockets** for each load of material that is removed from the site. The dockets should contain the following information:
	  ○ Date and time dispatched.
	  ○ Material description.
	  ○ The volume of material in the load.
	  ○ Haulage contractor details (name, address, contact person, contact telephone number).
	  ○ Truck and trailer registration number.
	  ○ The destination of material.
	• Documentation for **all imported fill** which shall include:
	  ○ Date and time dispatched.
	  ○ Address of source site.
	  ○ Type and proposed use of material.
	  ○ Weight and / or volume of material carried.
	  ○ Basis for treating the material as cleanfill (e.g., directly tested and confirmed to be cleanfill or directly sourced from a licensed quarry).
	• Information relating to any incidents or complaints and how these were managed.

7 Completion Reporting

A Summary of Works or Site Validation report may be requested by Council following completion of remedial works. The report shall be prepared in accordance with MfE Contaminated Land Management Guideline No. 1 (MfE, 2021) by a Contaminated Land Specialist SQEP who has monitored the remedial works. The report shall, as a minimum, include the following information:

- Summary of remedial earthworks and information relating to discovery of additional contamination, or site observations.
- Summary of the location and dimensions of the excavations carried out and the volume of soil excavated.
- Documentation relating to the disposal of controlled soil / fill.
- Documentation relating to the importation of cleanfill (if relevant).

8 Limitations

i. We have prepared this report in accordance with the brief as provided. This report has been prepared for the use of our client, Cabra Developments Limited, their professional advisers and the relevant Territorial Authorities in relation to the specified project brief described in this report. No liability is accepted for the use of any part of the report for any other purpose or by any other person or entity.

ii. The recommendations in this report are based on the ground conditions indicated from published sources, site assessments and subsurface investigations described in this report based on accepted normal methods of site investigations. Only a limited amount of information has been collected to meet the specific financial and technical requirements of the client's brief and this report does not purport to completely describe all the site characteristics and properties. The nature and continuity of the ground between test locations has been inferred using experience and judgement and it should be appreciated that actual conditions could vary from the assumed model.

iii. Subsurface conditions relevant to construction works should be assessed by contractors who can make their own interpretation of the factual data provided. They should perform any additional tests as necessary for their own purposes.

iv. This Limitation should be read in conjunction with the Engineering NZ/ACENZ Standard Terms of Engagement.

v. This report is not to be reproduced either wholly or in part without our prior written permission.

We trust that this information meets your current requirements. Please do not hesitate to contact the undersigned on (09) 972 2205 if you require any further information.

Report prepared by

Claire Davies, CEnvP

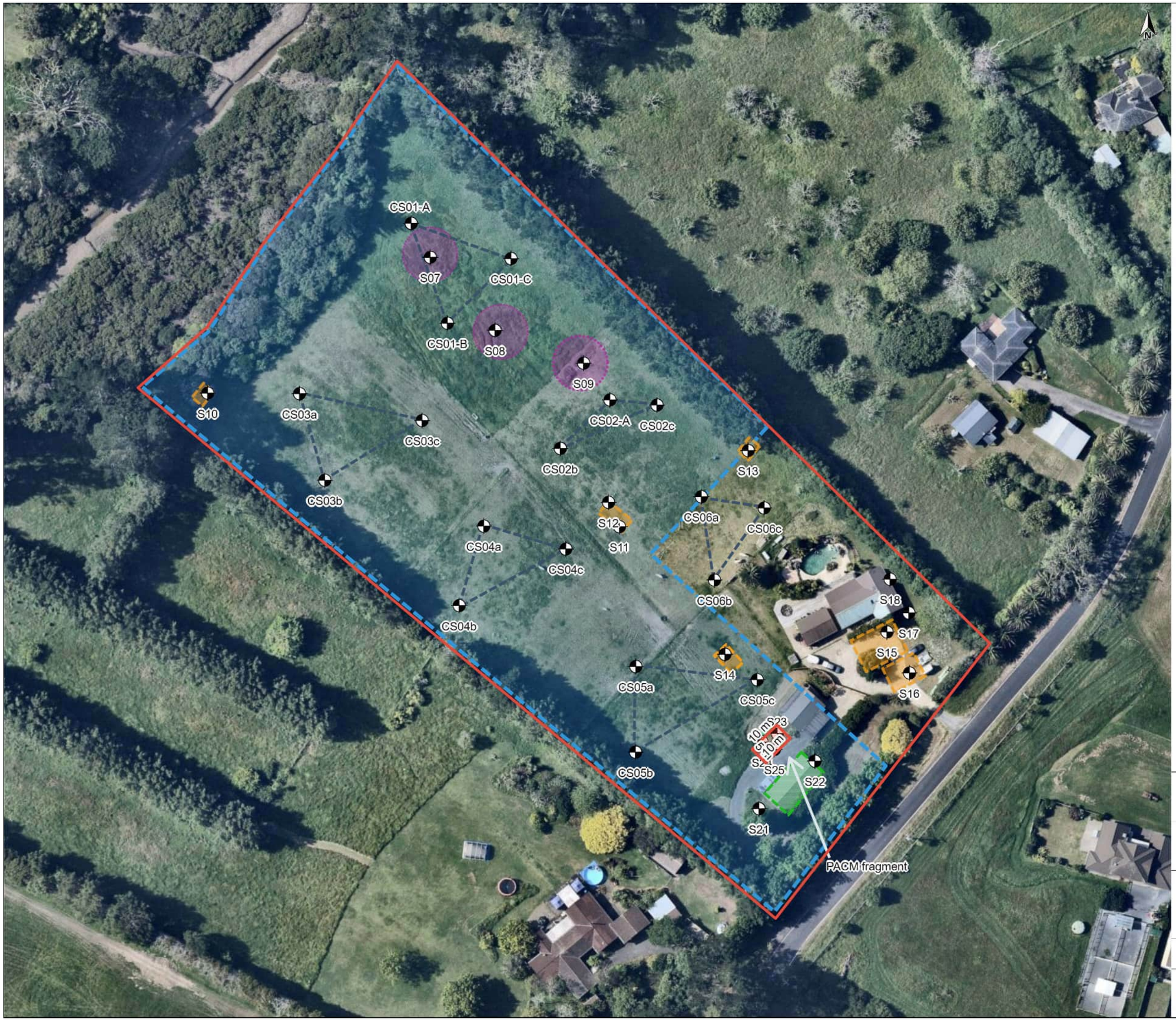
Associate Environmental Consultant

Report reviewed by

Lotta Liddell, CEng CEnv MICE

Senior Environmental Engineer

FIGURES



Legend

- Site Boundary
- Remedial Area
- Investigation Location
- Approximate location of previous 'hot spot' (Environmental and Earth Sciences Limited)
- Existing building constructed prior to 2000 (Potential HAIL I / E1)
- Footprint of former building (Potential HAIL I / E1)
- Approx. extent of potential burn pile (Potential HAIL I)
- Former horticultural area (HAIL A10)

0 10 m 20 m

ENGEO

Produced by **Datanest.earth**

Title: Environmental Investigation Location Plan		
Client: Cabra Developments Limited		Size: A3
Project: 14 Sinton Road, Hobsonville	Drawn: CD	Figure No.: 1
Date: 08-01-2024	Checked: LL	
Proj No: 23849.000.005	Scale: 1:1000	Version: 1.0

Legend

Site Boundary

Remedial Area

Note: non-shaded area likely complies with the Auckland Council definition of cleanfill material.

0 1 m 2 m

ENGEO

Produced by **Datanest.earth**

Title: Soil Management Areas		
Client: Cabra Developments Limited		Size: A3
Project: 14 Sinton Road, Hobsonville	Drawn: CD	Figure No.: 2
Date: 09-01-2024	Checked: LL	
Proj No: 23849.000.005	Scale: 1:100	Version: 1.0

APPENDIX 1:

Soil Results

Table A: Comparison of Soil Results to Assessment Criteria

				Heavy Metals/Metalloids								Polycyclic Aromatic Hydrocarbons	Organichlorine Pesticides		Asbestos
Sample ID	Sample Depth (m bgl)	Material Type	Date	Arsenic	Cadmium	Chromium	Copper	Laad	Mercury	Nickel	Zinc		All other Organochlorine Pesticides	Total DDT	
Composite of CS01A-CS01C	0.0 - 0.2	Topsoil - dark brown clayey silt with occasional orange / brown streaks / mottling	11-Dec-23	3	0.14	12	21	18.8	0.17	5	22	-	<LOR	<LOR	-
Composite of CS02A-CS02C	0.0 - 0.2 / 0.3	Topsoil - dark brown clayey silt with occasional orange / brown streaks / mottling	11-Dec-23	< 2	0.12	7	14	9.8	0.12	2	13	-	<LOR	<LOR	-
Composite of CS03A-CS03C	0.0 - 0.2	Topsoil - dark brown / grey clayey silt with occasional orange / brown streaks / mottling	11-Dec-23	3	0.18	11	28	19	0.21	4	21	-	<LOR	<LOR	-
Composite of CS04A-CS04C	0.0 - 0.2	Topsoil - dark brown clayey silt with occasional orange / brown streaks / mottling	11-Dec-23	3	0.12	9	16	11.8	0.15	4	30	-	<LOR	<LOR	-
Composite of CS05A-CS05C	0.0 - 0.2	Topsoil - dark brown clayey silt with occasional orange / brown streaks / mottling	11-Dec-23	< 2	< 0.10	5	7	5.2	< 0.10	2	8	-	<LOR	<LOR	-
Composite of CS06A-CS06C	0.0 - 0.2	Topsoil - dark brown clayey silt with occasional black / brown streaks / mottling	11-Dec-23	< 2	0.12	6	6	7.8	< 0.10	< 2	12	-	<LOR	<LOR	-
S07	0.0 -0.2	Topsoil - dark brown clayey silt with minor black streaks.	11-Dec-23	5	0.13	15	18	24	0.18	7	27	<LOR	<LOR	<LOR	-
S08	0.0 -0.2	Topsoil - dark brown clayey silt with orange-brown streaks	11-Dec-23	5	0.15	18	22	27	0.22	10	35	<LOR	<LOR	<LOR	-
S09	0.0 - 0.2	Topsoil - dark brown clayey silt	11-Dec-23	3	0.2	13	24	17.8	0.15	6	24	<LOR	<LOR	<LOR	-
S10	0.0 - 0.2	Topsoil - dark brown clayey silt	11-Dec-23	6	0.1	8	17	39	< 0.10	< 2	28	-	-	-	Asbestos not detected
S11	0.0 - 0.2	Topsoil - dark brown clayey silt with minor sand	11-Dec-23	4	< 0.10	8	5	14.2	< 0.10	5	43	<LOR	<LOR	<LOR	Asbestos not detected
S12	0.0 - 0.2	Topsoil - dark brown clayey silt with minor sand and orange mottling	11-Dec-23	2	< 0.10	7	4	7.4	< 0.10	3	55	<LOR	<LOR	<LOR	Asbestos not detected
S13	0.0 - 0.3	Topsoil - dark brown clayey silt with minor sand and red/ black mottling	11-Dec-23	7	< 0.10	12	7	12	0.14	3	25	-	-	-	Asbestos not detected
	0.3 - 0.5	Native - greyish brown silty clay with minor orange mottling	11-Dec-23	2	< 0.10	6	5	10.8	0.15	3	36	-	-	-	Asbestos not detected
S14	0.0 - 0.2	Topsoil - dark brown clayey silt with minor sand and dark brown / orange mottling	11-Dec-23	< 2	0.17	5	13	15.4	< 0.10	< 2	35	-	-	-	Asbestos not detected
	0.3 - 0.5	Native - light brown clayey silt with minor orange streaks	11-Dec-23	< 2	< 0.10	5	6	11.3	0.17	< 2	18	-	-	-	Asbestos not detected
S15	0.0 - 0.3	Topsoil - dark brown clayey silt with minor sand and red brown mottling	11-Dec-23	< 2	0.11	7	9	12.8	< 0.10	4	23	-	-	-	Asbestos not detected
	0.4 - 0.6	Native - light brown clayey silt with minor orange streaks	11-Dec-23	< 2	< 0.10	4	< 2	5.6	0.11	2	5	-	-	-	Asbestos not detected
S16	0.0 - 0.3	Fill - dark brown grey silty clay intermixed with sandy silt, with reddish-brown and orange brown streaks	11-Dec-23	< 2	< 0.10	7	5	16.8	< 0.10	2	14	<LOR	-	-	Asbestos not detected
S17	0.0 - 0.2	Topsoil - dark brown clayey silt with minor orange streaks	11-Dec-23	4	0.17	8	6	15.4	< 0.10	< 2	55	-	-	-	Asbestos not detected
S18	0.0 - 0.2	Topsoil - dark brown clayey silt with orange streaks	11-Dec-23	< 2	< 0.10	4	2	5.8	< 0.10	< 2	13	-	-	-	Asbestos not detected
S21	0.0 - 0.2	Topsoil: dark brown clayey silt with black and reddish brown mottling	11-Dec-23	3	< 0.10	4	4	8.7	< 0.10	3	48	<LOR	<LOR	<LOR	Asbestos not detected
S22	0.0 - 0.2	Topsoil - dark brown clayey silt with fine sand and black and reddish brown mottling	11-Dec-23	3	< 0.10	9	14	8.5	< 0.10	17	58	<LOR	<LOR	<LOR	Asbestos not detected
S23	0.0 - 0.1	Topsoil - dark brown clayey silt with fine to medium sand	24-Jan-24	4	0.1	9	15	6.8	< 0.10	3	23	-	<LOR	**26**	-
S24	0.0 - 0.1	Topsoil - dark brown clayey silt with fine to medium sand	24-Jan-24	2	0.12	5	13	7.9	< 0.10	2	17	-	<LOR	<LOR	-
S25	0.0 - 0.1	Topsoil - dark brown clayey silt with fine to medium sand	24-Jan-24	3	< 0.10	6	12	5.6	< 0.10	2	10	-	< LOR	<LOR[8]	-
Assessment Criteria:															
Human Health Criteria (High-density Residential) [1]				45	230 [4]	1500 [5]	10000	500	1000	1200 [6]	60000 [6]	various	various	240	various [7]
Human Health Criteria (Residential) [1]				20	3 [4]	460 [5]	> 10,000	210	310	400 [6]	7,400 [6]	various	various	70	various [7]
Environmental Criteria (Auckland Unitary Plan) [2]				100	7.5	400	325	250	0.75	105	400	various	various	12	-
Background Criteria (Auckland - Non-Volcanic) [3]				**0.4 - 12**	**< 0.1 - 0.65**	**2 - 55**	**1 - 45**	**< 5 - 65**	**<0.03 - 0.45**	**0.9 - 35**	**9 - 180**	**< LOR**	**< LOR**	**< LOR**	**< LOR**

Notes:
All results and criteria are presented in mg/kg dry weight basis, except asbestos which is reported as %w/w
Full results are included in the laboratory reports
LOR: Limit of Reporting; Results below LOR or background are shown in grey text
- : not analysed

1: MfE (2011) Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health (Standard and High-density Residential Land Use), or selected in accordance with CLMG No. 2
2: Environmental discharge criteria selected in accordance with Section E30.6.1.4 of the Auckland Unitary Plan (Auckland Council, 2016).
3: Background Ranges of Trace Elements in Auckland Soils (Non-Volcanic Range). Table E30.6.1.4.2 of the AUP (Auckland Council, 2016).
4. Assumes soil pH of 5.
5. Criteria for Chromium VI were conservatively selected.
6. National Environment Protection (Assessment of Site Contamination) Measure (NEPM). Residential A and B criteria listed.
7. New Zealand Guidelines for the Assessment and Management of Asbestos in Soil (BRANZ, 2017).
8. Whist the Total DDT isomers recorded were below the LOR, it should be noted that a detectable concentration of DDD and DDT were recorded.

APPENDIX 2:

Site Controls

Site Controls Relating to Contamination

14 Sinton Road, Hobsonville

SITE SUMMARY

Proposed works	An isolated area of the site requires remediation due to elevated OCPs.
Contaminants identified on-site	Concentration of copper and OCPs which exceed regional background concentrations.
Potential Risks to Site Workers	Incidental skin contact, ingestion of soil, or inhalation of dust should be avoided / mitigated through use of PPE and welfare measures.

KEY CONTACTS

Auckland Council Pollution Hotline	(09) 377 3107
WorkSafe	0800 030 040
Contaminated Land Specialist (ENGEO)	(09) 972 2205

HEALTH & SAFETY

All contractors and visitor shall be **inducted** before entering or commencing work to ensure they are **aware of the potential hazards** relating to contaminated soil at the site.

As a minimum, facilities to wash and dry hands prior to eating, drinking or vaping / smoking should be provided.

PPE / RPE *to minimise the effects of potential contamination exposure.* Standard PPE requirements for construction sites (e.g., work gloves and safety boots) are considered appropriate. Additional PPE (P2 Dust Masks) should be made available to workers if requested.

DAILY SITE CHECK *(take photographs to record check)*

- ☐ **Security fencing** and appropriate **warning signs** are in place.
- ☐ **Sediment control measures** in good condition and working as designed.
- ☐ Check site entrance and adjacent public road for silt / sediment deposition.
- ☐ Check integrity of stockpile controls (if applicable).
- ☐ Check excavations to see if **perched groundwater or surface water** requires removal. Approval from local authority is required to discharge to local network – refer to RAP.

REMEDIAL AREA *Remediation of soils in accordance with the RAP is required due to exceedance of assessment criteria.*

- ☐ Likely limited to topsoil (maximum depth encountered was 0.3 m bgl).

GENERAL SITE CONTROLS

- ☐ Dust shall be managed in accordance with consent requirements and relevant regulations.
- ☐ If excavated material is **odorous**, odour control measures shall be put in place.
- ☐ If **perched groundwater or surface water** is encountered the controls in the RAP shall be implemented.
- ☐ If **temporary stockpiling of non-cleanfill material** is necessary, dust shall be controlled through wetting during the workday. If left overnight, the material shall be covered (e.g., with plastic) and protected by erosion / sediment controls (e.g., bunded).
- ☐ Stockpiles of non-cleanfill material shall be located either on an impermeable surface, or the underlying material should be considered potentially contaminated, and shall be managed in accordance with the RAP.
- ☐ Clean and dirty areas should be managed to prevent tracking potentially impacted soils around the site and off-site.
- ☐ Any wastewater generated, or rock / soil utilised in a truck loading area should be disposed of as contaminated material, unless tested.

RECORD KEEPING

- ☐ Daily photographs to be made available on request.
- ☐ Disposal dockets for all material should be forwarded to the Contaminated Land Specialist.
- ☐ Fill imported to site shall meet the Auckland Council definition of cleanfill.

OFF-SITE DISPOSAL OF CONTAMINATED SOIL

- ☐ Trucks shall be loaded in a location within the site where runoff and possible spills during loading will be controlled and contained. Loads must be securely covered during off-site transport. Soil must be taken to an appropriate soil disposal facility authorised to accept the contaminants identified.
- ☐ Prior to acceptance the results of the soil testing may be requested by the receiving facility.
- ☐ Requirements for additional testing and truck lining / soil wrapping should be confirmed with the receiving landfill.
- ☐ Further testing may be required to assess whether deeper material is cleanfill / managed fill.

UNEXPECTED DISCOVERY

Works shall temporarily stop, and the Contaminated Land Specialist contacted should any areas of potential contamination be discovered during works. Typical indicators of contamination are asbestos containing material, staining, odorous material, visible sheen on water.

ENGEO

For details of the controls refer to the current site-specific RAP prepared by ENGEO. All site staff and subcontractors are aware of and comply with the procedures and health and safety requirements contained within this document.

APPENDIX 3:

Asbestos Controls

14 Sinton Road, Hobsonville
Asbestos Controls

Scenario (NZ GAMAS 2017 definitions)	Control Measure Objectives	Unlicensed Asbestos Work	Asbestos-related Work	Class B: non-friable	Class A: friable	*Source Guideline Reference*
FA/AF % w/w in soil		≤ 0.001	> 0.001	> 0.01	> 1	
ACM % w/w		≤ 0.01%	> 0.01	> 1	-	
Scale, soil volume		≤ NESCS	> NESCS	-	-	
Asbestos in air		< 0.01 f/mL in air	< 0.01 f/mL in air	≥ 0.01 f/mL in air	≥ 0.01 f/mL in air	
REMOVAL WORKS RESPONSIBILITIES						
Remedial Works Supervision / Oversight	OBJECTIVE: *Undertake work by persons who have adequate knowledge and experience to assess the risks and implement appropriate control measures*	A Suitably Qualified and Experienced Practitioner (Contaminated Land – refer to NESCS)		Class B Supervisor	Class A Supervisor	*ACOP*
WorkSafe Notification		Not required		Notification five days before earthworks are to be undertaken		*ACOP*
Contractor License Requirements		Not required		Class B License	Class A License	*ACOP*
Training/Certification Requirements		Non-certified training in asbestos identification, safe handling and suitable controls. A copy of the training shall be kept on record.		Certified training for workers. Certified, competent supervisors.	Certified training for workers. Certified, competent supervisors. Certified safety management system.	*Figure 17 ACOP*
SITE SET-UP						
Boundary Controls	OBJECTIVE: *Prevent unauthorised access into works areas and accidental transport of contaminated soils on boots, clothing, equipment, skin, or in air / dust.*	Physical barriers must be in place to prevent unauthorised access.	Physical barriers must be in place to prevent unauthorised access. Warning signs must be present that clearly show that asbestos related works are underway.	Physical barriers must be in place to prevent unauthorised access. Polythene sheeting may be necessary to prevent spread of airborne fibres outside of works area. Warning signs must be present that clearly show that asbestos removal works are underway.	Physical barriers must be in place to prevent unauthorised access. Consider use of solid hoarding placed at a suitable distance beyond the works area, or full enclosure. Warning signs must be present that clearly show that asbestos removal works are underway.	*ACOP*
Personal Decontamination Facilities		Educate site workers to minimise contact with soil. Provide a boot wash and lidded and plastic lined bin for secure disposal of used PPE.	Basic disposable decontamination tent and boot wash.		Basic disposable wet decontamination tent or trailer.	*NZ GAMAS Table 6*
Dust / Asbestos Fibre Suppression	OBJECTIVE: *Minimise the release of asbestos fibres from soils.*	Minimise the size of the earthworks areas and time exposed to the elements. Stabilise exposed earth surfaces as soon as possible following works.				
		Spray mist water via localised points. Consider use of surfactants or polymers where a reliable source of water is not available. Consider implementing additional controls (as per Class B works) if sensitive receptors nearby (such as adjacent to busy centres, schools).		Spray mist water via localised points. Addition of surfactants and polymers where the location is sensitive (such as adjacent to busy centres, schools) or if a source of water is not readily available. Consider temporary cover of contaminated areas awaiting remediation.		*NZ GAMAS Table 6*

14 Sinton Road, Hobsonville
Asbestos Controls

Scenario (NZ GAMAS 2017 definitions)		Control Measure Objectives	Unlicensed Asbestos Work	Asbestos-related Work	Class B: non-friable	Class A: friable	*Source Guideline Reference*
FA/AF % w/w in soil			≤ 0.001	> 0.001	> 0.01	> 1	
ACM % w/w			≤ 0.01%	> 0.01	> 1	-	
Scale, soil volume			≤ NESCS	> NESCS	-	-	
Asbestos in air			< 0.01 f/mL in air	< 0.01 f/mL in air	≥ 0.01 f/mL in air	≥ 0.01 f/mL in air	
OCCUPATIONAL HEALTH AND SAFETY							
Personal Protective Equipment & Respiratory Protective Equipment		OBJECTIVE: *Minimise workers exposure to asbestos fibres.* *Reduce accidental transport of asbestos contaminated soils off site on workers clothing, boots.*	Educate site workers to minimise contact with soil; to clean equipment and to undertake activities in a manner that reduces dust. Disposable P2 dust mask recommended.	Disposable coveralls rated type 5, category 3, nitrile gloves Steel toe capped gumboots are preferred as these can be readily washed down. Disposable overshoes can be used to prevent contamination of laces.	Half-face P3 respirator with particulate filter. Consider increasing to full-face if friable ACM present.	Full-face P3 respirator with particulate filter. Consider increasing to power-assisted if required.	*NZ GAMAS Table 6* *NZ GAMAS Table 6* *Refer to Part C section 14 of the ACOP and AS/NZS 1715:2009 for more information*
Contractor Health Monitoring		OBJECTIVE: *Mitigate risks to workers from the potentially harmful effects of asbestos through the workplace.*	The contractor must ensure that worker health monitoring is undertaken in accordance with the Asbestos Regulations Clause 15 and 16.		In accordance with the Asbestos Regulations Clause 15 and 16, a PCBU must ensure that health monitoring is provided to workers involved in more than four weeks of Class B work in any twelve-month period. Refer ACOP Section 16	In accordance with the Asbestos Regulations Clause 15 and 16, a PCBU must ensure that health monitoring is provided to workers involved in Class A work. Refer ACOP Section 16	*ACOP* *Section 16*
MONITORING PROCEDURES							
Air Monitoring	**Responsibility**	OBJECTIVE: *Provide a clear expectation of who is responsible for undertaking monitoring, and that the person has the appropriate skills and knowledge to do so.* *To provide verification that works have been safely undertaken.* *To provide early warning of potentially harmful levels of exposure.* *To identify when asbestos is present in air at a concentration that presents an*	SQEP / Competent Person		Independent Licensed Asbestos Assessor OR Independent Competent Person as defined within Section 30.4 of the ACOP	Independent Licensed Asbestos Assessor	*Section 30.4 of the ACOP*
	Requirement		Air monitoring is not required for Unlicensed Asbestos works, or Asbestos Related works (as defined under the NZ GAMAS) however it is recommended where possible to provide assurances regarding cross contamination and protection of workers.		If the SQEP or competent person considers that the trace level of 0.01 f/ml may be exceeded, then air monitoring must be undertaken.	Air monitoring must be conducted before and during Class A asbestos removal work.	*NZ GAMAS Section 5.5*

14 Sinton Road, Hobsonville
Asbestos Controls

Scenario (NZ GAMAS 2017 definitions)		Control Measure Objectives	Unlicensed Asbestos Work	Asbestos-related Work	Class B: non-friable	Class A: friable	*Source Guideline Reference*
FA/AF % w/w in soil			≤ 0.001	> 0.001	> 0.01	> 1	
ACM % w/w			≤ 0.01%	> 0.01	> 1	-	
Scale, soil volume			≤ NESCS	> NESCS	-	-	
Asbestos in air			< 0.01 f/mL in air	< 0.01 f/mL in air	≥ 0.01 f/mL in air	≥ 0.01 f/mL in air	
	Compliance	*unacceptable risk to site workers and surrounding receptors.* *Undertake works by persons who have been trained to manage the risks associated with asbestos.* *Implement additional control measures when necessary.*	If the concentration exceeds 0.01 f/ml then works are Class B or Class A works under the NZ GAMAS definition.		All results shall be below 0.01 fibres / ml. < 0.01 f/ml – continue with works > 0.01 f/ml – investigate the cause and implement additional controls > 0.02 f/ml – stop works and investigate, notify WorkSafe >0.1 f/ml – Remedial works required. PCBUs with management or control of workplace are to ensure that exposure of a person at the workplace to airborne asbestos is eliminated so far as is reasonably practicable.		*Section 30 of the ACOP*
SITE CONTROLS							
Vehicle Decontamination	**Vehicle assessment before demobilisation from site**	OBJECTIVE: *Minimise the potential for accidental transport of contaminated soils or asbestos fibres out of the works areas on, or in vehicles.*	Minimise vehicle transport onto site areas containing asbestos soils, or in locations where asbestos fibres may be present in air. Visual assessment.		Visual (plus swab samples if friable ACM is elsewhere on-site – lagging, insulation, etc).	Visual plus swab samples, air sampling should be undertaken inside the cab.	*NZ GAMAS Table 7*
	Vehicle assessment completed by		Competent person or SQEP.		Independent licensed assessor or independent competent person (meeting the requirements of regulation 41(3) under the Asbestos Regulations).	Independent licensed assessor.	*NZ GAMAS Table 7*
	Truck/excavator air conditioning	OBJECTIVE: *To prevent the contamination of internal spaces of equipment where people work.* *To avoid worker exposure to asbestos fibres.*	Standard air conditioning.		HEPA filter system fitted for all occupied vehicles where friable ACM on-site.	HEPA filter system fitted for all occupied vehicles, filter replaced or clean down with HEPA vacuum cleaner post work.	*NZ GAMAS Table 7*
MANAGEMENT OF CONTAMINATED MATERIAL							
Stockpiles of impacted soils		OBJECTIVE: *To minimise the release of asbestos fibres into air.*	Stockpiles should be avoided where possible to ensure that exposed areas of soil are minimised. All temporary stockpiled asbestos contaminated material which is created and not proposed to be immediately moved should be covered. Stockpiles shall be located on an impermeable surface within an area protected by erosion and sediment controls. Consider covering stockpiles with polythene.				*NZ GAMAS Section 6.6*

14 Sinton Road, Hobsonville
Asbestos Controls

Scenario (NZ GAMAS 2017 definitions)	Control Measure Objectives	Unlicensed Asbestos Work	Asbestos-related Work	Class B: non-friable	Class A: friable	*Source Guideline Reference*
FA/AF % w/w in soil		≤ 0.001	> 0.001	> 0.01	> 1	
ACM % w/w		≤ 0.01%	> 0.01	> 1	-	
Scale, soil volume		≤ NESCS	> NESCS	-	-	
Asbestos in air		< 0.01 f/mL in air	< 0.01 f/mL in air	≥ 0.01 f/mL in air	≥ 0.01 f/mL in air	
Used PPE	*Asbestos contaminated material is to be appropriately transported and disposed in a location where the material presents no unacceptable human health risk.* *To track the movement of contaminated materials.*	All disposable PPE used during remediation of asbestos impacted soil should be placed in a 200 micron HDPE plastic bag within the decontamination area. The bag should be taped closed (in a goose neck fashion) after each item is added and kept damp via the addition of water. Once full, the bag should be double bagged (200 micron HDPE) and labelled “Asbestos hazard – wear respirator and protective clothing while handling contents”.				*NZ GAMAS Section 6.6*
Contaminated Soil		The location of any soils retained on-site shall be recorded on as built drawings. The receiving facility should be contacted in advance of the soil disposal to verify the requirements for receiving the wastes. Trucks shall have their loads securely covered during off-site transport of material. Waste manifests should be completed and retained for all off-site disposal of soils. Site records shall be cross checked against receipts of soil disposal from the receiving facility. The bins / skips or trucks shall be loaded within the site where runoff and possible spills during loading will be controlled and contained.				*NZ GAMAS Section 6.6*
		Special waste bins / skips or trucks, approved for the transport of ACM to the appointed licensed landfill facility shall be placed on-site. The bins / skips or trucks will be lined / wrapped in accordance with requirements of receiving facility. It is recommended that any soil which contains asbestos in concentrations >0.001% w/w is considered hazardous and the controls stated in the Land Transport Rules adopted. For asbestos soil waste in significant quantities, hazard label signage should be displayed on the vehicles transporting the soil for disposal.	Special waste bins / skips or trucks, approved for the transport of ACM to the appointed licensed landfill facility shall be placed on-site. The bins / skips or trucks will be lined with 200 micron sealed plastic. It is recommended that any soil which contains asbestos in concentrations >0.001% w/w is considered hazardous and the controls stated in the Land Transport Rules adopted. For asbestos soil waste in significant quantities, hazard label signage should be displayed on the vehicles transporting the soil for disposal.		
Contaminated Water		Water used for cleaning asbestos-contaminated equipment (including vehicles) shall be placed into a drum or skip and disposed of at an appropriately licensed facility. If excessive water is applied, ponding or runoff may occur which could permit the transport and accumulation of asbestos fines outside of the site. Water from the work area should be retained inside the boundary of the site and wash water directed back into excavations and the site.				*NZ GAMAS Section 6.6*

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Project Number 23849.000.003

Preliminary and Detailed Environmental Site Investigation

16 Sinton Road, Hobsonville, Auckland

Submitted to:
Cabra Developments Limited
Unit 9B, 30 Foundry Road
Silverdale
Auckland 0932

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Appendices

ENGEO Document Control:

Report Title	Preliminary and Detailed Environmental Site Investigation - 16 Sinton Road, Hobsonville			
Project No.	23849.000.003	**Doc ID**	01	
Client	Cabra Developments Limited	**Client Contact**	Duncan Unsworth	
Distribution (PDF)	Duncan Unsworth, Cabra Developments Limited			
Date	**Revision Details / Status**	**Author**	**Reviewer**	**WP**
27/10/2023	Issued to Client	CD	JR	JT

SQEP Certifying Statement

I certify that the site has been assessed in accordance with current New Zealand Regulations and guidance documents and that this report has been prepared in general accordance with the Ministry for the Environment's Contaminated Land Management Guidelines No. 1: Reporting on Contaminated Sites in New Zealand, 2021.

I am considered by ENGEO Limited to be a suitably qualified and experienced practitioner (SQEP) able to certify reports pursuant to the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011, based on the company's definition of a SQEP as given below.

Report Reviewer

27 October 2023

(Date)

ENGEO Limited requires that a SQEP has the following Qualifications / Experience:

- *Tertiary science or engineering qualification relevant to environmental assessment.*
- *A minimum of 10 years of relevant experience.*
- *Registration with a professional body that assess and certifies environmental professionals in the competency criteria of training, experience, professional conduct and ethical behaviour.*

1 Introduction

ENGEO Ltd was requested by Cabra Developments Limited to undertake an environmental investigation of the property at 16 Sinton Road, Hobsonville, Auckland (herein referred to as 'the site'; shown in attached Figure 1). This work has been carried out in accordance with the signed agreement dated 2 August 2023.

We have been provided with a draft masterplan for the property which indicates that redevelopment comprises demolition of the existing buildings to allow construction of a residential subdivision. The purpose of this assessment is to support a resource consent application for the proposed redevelopment of the site.

This environmental investigation has been undertaken to satisfy the requirements of the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (the "NESCS"). This investigation provides information regarding the presence of land contaminants that may pose a risk to future site users and site redevelopment workers. The results of this investigation have been used to evaluate whether remediation is necessary prior to site redevelopment, and to assess the requirement for Resource Consent under the NESCS.

This investigation also addresses the requirements of regional regulations covering discharges to the environment from contaminated sites during and post-redevelopment works; namely, the Auckland Unitary Plan (AUP; Auckland Council, 2016).

This investigation was undertaken in general accordance with the Ministry for the Environment (MfE) Contaminated Land Management Guidelines (CLMG) No. 1: Reporting on Contaminated Sites in New Zealand (MfE, 2021a) and CLMG No 5: Site Investigation and Analysis of Soils (MfE, 2021b). The investigation was supervised, and the report reviewed and approved by a suitably qualified and experienced contaminated land practitioner in accordance with national environmental regulations for soil contamination. A geotechnical assessment at the site is occurring concurrently (ENGEO, 2023).

1.1 Objectives of the Assessment

The objective of the preliminary site investigation (PSI) was to gather information relating to the current and historical potentially contaminating activities at the site. The works comprised review of historical site information and review / assessment of information gathered during the site walkover undertaken on 16 August 2023.

This intrusive investigation (Detailed Site Investigation; DSI) was undertaken to assess:

- The type, extent and concentration of contaminants of potential concern identified during the desktop assessment (PSI).
- Whether the identified contaminants of concern pose a potential unacceptable risk to human health or identified environmental receptors and soil is suitable to remain on-site.

Note: Whilst this investigation provides an assessment of the site under contaminated land regulations (i.e., the NESCS and the AUP), the results can be used for disposal characterisation purposes. However, additional testing may be required or recommended to fully inform disposal options for excess site material.

2 Site Information

Site information is summarised in Table 1.

Table 1: Site Information

Item	Description
Legal Description	LOT 9 DP 57408
Current Land Use	Rural residential
Proposed Land Use	Residential
Site Area	Approximately 2.9 hectares
Territorial Authority	Auckland Council
Zoning (AUP)	Future Urban Zone
Geology	The site is mapped by GNS Science (GNS, 2001) as being underlain by Puketoka Formation alluvium in the southern portion of the site, comprising pumiceous mud, sand, and gravel with lenses of muddy peat and lignite. The northern portion of the site is mapped as being underlain by East Coast Bays Formation, comprising alternating sandstone and mudstone with variable volcanic content.
Topography	The site falls from Sinton Road in the east down to the north-western boundary in the northeast as a gentle slope of approximately three degrees. Minor changes in elevation can be noted along the alignment of the overland flow paths throughout the site.
Hydrology	Overland flow paths are mapped in Auckland Council GeoMaps as flowing northwest into the Waiarohia Inlet, a tributary of the Waitemata Harbour. A drainage channel in the eastern corner of the site, runs along the northern boundary, discharging water from the road to the sea.
Hydrogeology	A groundwater assessment was not completed as part of this investigation; however, during the geotechnical investigation standing water was encountered at variable depth, between 1.2 metres and 4.8 metres below ground level (m bgl). Based on the topography of the site, the mapped overland flow path and the nearest watercourse, shallow groundwater likely flows in a west to northwest direction.

3 Site History

ENGEO reviewed aerial photographs, property file documentation and Auckland Council's response to a contamination enquiry. Relevant information obtained during this review is summarised below.

3.1 Aerial Photographs

Aerial photographs dating from 1940 to 2023 have been reviewed (refer to Appendix 1). The aerial photographs were sourced from Auckland Council GeoMaps, Retrolens and Nearmaps. Relevant visible features on the site and surrounding area are summarised in Table 2.

Table 2: Aerial Photograph Summary

Date	Description
1940	The site and surrounding area comprise agricultural land; the site itself appears to be used for grazing. The northwest end of the site is vegetated and forms the edge of the Waiarohia Inlet. A darker area in the eastern corner of the site may represent a change in elevation.
1950	With the exception of a small area of bare ground in the eastern corner of the site, no significant changes to the site or surrounding area are noted.
1959	Some of the vegetation at the northwest end of the site has been cleared. A drainage channel appears to be located along the darker area previously observed in the eastern corner of the site. No significant changes to the surrounding area are observed.
1963	No significant changes to the site are observed. Horticultural activity is observed on land on the opposite side of the inlet.
1968	Image quality is too poor to assess details, however the site appears to have been separated into paddocks, and vegetation is brighter. Neighbouring land to the north has an area which has been separated into smaller plots which may represent cropping.
1972	The site and surrounding area comprise agricultural land (appears to be used for grazing). The potential crops observed previously are not identified.
1975	A building has been constructed at the southeast end of the site, more or less in the same position as the existing dwelling (but smaller in size). A brighter area in the northern corner may represent bare ground. Buildings (likely residential) have been constructed on land to the north.
1978	A small rectangular feature is observed to the northeast of the building on-site; based on the shadow is not likely to be tall enough to be a building. Three square fenced off areas are noted at the centre of the site. A line of shadow along the northwest extent indicates that land drops steeply down towards the inlet.
1988	The majority of the site is subject to horticultural activity, and areas of crop appear to be separated by shelterbelts. The building in the southeast has been extended and two additional smaller buildings constructed in the vicinity. The smaller feature to the northeast is no longer observed. Land to the north and southeast is subject to horticultural activity.

Date	Description
1996	The shelterbelts remain on-site; however, the land appears to be grassed again. Additional extension of the building in the southeast may have occurred, and potentially an additional smaller building to the northeast; however, details are not clear due to a poor-quality image. Horticultural activity on surrounding land may also have ceased.
2000	A small building has been constructed to the northeast of the main building, on the northern boundary. No significant changes are observed across the balance of the site. No significant changes to the surrounding area are observed.
2006	The main building has been extended and is more or less the size and shape currently observed. A small shed / garage has been constructed to the east of the main building. A small garden plot has been planted to the north of the building. A large building has been constructed on land to the south of the site, no other significant changes to the surrounding area are observed.
2008	The square fenced areas at the centre of the site appear to have been planted. A grassed circular feature is observed to the south of the main building. *An online real estate listing dated 2015 indicates that a putting green was present in this portion of the site.* Land to the north has been developed, or currently under construction.
2017	With the exception of the circular feature now comprising bare ground, no other significant observations are noted. No significant changes to the surrounding area are observed.
2020	The small building constructed in 2000 has been demolished, building debris is observed in the footprint. No significant changes to the surrounding area are observed.
2023	No significant changes to the site or surrounding area are observed.

3.2 Property File Review

The property file held by Auckland Council was reviewed on 16 August 2023. A summary of the information potentially relevant to this investigation is provided in Table 3.

Table 3: Property File Summary

Date	Description
2005 - 2009	Building consent and resource consent application for additions and alterations. Associated drainage plans indicate that stormwater from street discharges to the sea via a metal lined drain along the northern boundary (drain first observed in the 1959 aerial photograph).
1972	Building permit application and associated drawing depict the original dwelling.
1972 - 2023	Inspection documents and drainage plans indicate a septic tank is located to the north of the dwelling.
1979 and 1982	Building permit application for additions to the dwelling.
1980	Building permit application for an implement shed to the north of the dwelling, constructed of timber, corrugated iron and fibrolite.
1987	Building permit application to erect a conservatory.
1988 - 1989	Building permit application and drawings of a tractor shed (also referred to as an orchard machinery shelter). The permit states 'not to be used for the storage or use of dangerous goods without prior approval from Council's Dangerous Goods Surveyor'.
1990	Building permit application for a carport
1992	Building permit application for a tool shed
2004	Building permit application for additions and alterations to the existing dwelling. A letter from the architect to Waitakere City Council refers to a letter issued by Council on 16 November 2004 and a conversation relating to a possible soil contamination hazard. The architect proposes an alternative solution to a contamination report, such as retaining excess soil on-site to a pre-determined location. A drawing indicates the proposed location is in the southern corner of the site (a similar location to circular feature observed in 2008 aerial photograph).

3.3 Auckland Council Site Contamination Enquiry

The Site Contamination Enquiry response (dated 14 August 2023) prepared by Auckland Council was received and reviewed on 16 August 2023 (Appendix 2).

Auckland Council's records indicate that the site has been used for horticultural activities; as indicated in an aerial photograph dated 1988. Historical horticultural activity is included on the Hazardous Activities and Industries List (HAIL ID A10; MfE, 2011b). Auckland Council also noted that due to the age of the buildings on-site, there is also potential for these buildings to contain or have contained asbestos and / or lead-based paints.

In preparing the response, Auckland Council reviewed records within 200 m of the site for pollution incidents, bores, contaminated site and air discharges, closed landfills and identified HAIL activities. A summary of records is provided in Table 4; however, the features discussed in these records are not considered to present a significant potential risk to the proposed redevelopment activities.

Table 4: Site Contamination Enquiry Response Summary

Date	Description
-	Council's records identify 'HAIL sites' at the following addresses. No details of the nature of activities are included is in the response, however base of the aerial review (Section 0) likely relate to historical horticultural activities. • 12 and 14 Sinton Road • 20-26 and 34 Kauri Road • 174 Brigham Creek Road
1980s - 2016	• Cancelled consent to take water from a dam for industrial use at a property on Brigham Creek Road. • Consent to construct a groundwater borehole for the extraction of groundwater for irrigation of pasture and an orchard at a property on Sinton Road. • Authorisation to construct 15 groundwater wells at for geological, geotechnical and groundwater purposes. Property not identified. • Consent to discharge wastewater from a residential property at 21 Kauri Road. • Proposed wastewater discharge consent and comprehensive stormwater Discharge consent held by Watercare Services Limited and Auckland Council.

4 Current Site Conditions

The site walkover and intrusive investigation works were completed on 16 August 2023 by ENGEO environmental scientists.

Observations of conditions present at the site are summarised in Table 5. Photographs taken during the site visit are included in Appendix 3.

Table 5: Current Site Conditions

Site Conditions	Comments
Overview	The site is accessed via a private driveway directly off Sinton Road in the eastern corner of the site. A dwelling is located in the eastern portion of the site, along with a carport, toolshed and two sheds. A disused sleep out is present to the north or these buildings, on the site boundary. To the southeast of the sleep out, is a small, fenced garden and timber storage shed. The balance of the property comprises grassed paddocks, bordered by shelterbelts. A drainage channel in the eastern corner of the site, traversing the northern boundary discharges water from the road to the sea.
Surrounding Land Use	Rural residential properties are present to the north and south, similar in character to the site. The site is bound to the east by Sinton Road, and the Waiarohia Inlet to the west.

Site Conditions	Comments
Site Building(s)	The dwelling and toolshed are constructed of timber cladding with potential asbestos containing material (PACM) present in the soffits. The carport (attached to the dwelling) is constructed of timber, concrete and plasterboard soffits. The sheds situated to the southeast of the toolshed are constructed of timber cladding and plastic / polycarbonate roofing. The disused sleep out located to east of the dwelling, adjacent to the eastern property boundary comprised metal cladding and decking with soffits constructed of PACM. The small timber storage shed comprised of metal cladding and roofing. A small garden shed located to the southwest of the main dwelling had metal cladding and roofing. The buildings on-site generally appeared to be in good condition with no significant damage to paint or cracking observed.
Potential Sources of Contamination	PACM was observed on the dwelling and toolshed exterior. Weathering of, or damage to, this material may have resulted in contamination of surrounding soil. Concrete, corrugated iron, timber, glass, brick, steel wire and domestic refuse was observed on the coastal margin (Photo 11 and 12; Appendix 3). No other obvious sources of potential contamination were identified.
Potential for On - Or - Off - Site Migration of Contaminants	Whilst overland flow may form a pollution pathway towards the northwest, it is more likely that, most rainfall will infiltrate the ground due to the lack of significant hardstanding areas at the site. Contaminant transport (if relevant) would therefore more likely be into the ground and then via groundwater flow, rather than surface water flow.
Other Information of Note	The ground surface in the area to the southwest of the dwelling which may have been subject to soil disturbance was investigated using a hand auger; however, there were no indicators of potential contamination (e.g., staining, fill material, building debris etc.).
Limitations	The western site boundary is lined with trees / shrubs. Minimal access around this area may result in limitations regarding visibility of potential contamination (i.e., rubbish).

5 Potential HAIL Activities

If current or historical activities included on the Hazardous Activities and Industries List (HAIL; MfE, 2011a) are identified at a site the NESCS may apply. Based on the information reviewed as part of this environmental investigation and observations during the site walkovers, the following activities listed on the HAIL may have been historically and / or are currently present at the site:

- HAIL ID A10: *Persistent pesticide bulk storage or use including sport turfs, market gardens, orchards, glass houses or spray sheds* – The PSI indicates that parts of the site may have been subject to horticultural activity in the 1980s.
- HAIL ID E1: *Asbestos product manufacture or disposal including sites with buildings containing asbestos products known to be in a deteriorated condition* – The existing buildings were in good condition, however construction materials observed during the site walkover included PACM. Construction materials containing asbestos may result in contamination of adjacent soils during cutting of asbestos-containing building material (e.g., for service installation) and weathering of exterior building material.
- HAI ID G3: *Fill sites* – Waste material including concrete, corrugated iron, timber, glass, brick, steel wire and domestic refuse, was observed along the coastal margin. Based on the type and location of waste it is considered possible that this material may have been deposited by wind / water associated with the inlet and / or fly-tipping from the site.
- HAIL ID I: *Any other land that has been subject to the intentional or accidental release of a hazardous substance in sufficient quantity that it could be a risk to human health or the environment* – It is possible[1], that lead-based paint may have been used on buildings at the site. Contamination of surrounding soils may have occurred as a result of leaching, flaking of the paint or maintenance work (sanding) on the paint surface.

As discussed in Section 3.2, potentially contaminated soil (site derived) may have been placed in the southern portion of the site (a similar location to circular feature observed in 2008 aerial photograph). Based on the description of the material encountered during the investigation (i.e. topsoil underlain by native material), it is not considered to represent HAIL ID G3.

[1] The use of white lead in paint was banned in 1979, however some special-purpose paints may still contain red lead. WorkSafe recommends that if a building was built in the 1980s or earlier, it is best to presume that it has been painted with lead-based paint. (Guidelines for the Management of Lead-based Paint, Revised September 2013 by the Ministry of Health and the Ministry of Business, Innovation and Employment).

6 Preliminary Conceptual Site Model

A preliminary conceptual site model (CSM) has been developed to assess the potential exposure pathways present at the site. A contamination conceptual site model consists of three primary components. For a contaminant to present a risk to human health or an environmental receptor, all three components are required to be present and connected. The three components of a conceptual site model are:

- Source of contamination.
- An exposure route, where the receptor and contaminants come into contact (e.g., ingestion, inhalation, dermal contact).
- Receptor(s) that may be exposed to the contaminants.

The preliminary CSM based on the findings of the desktop investigation and observations during the walkover is summarised in Table 6.

Table 6: Preliminary Conceptual Site Model

Potential Source of Contamination	Primary Contaminants of Concern	Possible Extent of Contamination	Potential Pathway	Potential Receptor
Persistent pesticide use in historical horticultural areas *(HAIL ID: A10)*	Metals / metalloids and organochlorine pesticides (OCPs)	Shallow soil	Soil ingestion, inhalation of dust, and / or dermal contact	Current / Future site users Surrounding residents
			Leaching of contaminants into surface / shallow groundwater	Surrounding environment
Undocumented fill *(HAIL ID: G3)*	Metals / metalloids, polycyclic aromatic hydrocarbons (PAHs) and asbestos fines and fibrous asbestos	Fill material and surrounding soil	Soil ingestion, inhalation of dust, and / or dermal contact	Current / Future site users Surrounding residents
			Leaching of contaminants into surface / shallow groundwater	Surrounding environment
Building materials containing asbestos *(HAIL ID: E1)*	Asbestos fines and fibrous asbestos	Shallow soil within and adjacent to the current dwelling and toolshed	Inhalation of asbestos fibres released from impacted soils / dust	Current / Future site users Surrounding residents

Potential Source of Contamination	Primary Contaminants of Concern	Possible Extent of Contamination	Potential Pathway	Potential Receptor
Potential lead-based paint on existing buildings *(HAIL ID: I)*	Lead	Shallow soil within and adjacent to the site buildings	Soil ingestion, inhalation of dust, and / or dermal contact	Current / Future site users Surrounding residents
			Leaching of contaminants into surface / shallow groundwater	Surrounding environment

7 Intrusive Investigation

ENGEO completed an intrusive investigation at the site on 16 August 2023.

7.1 Methodology

A judgmental sampling approach was adopted to investigate potential HAIL activities at the site (as indicated in Figure 1). Based on the potential sources of contamination on-site, contamination (if present) was expected to be in shallow surface soils; therefore, the investigation comprised shallow hand augers and test pits to a maximum depth of 1.2 m bgl.

A summary of the investigation method for each area of concern is provided in Table 7. Refer to Figure 2 for investigation locations.

Table 7: Investigation Methodology

Area of Concern	Investigation Methodology	Investigation Location
Historical horticultural activity	Shallow sampling across areas subject to potential historical horticultural activity.	CS01A to CS08C[1]
Existing Buildings	Shallow sampling adjacent to the building footprint where the age of construction, or materials used in construction (i.e., PACM and / or paint) indicated the potential for contamination, and where storage of agrichemicals may have occurred.	S02 – S10
Former Building		S01
Waste material on coastal margin	Shallow sampling across areas subject to deposition	S13
Potential placement of contaminated soil in the southern portion of the site / circular feature identified during aerial review.	Shallow sampling across subject area	S11 and S12

[1] Samples collected from horticultural areas were composited by the laboratory into eight, two- and three-point composite samples. The chain of custody appended provides a summary of the samples included in the composite.

Fieldwork and sampling were undertaken in general accordance with the procedures for the appropriate handling of potentially contaminated soils as described in the MfE Contaminated Land Management Guidelines No. 5: Site Investigation and Analysis of Soils (MfE, 2021b).

The following was undertaken during the investigation:

- All soil samples were screened for visual and olfactory evidence of contamination.
- Samples were given a unique sample ID to identify the depth and location from where they were collected on-site.
- Samples were placed into laboratory-supplied sample containers using a new pair of nitrile gloves for each sample. The containers were capped, labelled with a unique identifier and placed into an insulated container and kept cool prior to transport to Eurofins New Zealand under a standard chain of custody.
- Prior to the collection of each sample, handheld equipment was decontaminated using potable water, Decon 90 solution and distilled water.

7.2 Ground Conditions

Ground conditions encountered during the intrusive investigation are summarised in Table 8. As noted previously, waste was observed on the coastal margin (i.e., concrete, corrugated iron, timber, glass, brick, steel wire and domestic refuse). No olfactory evidence of contamination was noted during the remainder of soil sampling. Table 8 also provides a summary of the soil samples collected and selected analysis suite. Refer to Figure 2 for sample locations.

Table 8: Soil Sample Summary

Investigation Location (Sample ID)	Depth of Material Type (m bgl)	Material Type	Sample Depth (m bgs)	Requested Analyses
S01, S04 – S12	0.0/0.05-0.3	Topsoil	0.0-0.3	Heavy metals / metalloids (S01, S04, S08 – S10, S12) Asbestos (semi-quantitative) (S01, S04, S08 – S10). Asbestos (presence/absence) (S12)
S02	0.0 – 0.05	Gravel, with thin layer of topsoil	-	-
S02	0.05 – 0.3	Dark brown / yellow SC* with trace gravel	0.05 – 0.3	Heavy metals / metalloids and asbestos (semi-quantitative)
S03	0.0 – 0.25	Topsoil with minor gravel	0.0 – 0.25	Heavy metals / metalloids and asbestos (semi-quantitative)
S01, S04, S07(A/B) - S12	0.25 – 0.5	Yellowish brown SC* (native)	0.25 – 0.5	Samples placed on cold hold.
S02, S03, S05, S06	@0.25/0.3	Hand auger terminated on obstruction. Assumed to be compacted gravels	-	-
S13	0.0-0.3	Intermixed brown CS, w/ waste material	0.0-0.3	Heavy metals / metalloids and asbestos (presence/absence)

Investigation Location (Sample ID)	Depth of Material Type (m bgl)	Material Type	Sample Depth (m bgs)	Requested Analyses
CS01A	0.0-0.3	Topsoil	0.1	Composited by the laboratory into a three-point composite sample (with shallow samples from CS01B and CS01C) and analysed for heavy metals / metalloids and OCPs.
	0.3 – 0.8	Brown / grey CS	0.5	Samples placed on cold hold.
	0.8 – 1.0	Light grey CS (native)	1.0	Samples placed on cold hold.
CS01B and CS01C CS02A – CS02C CS03A – CS03C CS04A – CS04C CS05A – CS05C CS06A – CS06C CS07A – CS07C CS08A – CS08C	0.0-0.3	Topsoil	0.1	Shallow samples composited by the laboratory into two- or three-point laboratory composite samples and analysed for heavy metals / metalloids and OCPs.
	0.3 – 0.6	Orange / brown/ grey CS (native)	0.4 – 0.5	Deeper samples placed on cold hold.

** Notes: SC = silty clay; CS = clayey silt.*

7.3 Assessment Criteria

Analytical results were assessed to determine consenting requirements and options for disposal of any soil which may be taken off-site.

Human Health Criteria

The following criteria were used to assess the risk to future site users:

- Development plans have not been finalised, therefore the soil contaminant standards from the Methodology for Deriving Contaminants in Soil to Protect Human Health ("the Methodology"; MfE, 2011b) for standard residential and high-density residential land use have been selected, based on the anticipated land use.
- The soil guideline values for standard residential and high-density residential land use from the New Zealand Guidelines for Assessing and Managing Asbestos in Soil (GAMAS; BRANZ, 2017).
- In accordance with Contaminated Land Management Guidelines No.2 – Hierarchy and Application in New Zealand of Environmental Guideline Values (CLMG 2; MfE, 2011c) for contaminants not listed above.

As discussed in Section 3.2.1 of the Methodology (MfE, 2011), the NESCS does not assess a maintenance or excavation worker exposure scenario as the risks to those workers is more appropriately managed under New Zealand health and safety legislation. Therefore, potential risks to contractors responsible for carrying out the earthworks and future maintenance are not further assessed.

Surrounding populations are considered to be adequately protected on the basis that the risks to earthworks contractors will be managed, and on the basis that the long-term risk to future site users is acceptable.

Environmental Criteria

In the Auckland region, potential discharges to the environment from land containing elevated levels of contaminants are managed through the AUP (AUP, 2016). Therefore, the Auckland Council permitted activity criteria referenced in this report were adopted from the AUP.

Background Criteria

To assess the results against the natural background levels (which also determines in part whether soil is suitable for disposal as cleanfill in the Auckland Region):

- Background concentrations for non-volcanic soils from Background Ranges of Trace Elements in Auckland Soils (Non-Volcanic Range). Table E30.6.1.4.2 of the AUP (AUP, 2016).
- The laboratory limit of reporting (LOR), where no natural background concentration for a given contaminant is available, or where the natural background limit is below the limit of reporting. The exception to this is asbestos where the recorded presence of asbestos below the LOR is also considered an exceedance of the natural background concentrations.

7.4 Soil Analysis Results

The soil results summary table included in Appendix 4 compares soil contaminant concentrations in the samples tested with the adopted investigation criteria. Full analytical laboratory reports are included in Appendix 5. Soil sample locations are shown in appended Figure 2.

A summary of the chemical and asbestos testing results is provided below:

- Elevated (above background) concentrations of arsenic, chromium, copper, nickel and zinc were recorded in the sample collected from soil adjacent to the shed in the eastern portion of site (labelled 'S03' in Figure 2). The concentration of arsenic in this sample exceeded the adopted human health criterion (high-density and standard residential) and hence this area of the site will require remediation. The source of the elevated concentrations is unknown, however may be associated with chromated copper arsenate (CCA) treated timber based on the combination of elevated contaminants identified (i.e., chromium, copper, and arsenic).
- Elevated (above background) concentrations of arsenic, cadmium, copper, lead and PAHs were recorded in the sample collected from soil surrounding waste material on the coastal margin (labelled 'S13' in Figure 2). The concentration of arsenic in this sample exceeded both the high-density and standard residential human health criterion. Additionally, the concentration of lead also exceeded standard residential human health criterion and environmental assessment criteria. This area of the site will require remediation. The source of the elevated concentrations is likely associated with deposited material.
- No asbestos was identified in the samples analysed.
- With the exception of the samples discussed above (S03 and S13) the results of analysis on the remaining samples recovered at the site were below regional background concentrations.

7.5 Quality Assurance and Quality Control

The quality assurance / quality control (QA / QC) procedures undertaken during the works included:

- Each soil sample was given a unique identification number.
- All samples were placed directly into a cooled container prior to transport to Eurofins laboratory under ENGEO standard chain of custody.
- Sampling equipment was decontaminated using a triple wash method (as previously stated) between each sample location.

Eurofins are accredited by International Accreditation New Zealand (IANZ) for the analyses performed. Additionally, Eurofins are accredited to AS-4964-2004: *Method for Qualitative Identification of Asbestos in Bulk Storage* for the analysis of suspected asbestos in soil samples, and to the international standards NZ ISO/IEC 17207:2018 *General requirements for the competence testing and calibration laboratories* in accordance with The Building Research Association New Zealand (BRANZ) Guidelines for Assessing and Managing Asbestos in Soil.

Our review of the laboratory QA reports indicated the following:

1. The relative percent difference (RPD) for arsenic, cadmium, chromium, lead and zinc recorded in the laboratory's duplicate sample exceeded the acceptable limits (33 - 75%, with an acceptable limit of 30%). This was attributed to sample heterogeneity.
2. The RPD for four PAHs in the laboratory's duplicate also exceeded the acceptable limits; however, the laboratory report states it passes Eurofins Environmental Testing's QC Acceptance Criteria as defined in the Internal Quality Control Review.

These findings are not expected to materially impact the conclusions of this report as all results for these contaminants are below assessment criteria.

7.5.1 Conceptual Site Model

The preliminary CSM from Section 6 has been updated based on the findings of the intrusive investigation and is summarised in Table 9.

Table 9: Conceptual Site Model

Potential Source of Contamination	Potential Pathway	Potential Receptor	Acceptable Risk?
Persistent pesticide use in horticultural areas *(HAIL ID: A10)*	Soil ingestion, inhalation of dust, and / or dermal contact	Future site users / site redevelopment workers Surrounding residents	Yes The concentration of contaminants of concern (metals / metalloids and OCPs) were below regional background criteria, human health and environmental discharge criteria.
	Leaching of contaminants	Surrounding environment	
Building materials containing asbestos *(HAIL ID: E1)*	Inhalation of asbestos fibres released from impacted soils / dust	Future site users Surrounding site users	**Yes** No asbestos was identified in the samples analysed.
Fill material *(HAIL ID: G3)*	Soil ingestion, inhalation of dust, and / or dermal contact	Future site users / site redevelopment workers Surrounding residents	No Samples collected from the soil surrounding the waste material along the coastal margin reported concentrations of relevant contaminants of concern in exceedance of human health and environmental criteria.
	Leaching of contaminants	Surrounding environment	

Potential Source of Contamination	Potential Pathway	Potential Receptor	Acceptable Risk?
Potential lead-based paint on existing buildings *(HAIL ID: I)*	Soil ingestion, inhalation of dust, and / or dermal contact	Future site users Surrounding site users	Yes No visual signs of contamination were identified in the soil, and the concentration of lead were below regional background concentrations.
	Leaching of contaminants	Surrounding environment	
Elevated concentration of arsenic and lead adjacent to the small shed *(HAIL ID: I)*	Soil ingestion, inhalation of dust, and / or dermal contact	Future site users Surrounding site users	No The concentration of arsenic and lead reported exceedance of human health and environmental criteria.
	Leaching of contaminants	Surrounding environment	

8 Regulatory Context

In Auckland, soil disturbance and change of land on sites with potentially contaminated soils are covered by two contaminated land regulations:

- Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (NESCS, 2011).
- Auckland Unitary Plan.

8.1 The NESCS

The intent of the NESCS is to protect the human health of the site's end users, the site redevelopment workers and the surrounding populations.

8.1.1 Applicability

The NESCS may apply to specific activities on sites where an activity on the HAIL (MfE, 2011a) has, or is more likely than not to have occurred. The activities to which the NESCS applies are listed in Table 10, which is based on the template provided in the Users' Guide: National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health ("the Users' Guide"; MfE, 2012). This table confirms the NESCS applies to the site.

Table 10: Applicability of NESCS

NESCS Checklist	
Is an activity described on the HAIL currently being undertaken on the piece of land to which this application applies?	Yes
Has an activity described on the HAIL ever been undertaken on the piece of land to which this application applies?	Yes
Is it more likely than not that an activity described on the HAIL is being or has been undertaken on the piece of land to which this application applies?	Yes
If 'Yes' to any of the above, then the NES for Assessing and Managing Contaminants in Soil to Protect Human Health may apply. Check the five activities to which the NES applies:	
Is the activity you propose to undertake removing or replacing a fuel storage system or parts of it?	No
Is the activity you propose to undertake sampling soil?	No
Is the activity you propose to undertake disturbing soil?	Yes
Is the activity you propose to undertake subdividing land?	Unknown
Is the activity you propose to undertake changing the use of the land?	Yes
If also 'Yes' to any of the above activities, then the NES for Assessing and Managing Contaminants in Soil to Protect Human Health is likely to apply.	

8.1.2 Consenting Requirements

ENGEO has not been provided with proposed soil disturbance or disposal volumes; however, taking into the account the area of the "piece of land", approximately 28,758 m^2), the NESCS allows 1,438 m^3 of soil to be disturbed as a Permitted Activity, and for 287 m^3 of soil to be removed for disposal per year.

If earthworks will not meet the permitted activity criteria, soil disturbance, soil disposal and changing use will be a restricted discretionary activity under Regulation 9 of the NESCS. Table 11 demonstrates compliance with the conditions for a restricted discretionary activity consent.

Table 11: NESCS Restricted Discretionary Activity Criteria

Restricted discretionary activity criteria (Regulation 10(2))	
(a) a detailed site investigation of the piece of land must exist.	Meets criterion. A DSI (this report) has been prepared for the site.
b) the report on the detailed site investigation must state that the soil contamination exceeds the applicable standard in regulation 7.	Meets criterion. The concentration of arsenic in two soil samples exceeds the relevant standard.
(c) the consent authority must have the report.	Meets criterion. We understand the DSI will be submitted to Auckland Council.
(d) conditions arising from the application of subclause (3), if there are any, must be complied with.	Meets criterion. Conditions arising out of subclause 3 (matters over which control is reserved) will be included in the resource consent for the works.

8.2 REGIONAL PLAN

8.2.1 Consenting Requirements

The AUP (AC, 2016) sets out consent requirements for managing discharges to the environment from land containing elevated concentrations of contaminants.

This investigation identified contaminant concentrations in the soils which exceed the regional environmental discharge criteria for lead in soil surrounding waste material in a small part of the site. Based on the approximate area of deposited material (100 m^2), and assuming that soil to a depth of 0.5 metres is impacted (i.e. a removal volume of 50 m^3) it is likely that the permitted activity volume from Rule E30.6.1.2 (200 m^3) won't be exceeded. On this basis, it is likely that the works will be a permitted activity under Rule E30.6.1. as demonstrated in Table 12.

Table 12: Criteria from E30.6.2.1

Discharges of contaminants into air, or into water, or onto or into land from disturbing soil on land containing elevated levels of contaminants	
The volume of soil disturbed must not exceed: a. 200 m^3 per site; or b. 200 m^3 per project for sites or roads with multiple concurrent land disturbance projects, where the cumulative total volume of soil disturbance associated with each given project will be used when determining activity status; or c. an average depth and width of 1m for linear trenching by network utilities in the road or rail corridor. For the purpose of this rule the railway corridor does not include land more than 10 m from the rail tracks	Likely meets criterion.
Prior to the activity commencing: a. the Council must be advised of the activity in writing if the volume of soil disturbed on land containing elevated levels of contaminants exceeds 25 m^3, including details of the measures and controls to be implemented to minimise discharges of contaminants to the environment, and such controls are to be effective for duration of the activity and until the soil is reinstated to an erosion-resistant state; and b. controls on linear trenching must be implemented to manage discharges to the environment from trenches acting as migration pathways for contaminants.	Meets criterion. We anticipate this DSI will be submitted to Council. A Remediation Action Plan (RAP) has been prepared and it is assumed a copy will be forwarded to Council.
Any discharge from land containing elevated levels of contaminants must not contain separate phase liquid contaminants including separate phase hydrocarbons.	Meets criterion. Subject to following the controls within the RAP, discharges from the land as a result of the soil disturbance are highly unlikely to cause significant adverse effects on the environment.
The duration of soil disturbance on a site must not exceed two months.	Likely meet criterion.
Any contaminated material removed from the site must be disposed of at a facility or site authorised to accept such materials.	Will meet criterion.

9 Conclusions

The investigation has identified that:

- Elevated (above background) concentrations of arsenic, chromium, copper, nickel and zinc were recorded in the sample collected from soil adjacent to the shed in the eastern portion of site (labelled 'S03' in Figure 2). The concentration of arsenic in this sample exceeded the adopted human health criterion (high-density and standard residential) and hence this area of the site will require remediation. The source of the elevated concentrations is unknown, however is likely associated with chromated copper arsenate (CCA) treated timber based on the combination of elevated contaminants identified (i.e., chromium, copper, and arsenic).
- Elevated (above background) concentrations of arsenic, cadmium, copper, lead and PAHs were recorded in the sample collected from soil surrounding fly-tipped material on the coastal margin (labelled 'S13' in Figure 2). The concentration of arsenic in this sample exceeded both the high-density and standard residential human health criterion. Additionally, the concentration of lead also exceeded standard residential human health criterion and environmental assessment criteria. This area of the site will require remediation. The source of the elevated concentrations is likely associated with fly-tipped material.
- The buildings on-site were considered to potentially contain asbestos; however, no asbestos was detected in soil samples collected adjacent to the buildings.

The NESCS may apply to specific activities on sites where an activity on the HAIL (MfE, 2011a) has, or is more likely than not to have occurred. Based on the results of this investigation, we consider that HAIL ID G3 and I apply to the site. If the permitted disturbance volume, removal volume and / or time frame is not likely to be complied with, and the results of analysis of samples described in this report identified contaminant concentrations in the soils above the human health criteria, a restricted discretionary activity consent under Regulation 10 of the NESCS will be required for the site.

As the estimated remedial volume is unlikely to exceed the permitted activity volume from Rule E30.6.1.2 (200 m^3), it is likely that the works will be a permitted activity under Rule E30.6.1.

10 Recommendations

10.1 Additional Investigation

Additional investigation is recommended to delineate the lateral and vertical extents of impacted material in the vicinity of investigation location S03 and S13. The proposed additional investigation works are detailed in the Remediation Action Plan (RAP) that has been prepared for the site.

10.2 Remediation Action Plan

It is recommended that the earthworks for the planned redevelopment be managed in accordance with the RAP that has been prepared for the site. The RAP outlines remediation and validation requirements for soil impacted by contaminants above the human health and environmental discharge criteria, as well as monitoring and management procedures for the balance of the earthworks due to the potential for encountering unidentified contamination.

10.3 Closure Reporting

Following completion of remediation works a Site Validation Report (SVR) should be prepared to document the remediation works and validation works. The SVR should also confirm that works have been undertaken in general accordance with the RAP.

10.4 Disposal Options

The objective of this investigation was to satisfy the requirements of the NESCS and AUP, however the results can be used to inform disposal options. The findings of this investigation indicate that large areas of the site are likely to be considered “cleanfill” for disposal purposes or reused at another earthworks site (AUP, 2016). Additional testing may be required prior to, or as part of, redevelopment works is required to confirm this.

11 Limitations

i. We have prepared this report in accordance with the brief as provided. This report has been prepared for the use of our client, Cabra Developments Limited, their professional advisers and the relevant Territorial Authorities in relation to the specified project brief described in this report. No liability is accepted for the use of any part of the report for any other purpose or by any other person or entity.

ii. The recommendations in this report are based on the ground conditions indicated from published sources, site assessments and subsurface investigations described in this report based on accepted normal methods of site investigations. Only a limited amount of information has been collected to meet the specific financial and technical requirements of the client's brief and this report does not purport to completely describe all the site characteristics and properties. The nature and continuity of the ground between test locations has been inferred using experience and judgement and it should be appreciated that actual conditions could vary from the assumed model.

iii. Subsurface conditions relevant to construction works should be assessed by contractors who can make their own interpretation of the factual data provided. They should perform any additional tests as necessary for their own purposes.

iv. This Limitation should be read in conjunction with the Engineering NZ/ACENZ Standard Terms of Engagement.

v. This report is not to be reproduced either wholly or in part without our prior written permission.

We trust that this information meets your current requirements. Please do not hesitate to contact the undersigned on (09) 972 2205 if you require any further information.

Report prepared by

Claire Davies, CEnvP

Associate Environmental Consultant

Report reviewed by

Jamie Rhodes, CEnvP (SC)

Associate Environmental Engineer

12 References

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NESCS, 2011. The Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations (2011).

FIGURES

Legend

- Site Boundary
- Approximate extent of deposited waste material
- Potential former horticultural area
- Approximate footprint of former building
- Circular feature

0 10 m 20 m

ENGEO

Produced by Datanest.earth

Title: Site Location and Key Features		
Client: Cabra Developments Limited		Figure No.: 1
Project: 16 Sinton Road, Whenupai	Drawn: CD	
Date: 12-10-2023	Checked: JR	
Proj No.: 23849.000.001_04	Scale: 1:1092	Version: 1.0

Legend

- Site Boundary
- Environmental Investigation Location
- Approximate extent of deposited waste material
- Approximate footprint of former building
- Circular feature

0 10 m 20 m

© Nearmap

ENGEO

Produced by Datanest.earth

Title: Environmental Site Investigation Plan		
Client: Cabra Developments Limited		
Project: 16 Sinton Road, Whenupai	Drawn: NR/TP	Figure No.: 2
Date: 12-10-2023	Checked: CD	
Proj No.: 23849.000.001_04	Scale: 1:1048	Version: 1.0

APPENDIX 1:

Aerial Photographs

1940 (Retrolens NZ)

1950 (Retrolens NZ)

1959 (Auckland Council GeoMaps)

1968 (Retrolens NZ)

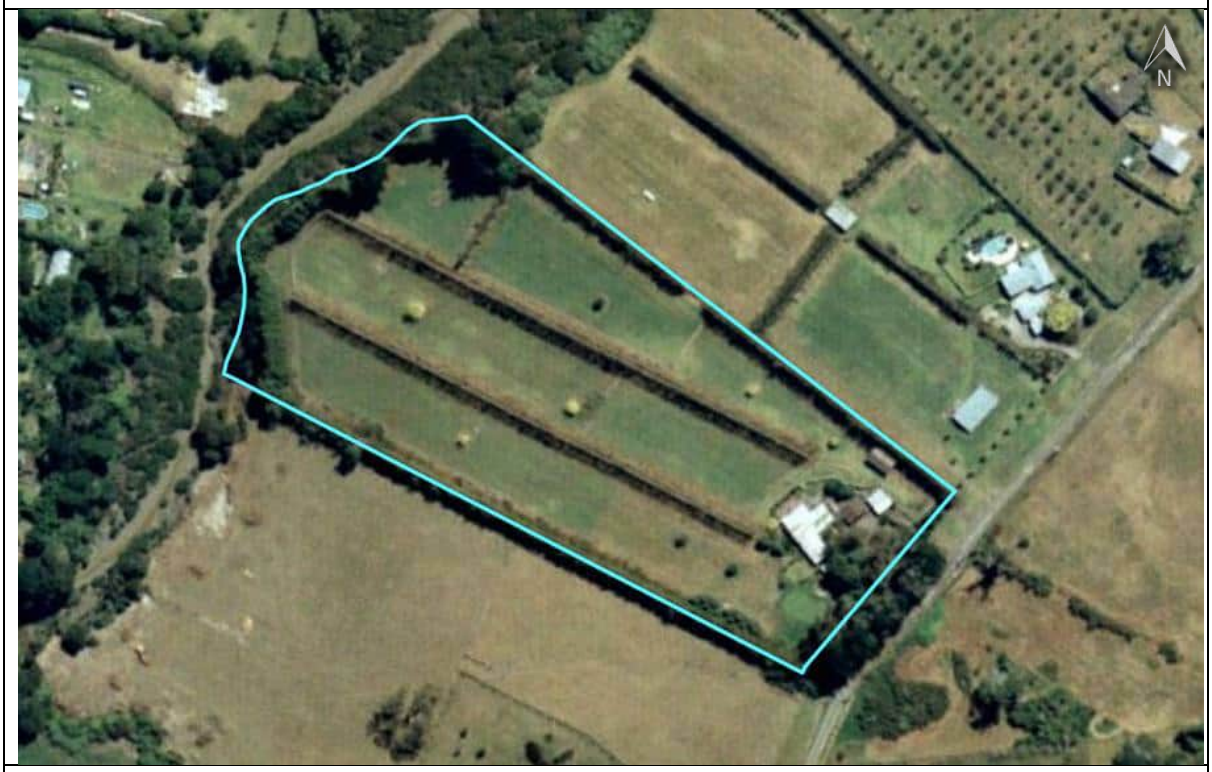
1972 (Retrolens NZ)

1975 (Retrolens NZ)

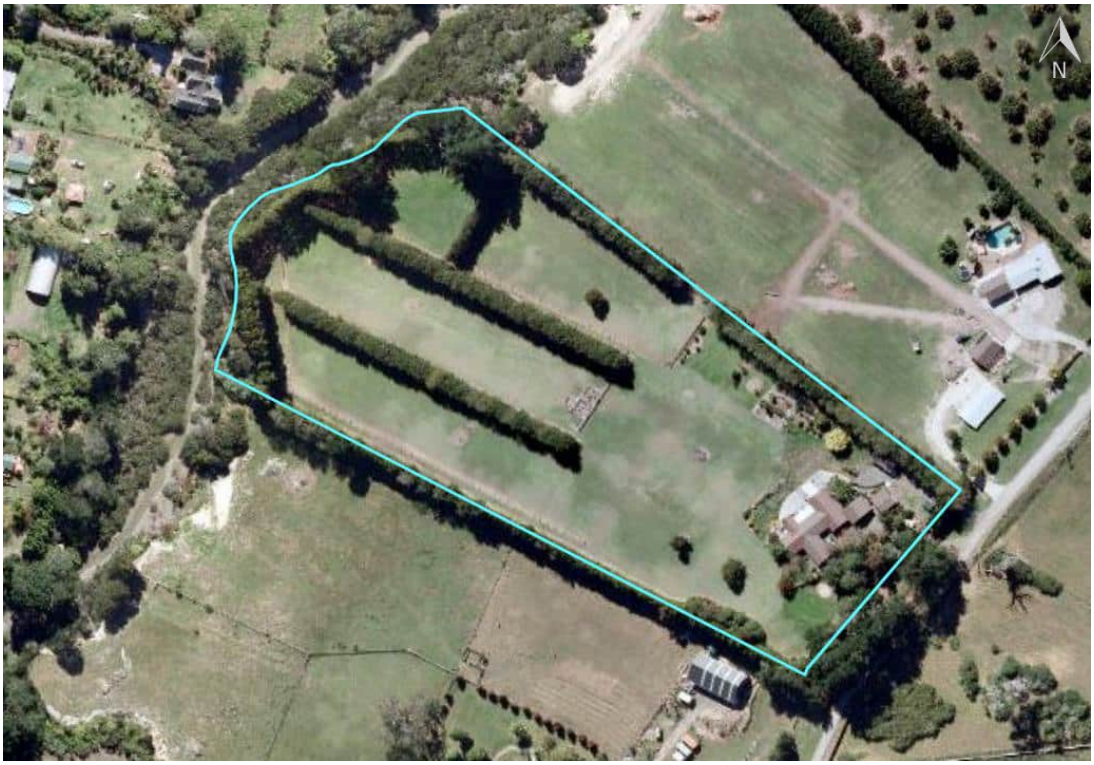
1978 (Retrolens NZ)

1988 (Retrolens NZ)

1996 (Auckland Council GeoMaps)



2000 (Auckland Council GeoMaps)



2008 (Auckland Council GeoMaps)

2017 (Nearmaps)

2020 (Nearmaps)

2023 (Nearmaps)

APPENDIX 2:

Council Documentation

14/08/2023

Engeo Limited
8 Greydene Place
Auckland

Attention: Jack Hammond

Dear Jack,

Site Contamination Enquiry – *16 Sinton Road, Hobsonville*

This letter is in response to your enquiry requesting available site contamination information within Auckland Council records for the above site. Please note this report does not constitute a site investigation report; such reports are required to be prepared by a (third-party) Suitably Qualified and Experienced Practitioner.

The following details are based on information available to the Contamination, Air & Noise Team in the Resource Consent Department. The details provided may be from former regional council information, as well as property information held by the former district/city councils. For completeness the relevant property file should also be requested to obtain all historical records and reports via 09 3010101 or online at:

https://www.aucklandcouncil.govt.nz/buying-property/order-property-report/Pages/order-property-file.aspx.

1. Hazardous Activities and Industries List (HAIL) Information

This list published by the Ministry for the Environment (MfE) comprises activities and industries that are considered likely to cause land contamination as a result of hazardous substance use, storage, and/or disposal.

Council's records indicate this site has possibly been subject to the following activity that fall within the HAIL:

- HAIL Item (A10) - Persistent pesticide bulk storage or use including sport turfs, market gardens, orchards, glass houses or spray sheds.

Aerial image dated 1988, indicates the site has been subject to historic horticultural activities.

Aerial Image 1988.

Please note:

- *If you are demolishing any building that may have asbestos containing materials (ACM) in it, you have obligations under the Health and Safety at Work (Asbestos) Regulations 2016 for the management and removal of asbestos, including the need to engage a Competent Asbestos Surveyor to confirm the presence or absence of any ACM.*
- *Paints used on external parts of properties up until the mid-1970's routinely contained lead, a poison and a persistent environmental pollutant. You are advised to ensure that soils affected by old, peeling or flaking paint are assessed in relation to the proposed use of the property, including high risk use by young children.*

2. Consents and Incidents Information (200m radius of the selected site)

The Council database was searched for records of the following activities within approximately 200 metres of the site and results are displayed in Figure 1 below:

- Pollution Incidents (including air discharges, oil or diesel spills)
- Bores
- Contaminated site and air discharges, and industrial trade process consents
- Closed Landfills
- Air quality permitted activities
- Identified HAIL activities

Figure 1: Selected Consents, Incidents and HAIL activities within approximately 200m of the subject site

Legend:

All Consents
All Applications
All Permitted Activities
All Bores
Closed Landfill (Auckland Council owned)
Closed Landfill (Privately owned)
All Incidents
HAIL activities

Relevant details of any pollution incidents and consents and HAIL activities are appended to this letter (Attachment A). Please refer to the column titled 'Property Address' on the spreadsheet to aid in identifying corresponding data on the map.

For any identified HAIL sites, please refer to the tab "HAIL activities" for more information (Column C and D include HAIL activity details where these are available).

Please note:

The HAIL activity hatching in Figure 1 only reflects whether a site has been identified as a HAIL site (both verified and non-verified) by the Council and the type of HAIL associated with the site. This does not confirm whether the site has been formally investigated or the contamination status of the property (e.g. contaminated, remediated etc.). Additionally, due to limitations within Council's records, the specific HAIL activity is not included in the data for all properties. For further information on any of these known HAIL sites, a subsequent site contamination enquiry can be lodged for the specific property (up to 5 adjacent properties can be covered in one request).

While the Auckland Council has carried out the above search using its best practical endeavours, it does not warrant its completeness or accuracy and disclaims any responsibility or liability in respect of the information. If you or any other person wishes to act or to rely on this information, or make any financial commitment based upon it, it is recommended that you seek appropriate technical and/or professional advice.

If you wish to clarify anything in this letter that relates to this site, please contact contaminatedsites@aucklandcouncil.govt.nz. Any follow up requests for information on other sites must go through the online order process.

Should you wish to request any of the files referenced above and/or listed in the attached spreadsheet for viewing, please contact the Auckland Council Call Centre on 301 0101 and note you are requesting former Auckland Regional Council records (the records department requires three working days' notice to ensure the files will be available).

Please note Auckland Council cost recovers officer's time for all site enquiries. As such an invoice for $128 for the time involved in this enquiry will follow shortly.

Yours Sincerely,

Contamination, Air and Noise Team
Specialist Unit | Resource Consents
Auckland Council

PERMITTED_ACTIVITY_ID	FILE_REFERENCE	PERMITTED_ACTIVITY_HOLDER	PERMITTED_ACTIVITY_TYPE	ACTIVITY	CONSENT_STATUS	GRANTED_DATE	REVIEW_DATE	EXPIRY_DATE	PROCESSING_OFFICER	PURPOSE	WORKS_DESCRIPTION	EASTING	NORTHING	ACTIVITY_ID	ACTIVITY_STATUS	ACTIVITY_DESCRIPTION	SITE_NAME	SITE_DESCRIPTION	DATE_CREATED	PROPERTY_ADDRESS	LOC_TYP
29	KRG04280		Small Low Risk Dam	Dam	Assessment Completed					PURPOSE UNKNOWN		1746400	5836200	27		PURPOSE UNKNOWN			2/06/2017		Point
53258	CG13-12-54457*		Bore	Bore	Assessment Completed				Reginald Samuel	To authorise the construction of fifteen bores for geological, geotechnical and groundwater purposes.	The construction of fifteen 70mm bores to a maximum depth of 15-45m. Installation of casing material to an approximate depth of 15-45m.	1746481	5836231	29910	Proposed	To authorise the construction of fifteen bores for geological, geotechnical and groundwater purposes.	Rideracaw Services		2/06/2017		Point

SAPSiteID	PropertyAddress	HAILCode	HAILDescription	ValidFrom
11131521	34 Kauri Road Whenuapai			1/06/2016
11131542	20-26 Kauri Road Whenuapai			1/06/2016
11132817	12 Sinton Road Hobsonville			1/06/2016
11131581	16 Sinton Road Hobsonville			1/06/2016
11131592	14 Sinton Road Hobsonville			1/06/2016
11133220	174 Brigham Creek Road Hobsonville			1/06/2016

CONSENT_NUMBER	FILE_REFERENCE	ACTIVITY	CONSENT_HOLDER	CONSENT_STATUS	GRANTED_DATE	REVIEW_DATE	EXPIRY_DATE	PROCESSING_OFFICER	PURPOSE	WORKS_DESCRIPTION	EASTING	NORTHING	ACTIVITY_ID	ACTIVITY_STATUS	ACTIVITY_DESCRIPTION	SITE_NAME	SITE_DESCRIPTION	DATE_CREATED	PROPERTY_ADDRESS	LOC_TYP	MONITORING_OFFICER	PREVIOUS_INSPECTION_DATE	NEXT_INSPECTION_DATE
46257	26913	Wastewater Discharge	Edwin C Sutherland	Issued	20160726	20170731	20310630	Alan Moore	To discharge up to 1.16 cmpd of treated domestic wastewater to land from a 5 bedroom dwelling.	The key components of the wastewater treatment systems shall be consistent with that described in the application and shall comprise at least the following minimum components, dimensions and standards:a) Wastewater treatment system consisting of: (i)a)A.	1746062.91	5926465.64	21715	Proposed	To discharge up to 1.16 cmpd of treated domestic wastewater to land from a 5 bedroom dwelling	21 Kauri Road		2/04/2017	21 Kauri Road Whenuapai Waitakere	Point	Megan Griffiths	Invalid Date	Invalid Date
4218	AGB31839	Take	Mr ANDREWS RM ANDREWS	Replaced	19841109		19881231		To take from a Bore up to 65 cmpd for - Pastoral		1746420	5926520	2185		To take from a Bore up to 65 cmpd for - Pastoral			2/04/2017	SINTON RD HOBSONVILLE Waitakere City	Point		Invalid Date	Invalid Date
4487	AKB44126	Take	RN NEALE LM NEALE	Cancelled	19851109		19911231		To take from a Dam up to 18 cmpd for - Industrial Use		1746400	5926200	2182		To take from a Dam up to 18 cmpd for - Industrial Use			2/04/2017	BRIGHAMS CK RD HOBSONVILLE Waitakere City	Point		Invalid Date	Invalid Date
4500	AGB86328	Take	Mr ANDREWS RM ANDREWS	Expired	19890905		19940531		2.5 hectares of Orchard.^^^^^		1746420	5926520	2184				SINTON ROAD, HOBSONVILLE	2/04/2017	SINTON RD HOBSONVILLE Waitakere City	Point		Invalid Date	Invalid Date
25692	15806	Comprehensive Stormwater Discharge	Auckland Council	Issued	20080121	20090630	20411231	_Christine Mitchell	To authorise the diversion and discharge of stormwater from the Waiarohia Stream Catchment associated with Plan Change 14 to land and water in accordance with Sections 14(1)(a) and 15(1)(a) and (b) of the Resource Management Act 1991.	As detailed in the Waiarohia Stream Integrated Catchment Management Plan prepared by the Waitakere City Council.	1745966	5926490	20333	Proposed	To divert and discharge stormwater and wastewater overflows, to dam & divert watercourses & to undertake clearance & maintenance of watercourses & otherwise to manage the diversions and discharges of stormwater & wastewater from & within the 510 ha Waiaro	Waiarohia Catchment CMP	Waiarohia Catchment Waitakere City	2/04/2017		Area	Leon Blackburn	2/05/2013	1/03/2014
31896	21446	Wastewater Discharge	Watercare Services Limited	Surrendered	20090505	20100630	20411231	_Christine Mitchell	To authorise the discharge of wastewater to land or water in accordance with Sections 15(1)(a) and (b) of the Resource Management Act 1991 as a result of:â€¢Network overflows during periods of wet weather flow;â€¢Network overflows resulting solely from ne	As proposed in the Waiarohia Integrated Catchment Management Plan (WICMP).	1746000	5926400	20844	Proposed	The catchment area generally described as that land in the Waiarohia Stream Catchment that is bounded by Trig Road to the west, Hobsonville Road to the east and Waiarohia Inlet to the north.	WCC-Waiarohia Catchment WWNetWk		2/04/2017	Waiarohia Catchment Wastewater Network Waitakere City	Point	Patricia Burford	Invalid Date	Invalid Date

CONSENT_NUMBER	FILE_REFERENCE	CONSENT_HOLDER	BORE_ID	GRANTED_DATE	REVIEW_DATE	EXPIRY_DATE	CONSENT_STATUS	PROCESSING_OFFICER	PURPOSE	WORKS_DESCRIPTION	EASTING	NORTHING	ACTIVITY_STATUS	LAND_USE	LAND_USE_UPDATED	LAND_USE_NOTE	BORE_USE	ACTIVITY_DESCRIPTION	SITE_NAME	SITE_DESCRIPTION	MAIN_AQUIFER	AQUIFER	SUB_AQUIFER1	SUB_AQUIFER2	ENVIRONMENT_REPORTING_AREA	ALW_PLAN_ZONES	TLA	HYDSYS_NUMBER	DATE_DRILLED	TOTAL_DEPTH	GROUND_ELEVATION	STATIC_WATER_LEVEL	STATIC_WATER_DATE	BORE_LOG	AQUIFER_TEST	DIAMETER_FROM	DIAMETER_TO	DIAMETER	CASING_FROM	CASING_TO	CASING_TYPE	CASING_DIAMETER	SCREEN_FROM	SCREEN_TO	SCREEN_TYPE	CONTRACTOR	CONSULTANT	DATE_CREATED	PROPERTY_ADDRESS	LOC_TYP
0			2601								1746420	5926520	Drilled					Drilled pre-1987 for ANDREWS IA &RM by *** DRILLER UNKNOWN ***.			Waitemata	Kumeu Waitemata	Kumeu Zone 3			Kumeu Waitemata			20000101	182				Y		0	182	100	0			100						20170601		Point
53258	CS12-12-5643*		29910	20150825			Assessment Completed	Reginald Samuel	To authorise the construction of fifteen bores for geological, geotechnical and groundwater purposes.	The construction of fifteen 70mm bores to a maximum depth of 15-45m. Installation of casing material to an approximate depth of 15-45m.	1746481	5926231	Proposed					To authorise the construction of fifteen bores for geological, geotechnical and groundwater purposes.	Watercare Services																												Tonkin & Taylor Limited	20170601		Point

INCIDENTNUMBER	XCOORD	YCOORD	NZTMXCOORD	NZTMYCOORD	LOCATION	SUBURB	CATCHMENTCODE	POLLUTANTTYPE	RECIEVED	REPORT	INCIDENTTYPE	ACTIONEDBY	IMPACT	VOLUME	PROBLEMFOUND	CULPRITTRACED	RECORDDATE	INVESTIGATIONDATE
14/1335	1746251.39	5926244.92	1746251.39	5926244.92	118 Hobsonville Rd	Hobsonville	5-Oct	Concrete Wastewater	Hotline	Dead Eels and Fish	Water / Land Pollution	Glenn Riddell	Things died	10-200 litres	YES	YES	4/04/2014	4/04/2014

APPENDIX 3:

Site Photographs

Photo 1: View from entrance to site, and the southeast side of the dwelling.

Photo 2: Building positioned on northern site boundary, in the eastern corner of the site.

Photo 3: Northern side of dwelling.

Photo 4: Shed / garage to the east of the dwelling.

Photo 5: Wood storage shed.

Photo 6: Western paddock adjacent to southern site boundary, looking east.

Photo 7: Yard area to the north of the dwelling, looking south.

Photo 8: Central western paddock, looking west.

Photo 9: Northern corner of the site.

Photo 10: View across paddocks, looking west.

Photo 11: Waste material deposited along coastal margin.

Photo 12: Waste material deposited along coastal margin.

APPENDIX 4:

Results Summary

Table A: Comparison of Soil Results to Assessment Criteria

				Heavy Metals/Metalloids								Polycyclic Aromatic Hydrocarbons		Organochlorine Pesticides	Asbestos	
Investigation Location	Depth (m bgl)	Sample ID	Date	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc	Benzo[a]pyrene (middle bound)	Other PAHs		Asbestos Containing Material (ACM)	Asbestos Fines / Friable Asbestos (AF/FA)
S01	0.0 - 0.25	S01 0.0-0.25	16-Aug-23	12	0.05	8.2	12	5.7	0.09	1.8	32	nt	nt	nt	NAD	NAD
S02	0.05 - 0.3	S02 0.05-0.3	16-Aug-23	5.2	0.07	7.3	7.2	7.9	0.11	3.5	26	nt	nt	nt	NAD	NAD
S03	0.0 - 0.25	S03 0.0-0.25	16-Aug-23	**100**	0.15	**56**	**230**	8.4	0.03	**43**	**190**	nt	nt	nt	NAD	NAD
S04	0.0 - 0.3	S04 0.0-0.3	16-Aug-23	4.6	0.14	9.8	32	7.9	0.06	9.3	27	nt	nt	nt	NAD	NAD
S08	0.0 - 0.3	S08 0.0-0.3	16-Aug-23	12	0.1	6.2	7.4	9.5	0.09	2	14	nt	nt	nt	NAD	NAD
S09	0.0 - 0.25	S09 0.0-0.25	16-Aug-23	3.9	0.13	7.1	8.5	6.7	0.08	2.6	44	nt	nt	nt	NAD	NAD
S10	0.0 - 0.3	S10 0.0-0.3	16-Aug-23	8.3	0.24	13	28	16	0.06	6.1	44	nt	nt	nt	NAD	NAD
S13	0.0 - 0.3	S13 0.0-0.3	16-Aug-23	**92**	**0.77**	20	**240**	**460**	0.32	7.8	120	**0.05**	<LOR	nt	NAD	NAD
S11 / S12	0.0 - 0.3	LAB COMPOSITE S11 & S12 0.0-0.3	16-Aug-23	6	0.23	11	9.6	17	0.14	6.6	24	nt	nt	nt	NAD	NAD
CS01A - CS01C	0.1	CS01 (composite of CS01A 0.1 CS01B 0.1 AND CS01C 0.1)	16-Aug-23	1.2	0.16	5.7	3	9.1	0.1	2.2	7.1	nt	nt	<LOR	nt	nt
CS02A - CS02C	0.1	CS02 (composite of CS012 0.1 CS02 0.1 AND CS02C 0.1)	16-Aug-23	1.1	0.23	5	2.7	7	0.06	1.5	5.8	nt	nt	<LOR	nt	nt
CS03A - CS03C	0.1	CS03 (composite of CS03A 0.1 CS03B 0.1 AND CS03C 0.1)	16-Aug-23	1.3	0.14	6.2	3.5	10	0.14	2.6	9.4	nt	nt	<LOR	nt	nt
CS04A - CS04C	0.1	CS04 (composite of CS04A 0.1 CS04B 0.1 AND CS04C 0.1)	16-Aug-23	1.9	0.2	6.5	4.6	9.1	0.12	2.6	9.5	nt	nt	<LOR	nt	nt
CS05A - CS05C	0.1	CS05 (composite of CS05A 0.1 CS05B 0.1 AND CS05C 0.1)	16-Aug-23	1.4	0.15	6.2	3.1	6.9	0.1	2.6	8	nt	nt	<LOR	nt	nt
CS06A - CS06C	0.1	CS06 (composite of CS06A 0.1 CS06B 0.1 AND CS06C 0.1)	16-Aug-23	4.8	0.25	11	7.3	16	0.18	4.8	22	nt	nt	<LOR	nt	nt
CS07A - CS07C	0.1	CS07 (composite of CS07A 0.1 CS07B 0.1 AND CS07C 0.1)	16-Aug-23	5.1	0.19	6.8	9.1	5.8	0.07	1.3	9.3	nt	nt	<LOR	nt	nt
CS08A - CS08C	0.1	CS08 (composite of CS08A 0.1 CS08B 0.1 AND CS08C 0.1)	16-Aug-23	4	0.19	6.7	4.8	8.9	0.08	2.5	11	nt	nt	<LOR	nt	nt
Assessment Criteria:																
		Human Health Criteria (High-density Residential) [1]		45	230 [4]	1500 [5]	10000	500	1000	1200 [6]	60000 [6]	24	various	various	0.04 [7]	0.001 [8]
		Human Health Criteria (Residential) [1]		20	3 [4]	460 [5]	> 10,000	210	310	400 [6]	7,400 [6]	10	various	various	0.01 [7]	0.001 [8]
		Environmental Criteria (Auckland Unitary Plan) [2]		100	7.5	400	325	250	0.75	105	400	20	various	various	-	-
		Background Criteria (Auckland - Non-Volcanic) [3]		**0.4 - 12**	**< 0.1 - 0.65**	**2 - 55**	**1 - 45**	**< 5 - 65**	**<0.03 - 0.45**	**0.9 - 35**	**9 - 180**	**< LOR**	**< LOR**	**< LOR**	**< LOR**	**< LOR**

Notes:
All results and criteria are presented in mg/kg dry weight basis, except asbestos which is reported as %w/w
Full results are included in the laboratory reports
LOR: Limit of Reporting; Results below LOR or background are shown in grey text
nt: not tested
- : no applicable criteria
NAD: No Asbestos Detected (Note:' <0.001' indicates asbestos detected, but below the limit of reporting)

1: MfE (2011) Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health (Residential Land Use), or selected in accordance with CLMG No. 2
2: Environmental discharge criteria selected in accordance with Section E30.6.1.4 of the Auckland Unitary Plan (Auckland Council, 2016).
3: Background Ranges of Trace Elements in Auckland Soils (Non-Volcanic Range). Table E30.6.1.4.2 of the AUP (Auckland Council, 2016).
4. Assumes soil pH of 5.
5. Criteria for Chromium VI were conservatively selected.
6. National Environment Protection (Assessment of Site Contamination) Measure (NEPM). Residential A criteria listed.
7. New Zealand Guidelines for the Assessment and Management of Asbestos in Soil (BRANZ, 2017). Commercial and Industrial Land Use.
8. New Zealand Guidelines for the Assessment and Management of Asbestos in Soil (BRANZ, 2017). All Land uses.

APPENDIX 5:

Analytical Reports and Chain of Custody Documentation

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

ENGEO Ltd
8 Greydene Place
Takapuna
Auckland 0622

Attention: **Claire Davies**

Report **1018938-S**
Project name 16 SINTON ROAD
Project ID 23849.000.003
Received Date Aug 18, 2023

Client Sample ID			**S01 0.0-0.25**	**S02 0.05-0.3**	**S03 0.0-0.25**	**S04 0.0-0.3**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins Sample No.			**K23-Au0053704**	**K23-Au0053705**	**K23-Au0053706**	**K23-Au0053707**
Date Sampled			**Aug 16, 2023**	**Aug 16, 2023**	**Aug 16, 2023**	**Aug 16, 2023**
Test/Reference	LOR	Unit				
Metals M8 (NZ MfE)						
Arsenic	0.1	mg/kg	12	5.2	100	4.6
Cadmium	0.01	mg/kg	0.05	0.07	0.15	0.14
Chromium	0.1	mg/kg	8.2	7.3	56	9.8
Copper	0.1	mg/kg	12	7.2	230	32
Lead	0.1	mg/kg	5.7	7.9	8.4	7.9
Mercury	0.01	mg/kg	0.09	0.11	0.03	0.06
Nickel	0.1	mg/kg	1.8	3.5	43	9.3
Zinc	5	mg/kg	32	26	190	27
Sample Properties						
% Moisture	1	%	18	20	41	17

Client Sample ID			**S08 0.0-0.3**	**S09 0.0-0.25**	**S10 0.0-0.3**	**S13 0.0-0.3**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins Sample No.			**K23-Au0053708**	**K23-Au0053709**	**K23-Au0053710**	**K23-Au0053712**
Date Sampled			**Aug 16, 2023**	**Aug 16, 2023**	**Aug 16, 2023**	**Aug 16, 2023**
Test/Reference	LOR	Unit				
Metals M8 (NZ MfE)						
Arsenic	0.1	mg/kg	12	3.9	8.3	92
Cadmium	0.01	mg/kg	0.10	0.13	0.24	0.77
Chromium	0.1	mg/kg	6.2	7.1	13	20
Copper	0.1	mg/kg	7.4	8.5	28	240
Lead	0.1	mg/kg	9.5	6.7	16	460
Mercury	0.01	mg/kg	0.09	0.08	0.06	0.32
Nickel	0.1	mg/kg	2.0	2.6	6.1	7.8
Zinc	5	mg/kg	14	44	44	120
Sample Properties						
% Moisture	1	%	32	29	29	50
Polycyclic Aromatic Hydrocarbons (NZ MfE)						
Acenaphthene	0.03	mg/kg	-	-	-	< 0.03
Acenaphthylene	0.03	mg/kg	-	-	-	< 0.03
Anthracene	0.03	mg/kg	-	-	-	< 0.03
Benz(a)anthracene	0.03	mg/kg	-	-	-	0.03
Benzo(a)pyrene	0.03	mg/kg	-	-	-	0.03

Client Sample ID			S08 0.0-0.3	S09 0.0-0.25	S10 0.0-0.3	S13 0.0-0.3
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			K23-Au0053708	K23-Au0053709	K23-Au0053710	K23-Au0053712
Date Sampled			Aug 16, 2023	Aug 16, 2023	Aug 16, 2023	Aug 16, 2023
Test/Reference	LOR	Unit				
Polycyclic Aromatic Hydrocarbons (NZ MfE)						
Benzo(a)pyrene TEQ (lower bound)*	0.03	mg/kg	-	-	-	0.03
Benzo(a)pyrene TEQ (medium bound)*	0.03	mg/kg	-	-	-	0.05
Benzo(a)pyrene TEQ (upper bound)*	0.03	mg/kg	-	-	-	0.08
Benzo(b&j)fluoranthene[N07]	0.03	mg/kg	-	-	-	< 0.03
Benzo(g.h.i)perylene	0.03	mg/kg	-	-	-	< 0.03
Benzo(k)fluoranthene	0.03	mg/kg	-	-	-	< 0.03
Chrysene	0.03	mg/kg	-	-	-	< 0.03
Dibenz(a.h)anthracene	0.03	mg/kg	-	-	-	< 0.03
Fluoranthene	0.03	mg/kg	-	-	-	< 0.03
Fluorene	0.03	mg/kg	-	-	-	< 0.03
Indeno(1.2.3-cd)pyrene	0.03	mg/kg	-	-	-	< 0.03
Naphthalene	0.1	mg/kg	-	-	-	< 0.1
Phenanthrene	0.03	mg/kg	-	-	-	< 0.03
Pyrene	0.03	mg/kg	-	-	-	< 0.03
Total PAH*	0.1	mg/kg	-	-	-	< 0.1
p-Terphenyl-d14 (surr.)	1	%	-	-	-	78
2-Fluorobiphenyl (surr.)	1	%	-	-	-	86

Client Sample ID			CS01 (composite of CS01A 0.1 CS01B 0.1 AND CS01C 0.1)	CS02 (composite of CS012 0.1 CS02 0.1 AND CS02C 0.1)	CS03 (composite of CS03A 0.1 CS03B 0.1 AND CS03C 0.1)	CS04 (composite of CS04A 0.1 CS04B 0.1 AND CS04C 0.1)
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			K23-Au0053713	K23-Au0053714	K23-Au0053715	K23-Au0053716
Date Sampled			Aug 16, 2023	Aug 16, 2023	Aug 16, 2023	Aug 16, 2023
Test/Reference	LOR	Unit				
Metals M8 (NZ MfE)						
Arsenic	0.1	mg/kg	1.2	1.1	1.3	1.9
Cadmium	0.01	mg/kg	0.16	0.23	0.14	0.20
Chromium	0.1	mg/kg	5.7	5.0	6.2	6.5
Copper	0.1	mg/kg	3.0	2.7	3.5	4.6
Lead	0.1	mg/kg	9.1	7.0	10	9.1
Mercury	0.01	mg/kg	0.10	0.06	0.14	0.12
Nickel	0.1	mg/kg	2.2	1.5	2.6	2.6
Zinc	5	mg/kg	7.1	5.8	9.4	9.5
Sample Properties						
% Moisture	1	%	31	28	29	29
Organochlorine Pesticides (NZ MfE)						
2.4'-DDD	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
2.4'-DDE	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
2.4'-DDT	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
4.4'-DDD	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
4.4'-DDE	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
4.4'-DDT	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
DDT + DDE + DDD (Total)*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
a-HCH	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aldrin	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01

Client Sample ID			CS01 (composite of CS01A 0.1 CS01B 0.1 AND CS01C 0.1)	CS02 (composite of CS012 0.1 CS02 0.1 AND CS02C 0.1)	CS03 (composite of CS03A 0.1 CS03B 0.1 AND CS03C 0.1)	CS04 (composite of CS04A 0.1 CS04B 0.1 AND CS04C 0.1)
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins Sample No.			**K23-Au0053713**	**K23-Au0053714**	**K23-Au0053715**	**K23-Au0053716**
Date Sampled			**Aug 16, 2023**	**Aug 16, 2023**	**Aug 16, 2023**	**Aug 16, 2023**
Test/Reference	LOR	Unit				
Organochlorine Pesticides (NZ MfE)						
b-HCH	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Chlordanes - Total	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
cis-Chlordane	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
d-HCH	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Dieldrin	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Endosulfan I	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Endosulfan II	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Endosulfan sulphate	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Endrin	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Endrin aldehyde	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Endrin ketone	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
g-HCH (Lindane)	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Heptachlor	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Heptachlor epoxide	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Hexachlorobenzene	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Methoxychlor	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Toxaphene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
trans-Chlordane	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Dibutylchlorendate (surr.)	1	%	121	98	98	96
Tetrachloro-m-xylene (surr.)	1	%	79	72	75	75

Client Sample ID			CS05 (composite of CS05A 0.1 CS05B 0.1 AND CS05C 0.1)	CS06 (composite of CS06A 0.1 CS06B 0.1 AND CS06C 0.1)	CS07 (composite of CS07A 0.1 CS07B 0.1 AND CS07C 0.1)	CS08 (composite of CS08A 0.1 CS08B 0.1 AND CS08C 0.1)
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins Sample No.			**K23-Au0053717**	**K23-Au0053718**	**K23-Au0053719**	**K23-Au0053720**
Date Sampled			**Aug 16, 2023**	**Aug 16, 2023**	**Aug 16, 2023**	**Aug 16, 2023**
Test/Reference	LOR	Unit				
Metals M8 (NZ MfE)						
Arsenic	0.1	mg/kg	1.4	4.8	5.1	4.0
Cadmium	0.01	mg/kg	0.15	0.25	0.19	0.19
Chromium	0.1	mg/kg	6.2	11	6.8	6.7
Copper	0.1	mg/kg	3.1	7.3	9.1	4.8
Lead	0.1	mg/kg	6.9	16	5.8	8.9
Mercury	0.01	mg/kg	0.10	0.18	0.07	0.08
Nickel	0.1	mg/kg	2.6	4.8	1.3	2.5
Zinc	5	mg/kg	8.0	22	9.3	11
Sample Properties						
% Moisture	1	%	28	35	33	32

Client Sample ID			CS05 (composite of CS05A 0.1 CS05B 0.1 AND CS05C 0.1)	CS06 (composite of CS06A 0.1 CS06B 0.1 AND CS06C 0.1)	CS07 (composite of CS07A 0.1 CS07B 0.1 AND CS07C 0.1)	CS08 (composite of CS08A 0.1 CS08B 0.1 AND CS08C 0.1)
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins Sample No.			**K23-Au0053717**	**K23-Au0053718**	**K23-Au0053719**	**K23-Au0053720**
Date Sampled			**Aug 16, 2023**	**Aug 16, 2023**	**Aug 16, 2023**	**Aug 16, 2023**
Test/Reference	LOR	Unit				
Organochlorine Pesticides (NZ MfE)						
2.4'-DDD	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
2.4'-DDE	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
2.4'-DDT	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
4.4'-DDD	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
4.4'-DDE	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
4.4'-DDT	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
DDT + DDE + DDD (Total)*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
a-HCH	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aldrin	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
b-HCH	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Chlordanes - Total	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
cis-Chlordane	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
d-HCH	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Dieldrin	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Endosulfan I	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Endosulfan II	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Endosulfan sulphate	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Endrin	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Endrin aldehyde	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Endrin ketone	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
g-HCH (Lindane)	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Heptachlor	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Heptachlor epoxide	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Hexachlorobenzene	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Methoxychlor	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Toxaphene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
trans-Chlordane	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Dibutylchlorendate (surr.)	1	%	102	98	104	110
Tetrachloro-m-xylene (surr.)	1	%	75	79	73	74

Client Sample ID			LAB COMPOSITE S11 & S12 0.0-0.3
Sample Matrix			**Soil**
Eurofins Sample No.			**K23-Au0054137**
Date Sampled			**Aug 16, 2023**
Test/Reference	LOR	Unit	
Metals M8 (NZ MfE)			
Arsenic	0.1	mg/kg	6.0
Cadmium	0.01	mg/kg	0.23
Chromium	0.1	mg/kg	11
Copper	0.1	mg/kg	9.6
Lead	0.1	mg/kg	17
Mercury	0.01	mg/kg	0.14

Client Sample ID			LAB COMPOSITE S11 & S12 0.0-0.3
Sample Matrix			**Soil**
Eurofins Sample No.			**K23-Au0054137**
Date Sampled			**Aug 16, 2023**
Test/Reference	LOR	Unit	
Metals M8 (NZ MfE)			
Nickel	0.1	mg/kg	6.6
Zinc	5	mg/kg	24
Sample Properties			
% Moisture	1	%	31

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Metals M8 (NZ MfE)	Auckland	Aug 24, 2023	28 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			
Polycyclic Aromatic Hydrocarbons (NZ MfE)	Auckland	Aug 23, 2023	14 Days
- Method: LTM-ORG-2130 PAH and Phenols in Soil and Water by GC MSMS			
Organochlorine Pesticides (NZ MfE)	Auckland	Aug 24, 2023	14 Days
- Method: LTM-ORG-2220 OCP & PCB in Soil and Water by GCMSMS			
% Moisture	Auckland	Aug 22, 2023	14 Days
- Method: LTM-GEN-7080 Moisture Content in Soil by Gravimetry			

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NZBN: 9429046024954

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IANZ# 1327	IANZ# 1290	IANZ# 1402

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6 Monterey Road	19/8 Lewalan Street	179 Magowar Road	Unit 1,2 Dacre Street	1/21 Smallwood Place	1/2 Frost Drive
Dandenong South	Grovedale	Girraween	Mitchell	Murarrie	Mayfield West NSW 2304
VIC 3175	VIC 3216	NSW 2145	ACT 2911	QLD 4172	Tel: +61 2 4968 8448
Tel: +61 3 8564 5000	Tel: +61 3 8564 5000	Tel: +61 2 9900 8400	Tel: +61 2 6113 8091	Tel: +61 7 3902 4600	NATA# 1261
NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	Site# 25079 & 25289
Site# 1254	Site# 25403	Site# 18217	Site# 25466	Site# 20794	

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NATA# 2377
Site# 2370

Company Name: ENGEO Ltd - NI
Address: 8 Greydene Place
Takapuna
Auckland 0622

Project Name: 16 SINTON ROAD
Project ID: 23849.000.003

Order No.:
Report #: 1018938
Phone: 0011 64 9 9722 205
Fax:

Received: Aug 18, 2023 1:45 PM
Due: Aug 25, 2023
Priority: 5 Day
Contact Name: Claire Davies

Eurofins Analytical Services Manager : Katyana Gausel

Sample Detail						Asbestos - AS4964	Asbestos - AS4964	Asbestos - WA guidelines	HOLD	Moisture Set	Organochlorine Pesticides (NZ MfE)	Metals M8 (NZ MfE)	Polycyclic Aromatic Hydrocarbons (NZ MfE)
Auckland Laboratory - IANZ# 1327							X		X	X	X	X	X
Christchurch Laboratory - IANZ# 1290						X		X					
Tauranga Laboratory - IANZ# 1402													
External Laboratory													
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**								
1	S01 0.0-0.25	Aug 16, 2023		Soil	K23-Au0053704		X			X		X	
2	S02 0.05-0.3	Aug 16, 2023		Soil	K23-Au0053705		X			X		X	
3	S03 0.0-0.25	Aug 16, 2023		Soil	K23-Au0053706		X			X		X	
4	S04 0.0-0.3	Aug 16, 2023		Soil	K23-Au0053707		X			X		X	
5	S08 0.0-0.3	Aug 16, 2023		Soil	K23-Au0053708			X		X		X	
6	S09 0.0-0.25	Aug 16, 2023		Soil	K23-Au0053709			X		X		X	
7	S10 0.0-0.3	Aug 16, 2023		Soil	K23-Au0053710			X		X		X	
8	S12 0.0-0.4	Aug 16, 2023		Soil	K23-Au0053711				X				
9	S13 0.0-0.3	Aug 16, 2023		Soil	K23-Au0053712	X				X		X	X
10	CS01 (composite of CS01A 0.1	Aug 16, 2023		Soil	K23-Au0053713					X	X	X	

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IANZ# 1327	IANZ# 1290	IANZ# 1402

Eurofins Environment Testing Australia Pty Ltd
ABN: 50 005 085 521

Melbourne	Geelong	Sydney	Canberra	Brisbane	Newcastle
6 Monterey Road	19/8 Lewalan Street	179 Magowar Road	Unit 1,2 Dacre Street	1/21 Smallwood Place	1/2 Frost Drive
Dandenong South	Grovedale	Girraween	Mitchell	Murarrie	Mayfield West NSW 2304
VIC 3175	VIC 3216	NSW 2145	ACT 2911	QLD 4172	Tel: +61 2 4968 8448
Tel: +61 3 8564 5000	Tel: +61 3 8564 5000	Tel: +61 2 9900 8400	Tel: +61 2 6113 8091	Tel: +61 7 3902 4600	NATA# 1261
NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	Site# 25079 & 25289
Site# 1254	Site# 25403	Site# 18217	Site# 25466	Site# 20794	

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NATA# 2377
Site# 2370

Company Name: ENGEO Ltd - NI
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Auckland 0622

Project Name: 16 SINTON ROAD
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Order No.:
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Phone: 0011 64 9 9722 205
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Received: Aug 18, 2023 1:45 PM
Due: Aug 25, 2023
Priority: 5 Day
Contact Name: Claire Davies

Eurofins Analytical Services Manager : Katyana Gausel

Sample Detail						Asbestos - AS4964	Asbestos - AS4964	Asbestos - WA guidelines	HOLD	Moisture Set	Organochlorine Pesticides (NZ MfE)	Metals M8 (NZ MfE)	Polycyclic Aromatic Hydrocarbons (NZ MfE)
Auckland Laboratory - IANZ# 1327							X		X	X	X	X	X
Christchurch Laboratory - IANZ# 1290						X		X					
Tauranga Laboratory - IANZ# 1402													
	CS01B 0.1 AND CS01C 0.1)												
11	CS02 (composite of CS012 0.1 CS02 0.1 AND CS02C 0.1)	Aug 16, 2023		Soil	K23-Au0053714					X	X	X	
12	CS03 (composite of CS03A 0.1 CS03B 0.1 AND CS03C 0.1)	Aug 16, 2023		Soil	K23-Au0053715					X	X	X	
13	CS04 (composite of CS04A 0.1 CS04B 0.1 AND CS04C	Aug 16, 2023		Soil	K23-Au0053716					X	X	X	

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Company Name: ENGEO Ltd - NI
Address: 8 Greydene Place
Takapuna
Auckland 0622

Project Name: 16 SINTON ROAD
Project ID: 23849.000.003

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Fax:

Received: Aug 18, 2023 1:45 PM
Due: Aug 25, 2023
Priority: 5 Day
Contact Name: Claire Davies

Eurofins Analytical Services Manager : Katyana Gausel

Sample Detail						Asbestos - AS4964	Asbestos - AS4964	Asbestos - WA guidelines	HOLD	Moisture Set	Organochlorine Pesticides (NZ MfE)	Metals M8 (NZ MfE)	Polycyclic Aromatic Hydrocarbons (NZ MfE)
Auckland Laboratory - IANZ# 1327							X		X	X	X	X	X
Christchurch Laboratory - IANZ# 1290						X		X					
Tauranga Laboratory - IANZ# 1402													
	AND CS04C 0.1)												
14	CS05 (composite of CS05A 0.1 CS05B 0.1 AND CS05C 0.1)	Aug 16, 2023		Soil	K23-Au0053717					X	X	X	
15	CS06 (composite of CS06A 0.1 CS06B 0.1 AND CS06C 0.1)	Aug 16, 2023		Soil	K23-Au0053718					X	X	X	
16	CS07 (composite of CS07A 0.1 CS07B 0.1 AND CS07C	Aug 16, 2023		Soil	K23-Au0053719					X	X	X	

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Auckland Laboratory - IANZ# 1327							X		X	X	X	X	X
Christchurch Laboratory - IANZ# 1290						X		X					
Tauranga Laboratory - IANZ# 1402													
	0.1)												
17	CS08 (composite of CS08A 0.1 CS08B 0.1 AND CS08C 0.1)	Aug 16, 2023		Soil	K23-Au0053720					X	X	X	
18	S01 0.25-0.5	Aug 16, 2023		Soil	K23-Au0053721				X				
19	S04 0.3-0.6	Aug 16, 2023		Soil	K23-Au0053722				X				
20	S05 0.0-0.25	Aug 16, 2023		Soil	K23-Au0053723				X				
21	S06 0.0-0.25	Aug 16, 2023		Soil	K23-Au0053724				X				
22	S07-A 0.0-0.3	Aug 16, 2023		Soil	K23-Au0053725				X				
23	S07-B 0.0-0.4	Aug 16, 2023		Soil	K23-Au0053726				X				
24	S07-B 0.4-0.6	Aug 16, 2023		Soil	K23-Au0053727				X				
25	S08 0.3-0.5	Aug 16, 2023		Soil	K23-Au0053728				X				

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Sample Detail						Asbestos - AS4964	Asbestos - AS4964	Asbestos - WA guidelines	HOLD	Moisture Set	Organochlorine Pesticides (NZ MfE)	Metals M8 (NZ MfE)	Polycyclic Aromatic Hydrocarbons (NZ MfE)
Auckland Laboratory - IANZ# 1327							X		X	X	X	X	X
Christchurch Laboratory - IANZ# 1290						X		X					
Tauranga Laboratory - IANZ# 1402													
26	S09 0.25-0.5	Aug 16, 2023		Soil	K23-Au0053729				X				
27	S10 0.3-0.5	Aug 16, 2023		Soil	K23-Au0053730				X				
28	S11 0.0-0.3	Aug 16, 2023		Soil	K23-Au0053731				X				
29	S11 0.3-0.5	Aug 16, 2023		Soil	K23-Au0053732				X				
30	S12 0.4-0.6	Aug 16, 2023		Soil	K23-Au0053733				X				
31	CS01A 0.1	Aug 16, 2023		Soil	K23-Au0053734				X				
32	CS01A 0.5	Aug 16, 2023		Soil	K23-Au0053735				X				
33	CS01A 1.0	Aug 16, 2023		Soil	K23-Au0053736				X				
34	CS01B 0.1	Aug 16, 2023		Soil	K23-Au0053737				X				
35	CS01B 0.4	Aug 16, 2023		Soil	K23-Au0053738				X				
36	CS01C 0.1	Aug 16, 2023		Soil	K23-Au0053739				X				
37	CS01C 0.4	Aug 16, 2023		Soil	K23-Au0053740				X				
38	CS02A 0.1	Aug 16, 2023		Soil	K23-Au0053741				X				
39	CS02A 0.4	Aug 16, 2023		Soil	K23-Au0053742				X				

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Auckland Laboratory - IANZ# 1327							X		X	X	X	X	X
Christchurch Laboratory - IANZ# 1290						X		X					
Tauranga Laboratory - IANZ# 1402													
40	CS02B0.1	Aug 16, 2023		Soil	K23-Au0053743				X				
41	CS02B 0.4	Aug 16, 2023		Soil	K23-Au0053744				X				
42	CS02C 0.1	Aug 16, 2023		Soil	K23-Au0053745				X				
43	CS02C 0.4	Aug 16, 2023		Soil	K23-Au0053746				X				
44	CS03A 0.1	Aug 16, 2023		Soil	K23-Au0053747				X				
45	CS03A 0.4	Aug 16, 2023		Soil	K23-Au0053748				X				
46	CS03B 0.1	Aug 16, 2023		Soil	K23-Au0053749				X				
47	CS03B 0.4	Aug 16, 2023		Soil	K23-Au0053750				X				
48	CS03C 0.1	Aug 16, 2023		Soil	K23-Au0053751				X				
49	CS03C 0.4	Aug 16, 2023		Soil	K23-Au0053752				X				
50	CS04A 0.1	Aug 16, 2023		Soil	K23-Au0053753				X				
51	CS04A 0.4	Aug 16, 2023		Soil	K23-Au0053754				X				
52	CS04B 0.1	Aug 16, 2023		Soil	K23-Au0053755				X				
53	CS04B 0.4	Aug 16, 2023		Soil	K23-Au0053756				X				

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Auckland Laboratory - IANZ# 1327							X		X	X	X	X	X
Christchurch Laboratory - IANZ# 1290						X		X					
Tauranga Laboratory - IANZ# 1402													
54	CS04C 0.1	Aug 16, 2023		Soil	K23-Au0053757				X				
55	CS04C 0.4	Aug 16, 2023		Soil	K23-Au0053758				X				
56	CS05A 0.1	Aug 16, 2023		Soil	K23-Au0053759				X				
57	CS05A 0.4	Aug 16, 2023		Soil	K23-Au0053760				X				
58	CS05B 0.1	Aug 16, 2023		Soil	K23-Au0053761				X				
59	CS05B 0.4	Aug 16, 2023		Soil	K23-Au0053762				X				
60	CS05C 0.1	Aug 16, 2023		Soil	K23-Au0053763				X				
61	CS05C 0.4	Aug 16, 2023		Soil	K23-Au0053764				X				
62	CS06A 0.1	Aug 16, 2023		Soil	K23-Au0053765				X				
63	CS06A 0.4	Aug 16, 2023		Soil	K23-Au0053766				X				
64	CS06B 0.1	Aug 16, 2023		Soil	K23-Au0053767				X				
65	CS06B 0.4	Aug 16, 2023		Soil	K23-Au0053768				X				
66	CS06C 0.1	Aug 16, 2023		Soil	K23-Au0053769				X				
67	CS06C 0.4	Aug 16, 2023		Soil	K23-Au0053770				X				

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Auckland Laboratory - IANZ# 1327							X		X	X	X	X	X
Christchurch Laboratory - IANZ# 1290						X		X					
Tauranga Laboratory - IANZ# 1402													
68	CS07A 0.1	Aug 16, 2023		Soil	K23-Au0053771				X				
69	CS07A 0.4	Aug 16, 2023		Soil	K23-Au0053772				X				
70	CS07B 0.1	Aug 16, 2023		Soil	K23-Au0053773				X				
71	CS07B 0.4	Aug 16, 2023		Soil	K23-Au0053774				X				
72	CS07C 0.1	Aug 16, 2023		Soil	K23-Au0053775				X				
73	CS07C 0.4	Aug 16, 2023		Soil	K23-Au0053776				X				
74	CS08A 0.1	Aug 16, 2023		Soil	K23-Au0053777				X				
75	CS08A 0.4	Aug 16, 2023		Soil	K23-Au0053778				X				
76	CS08B 0.1	Aug 16, 2023		Soil	K23-Au0053779				X				
77	CS08B 0.4	Aug 16, 2023		Soil	K23-Au0053780				X				
78	CS08C 0.1	Aug 16, 2023		Soil	K23-Au0053781				X				
79	CS08C 0.4	Aug 16, 2023		Soil	K23-Au0053782				X				
80	LAB COMPOSITE	Aug 16, 2023		Soil	K23-Au0054137	X				X		X	

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Auckland Laboratory - IANZ# 1327		X		X	X	X	X	X
Christchurch Laboratory - IANZ# 1290	X		X					
Tauranga Laboratory - IANZ# 1402								
S11 & S12 0.0-0.3								
Test Counts	6	6	3	63	17	8	17	1

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

Units

mg/kg: milligrams per kilogram	**mg/L:** milligrams per litre	**µg/L:** micrograms per litre
ppm: parts per million	**ppb:** parts per billion	**%:** Percentage
org/100 mL: Organisms per 100 millilitres	**NTU:** Nephelometric Turbidity Units	**MPN/100 mL:** Most Probable Number of organisms per 100 millilitres
CFU: Colony forming unit		

Terms

APHA	American Public Health Association
COC	Chain of Custody
CP	Client Parent - QC was performed on samples pertaining to this report
CRM	Certified Reference Material (ISO17034) - reported as percent recovery.
Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
LOR	Limit of Reporting.
LCS	Laboratory Control Sample - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
SRA	Sample Receipt Advice
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
TBTO	Tributyltin oxide (*bis*-tributyltin oxide) - individual tributyltin compounds cannot be identified separately in the environment however free tributyltin was measured and its values were converted stoichiometrically into tributyltin oxide for comparison with regulatory limits.
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Toxic Equivalency Quotient or Total Equivalence
QSM	US Department of Defense Quality Systems Manual Version 5.4
US EPA	United States Environmental Protection Agency
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC - Acceptance Criteria

The acceptance criteria should be used as a guide only and may be different when site specific Sampling Analysis and Quality Plan (SAQP) have been implemented

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR: No Limit

Results between 10-20 times the LOR: RPD must lie between 0-50%

Results >20 times the LOR: RPD must lie between 0-30%

NOTE: pH duplicates are reported as a range not as RPD

Surrogate Recoveries: Recoveries must lie between 20-130% for Speciated Phenols & 50-150% for PFAS. SVOCs recoveries 20 – 150%

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.4 where no positive PFAS results have been reported have been reviewed and no data was affected.

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore, laboratory analysis is unlikely to be completed within holding time.Analysis will begin as soon as possible after sample receipt.
4. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of recovery the term "INT" appears against that analyte.
5. For Matrix Spikes and LCS results a dash "-" in the report means that the specific analyte was not added to the QC sample.
6. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Metals M8 (NZ MfE)							
Arsenic	mg/kg	< 0.1			0.1	Pass	
Cadmium	mg/kg	< 0.01			0.01	Pass	
Chromium	mg/kg	< 0.1			0.1	Pass	
Copper	mg/kg	< 0.1			0.1	Pass	
Lead	mg/kg	< 0.1			0.1	Pass	
Mercury	mg/kg	< 0.01			0.01	Pass	
Nickel	mg/kg	< 0.1			0.1	Pass	
Zinc	mg/kg	< 5			5	Pass	
Method Blank							
Polycyclic Aromatic Hydrocarbons (NZ MfE)							
Acenaphthene	mg/kg	< 0.03			0.03	Pass	
Acenaphthylene	mg/kg	< 0.03			0.03	Pass	
Anthracene	mg/kg	< 0.03			0.03	Pass	
Benz(a)anthracene	mg/kg	< 0.03			0.03	Pass	
Benzo(a)pyrene	mg/kg	< 0.03			0.03	Pass	
Benzo(b&j)fluoranthene	mg/kg	< 0.03			0.03	Pass	
Benzo(g.h.i)perylene	mg/kg	< 0.03			0.03	Pass	
Benzo(k)fluoranthene	mg/kg	< 0.03			0.03	Pass	
Chrysene	mg/kg	< 0.03			0.03	Pass	
Dibenz(a.h)anthracene	mg/kg	< 0.03			0.03	Pass	
Fluoranthene	mg/kg	< 0.03			0.03	Pass	
Fluorene	mg/kg	< 0.03			0.03	Pass	
Indeno(1.2.3-cd)pyrene	mg/kg	< 0.03			0.03	Pass	
Naphthalene	mg/kg	< 0.1			0.1	Pass	
Phenanthrene	mg/kg	< 0.03			0.03	Pass	
Pyrene	mg/kg	< 0.03			0.03	Pass	
Method Blank							
Organochlorine Pesticides (NZ MfE)							
2.4'-DDD	mg/kg	< 0.01			0.01	Pass	
2.4'-DDE	mg/kg	< 0.01			0.01	Pass	
2.4'-DDT	mg/kg	< 0.01			0.01	Pass	
4.4'-DDD	mg/kg	< 0.01			0.01	Pass	
4.4'-DDE	mg/kg	< 0.01			0.01	Pass	
4.4'-DDT	mg/kg	< 0.01			0.01	Pass	
a-HCH	mg/kg	< 0.01			0.01	Pass	
Aldrin	mg/kg	< 0.01			0.01	Pass	
b-HCH	mg/kg	< 0.01			0.01	Pass	
Chlordanes - Total	mg/kg	< 0.01			0.01	Pass	
cis-Chlordane	mg/kg	< 0.01			0.01	Pass	
d-HCH	mg/kg	< 0.01			0.01	Pass	
Dieldrin	mg/kg	< 0.01			0.01	Pass	
Endosulfan I	mg/kg	< 0.01			0.01	Pass	
Endosulfan II	mg/kg	< 0.01			0.01	Pass	
Endosulfan sulphate	mg/kg	< 0.01			0.01	Pass	
Endrin	mg/kg	< 0.01			0.01	Pass	
Endrin aldehyde	mg/kg	< 0.01			0.01	Pass	
Endrin ketone	mg/kg	< 0.01			0.01	Pass	
g-HCH (Lindane)	mg/kg	< 0.01			0.01	Pass	
Heptachlor	mg/kg	< 0.01			0.01	Pass	
Heptachlor epoxide	mg/kg	< 0.01			0.01	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Hexachlorobenzene	mg/kg	< 0.01			0.01	Pass	
Methoxychlor	mg/kg	< 0.01			0.01	Pass	
Toxaphene	mg/kg	< 0.5			0.5	Pass	
trans-Chlordane	mg/kg	< 0.01			0.01	Pass	
LCS - % Recovery							
Metals M8 (NZ MfE)							
Arsenic	%	110			80-120	Pass	
Cadmium	%	108			80-120	Pass	
Chromium	%	106			80-120	Pass	
Copper	%	109			80-120	Pass	
Lead	%	105			80-120	Pass	
Mercury	%	109			80-120	Pass	
Nickel	%	103			80-120	Pass	
Zinc	%	97			80-120	Pass	
LCS - % Recovery							
Polycyclic Aromatic Hydrocarbons (NZ MfE)							
Acenaphthene	%	111			70-130	Pass	
Acenaphthylene	%	115			70-130	Pass	
Anthracene	%	98			70-130	Pass	
Benz(a)anthracene	%	114			70-130	Pass	
Benzo(a)pyrene	%	101			70-130	Pass	
Benzo(b&j)fluoranthene	%	86			70-130	Pass	
Benzo(g.h.i)perylene	%	114			70-130	Pass	
Benzo(k)fluoranthene	%	118			70-130	Pass	
Chrysene	%	119			70-130	Pass	
Dibenz(a.h)anthracene	%	104			70-130	Pass	
Fluoranthene	%	93			70-130	Pass	
Fluorene	%	108			70-130	Pass	
Indeno(1.2.3-cd)pyrene	%	106			70-130	Pass	
Naphthalene	%	116			70-130	Pass	
Phenanthrene	%	104			70-130	Pass	
Pyrene	%	101			70-130	Pass	
LCS - % Recovery							
Organochlorine Pesticides (NZ MfE)							
2.4'-DDD	%	107			70-130	Pass	
2.4'-DDE	%	94			70-130	Pass	
2.4'-DDT	%	99			70-130	Pass	
4.4'-DDD	%	111			70-130	Pass	
4.4'-DDE	%	91			70-130	Pass	
4.4'-DDT	%	73			70-130	Pass	
a-HCH	%	102			70-130	Pass	
Aldrin	%	85			70-130	Pass	
b-HCH	%	98			70-130	Pass	
cis-Chlordane	%	98			70-130	Pass	
d-HCH	%	92			70-130	Pass	
Dieldrin	%	92			70-130	Pass	
Endosulfan I	%	86			70-130	Pass	
Endosulfan II	%	93			70-130	Pass	
Endosulfan sulphate	%	86			70-130	Pass	
Endrin	%	85			70-130	Pass	
Endrin aldehyde	%	81			70-130	Pass	
Endrin ketone	%	120			70-130	Pass	
g-HCH (Lindane)	%	95			70-130	Pass	
Heptachlor	%	115			70-130	Pass	

Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Heptachlor epoxide			%	93			70-130	Pass	
Hexachlorobenzene			%	76			70-130	Pass	
Methoxychlor			%	75			70-130	Pass	
Toxaphene			%	106			70-130	Pass	
trans-Chlordane			%	97			70-130	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Spike - % Recovery									
Metals M8 (NZ MfE)				Result 1					
Arsenic	K23-Au0053707	CP	%	110			75-125	Pass	
Chromium	K23-Au0053707	CP	%	114			75-125	Pass	
Copper	K23-Au0053707	CP	%	112			75-125	Pass	
Lead	K23-Au0053707	CP	%	108			75-125	Pass	
Mercury	K23-Au0053707	CP	%	115			75-125	Pass	
Nickel	K23-Au0053707	CP	%	106			75-125	Pass	
Zinc	K23-Au0053707	CP	%	103			75-125	Pass	
Spike - % Recovery									
Polycyclic Aromatic Hydrocarbons (NZ MfE)				Result 1					
Acenaphthene	K23-Au0055860	NCP	%	100			70-130	Pass	
Acenaphthylene	K23-Au0055860	NCP	%	105			70-130	Pass	
Anthracene	K23-Au0055860	NCP	%	74			70-130	Pass	
Benz(a)anthracene	K23-Au0055860	NCP	%	88			70-130	Pass	
Benzo(a)pyrene	K23-Au0055860	NCP	%	91			70-130	Pass	
Benzo(b&j)fluoranthene	K23-Au0053408	NCP	%	115			70-130	Pass	
Benzo(g.h.i)perylene	K23-Au0053408	NCP	%	120			70-130	Pass	
Benzo(k)fluoranthene	K23-Au0055860	NCP	%	93			70-130	Pass	
Chrysene	K23-Au0055860	NCP	%	117			70-130	Pass	
Dibenz(a.h)anthracene	K23-Au0053408	NCP	%	116			70-130	Pass	
Fluoranthene	K23-Au0055860	NCP	%	78			70-130	Pass	
Fluorene	K23-Au0055860	NCP	%	86			70-130	Pass	
Indeno(1.2.3-cd)pyrene	K23-Au0053408	NCP	%	113			70-130	Pass	
Naphthalene	K23-Au0055860	NCP	%	104			70-130	Pass	
Phenanthrene	K23-Au0055860	NCP	%	73			70-130	Pass	
Pyrene	K23-Au0055860	NCP	%	87			70-130	Pass	
Spike - % Recovery									
Organochlorine Pesticides (NZ MfE)				Result 1					
2.4'-DDD	K23-Au0035644	NCP	%	89			70-130	Pass	
2.4'-DDE	K23-Au0035644	NCP	%	78			70-130	Pass	
2.4'-DDT	K23-Au0035644	NCP	%	83			70-130	Pass	
4.4'-DDD	K23-Au0035644	NCP	%	117			70-130	Pass	
4.4'-DDE	K23-Au0035644	NCP	%	76			70-130	Pass	
4.4'-DDT	Z23-Au0014481	NCP	%	117			70-130	Pass	
a-HCH	K23-Au0035644	NCP	%	84			70-130	Pass	
Aldrin	K23-Au0035644	NCP	%	72			70-130	Pass	
b-HCH	K23-Au0035644	NCP	%	85			70-130	Pass	
cis-Chlordane	K23-Au0035644	NCP	%	83			70-130	Pass	
d-HCH	K23-Au0035644	NCP	%	76			70-130	Pass	
Dieldrin	K23-Au0035644	NCP	%	92			70-130	Pass	
Endosulfan I	K23-Au0035644	NCP	%	71			70-130	Pass	
Endosulfan II	K23-Au0035644	NCP	%	78			70-130	Pass	
Endosulfan sulphate	K23-Au0035644	NCP	%	71			70-130	Pass	
Endrin	K23-Au0035644	NCP	%	80			70-130	Pass	
Endrin ketone	K23-Au0035644	NCP	%	99			70-130	Pass	
g-HCH (Lindane)	K23-Au0035644	NCP	%	81			70-130	Pass	
Heptachlor	K23-Au0035644	NCP	%	96			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Heptachlor epoxide	K23-Au0035644	NCP	%	82			70-130	Pass	
Hexachlorobenzene	K23-Au0035644	NCP	%	86			70-130	Pass	
Methoxychlor	K23-Au0035644	NCP	%	75			70-130	Pass	
trans-Chlordane	K23-Au0035644	NCP	%	83			70-130	Pass	
Spike - % Recovery									
Metals M8 (NZ MfE)				Result 1					
Arsenic	K23-Au0053718	CP	%	97			75-125	Pass	
Chromium	K23-Au0053718	CP	%	102			75-125	Pass	
Copper	K23-Au0053718	CP	%	109			75-125	Pass	
Lead	K23-Au0053718	CP	%	103			75-125	Pass	
Mercury	K23-Au0053718	CP	%	110			75-125	Pass	
Nickel	K23-Au0053718	CP	%	101			75-125	Pass	
Zinc	K23-Au0053718	CP	%	101			75-125	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
Metals M8 (NZ MfE)				Result 1	Result 2	RPD			
Arsenic	K23-Au0053706	CP	mg/kg	100	170	49	30%	Fail	Q02
Cadmium	K23-Au0053706	CP	mg/kg	0.15	0.20	33	30%	Fail	Q02
Chromium	K23-Au0053706	CP	mg/kg	56	120	75	30%	Fail	Q02
Copper	K23-Au0053706	CP	mg/kg	230	250	8.6	30%	Pass	
Lead	K23-Au0053706	CP	mg/kg	8.4	12	36	30%	Fail	Q02
Mercury	K23-Au0053706	CP	mg/kg	0.03	0.03	12	30%	Pass	
Nickel	K23-Au0053706	CP	mg/kg	43	40	7.6	30%	Pass	
Zinc	K23-Au0053706	CP	mg/kg	190	280	36	30%	Fail	Q02
Duplicate									
Polycyclic Aromatic Hydrocarbons (NZ MfE)				Result 1	Result 2	RPD			
Acenaphthene	K23-Au0053436	NCP	mg/kg	< 0.03	< 0.03	<1	30%	Pass	
Acenaphthylene	K23-Au0053436	NCP	mg/kg	< 0.03	< 0.03	<1	30%	Pass	
Anthracene	K23-Au0053436	NCP	mg/kg	< 0.03	< 0.03	<1	30%	Pass	
Benz(a)anthracene	K23-Au0053436	NCP	mg/kg	0.05	0.04	33	30%	Fail	Q15
Benzo(a)pyrene	K23-Au0053436	NCP	mg/kg	0.06	0.04	31	30%	Fail	Q15
Benzo(b&j)fluoranthene	K23-Au0053436	NCP	mg/kg	< 0.03	< 0.03	<1	30%	Pass	
Benzo(g.h.i)perylene	K23-Au0053436	NCP	mg/kg	0.04	< 0.03	49	30%	Fail	Q15
Benzo(k)fluoranthene	K23-Au0053436	NCP	mg/kg	0.03	< 0.03	12	30%	Pass	
Chrysene	K23-Au0053436	NCP	mg/kg	0.06	0.05	30	30%	Pass	
Dibenz(a.h)anthracene	K23-Au0053436	NCP	mg/kg	< 0.03	< 0.03	<1	30%	Pass	
Fluoranthene	K23-Au0053436	NCP	mg/kg	0.08	0.07	14	30%	Pass	
Fluorene	K23-Au0053436	NCP	mg/kg	< 0.03	< 0.03	<1	30%	Pass	
Indeno(1.2.3-cd)pyrene	K23-Au0053436	NCP	mg/kg	< 0.03	< 0.03	<1	30%	Pass	
Naphthalene	K23-Au0053436	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Phenanthrene	K23-Au0053436	NCP	mg/kg	0.03	0.05	40	30%	Fail	Q15
Pyrene	K23-Au0053436	NCP	mg/kg	0.10	0.08	22	30%	Pass	
Duplicate									
Organochlorine Pesticides (NZ MfE)				Result 1	Result 2	RPD			
2.4'-DDD	K23-Au0053436	NCP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
2.4'-DDE	K23-Au0053436	NCP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
2.4'-DDT	K23-Au0053436	NCP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
4.4'-DDD	K23-Au0053436	NCP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
4.4'-DDE	K23-Au0053436	NCP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
4.4'-DDT	K23-Au0053436	NCP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
a-HCH	K23-Au0053436	NCP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
Aldrin	K23-Au0053436	NCP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
b-HCH	K23-Au0053436	NCP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
cis-Chlordane	K23-Au0053436	NCP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	

Duplicate									
Organochlorine Pesticides (NZ MfE)				Result 1	Result 2	RPD			
d-HCH	K23-Au0053436	NCP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
Dieldrin	K23-Au0053436	NCP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
Endosulfan I	K23-Au0053436	NCP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
Endosulfan II	K23-Au0053436	NCP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
Endosulfan sulphate	K23-Au0053436	NCP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
Endrin	K23-Au0053436	NCP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
Endrin aldehyde	K23-Au0053436	NCP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
Endrin ketone	K23-Au0053436	NCP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
g-HCH (Lindane)	K23-Au0053436	NCP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
Heptachlor	K23-Au0053436	NCP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
Heptachlor epoxide	K23-Au0053436	NCP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
Hexachlorobenzene	K23-Au0053436	NCP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
Methoxychlor	K23-Au0053436	NCP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
Toxaphene	K23-Au0053436	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
trans-Chlordane	K23-Au0053436	NCP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
Duplicate									
Sample Properties				Result 1	Result 2	RPD			
% Moisture	K23-Au0053714	CP	%	28	28	1.7	30%	Pass	
Duplicate									
Metals M8 (NZ MfE)				Result 1	Result 2	RPD			
Arsenic	K23-Au0053717	CP	mg/kg	1.4	1.2	13	30%	Pass	
Cadmium	K23-Au0053717	CP	mg/kg	0.15	0.13	11	30%	Pass	
Chromium	K23-Au0053717	CP	mg/kg	6.2	5.7	8.3	30%	Pass	
Copper	K23-Au0053717	CP	mg/kg	3.1	3.0	5.3	30%	Pass	
Lead	K23-Au0053717	CP	mg/kg	6.9	6.9	<1	30%	Pass	
Mercury	K23-Au0053717	CP	mg/kg	0.10	0.09	2.8	30%	Pass	
Nickel	K23-Au0053717	CP	mg/kg	2.6	2.3	14	30%	Pass	
Zinc	K23-Au0053717	CP	mg/kg	8.0	6.4	22	30%	Pass	
Duplicate									
Metals M8 (NZ MfE)				Result 1	Result 2	RPD			
Arsenic	K23-Au0054137	CP	mg/kg	6.0	5.8	3.6	30%	Pass	
Cadmium	K23-Au0054137	CP	mg/kg	0.23	0.26	11	30%	Pass	
Chromium	K23-Au0054137	CP	mg/kg	11	11	4.4	30%	Pass	
Copper	K23-Au0054137	CP	mg/kg	9.6	9.3	2.7	30%	Pass	
Lead	K23-Au0054137	CP	mg/kg	17	16	3.5	30%	Pass	
Mercury	K23-Au0054137	CP	mg/kg	0.14	0.13	3.3	30%	Pass	
Nickel	K23-Au0054137	CP	mg/kg	6.6	6.2	6.2	30%	Pass	
Zinc	K23-Au0054137	CP	mg/kg	24	23	5.2	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
N07	Please note:- These two PAH isomers closely co-elute using the most contemporary analytical methods and both the reported concentration (and the TEQ) apply specifically to the total of the two co-eluting PAHs
Q02	The duplicate %RPD is outside the recommended acceptance criteria. Further analysis indicates sample heterogeneity as the cause
Q15	The RPD reported passes Eurofins Environment Testing's QC - Acceptance Criteria as defined in the Internal Quality Control Review and Glossary page of this report.

Authorised by:

Katyana Gausel	Analytical Services Manager
Raymond Siu	Senior Analyst-Metal
Raymond Siu	Senior Analyst-Organic
Sophie Bush	Senior Analyst-Asbestos

Raymond Siu
Senior Instrument Chemist (Key Technical Personnel)

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates IANZ accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

Certificate of Analysis

eurofins | Environment Testing

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

ENGEO Ltd
8 Greydene Place
Takapuna
Auckland 0622

Attention:	Claire Davies
Report	1018938-AID
Project Name	16 SINTON ROAD
Project ID	23849.000.003
Received Date	Aug 18, 2023
Date Reported	Aug 25, 2023

Methodology:

Asbestos Fibre Identification	Conducted in accordance with the Australian Standard AS 4964 – 2004: Method for the Qualitative Identification of Asbestos in Bulk Samples and in-house Method LTM-ASB-8020 by polarised light microscopy (PLM) and dispersion staining (DS) techniques. *NOTE: Positive Trace Analysis results indicate the sample contains detectable respirable fibres.*
Unknown Mineral Fibres	Mineral fibres of unknown type, as determined by PLM with DS, may require another analytical technique, such as Electron Microscopy, to confirm unequivocal identity. *NOTE: While Actinolite, Anthophyllite and Tremolite asbestos may be detected by PLM with DS, due to variability in the optical properties of these materials, AS4964 requires that these are reported as UMF unless confirmed by an independent technique.*
Subsampling Soil Samples	The whole sample submitted is first dried and then passed through a 10mm sieve followed by a 2mm sieve. All fibrous matter greater than 10mm, greater than 2mm as well as the material passing through the 2mm sieve are retained and analysed for the presence of asbestos. If the sub 2mm fraction is greater than approximately 30 to 60g then a sub-sampling routine based on ISO 3082:2009(E) is employed. *NOTE: Depending on the nature and size of the soil sample, the sub-2 mm residue material may need to be sub-sampled for trace analysis, in accordance with AS 4964-2004.*
Bonded asbestos-containing material (ACM)	The material is first examined and any fibres isolated for identification by PLM and DS. Where required, interfering matrices may be removed by disintegration using a range of heat, chemical or physical treatments, possibly in combination.The resultant material is then further examined in accordance with AS 4964 - 2004. *NOTE: Even after disintegration it may be difficult to detect the presence of asbestos in some asbestos-containing bulk materials using PLM and DS. This is due to the low grade or small length or diameter of the asbestos fibres present in the material, or to the fact that very fine fibres have been distributed intimately throughout the materials. Vinyl/asbestos floor tiles, some asbestos-containing sealants and mastics, asbestos-containing epoxy resins and some ore samples are examples of these types of material, which are difficult to analyse.*
Limit of Reporting	The performance limitation of the AS 4964 (2004) method for non-homogeneous samples is around 0.1 g/kg (equivalent to 0.01% (w/w)). Where no asbestos is found by PLM and DS, including Trace Analysis, this is considered to be at the nominal reporting limit of 0.01% (w/w). The NEPM screening level of 0.001% (w/w) is intended as an on-site determination, not a laboratory Limit of Reporting (LOR), per se. Examination of a large sample size (e.g. 500 mL) may improve the likelihood of detecting asbestos, particularly AF, to aid assessment against the NEPM criteria. Gravimetric determinations to this level of accuracy are outside of AS 4964 and hence IANZ Accreditation does not cover the performance of this service (non-IANZ results shown with an asterisk). *NOTE: NATA News March 2014, p.7, states in relation to AS 4964: "This is a qualitative method with a nominal reporting limit of 0.01 % " and that currently in Australia "there is no validated method available for the quantification of asbestos".This report is consistent with the analytical procedures and reporting recommendations in the NEPM and the WA DoH.*

Project Name 16 SINTON ROAD
Project ID 23849.000.003
Date Sampled Aug 16, 2023
Report 1018938-AID

Client Sample ID	Eurofins Sample No.	Date Sampled	Sample Description	Result
S01 0.0-0.25	23-Au0053704	Aug 16, 2023	Approximate Sample 200g Sample consisted of: Fine grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.
S02 0.05-0.3	23-Au0053705	Aug 16, 2023	Approximate Sample 189g Sample consisted of: Fine grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.
S03 0.0-0.25	23-Au0053706	Aug 16, 2023	Approximate Sample 145g Sample consisted of: Fine grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.
S04 0.0-0.3	23-Au0053707	Aug 16, 2023	Approximate Sample 207g Sample consisted of: Fine grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.
S08 0.0-0.3	23-Au0053708	Aug 16, 2023	Approximate Sample 443g Sample consisted of: Fine grained soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No trace asbestos detected.
S09 0.0-0.25	23-Au0053709	Aug 16, 2023	Approximate Sample 567g Sample consisted of: Fine grained soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No trace asbestos detected.
S10 0.0-0.3	23-Au0053710	Aug 16, 2023	Approximate Sample 591g Sample consisted of: Fine grained soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No trace asbestos detected.
S13 0.0-0.3	23-Au0053712	Aug 16, 2023	Approximate Sample 407g Sample consisted of: Fine grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.

Client Sample ID	Eurofins Sample No.	Date Sampled	Sample Description	Result
LAB COMPOSITE S11 & S12 0.0-0.3	23-Au0054137	Aug 16, 2023	Approximate Sample 53g Sample consisted of: Fine grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Asbestos - LTM-ASB-8020	Christchurch	Aug 25, 2023	Indefinite
Asbestos - LTM-ASB-8020	Christchurch	Aug 25, 2023	Indefinite

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IANZ# 1327	IANZ# 1290	IANZ# 1402

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NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	Site# 25079 & 25289
Site# 1254	Site# 25403	Site# 18217	Site# 25466	Site# 20794	

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Company Name: ENGEO Ltd - NI
Address: 8 Greydene Place
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Auckland 0622

Project Name: 16 SINTON ROAD
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Order No.:
Report #: 1018938
Phone: 0011 64 9 9722 205
Fax:

Received: Aug 18, 2023 1:45 PM
Due: Aug 25, 2023
Priority: 5 Day
Contact Name: Claire Davies

Eurofins Analytical Services Manager : Katyana Gausel

Sample Detail						Asbestos - AS4964	Asbestos - WA guidelines	HOLD	Moisture Set	Organochlorine Pesticides (NZ MfE)	Metals M8 (NZ MfE)	Polycyclic Aromatic Hydrocarbons (NZ MfE)
Auckland Laboratory - IANZ# 1327								X	X	X	X	X
Christchurch Laboratory - IANZ# 1290						X	X					
Tauranga Laboratory - IANZ# 1402												
External Laboratory												
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**							
1	S01 0.0-0.25	Aug 16, 2023		Soil	K23-Au0053704	X			X		X	
2	S02 0.05-0.3	Aug 16, 2023		Soil	K23-Au0053705	X			X		X	
3	S03 0.0-0.25	Aug 16, 2023		Soil	K23-Au0053706	X			X		X	
4	S04 0.0-0.3	Aug 16, 2023		Soil	K23-Au0053707	X			X		X	
5	S08 0.0-0.3	Aug 16, 2023		Soil	K23-Au0053708		X		X		X	
6	S09 0.0-0.25	Aug 16, 2023		Soil	K23-Au0053709		X		X		X	
7	S10 0.0-0.3	Aug 16, 2023		Soil	K23-Au0053710		X		X		X	
8	S12 0.0-0.4	Aug 16, 2023		Soil	K23-Au0053711			X				
9	S13 0.0-0.3	Aug 16, 2023		Soil	K23-Au0053712	X			X		X	X
10	CS01 (composite of CS01A 0.1	Aug 16, 2023		Soil	K23-Au0053713				X	X	X	

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Auckland Laboratory - IANZ# 1327								X	X	X	X	X
Christchurch Laboratory - IANZ# 1290						X	X					
Tauranga Laboratory - IANZ# 1402												
	CS01B 0.1 AND CS01C 0.1)											
11	CS02 (composite of CS012 0.1 CS02 0.1 AND CS02C 0.1)	Aug 16, 2023		Soil	K23-Au0053714				X	X	X	
12	CS03 (composite of CS03A 0.1 CS03B 0.1 AND CS03C 0.1)	Aug 16, 2023		Soil	K23-Au0053715				X	X	X	
13	CS04 (composite of CS04A 0.1 CS04B 0.1 AND CS04C	Aug 16, 2023		Soil	K23-Au0053716				X	X	X	

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Auckland Laboratory - IANZ# 1327								X	X	X	X	X
Christchurch Laboratory - IANZ# 1290						X	X					
Tauranga Laboratory - IANZ# 1402												
	AND CS04C 0.1)											
14	CS05 (composite of CS05A 0.1 CS05B 0.1 AND CS05C 0.1)	Aug 16, 2023		Soil	K23-Au0053717				X	X	X	
15	CS06 (composite of CS06A 0.1 CS06B 0.1 AND CS06C 0.1)	Aug 16, 2023		Soil	K23-Au0053718				X	X	X	
16	CS07 (composite of CS07A 0.1 CS07B 0.1 AND CS07C	Aug 16, 2023		Soil	K23-Au0053719				X	X	X	

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Auckland Laboratory - IANZ# 1327								X	X	X	X	X
Christchurch Laboratory - IANZ# 1290						X	X					
Tauranga Laboratory - IANZ# 1402												
	0.1)											
17	CS08 (composite of CS08A 0.1 CS08B 0.1 AND CS08C 0.1)	Aug 16, 2023		Soil	K23-Au0053720				X	X	X	
18	S01 0.25-0.5	Aug 16, 2023		Soil	K23-Au0053721			X				
19	S04 0.3-0.6	Aug 16, 2023		Soil	K23-Au0053722			X				
20	S05 0.0-0.25	Aug 16, 2023		Soil	K23-Au0053723			X				
21	S06 0.0-0.25	Aug 16, 2023		Soil	K23-Au0053724			X				
22	S07-A 0.0-0.3	Aug 16, 2023		Soil	K23-Au0053725			X				
23	S07-B 0.0-0.4	Aug 16, 2023		Soil	K23-Au0053726			X				
24	S07-B 0.4-0.6	Aug 16, 2023		Soil	K23-Au0053727			X				
25	S08 0.3-0.5	Aug 16, 2023		Soil	K23-Au0053728			X				

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Auckland Laboratory - IANZ# 1327								X	X	X	X	X
Christchurch Laboratory - IANZ# 1290						X	X					
Tauranga Laboratory - IANZ# 1402												
26	S09 0.25-0.5	Aug 16, 2023		Soil	K23-Au0053729			X				
27	S10 0.3-0.5	Aug 16, 2023		Soil	K23-Au0053730			X				
28	S11 0.0-0.3	Aug 16, 2023		Soil	K23-Au0053731			X				
29	S11 0.3-0.5	Aug 16, 2023		Soil	K23-Au0053732			X				
30	S12 0.4-0.6	Aug 16, 2023		Soil	K23-Au0053733			X				
31	CS01A 0.1	Aug 16, 2023		Soil	K23-Au0053734			X				
32	CS01A 0.5	Aug 16, 2023		Soil	K23-Au0053735			X				
33	CS01A 1.0	Aug 16, 2023		Soil	K23-Au0053736			X				
34	CS01B 0.1	Aug 16, 2023		Soil	K23-Au0053737			X				
35	CS01B 0.4	Aug 16, 2023		Soil	K23-Au0053738			X				
36	CS01C 0.1	Aug 16, 2023		Soil	K23-Au0053739			X				
37	CS01C 0.4	Aug 16, 2023		Soil	K23-Au0053740			X				
38	CS02A 0.1	Aug 16, 2023		Soil	K23-Au0053741			X				
39	CS02A 0.4	Aug 16, 2023		Soil	K23-Au0053742			X				

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Auckland Laboratory - IANZ# 1327								X	X	X	X	X
Christchurch Laboratory - IANZ# 1290						X	X					
Tauranga Laboratory - IANZ# 1402												
40	CS02B0.1	Aug 16, 2023		Soil	K23-Au0053743			X				
41	CS02B 0.4	Aug 16, 2023		Soil	K23-Au0053744			X				
42	CS02C 0.1	Aug 16, 2023		Soil	K23-Au0053745			X				
43	CS02C 0.4	Aug 16, 2023		Soil	K23-Au0053746			X				
44	CS03A 0.1	Aug 16, 2023		Soil	K23-Au0053747			X				
45	CS03A 0.4	Aug 16, 2023		Soil	K23-Au0053748			X				
46	CS03B 0.1	Aug 16, 2023		Soil	K23-Au0053749			X				
47	CS03B 0.4	Aug 16, 2023		Soil	K23-Au0053750			X				
48	CS03C 0.1	Aug 16, 2023		Soil	K23-Au0053751			X				
49	CS03C 0.4	Aug 16, 2023		Soil	K23-Au0053752			X				
50	CS04A 0.1	Aug 16, 2023		Soil	K23-Au0053753			X				
51	CS04A 0.4	Aug 16, 2023		Soil	K23-Au0053754			X				
52	CS04B 0.1	Aug 16, 2023		Soil	K23-Au0053755			X				
53	CS04B 0.4	Aug 16, 2023		Soil	K23-Au0053756			X				

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Project Name: 16 SINTON ROAD
Project ID: 23849.000.003

Order No.:
Report #: 1018938
Phone: 0011 64 9 9722 205
Fax:

Received: Aug 18, 2023 1:45 PM
Due: Aug 25, 2023
Priority: 5 Day
Contact Name: Claire Davies

Eurofins Analytical Services Manager : Katyana Gausel

Sample Detail						Asbestos - AS4964	Asbestos - WA guidelines	HOLD	Moisture Set	Organochlorine Pesticides (NZ MfE)	Metals M8 (NZ MfE)	Polycyclic Aromatic Hydrocarbons (NZ MfE)
Auckland Laboratory - IANZ# 1327								X	X	X	X	X
Christchurch Laboratory - IANZ# 1290						X	X					
Tauranga Laboratory - IANZ# 1402												
54	CS04C 0.1	Aug 16, 2023		Soil	K23-Au0053757			X				
55	CS04C 0.4	Aug 16, 2023		Soil	K23-Au0053758			X				
56	CS05A 0.1	Aug 16, 2023		Soil	K23-Au0053759			X				
57	CS05A 0.4	Aug 16, 2023		Soil	K23-Au0053760			X				
58	CS05B 0.1	Aug 16, 2023		Soil	K23-Au0053761			X				
59	CS05B 0.4	Aug 16, 2023		Soil	K23-Au0053762			X				
60	CS05C 0.1	Aug 16, 2023		Soil	K23-Au0053763			X				
61	CS05C 0.4	Aug 16, 2023		Soil	K23-Au0053764			X				
62	CS06A 0.1	Aug 16, 2023		Soil	K23-Au0053765			X				
63	CS06A 0.4	Aug 16, 2023		Soil	K23-Au0053766			X				
64	CS06B 0.1	Aug 16, 2023		Soil	K23-Au0053767			X				
65	CS06B 0.4	Aug 16, 2023		Soil	K23-Au0053768			X				
66	CS06C 0.1	Aug 16, 2023		Soil	K23-Au0053769			X				
67	CS06C 0.4	Aug 16, 2023		Soil	K23-Au0053770			X				

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Dandenong South	Grovedale	Girraween	Mitchell	Murarrie	Mayfield West NSW 2304
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Tel: +61 3 8564 5000	Tel: +61 3 8564 5000	Tel: +61 2 9900 8400	Tel: +61 2 6113 8091	Tel: +61 7 3902 4600	NATA# 1261
NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	Site# 25079 & 25289
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Auckland Laboratory - IANZ# 1327								X	X	X	X	X
Christchurch Laboratory - IANZ# 1290						X	X					
Tauranga Laboratory - IANZ# 1402												
68	CS07A 0.1	Aug 16, 2023		Soil	K23-Au0053771			X				
69	CS07A 0.4	Aug 16, 2023		Soil	K23-Au0053772			X				
70	CS07B 0.1	Aug 16, 2023		Soil	K23-Au0053773			X				
71	CS07B 0.4	Aug 16, 2023		Soil	K23-Au0053774			X				
72	CS07C 0.1	Aug 16, 2023		Soil	K23-Au0053775			X				
73	CS07C 0.4	Aug 16, 2023		Soil	K23-Au0053776			X				
74	CS08A 0.1	Aug 16, 2023		Soil	K23-Au0053777			X				
75	CS08A 0.4	Aug 16, 2023		Soil	K23-Au0053778			X				
76	CS08B 0.1	Aug 16, 2023		Soil	K23-Au0053779			X				
77	CS08B 0.4	Aug 16, 2023		Soil	K23-Au0053780			X				
78	CS08C 0.1	Aug 16, 2023		Soil	K23-Au0053781			X				
79	CS08C 0.4	Aug 16, 2023		Soil	K23-Au0053782			X				
80	LAB COMPOSITE	Aug 16, 2023		Soil	K23-Au0054137	X			X		X	

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Auckland Laboratory - IANZ# 1327			X	X	X	X	X
Christchurch Laboratory - IANZ# 1290	X	X					
Tauranga Laboratory - IANZ# 1402							
S11 & S12 0.0-0.3							
Test Counts	6	3	63	17	8	17	1

Internal Quality Control Review and Glossary General

1. QC data may be available on request.
2. All soil results are reported on a dry basis, unless otherwise stated.
3. Samples were analysed on an 'as received' basis.
4. Information identified on this report with the colour **blue** indicates data provided by customer that may have an impact on the results.
5. This report replaces any interim results previously issued.

Holding Times

Please refer to the most recent version of the 'Sample Preservation and Container Guide' for holding times (QS3001).
If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported. Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

Units

% w/w:	Percentage weight-for-weight basis, e.g. of asbestos in asbestos-containing finds in soil samples (**% w/w**)
F/fld	Airborne fibre filter loading as Fibres (**N**) per Fields counted (**n**)
F/mL	Airborne fibre reported concentration as Fibres per millilitre of air drawn over the sampler membrane (**C**)
g, kg	Mass, e.g. of whole sample (**M**) or asbestos-containing find within the sample (**m**)
g/kg	Concentration in grams per kilogram
L, mL	Volume, e.g. of air as measured in AFM (**V** = **r** x **t**)
L/min	Airborne fibre sampling Flowrate as litres per minute of air drawn over the sampler membrane (**r**)
min	Time (**t**), e.g. of air sample collection period

Calculations

Airborne Fibre Concentration: $C = \left(\frac{A}{a}\right) \times \left(\frac{N}{n}\right) \times \left(\frac{1}{r}\right) \times \left(\frac{1}{t}\right) = K \times \left(\frac{N}{n}\right) \times \left(\frac{1}{V}\right)$

Asbestos Content (as asbestos): $\%\, w/w = \frac{(m \times P_A)}{M}$

Weighted Average (of asbestos): $\%_{WA} = \sum \frac{(m \times P_A)_x}{x}$

Terms

%asbestos	Estimated percentage of asbestos in a given matrix. May be derived from knowledge or experience of the material, informed by HSG264 *Appendix 2*, else assumed to be 15% in accordance with WA DOH *Appendix 2* (**P_A**).
ACM	Asbestos Containing Materials. Asbestos contained within a non-asbestos matrix, typically presented in bonded (non-friable) condition. For the purposes of the NEPM and WA DOH, ACM corresponds to material larger than 7 mm x 7 mm.
AF	Asbestos Fines. Asbestos contamination within a soil sample, as defined by WA DOH. Includes loose fibre bundles and small pieces of friable and non-friable material such as asbestos cement fragments mixed with soil. Considered under the NEPM as equivalent to “non-bonded / friable”.
AFM	Airborne Fibre Monitoring, e.g. by the MFM.
Amosite	Amosite Asbestos Detected. Amosite may also refer to Fibrous Grunerite or Brown Asbestos. Identified in accordance with AS 4964-2004.
AS	Australian Standard.
Asbestos Content (as asbestos)	Total % w/w asbestos content in asbestos-containing finds in a soil sample (**% w/w)**.
Chrysotile	Chrysotile Asbestos Detected. Chrysotile may also refer to Fibrous Serpentine or White Asbestos. Identified in accordance with AS 4964-2004.
COC	Chain of Custody.
Crocidolite	Crocidolite Asbestos Detected. Crocidolite may also refer to Fibrous Riebeckite or Blue Asbestos. Identified in accordance with AS 4964-2004.
Dry	Sample is dried by heating prior to analysis.
DS	Dispersion Staining. Technique required for Unequivocal Identification of asbestos fibres by PLM.
FA	Fibrous Asbestos. Asbestos containing material that is wholly or in part friable, including materials with higher asbestos content with a propensity to become friable with handling, and any material that was previously non-friable and in a severely degraded condition. For the purposes of the NEPM and WA DOH, FA generally corresponds to material larger than 7 mm x 7 mm, although FA may be more difficult to visibly distinguish and may be assessed as AF.
Fibre Count	Total of all fibres (whether asbestos or not) meeting the counting criteria set out in the NOHSC:3003
Fibre ID	Fibre Identification. Unequivocal identification of asbestos fibres according to AS 4964-2004. Includes Chrysotile, Amosite (Grunerite) or Crocidolite asbestos.
Friable	Asbestos-containing materials of any size that may be broken or crumbled by hand pressure. For the purposes of the NEPM, this includes both AF and FA. It is outside of the laboratory’s remit to assess degree of friability.
HSG248	UK HSE HSG248, *Asbestos: The Analysts Guide*, 2nd Edition (2021).
HSG264	UK HSE HSG264, *Asbestos: The Survey Guide* (2012).
ISO (also ISO/IEC)	International Organization for Standardization / International Electrotechnical Commission.
K Factor	Microscope constant (**K**) as derived from the effective filter area of the given AFM membrane used for collecting the sample (**A**) and the projected eyepiece graticule area of the specific microscope used for the analysis (**a**).
LOR	Limit of Reporting.
MFM (also NOHSC:3003)	Membrane Filter Method. As described by the Australian Government National Occupational Health and Safety Commission, *Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres*, 2nd Edition [NOHSC:3003(2005)].
NEPM (also ASC NEPM)	National Environment Protection (Assessment of Site Contamination) Measure, (2013, as amended).
Organic	Organic Fibres Detected. Organic may refer to Natural or Man-Made Polymeric Fibres. Identified in accordance with AS 4964-2004.
PCM	Phase Contrast Microscopy. As used for Fibre Counting according to the MFM.
PLM	Polarised Light Microscopy. As used for Fibre Identification and Trace Analysis according to AS 4964-2004.
Sampling	Unless otherwise stated Eurofins are not responsible for sampling equipment or the sampling process.
SMF	Synthetic Mineral Fibre Detected. SMF may also refer to Man Made Vitreous Fibres. Identified in accordance with AS 4964-2004.
SRA	Sample Receipt Advice.
Trace Analysis	Analytical procedure used to detect the presence of respirable fibres (particularly asbestos) in a given sample matrix.
UK HSE HSG	United Kingdom, Health and Safety Executive, Health and Safety Guidance, publication.
UMF	Unidentified Mineral Fibre Detected. Fibrous minerals that are detected but have not been unequivocally identified by PLM with DS according the AS 4964-2004. May include (but not limited to) Actinolite, Anthophyllite or Tremolite asbestos.
WA DOH	Reference document for the NEPM. Government of Western Australia, *Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia* (updated 2021), including Appendix Four: *Laboratory analysis*
Weighted Average	Combined average % w/w asbestos content of all asbestos-containing finds in the given aliquot or total soil sample (**$\%_{WA}$**).

Comments

Samples Au0053704-07 were significantly less than the nominal 500mL as recommended in Section 4.10 of the NEPM Schedule B1 - Guideline on Investigation Levels for Soil and Groundwater. It was therefore necessary to instead analyse according to AS4964 guidelines.

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Asbestos Counter/Identifier:

Adelle Black	Senior Analyst-Asbestos

Authorised by:

Sophie Bush	Senior Analyst-Asbestos

Sophie Bush
Senior Analyst-Asbestos (Key Technical Personnel)

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates ISO/IEC 17025:2017 accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

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Project Number 23849.000.003

Remediation Action Plan

16 Sinton Road, Whenuapai, Auckland

Submitted to:
Cabra Developments Limited
Unit 9B, 30 Foundry Road
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Auckland 0932

Contents

Tables

Appendices

ENGEO Document Control:

Report Title	Remediation Action Plan - 16 Sinton Road, Whenuapai			
Project No.	23849.000.003	**Doc ID**	02	
Client	Cabra Developments Limited	**Client Contact**	Duncan Unsworth	
Distribution (PDF)	Duncan Unsworth, Cabra Developments Limited			
Date	**Revision Details / Status**	**Author**	**Reviewer**	**WP**
30/10/2023	Issued to Client	CD	JR	DF

1 Introduction

ENGEO Ltd was requested by Cabra Developments Limited to prepare a Remediation Action Plan (RAP) for soil disturbance activities to be carried out at 16 Sinton Road, Whenuapai, Auckland (herein referred to as 'the site'; shown on Figure 1) to support the application for Resource Consent for the development of a residential estate. This work has been carried out in accordance with the signed agreement dated 2 August 2023.

ENGEO completed a preliminary and detailed site investigation (PSI / DSI) for the site in October 2023 (ENGEO, 2023a). The investigation comprised a review of publicly available historical information relating to the site and recovery and analysis of soil samples. The results of analysis of soil samples recovered from the site indicate that potential contaminants of concern are present in soil at concentrations which exceed adopted criteria (discussed further in Section 3.1).

Table 1: Site Summary

Contaminants identified on-site	In the northwest portion and eastern portion of the site, the concentration of lead exceeds the adopted environmental criterion, and the concentration of arsenic exceeds the adopted human health criterion.
Scope of Proposed Works	ENGEO understand that development of the residential estate will include the demolition of existing site structures to allow construction of the estate. No cut / fill plans have been provided to ENGEO at the time of writing this report.

This RAP contains:

- A summary of previous investigations completed at the site.
- A summary of the additional investigation works that will be undertaken to delineate the identified contamination 'hotspots' and to inform the need for a long-term discharge consent under the Auckland Unitary Plan (AUP, 2016), if relevant.
- Details of the proposed remediation works (removal of impacted soil and validation sampling).
- Management procedures to assist in:
    - Achieving a safe working environment for relevant personnel.
    - Protecting the environment from contaminants in site discharges during the redevelopment works.

If not already undertaken, a pre-demolition asbestos survey of the site buildings will be required. If the surveys identify asbestos containing material in exterior building surfaces adjacent to exposed ground, soil samples shall be collected from this soil and analysed for asbestos (semi-quantitative). Additionally, if evidence of other actual or potential contamination is identified further testing of this soil may be required.

2 Objectives and Relevance of the RAP

2.1 Objective

The objectives of the RAP are to:

- Support an application for consent under the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (the "NESCS") and the AUP;
- Detail remedial actions for the site based on previous investigation(s);
- Outline requirements for oversight and validation during and following remedial works;
- Outline management for site soils; and
- Outline actions to be undertake if unidentified contamination is encountered.

2.2 Relevance

This document has been prepared in general accordance with the Ministry for the Environment's (MfE's) Contaminated Land Management Guidelines No.1 – Reporting on Contaminated Sites in New Zealand (MfE, 2021) and should be read in conjunction with the PSI / DSI (ENGEO, 2023a) prepared for the site. This RAP has been prepared to fulfil the requirements of a site management plan and remedial action plan so all relevant information is available in one location, to facilitate implementation on-site.

The information and recommendations provided herein are to augment the processes on-site and are not intended to relieve any contractor with control of the site or person conducting a business or undertaking (PCBU) associated with the site of their responsibility for the health and safety of their workers and contractors. Nor is it intended to relieve contractors undertaking work on the site of their responsibilities under the Health and Safety at Work Act 2015 and subsequent amendments.

The provisions of the RAP are mandatory for all persons entering the site and all contractor and sub-contractor employees who will be involved in implementing the procedures identified in this document.

The contractor shall develop a site-specific health and safety plan to complement this RAP and to address other health and safety requirements that may be applicable to their site works.

This RAP is considered suitable to provide controls based on the contamination identified during the previous investigation works (ENGEO, 2023a). If contamination is found that varies from what has been assumed in preparing this RAP, the RAP will need to be updated to account for the changed site understanding. If a revised RAP is prepared, it should be re-distributed to Council and the project team (Table 2) prior to earthworks commencing or as soon as practicable after such contamination is discovered.

Table 2: Assigned Responsibilities for Site Work

Role	Responsibility
Site Owner – Cabra Developments Limited	To distribute this RAP and be responsible for ensuring that the site works are undertaken in accordance with this document and any revisions to this document.
Site Contractor (main contractor / general earthworks) – *to be confirmed*	To distribute the RAP (including updated versions) to employees and subcontractors, and to ensure that the most up-to-date version of the RAP is available on-site at all times. To provide control and oversee the redevelopment works. It is recommended that a designated, suitably trained Site Supervisor is present to oversee the works. The Site Supervisor should address changes to site procedures, as necessary, should unanticipated conditions arise. This also includes ensuring that all site staff and subcontractors are aware of and comply with the procedures and health and safety requirements contained within this document. It is anticipated that this Site Supervisor would represent the main site contractor. Should an incident occur on-site which may result in discharges, the supervisor should take control of the situation and coordinate the efforts of all people on-site to minimise the impact. Worker and public Health and Safety concerns will take precedence over environmental discharges, should it be unsafe to employ controls or emergency measures immediately. As a minimum, the Site Supervisor should have received non-certified training in asbestos identification, safe handling and suitable controls, to ensure that if asbestos / asbestos containing materials (ACMs) are encountered they are identified and appropriately managed. Written evidence of the training shall be kept on record.
Contaminated Land Specialist – ENGEO	A company with Suitably Qualified and Experienced Practitioners (SQEPs) in contaminated land management shall be appointed to liaise with the contractor during the course of the works. A SQEP or their nominated representative from the Contaminated Land Specialist company shall: • Visit the site on at least two occasions during remedial works to assess the controls and procedures on-site, as they relate to this RAP. • Perform the additional investigation and validation works. • Provide environmental support during site works (if required) and prepare an appropriate closure report at the completion of works.

3 Site Information and History

The site is accessed via a private driveway directly off Sinton Road in the eastern corner of the site. A dwelling is located in the eastern portion of the site, along with a carport, toolshed and two sheds. A disused sleep out is present to the north or these buildings, on the site boundary. To the southeast of the sleep out, is a small, fenced garden and timber storage shed. The balance of the property comprises grassed paddocks, bordered by shelterbelts. The site setting is summarised in Table 3.

Table 3: Site Setting

Item	Description
Local Setting	The site is located in a rural residential area. The site is bound to the east by Sinton Road, and the Waiarohia Inlet to the west.
Geology	The site is mapped by GNS Science as being underlain by Puketoka Formation alluvium in the southern portion of the site, comprising pumiceous mud, sand, and gravel with lenses of muddy peat and lignite. The northern portion of the site is mapped as being underlain by East Coast Bays Formation, comprising alternating sandstone and mudstone with variable volcanic content
Topography	The site falls from Sinton Road in the east down to the north-western boundary in the northeast as a gentle slope of approximately three degrees. Minor changes in elevation can be noted along the alignment of the overland flow paths throughout the site.
Hydrology	Overland flow paths are mapped in Auckland Council GeoMaps as flowing northwest into the Waiarohia Inlet, a tributary of the Waitemata Harbour. A drainage channel in the eastern corner of the site, runs along the northern boundary, discharging water from the road to the sea.
Hydrogeology	A groundwater assessment was not completed as part of this investigation; however, during the geotechnical investigation standing water was encountered at variable depth, between 1.2 metres and 4.8 metres below ground level (m bgl). Based on the topography of the site, the mapped overland flow path and the nearest watercourse, shallow groundwater likely flows in a west to northwest direction.

3.1 Previous Investigation

ENGEO completed a PSI / DSI at the site in October 2023 (ENGEO, 2023a).

Based on our desktop review and site observations, the site has historically been used as agricultural land. In the 1980s horticultural activity may have occurred. With the exception of the existing buildings, the site has primarily been undeveloped. Due to historical land uses there was considered to be potential for metals, organochlorine pesticides (OCPs) and asbestos to contaminate soils.

Findings of the intrusive investigation works are summarised below:

- Elevated (above background) concentrations of arsenic, chromium, copper, nickel and zinc were recorded in the sample collected from soil adjacent to the shed in the eastern portion of site (labelled ‘S03’ in Figure 2). The concentration of arsenic in this sample exceeded the adopted human health criterion (high-density and standard residential) and hence this area of the site will require remediation. The source of the elevated concentrations is unknown, however may be associated with chromated copper arsenate (CCA) treated timber based on the combination of elevated contaminants identified (i.e., chromium, copper, and arsenic).
- Elevated (above background) concentrations of arsenic, cadmium, copper, lead and PAHs were recorded in the sample collected from soil surrounding waste material on the coastal margin (labelled ‘S13’ in Figure 2). The concentration of arsenic in this sample exceeded both the high-density and standard residential human health criterion. Additionally, the concentration of lead also exceeded standard residential human health criterion and environmental assessment criteria. This area of the site will require remediation. The source of the elevated concentrations is likely associated with deposited material.
- No asbestos was identified in the samples analysed.
- The objective of the investigation was to satisfy the requirements of the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (NESCS); however, the results can be used to inform disposal options. The findings of this investigation indicate that large areas of the site are likely to be considered “cleanfill” for disposal purposes or reused at another earthworks site (AUP, 2016). Additional testing may be required prior to, or as part of, redevelopment works is required to confirm this.

The summary of results table (extracted from the PSI / DSI (ENGEO, 2023a)) is included in Appendix 1, and a site investigation plan is included as Figure 1.

A conceptual site model was prepared based on the findings of the intrusive investigation and is summarised below.

Table 4: Conceptual Site Model

Potential Source of Contamination	Potential Pathway	Potential Receptor	Acceptable Risk?
Persistent pesticide use in horticultural areas *(HAIL ID: A10)*	Soil ingestion, inhalation of dust, and / or dermal contact	Future site users / site redevelopment workers Surrounding residents	Yes The concentration of contaminants of concern (metals / metalloids and OCPs) were below regional background criteria, human health and environmental discharge criteria.
	Leaching of contaminants	Surrounding environment	
Building materials containing asbestos *(HAIL ID: E1)*	Inhalation of asbestos fibres released from impacted soils / dust	Future site users Surrounding site users	**Yes** No asbestos was identified in the samples analysed.
Fill material *(HAIL ID: G3)*	Soil ingestion, inhalation of dust, and / or dermal contact	Future site users / site redevelopment workers Surrounding residents	No Samples collected from the soil surrounding the waste material along the coastal margin reported concentrations of relevant contaminants of concern in exceedance of human health and environmental criteria.
	Leaching of contaminants	Surrounding environment	
Potential lead-based paint on existing buildings *(HAIL ID: I)*	Soil ingestion, inhalation of dust, and / or dermal contact	Future site users Surrounding site users	Yes No visual signs of contamination were identified in the soil, and the concentration of lead were below regional background concentrations.
	Leaching of contaminants	Surrounding environment	
Elevated concentration of arsenic and lead adjacent to the small shed *(HAIL ID: I)*	Soil ingestion, inhalation of dust, and / or dermal contact	Future site users Surrounding site users	No The concentration of arsenic and lead reported exceedance of human health and environmental criteria.
	Leaching of contaminants	Surrounding environment	

Note: HAIL IDs refer to activities included on the Hazardous Activities and Industries List (HAIL; MfE, 2011a).

4 Summary of Development Activities Relevant to this RAP

Site Preparation

Site preparation activities include site establishment (i.e., mobilisation, erecting fences, and establishing site security) and set-up of stormwater / silt control measures.

Earthworks

All soil disturbance works including topsoil stripping, excavations for utility installation, construction of building platforms, and foundation excavations.

5 Proposed Additional Investigation Works

The following additional works are proposed:

i. Following demolition of buildings and removal of areas of hard standing a walkover inspection will be undertaken by a SQEP or their representative, working under their supervision, to identify any visual or olfactory evidence of contamination. If areas of potential concern are noted, soil samples will be recovered from those areas for analysis of an appropriate suite of potential contaminants.

ii. Additional delineation is recommended to try to reduce the volume of material requiring off-site disposal as managed fill or landfill. Additional soil sampling will be undertaken around each previous location where remediation is proposed, as listed in Table 5. It is proposed to collect a minimum of four lateral samples, and at least one vertical sample at the original sample location. Samples will be analysed for contaminants of concern, as detailed in Table 5. A portable XRF (X-ray fluorescence) analyser may also be used to screen soil, to assist with delineation and reduce the requirements for laboratory analysis.

5.1 Additional Reporting

If contamination is identified that requires modification to the remedial works or control measures detailed in this RAP, a letter report summarising the results of the additional investigations will be forwarded to Auckland Council, together with any proposed amendments to the RAP required as a result of the findings. In all other cases, the results of the additional investigation works will be included in the Site Validation Report (SVR) as described in Section 11.

6 Remedial Works

6.1 Remediation Options

The remedial objective is to reduce risk to future site users and environmental receptors associated with the presence of elevated concentrations of contaminants in some locations at the site. The following potential remediation options have been identified for this site.

Off-site Disposal

Removal and off-site disposal at an appropriately licensed landfill facility of soil that has been identified as containing concentrations of contaminants either above the adopted human health criteria or the environmental discharge criteria.

Off-site disposal at an appropriately licensed landfill facility permanently removes the risk to human health and environmental receptors associated with the soil identified as containing concentrations of contaminants above the adopted human health criteria or the environmental discharge criteria. This option also has the advantage that there is no requirement for long-term management.

Encapsulation / Capping / Re-use

This remedial strategy is considered to offer a more sustainable approach and can be equally or more protective than disposing of material at a landfill. This option involves the placement of a suitable capping layer over the area where impacted material is proposed to be retained *in situ*. The cap will generally consist of the following placed above the leveled site surface:

Beneath building foundations and external hard surfaced areas:

- Concrete slab;
- Damp proof membrane; and
- Fill material placed and compacted to a specified thickness and specification.

Beneath communal recreational / amenity soft landscaped areas:

- A minimum of 500 mm clean imported soil; and
- A warning layer of geotextile cloth.

This option avoids the cost of transportation and disposal of the material; however, groundwater monitoring may be required around areas identified as exceeding the environmental discharge criteria to verify that contamination hasn't impacted groundwater and to assess the need for a long-term discharge consent associated with the impacted material.

To ensure appropriate long-term management of the site, as-built drawings will need to be prepared. This can be accomplished by surveying the site, prior and post placement of the capping layer. The as-built survey plans will confirm the capping has been placed in accordance with the design and will also provide information regarding the depth to contaminated materials for future site excavation activities.

6.2 Remediation Strategy

As the identified contamination is likely limited to shallow soil, which is likely to be geotechnically unsuitable to remain *in situ*, and the estimated remedial volume is small, the preferred remedial strategy is off-site disposal.

6.3 Remediation Volume

Based on the results of the PSI / DSI, an estimate of the soil volume requiring remediation is provided in Table 5. The location of the remedial area is presented on Figure 1. Additional delineation is recommended (Section 5) to try to reduce the volume of material requiring off-site disposal as managed fill or landfill. The remedial area may be extended (or reduced) if contamination is found that varies from what is currently known.

Table 5: Remedial Volume Estimation (based on current dataset)

Remedial Area	Sample exceeding relevant criteria	Exceedance	Estimated Area of Impact (m^2)	Estimated Depth of Impact (m below ground level)	Estimated Volume of Impacted Material (m^3)
Remedial Area 1	S03	Arsenic	6 [1]	0.4 [2]	2.4
Remedial Area 2	S13	Arsenic Lead	90 [1]	0.5 [2]	45

Notes:

[1] Estimated area is likely conservative as the lateral extent of contamination has not been determined. The estimate assumes that impacted soil is limited to the area to the southeast of the shed (RA1) and area where fly-tipped material was observed (RA2).

[2] Vertical extent of contamination is an estimate. The impact is considered likely limited to topsoil (RA1) or soil underlying / surrounding fly-tipped material. Successful remediation will be confirmed through validation sampling.

6.4 Remediation Controls

Any remedial earthworks shall be completed and validated prior to the bulk topsoil strip to minimise the potential for accidental mixing of impacted soils with non-impacted soils.

Earthworks involving disturbance of soils within the remedial areas should be undertaken in accordance with the controls in Section 7. During the remedial works, a Contaminated Land Specialist shall be engaged to visit the site to verify that earthworks are being conducted in accordance with the methodology, and controls listed within this document.

6.5 Validation and Oversight

Following removal of impacted soils, a Contaminated Land Specialist shall be engaged to collect validation samples. Samples are to be collected from the base and sidewalls of the remedial areas with a minimum of five samples collected; the planned validation sampling strategy may be amended based on site observations or upon discovery of additional information, however changes to the sampling strategy shall be justified by the Contaminated Land Specialist in the validation report. Samples shall be analysed at an accredited laboratory for lead and arsenic.

The results shall be assessed against the remedial criteria presented in Table 6. If soil validation sampling indicates that the remaining soils exceed the remedial criteria, the Contaminated Land Specialist will advise further remedial actions to achieve the remedial objectives. If this requires a change to the remedial strategy, then this should be communicated to Auckland Council for approval in advance.

6.6 Assessment Criteria

The remedial criteria have been selected from the lesser of the human health and environmental discharge criteria for each contaminant and are provided in Table 6 below.

Table 6: Adopted Remedial Criteria

Contaminant of Concern	Remedial Goal	Remedial Goal Source
Lead	210 mg / kg	Residential soil contaminant Standard from *Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health* (MfE, 2011b)
Arsenic	20 mg / kg	Residential soil contaminant Standard from *Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health* (MfE, 2011b)

If additional unexpected contamination is encountered during the works, appropriate remedial criteria shall be selected from the Auckland Unitary Plan (AUP, 2016), the Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health (MfE, 2011b) and following MfE Contaminated Land Management Guidelines No. 2 (MfE, 2011c).

7 Site Management Practices and Controls

The site management practices in Table 7 shall be implemented during ground-disturbing works in the remedial areas. Many of the required control measures are standard construction site procedures; however, the relevance and effectiveness of these protocols shall be reviewed by the Site Supervisor on a daily basis during works in these areas of the site. The Site Controls summary in Appendix 2 provides an overview of controls required. It is anticipated that this will be displayed on-site for contractor reference.

Earthworks outside of the remedial areas can be managed under controls appropriate for similar earthworks activities on an uncontaminated site, however, care must be taken to identify potential unanticipated contamination (refer to Section 9).

During the works, a SQEP from the Contaminated Land Specialist company shall visit the site to observe site activities and confirm that the works are being performed in accordance with this RAP. The number of visits required will be subject to the staging and duration of works; however, at least two site visits will be performed.

Table 7: Site Management Practices

General Site Procedures	Contractor staff, subcontractors and visitors shall be inducted before entering the site or commencing work to ensure they are aware of the potential hazards relating to contaminated soil at the site. The following general safety procedures shall be followed by all staff entering or working in the immediate area of the earthworks: • Site workers shall avoid unnecessary contact with site soils. • Hands are to be washed prior to eating, drinking or smoking. All incidents shall be reported to the main contractor's health and safety advisor, or equivalent responsible person on-site.
Personal Protective Equipment (PPE)	To minimise the effects of potential contamination exposure via incidental ingestion of soil, skin contact or inhalation of dust anyone entering the remedial areas should wear the following PPE in addition to standard PPE requirements for construction sites (e.g., safety boots): • Disposable gloves if contact with soil is unavoidable. For the remainder of the site the following should be considered over-and-above standard PPE requirements for construction sites (e.g., safety boots): • P2 Dust mask (if visible dust is present). • Work gloves / Coveralls (if contact with soil unavoidable) • Goggles / safety glasses.
Boundary Controls	Security fencing and appropriate warning signs shall be erected around earthworks areas to prevent unauthorised access. Appropriate sediment control measures shall be implemented to minimise sediment runoff from the site. Minimum controls shall include: • A stabilised site entrance to minimise the movement of soil off-site. • Suitable sediment controls (e.g., silt fencing) placed around the perimeter of the works area and stormwater drains where there is a potential for runoff. Set up of clean and dirty areas to minimise tracking potentially impacted soils around the site and off-site. • Machinery used in the remedial areas should be cleaned of loose soil in a designated 'wash down' area (e.g., paved area or area of existing hardfill), including wheel/track washing (if appropriate), prior to leaving site. • Once loose soil has been removed, the cleaned item can be moved to the clean area. Any wastewater generated should not be discharged off-site and should be allowed to drain back into the site. • Imported rock / utilised in the 'wash down area' and / or 'truck loading area' (if relevant) should be disposed of as contaminated material, unless tested.

Stockpiling		Stockpiling of contaminated material shall be avoided. If temporary stockpiling of material is necessary, dust shall be controlled through wetting during the workday. If left overnight, the material shall be covered (e.g., with plastic) and protected by erosion / sediment controls (e.g., bunded). Stockpiles shall be located on an impermeable surface. If this is not possible, the underlying material should be considered potentially contaminated, and shall be managed / disposed of appropriately.
Groundwater	Site Specific Detail	A groundwater assessment was not completed as part of the previous investigation; however, during the geotechnical investigation (ENGEO, 2023b) standing water was encountered at variable depth, between 1.2 metres and 4.8 metres below ground level (m bgl). Dewatering may be required during earthworks, if dewatering is undertaken, disposal options are as follows.
	Discharge to Land On-site	Groundwater may be discharged to land on-site (either directly or after interim storage on-site), provided it complies with the permitted activity standards outlined in Section E4.6.1 and E4.6.2.5 of the Auckland Unitary Plan (AUP, 2016). These controls include restrictions on any changes to colour or visual clarity, odour emissions or effects on aquatic life.
	Discharge to Stormwater or Surface Water	Approval shall be sought from Auckland Council [for stormwater] or Watercare [for wastewater]) prior to discharge to the stormwater or wastewater network. Note: No free-phase hydrocarbons shall be permitted to be discharged into stormwater system.
Stormwater		Uncontrolled discharge of stormwater from earthworks sites is not permitted. If the on-site erosion and sediment control measures fail, a vacuum truck shall be called to site immediately so that the discharge of stormwater from site is eliminated. It may be necessary to test any such water removed off-site to identify an appropriate disposal site.

Dust	Dust shall be managed in accordance with consent requirements and relevant regulations. The contractor shall consider the following (as appropriate): • Limit vehicle access onto the excavated areas as far as possible. • Dampen surface soil using a water truck or portable water mist. Ensure that the volume of water used does not induce soil erosion, or cause surface ponding or runoff, that could discharge into natural water bodies or stormwater drains. • Use wind screens or avoid work during windy conditions. • Consider use of surfactants or polymers where a reliable source of water is not available. In the unlikely event that unsatisfactory dust emissions emanate from the site on a sustained basis or complaints are received in relation to the works, mitigation of the adverse effects shall be applied in accordance with the hierarchy of control described in the Health and Safety at Work Act 2015 (MBIE, 2015) - eliminate the risk, so far as is reasonably practicable; and if it is not reasonably practicable to eliminate a risk, to minimise those risks so far as is reasonably practicable. If the emission or discharges persist, professional advice shall be sought in order to define appropriate control measures. It is also recommended that consultation with appropriate council representatives be undertaken prior to recommencing works.
Odour	If excavated material is odorous, odour control measures shall be put in place. This could include covering the material with cleanfill, a polythene cover or instituting a deodoriser system.
Soil Disposal and Management	Trucks shall be loaded within the site where runoff and possible spills during loading will be controlled and contained. Loads must be securely covered before leaving site and during off-site transport. Soil must be taken directly to an appropriate soil disposal facility authorised to accept the contaminants present. No loaded trucks should be parked overnight anywhere other than on site or at the disposal facility (following their written agreement). Prior to acceptance, the results of the soil testing may be requested by the receiving facility. Requirements for additional testing and truck lining / soil wrapping should be confirmed with the receiving landfill. Outside the remedial area (Figure 1), soil being disturbed during redevelopment earthworks is suitable to remain on-site. If off-site disposal is required, such material may comply with the Auckland Council definition of cleanfill material; however, further testing is required to confirm this.

8 Asbestos Controls

Based on the findings of the previous investigations it is currently not anticipated that soil impacted by asbestos is present at the site, however care must be taken to identify any potential asbestos containing material (ACM) during earthworks activities. The earthworks contractor shall contact the Contaminated Land Specialist if areas of potential contamination are discovered during works.

If asbestos is identified as part of the additional investigation works (Section 5) or during the redevelopment works (e.g., if asbestos cement pipes are encountered), the controls for the relevant asbestos works classification in Appendix 3 shall be implemented. As asbestos is considered primarily a human health contaminant, the objective of these asbestos controls is to eliminate personal exposure to airborne asbestos on and off-site, so far as reasonably practicable. The Health and Safety at Work (Asbestos) Regulations 2016 (herein referred to as 'the HSW(A)R') requires that if it is not reasonably practicable to eliminate personal exposure to airborne asbestos, exposure must be minimised, so far as is reasonably practicable. The Contaminated Land Specialist shall assess the appropriate level of asbestos controls to be implemented.

The control measures in Appendix 3 aim to address the Safe Work Practices specified in the ACOP (WorkSafe, 2016), and the NZ GAMAS (BRANZ, 2017); an asbestos removal plan will need to be prepared if asbestos pipes are identified. As the NZGAMAS (BRANZ, 2017) is referenced in the WorkSafe ACOP, the NZGAMAS (BRANZ, 2017) or higher level of controls are required to be adhered to.

9 Unanticipated Ground Conditions

Should any unanticipated contaminated material be uncovered during earthworks, works shall stop in that area and a SQEP from the Contaminated Land Specialist contacted to assess the potential risk and advise on what measures should be taken to manage the soil in that area.

Typical indicators of contamination include but are not limited to:

- Buried waste (for example drums or tanks with unknown liquid).
- Odour (petroleum hydrocarbons, solvent).
- Discoloured soil (black, purple, or green staining most common).
- Asbestos containing materials (ACM) as fragments visible to the naked eye.
- Uncontrolled fill material.

Examples of typical indicators of contamination have been provided in Table 8.

Table 8: Typical indicators of contamination

Uncontrolled Filling Building debris may contain asbestos or other contaminants.	 
Asbestos Containing Material Intact sheets, gaskets, fabric or pieces thereof, may be mixed with other material	
Separate-phase Hydrocarbons Black liquid, odours, sheen	

10 Documentation

In order to demonstrate that the requirements of this RAP have been adhered to, the documents listed in Table 9 should be forwarded to the Contaminated Land Specialist in the timeframes stipulated in the table. These documents will be included in a completion report for the site (discussed further in Section 11).

Table 9: Contractor Documentation

Prior to Earthworks Commencing	• Written confirmation from the proposed disposal site(s) confirming that they are able to accept excess material from the site and stating which type(s) of material. • For any material that is to be imported to the site as cleanfill on the basis of direct testing, a copy of the analytical laboratory test report must be provided prior to transport.

Within Two Weeks of Earthworks Being Completed (or on an ongoing basis during works)	• Daily site photographs showing the site entrance, the area of work, sediment control measures, other structural control measures and any stockpiles resulting from the works.
	• A site plan showing any areas where site-won controlled material has been reused.
	• **Disposal dockets** for each load of material that is removed from the site. The dockets should contain the following information:
	  ○ Date and time dispatched.
	  ○ Material description.
	  ○ The volume of material in the load.
	  ○ Haulage contractor details (name, address, contact person, contact telephone number).
	  ○ Truck and trailer registration number.
	  ○ The destination of material.
	• Documentation for **all imported fill** which shall include:
	  ○ Date and time dispatched.
	  ○ Address of source site.
	  ○ Type and proposed use of material.
	  ○ Weight and / or volume of material carried.
	  ○ Basis for treating the material as cleanfill (e.g., directly tested and confirmed to be cleanfill or directly sourced from a licensed quarry).
	• Information relating to any incidents or complaints and how these were managed.

11 Completion Reporting

A SVR will need to be prepared following remedial earthworks. The SVR should be prepared in accordance with MfE Contaminated Land Management Guideline No. 1 (MfE, 2021) by a Contaminated Land Specialist SQEP or their nominated representative, who has monitored the earthworks on-site. The report shall, as a minimum, include the following information:

- A description of the additional investigation works undertaken (if relevant) and the results thereof.
- A summary of the remedial works undertaken, including the location and dimensions of the excavations carried out and the volume of soil excavated and / or capping undertaken.
- Documentation relating to the disposal of contaminated soil / fill and used PPE.
- Documentation relating to the importation of cleanfill (if relevant).
- Results of validation works.
- A statement of whether soils remaining on-site are considered, based on the work undertaken, to present an unacceptable risk to human health or environmental receptors and the need for long term controls or consents.

12 Limitations

i. We have prepared this report in accordance with the brief as provided. This report has been prepared for the use of our client, Cabra Developments Limited, their professional advisers and the relevant Territorial Authorities in relation to the specified project brief described in this report. No liability is accepted for the use of any part of the report for any other purpose or by any other person or entity.

ii. The recommendations in this report are based on the ground conditions indicated from published sources, site assessments and subsurface investigations described in this report based on accepted normal methods of site investigations. Only a limited amount of information has been collected to meet the specific financial and technical requirements of the client's brief and this report does not purport to completely describe all the site characteristics and properties. The nature and continuity of the ground between test locations has been inferred using experience and judgement and it should be appreciated that actual conditions could vary from the assumed model.

iii. Subsurface conditions relevant to construction works should be assessed by contractors who can make their own interpretation of the factual data provided. They should perform any additional tests as necessary for their own purposes.

iv. This Limitation should be read in conjunction with the Engineering NZ/ACENZ Standard Terms of Engagement.

v. This report is not to be reproduced either wholly or in part without our prior written permission.

We trust that this information meets your current requirements. Please do not hesitate to contact the undersigned on (09) 972 2205 if you require any further information.

Report prepared by

Claire Davies, CEnvP

Associate Environmental Consultant

Report reviewed by

Jamie Rhodes, CEnvP (SC)

Associate Environmental Engineer

13 References

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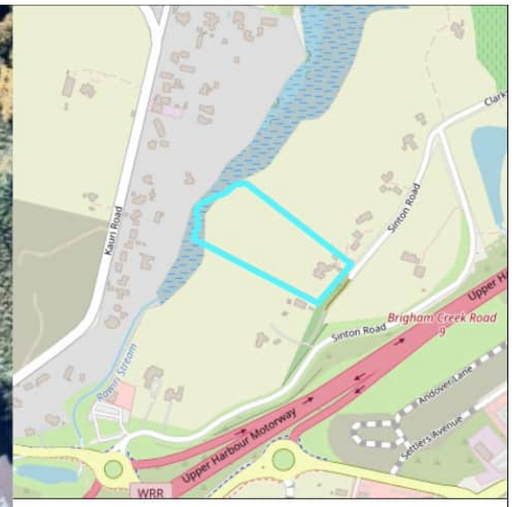
FIGURES



Legend

- Site Boundary
- Environmental Investigation Location
- Remedial Works Area (lateral and vertical extent to be assessed)

0 10 m 20 m

ENGEO

Produced by **Datanest.earth**

Title: Soil Management Areas		
Client: Cabra Developments Limited		
Project: 16 Sinton Road, Whenupai	Drawn: CD	Figure No.: 1 Size: A3
Date: 12-10-2023	Checked: LL	
Proj No.: 23849.000.001_04	Scale: 1:1016	Version: 1.0

APPENDIX 1:

Soil Results

Table A: Comparison of Soil Results to Assessment Criteria

				Heavy Metals/Metalloids								Polycyclic Aromatic Hydrocarbons		Organochlorine Pesticides	Asbestos	
Investigation Location	Depth (m bgl)	Sample ID	Date	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc	Benzo[a]pyrene (middle bound)	Other PAHs		Asbestos Containing Material (ACM)	Asbestos Fines / Friable Asbestos (AF/FA)
S01	0.0 - 0.25	S01 0.0-0.25	16-Aug-23	12	0.05	8.2	12	5.7	0.09	1.8	32	nt	nt	nt	NAD	NAD
S02	0.05 - 0.3	S02 0.05-0.3	16-Aug-23	5.2	0.07	7.3	7.2	7.9	0.11	3.5	26	nt	nt	nt	NAD	NAD
S03	0.0 - 0.25	S03 0.0-0.25	16-Aug-23	**100**	0.15	**56**	**230**	8.4	0.03	**43**	**190**	nt	nt	nt	NAD	NAD
S04	0.0 - 0.3	S04 0.0-0.3	16-Aug-23	4.6	0.14	9.8	32	7.9	0.06	9.3	27	nt	nt	nt	NAD	NAD
S08	0.0 - 0.3	S08 0.0-0.3	16-Aug-23	12	0.1	6.2	7.4	9.5	0.09	2	14	nt	nt	nt	NAD	NAD
S09	0.0 - 0.25	S09 0.0-0.25	16-Aug-23	3.9	0.13	7.1	8.5	6.7	0.08	2.6	44	nt	nt	nt	NAD	NAD
S10	0.0 - 0.3	S10 0.0-0.3	16-Aug-23	8.3	0.24	13	28	16	0.06	6.1	44	nt	nt	nt	NAD	NAD
S13	0.0 - 0.3	S13 0.0-0.3	16-Aug-23	**92**	**0.77**	20	**240**	**460**	0.32	7.8	120	**0.05**	<LOR	nt	NAD	NAD
S11 / S12	0.0 - 0.3	LAB COMPOSITE S11 & S12 0.0-0.3	16-Aug-23	6	0.23	11	9.6	17	0.14	6.6	24	nt	nt	nt	NAD	NAD
CS01A - CS01C	0.1	CS01 (composite of CS01A 0.1 CS01B 0.1 AND CS01C 0.1)	16-Aug-23	1.2	0.16	5.7	3	9.1	0.1	2.2	7.1	nt	nt	<LOR	nt	nt
CS02A - CS02C	0.1	CS02 (composite of CS012 0.1 CS02 0.1 AND CS02C 0.1)	16-Aug-23	1.1	0.23	5	2.7	7	0.06	1.5	5.8	nt	nt	<LOR	nt	nt
CS03A - CS03C	0.1	CS03 (composite of CS03A 0.1 CS03B 0.1 AND CS03C 0.1)	16-Aug-23	1.3	0.14	6.2	3.5	10	0.14	2.6	9.4	nt	nt	<LOR	nt	nt
CS04A - CS04C	0.1	CS04 (composite of CS04A 0.1 CS04B 0.1 AND CS04C 0.1)	16-Aug-23	1.9	0.2	6.5	4.6	9.1	0.12	2.6	9.5	nt	nt	<LOR	nt	nt
CS05A - CS05C	0.1	CS05 (composite of CS05A 0.1 CS05B 0.1 AND CS05C 0.1)	16-Aug-23	1.4	0.15	6.2	3.1	6.9	0.1	2.6	8	nt	nt	<LOR	nt	nt
CS06A - CS06C	0.1	CS06 (composite of CS06A 0.1 CS06B 0.1 AND CS06C 0.1)	16-Aug-23	4.8	0.25	11	7.3	16	0.18	4.8	22	nt	nt	<LOR	nt	nt
CS07A - CS07C	0.1	CS07 (composite of CS07A 0.1 CS07B 0.1 AND CS07C 0.1)	16-Aug-23	5.1	0.19	6.8	9.1	5.8	0.07	1.3	9.3	nt	nt	<LOR	nt	nt
CS08A - CS08C	0.1	CS08 (composite of CS08A 0.1 CS08B 0.1 AND CS08C 0.1)	16-Aug-23	4	0.19	6.7	4.8	8.9	0.08	2.5	11	nt	nt	<LOR	nt	nt
Assessment Criteria:																
		Human Health Criteria (High-density Residential) [1]		45	230 [4]	1500 [5]	10000	500	1000	1200 [6]	60000 [6]	24	various	various	0.04 [7]	0.001 [8]
		Human Health Criteria (Residential) [1]		20	3 [4]	460 [5]	> 10,000	210	310	400 [6]	7,400 [6]	10	various	various	0.01 [7]	0.001 [8]
		Environmental Criteria (Auckland Unitary Plan) [2]		100	7.5	400	325	250	0.75	105	400	20	various	various	-	-
		Background Criteria (Auckland - Non-Volcanic) [3]		**0.4 - 12**	**< 0.1 - 0.65**	**2 - 55**	**1 - 45**	**< 5 - 65**	**<0.03 - 0.45**	**0.9 - 35**	**9 - 180**	**< LOR**	**< LOR**	**< LOR**	**< LOR**	**< LOR**

Notes:
All results and criteria are presented in mg/kg dry weight basis, except asbestos which is reported as %w/w
Full results are included in the laboratory reports
LOR: Limit of Reporting; Results below LOR or background are shown in grey text
nt: not tested
- : no applicable criteria
NAD: No Asbestos Detected (Note:' <0.001' indicates asbestos detected, but below the limit of reporting)

1: MfE (2011) Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health (Residential Land Use), or selected in accordance with CLMG No. 2
2: Environmental discharge criteria selected in accordance with Section E30.6.1.4 of the Auckland Unitary Plan (Auckland Council, 2016).
3: Background Ranges of Trace Elements in Auckland Soils (Non-Volcanic Range). Table E30.6.1.4.2 of the AUP (Auckland Council, 2016).
4. Assumes soil pH of 5.
5. Criteria for Chromium VI were conservatively selected.
6. National Environment Protection (Assessment of Site Contamination) Measure (NEPM). Residential A criteria listed.
7. New Zealand Guidelines for the Assessment and Management of Asbestos in Soil (BRANZ, 2017). Commercial and Industrial Land Use.
8. New Zealand Guidelines for the Assessment and Management of Asbestos in Soil (BRANZ, 2017). All Land uses.

APPENDIX 2:

Site Controls

Site Controls Relating to Contamination

16 Sinton Road, Whenuapai, Auckland

SITE SUMMARY

Proposed works	Soil disturbance works associated with a residential development.
Contaminants identified on-site	Metals (lead and arsenic) in isolated areas at concentrations above human health and environmental criteria.
Potential Risks to Site Workers	Incidental skin contact, ingestion of soil, or inhalation of dust should be avoided / mitigated through use of PPE and welfare measures.

KEY CONTACTS

Auckland Council Pollution Hotline	(09) 377 3107
WorkSafe	0800 030 040
Contaminated Land Specialist (ENGEO)	(09) 972 2205

HEALTH & SAFETY

All contractors and visitor shall be **inducted** before entering site or commencing work to ensure they are **aware of the potential hazards** relating to contaminated soil at the site.

As a minimum, facilities to wash and dry hands prior to eating, drinking or vaping / smoking should be provided.

PPE / RPE *to minimise the effects of potential contamination exposure.* Along with standard PPE requirements for construction sites (e.g., safety boots) the following should be used in the remedial area:

- ☐ P2 Dust mask.

In other areas the following should be considered:

- ☐ P2 Dust mask (if visible dust is present).
- ☐ Work gloves / Coveralls (if contact with soil unavoidable)
- ☐ Goggles / safety glasses.

UNEXPECTED DISCOVERY

Works shall be immediately stopped, and the Contaminated Land Specialist contacted should any areas of potential contamination be discovered during works. Typical indicators of contamination are asbestos containing material, staining, odorous material, visible sheen on water.

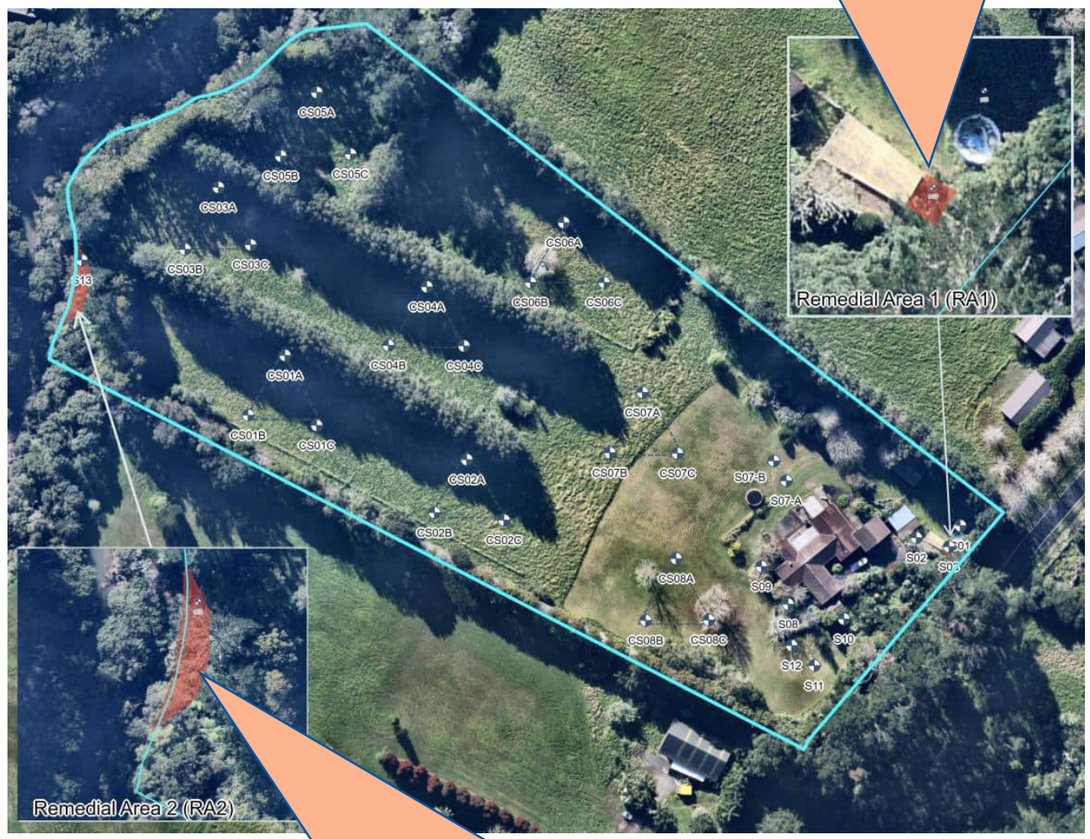
ADDITIONAL OVERSIGHT BY SQEP

- ☐ Observation and testing of soil / sub-base following removal of building platforms / hardstand.
- ☐ Delineation and validation sampling.

Non-shaded areas are considered likely **CLEANFILL** with no specific management requirements.

REMEDIAL WORKS AREA *Remediation of soils in accordance with the RAP is required due to exceedance of assessment criteria.*

- ☐ Estimated area is likely conservative as the lateral extent of contamination has not been determined. The estimate assumes tha impacted soil is limited to the area southeast of the shed. Vertical extent of contamination has not been assessed however impact is considered likely limited to shallow soil. Successful remediation will be confirmed through validation sampling.
- ☐ Additional delineation recommended.



REMEDIAL WORKS AREA *Remediation of soils in accordance with the RAP is required due to exceedance of assessment criteria.*

- ☐ Estimated area is likely conservative as the lateral extent of contamination has not been determined. The estimate assumes that impacted soil is limited to the area where fly-tipped material was observed. Vertical extent of contamination has not been assessed however impact is considered likely limited soil underlying / surrounding fly-tipped material. Successful remediation will be confirmed through validation sampling.
- ☐ Additional delineation recommended.

DAILY SITE CHECK *(take photographs to record check)*

- ☐ **Security fencing** and appropriate **warning signs** are in place.
- ☐ **Sediment control measures** in good condition and working as designed.
- ☐ Check site entrance and adjacent public road for silt / sediment deposition.
- ☐ Check integrity of stockpile controls (if applicable).
- ☐ Check excavations to see if **perched groundwater or surface water** requires removal. Approval from local authority is required to discharge to local network – refer to RAP.

GENERAL SITE CONTROLS

- ☐ Dust shall be managed in accordance with consent requirements and relevant regulations.
- ☐ If excavated material is **odorous**, odour control measures shall be put in place.
- ☐ If **perched groundwater or surface water** is encountered the controls in the RAP shall be implemented.
- ☐ If **temporary stockpiling of non-cleanfill material** is necessary, dust shall be controlled through wetting during the workday. If left overnight, the material shall be covered (e.g., with plastic) and protected by erosion / sediment controls (e.g., bunded).
- ☐ Stockpiles of non-cleanfill material shall be located either on an impermeable surface, or the underlying material should be considered potentially contaminated, and shall be managed in accordance with the RAP.
- ☐ Clean and dirty areas should be managed to prevent tracking potentially impacted soils around the site and off-site.
- ☐ Wastewater generated, or rock / soil utilised in a truck loading area should be disposed of as contaminated material, unless tested.

RECORD KEEPING

- ☐ Daily photographs to be made available on request.
- ☐ Disposal dockets for all material should be forwarded to the Contaminated Land Specialist.
- ☐ Fill imported to site shall meet the Auckland Council definition of cleanfill.
- ☐ The location of any contaminated soils retained on-site shall be recorded on as built drawings.

OFF-SITE DISPOSAL OF CONTAMINATED SOIL

- ☐ Trucks shall be loaded in a location within the site where runoff and possible spills during loading will be controlled and contained. Loads must be securely covered prior to leaving site and during off-site transport. Soil must be taken to an appropriate soil disposal facility authorised to accept the contaminants identified.
- ☐ Prior to acceptance the results of the soil testing may be requested by the receiving facility.
- ☐ Requirements for additional testing and truck lining / soil wrapping should be confirmed with the receiving landfill.
- ☐ Further testing may be required to assess whether deeper material is cleanfill / managed fill.

For details of the controls refer to the current site-specific RAP prepared by ENGEO. All site staff and subcontractors are aware of and comply with the procedures and health and safety requirements contained within this document.

ENGEO

30.10.2023

23849.000.003_02

APPENDIX 3:

Asbestos Controls

16 Sinton Road, Whenuapai, Auckland
Asbestos Controls

Scenario (NZ GAMAS 2017 definitions)	Control Measure Objectives	Unlicensed Asbestos Work	Asbestos-related Work	Class B: non-friable	Class A: friable	*Source Guideline Reference*
FA/AF % w/w in soil		≤ 0.001	> 0.001	> 0.01	> 1	
ACM % w/w		≤ 0.01%	> 0.01	> 1	-	
Scale, soil volume		≤ NESCS	> NESCS	-	-	
Asbestos in air		< 0.01 f/mL in air	< 0.01 f/mL in air	≥ 0.01 f/mL in air	≥ 0.01 f/mL in air	
REMOVAL WORKS RESPONSIBILITIES						
Remedial Works Supervision / Oversight	OBJECTIVE: *Undertake work by persons who have adequate knowledge and experience to assess the risks and implement appropriate control measures*	A Suitably Qualified and Experienced Practitioner (Contaminated Land – refer to NESCS)		Class B Supervisor	Class A Supervisor	*ACOP*
WorkSafe Notification		Not required		Notification five days before earthworks are to be undertaken		*ACOP*
Contractor License Requirements		Not required		Class B License	Class A License	*ACOP*
Training/Certification Requirements		Non-certified training in asbestos identification, safe handling and suitable controls. A copy of the training shall be kept on record.		Certified training for workers. Certified, competent supervisors.	Certified training for workers. Certified, competent supervisors. Certified safety management system.	*Figure 17 ACOP*
SITE SET-UP						
Boundary Controls	OBJECTIVE: *Prevent unauthorised access into works areas and accidental transport of contaminated soils on boots, clothing, equipment, skin, or in air / dust.*	Physical barriers must be in place to prevent unauthorised access.	Physical barriers must be in place to prevent unauthorised access. Warning signs must be present that clearly show that asbestos related works are underway.	Physical barriers must be in place to prevent unauthorised access. Polythene sheeting may be necessary to prevent spread of airborne fibres outside of works area. Warning signs must be present that clearly show that asbestos removal works are underway.	Physical barriers must be in place to prevent unauthorised access. Consider use of solid hoarding placed at a suitable distance beyond the works area, or full enclosure. Warning signs must be present that clearly show that asbestos removal works are underway.	*ACOP*
Personal Decontamination Facilities		Educate site workers to minimise contact with soil. Provide a boot wash and lidded and plastic lined bin for secure disposal of used PPE.	Basic disposable decontamination tent and boot wash.		Basic disposable wet decontamination tent or trailer.	*NZ GAMAS Table 6*
Dust / Asbestos Fibre Suppression	OBJECTIVE: *Minimise the release of asbestos fibres from soils.*	Minimise the size of the earthworks areas and time exposed to the elements. Stabilise exposed earth surfaces as soon as possible following works.				
		Spray mist water via localised points. Consider use of surfactants or polymers where a reliable source of water is not available. Consider implementing additional controls (as per Class B works) if sensitive receptors nearby (such as adjacent to busy centres, schools).		Spray mist water via localised points. Addition of surfactants and polymers where the location is sensitive (such as adjacent to busy centres, schools) or if a source of water is not readily available. Consider temporary cover of contaminated areas awaiting remediation.		*NZ GAMAS Table 6*

16 Sinton Road, Whenuapai, Auckland
Asbestos Controls

Scenario (NZ GAMAS 2017 definitions)		Control Measure Objectives	Unlicensed Asbestos Work	Asbestos-related Work	Class B: non-friable	Class A: friable	*Source Guideline Reference*
FA/AF % w/w in soil			≤ 0.001	> 0.001	> 0.01	> 1	
ACM % w/w			≤ 0.01%	> 0.01	> 1	-	
Scale, soil volume			≤ NESCS	> NESCS	-	-	
Asbestos in air			< 0.01 f/mL in air	< 0.01 f/mL in air	≥ 0.01 f/mL in air	≥ 0.01 f/mL in air	
OCCUPATIONAL HEALTH AND SAFETY							
Personal Protective Equipment & Respiratory Protective Equipment		OBJECTIVE: *Minimise workers exposure to asbestos fibres.* *Reduce accidental transport of asbestos contaminated soils off site on workers clothing, boots.*	Educate site workers to minimise contact with soil; to clean equipment and to undertake activities in a manner that reduces dust. Disposable P2 dust mask recommended.	Disposable coveralls rated type 5, category 3, nitrile gloves Steel toe capped gumboots are preferred as these can be readily washed down. Disposable overshoes can be used to prevent contamination of laces.	Half-face P3 respirator with particulate filter. Consider increasing to full-face if friable ACM present.	Full-face P3 respirator with particulate filter. Consider increasing to power-assisted if required.	*NZ GAMAS Table 6* *NZ GAMAS Table 6* *Refer to Part C section 14 of the ACOP and AS/NZS 1715:2009 for more information*
Contractor Health Monitoring		OBJECTIVE: *Mitigate risks to workers from the potentially harmful effects of asbestos through the workplace.*	The contractor must ensure that worker health monitoring is undertaken in accordance with the Asbestos Regulations Clause 15 and 16.		In accordance with the Asbestos Regulations Clause 15 and 16, a PCBU must ensure that health monitoring is provided to workers involved in more than four weeks of Class B work in any twelve-month period. Refer ACOP Section 16	In accordance with the Asbestos Regulations Clause 15 and 16, a PCBU must ensure that health monitoring is provided to workers involved in Class A work. Refer ACOP Section 16	*ACOP* *Section 16*
MONITORING PROCEDURES							
Air Monitoring	**Responsibility**	OBJECTIVE: *Provide a clear expectation of who is responsible for undertaking monitoring, and that the person has the appropriate skills and knowledge to do so.* *To provide verification that works have been safely undertaken.* *To provide early warning of potentially harmful levels of exposure.* *To identify when asbestos is present in air at a concentration that presents an*	SQEP / Competent Person		Independent Licensed Asbestos Assessor OR Independent Competent Person as defined within Section 30.4 of the ACOP	Independent Licensed Asbestos Assessor	*Section 30.4 of the ACOP*
	Requirement		Air monitoring is not required for Unlicensed Asbestos works, or Asbestos Related works (as defined under the NZ GAMAS) however it is recommended where possible to provide assurances regarding cross contamination and protection of workers.		If the SQEP or competent person considers that the trace level of 0.01 f/ml may be exceeded, then air monitoring must be undertaken.	Air monitoring must be conducted before and during Class A asbestos removal work.	*NZ GAMAS Section 5.5*

16 Sinton Road, Whenuapai, Auckland
Asbestos Controls

Scenario (NZ GAMAS 2017 definitions)		Control Measure Objectives	Unlicensed Asbestos Work	Asbestos-related Work	Class B: non-friable	Class A: friable	*Source Guideline Reference*
FA/AF % w/w in soil			≤ 0.001	> 0.001	> 0.01	> 1	
ACM % w/w			≤ 0.01%	> 0.01	> 1	-	
Scale, soil volume			≤ NESCS	> NESCS	-	-	
Asbestos in air			< 0.01 f/mL in air	< 0.01 f/mL in air	≥ 0.01 f/mL in air	≥ 0.01 f/mL in air	
	Compliance	*unacceptable risk to site workers and surrounding receptors.* *Undertake works by persons who have been trained to manage the risks associated with asbestos.* *Implement additional control measures when necessary.*	If the concentration exceeds 0.01 f/ml then works are Class B or Class A works under the NZ GAMAS definition.		All results shall be below 0.01 fibres / ml. < 0.01 f/ml – continue with works > 0.01 f/ml – investigate the cause and implement additional controls > 0.02 f/ml – stop works and investigate, notify WorkSafe >0.1 f/ml – Remedial works required. PCBUs with management or control of workplace are to ensure that exposure of a person at the workplace to airborne asbestos is eliminated so far as is reasonably practicable.		*Section 30 of the ACOP*
SITE CONTROLS							
Vehicle Decontamination	**Vehicle assessment before demobilisation from site**	OBJECTIVE: *Minimise the potential for accidental transport of contaminated soils or asbestos fibres out of the works areas on, or in vehicles.*	Minimise vehicle transport onto site areas containing asbestos soils, or in locations where asbestos fibres may be present in air. Visual assessment.		Visual (plus swab samples if friable ACM is elsewhere on-site – lagging, insulation, etc).	Visual plus swab samples, air sampling should be undertaken inside the cab.	*NZ GAMAS Table 7*
	Vehicle assessment completed by		Competent person or SQEP.		Independent licensed assessor or independent competent person (meeting the requirements of regulation 41(3) under the Asbestos Regulations).	Independent licensed assessor.	*NZ GAMAS Table 7*
	Truck/excavator air conditioning	OBJECTIVE: *To prevent the contamination of internal spaces of equipment where people work.* *To avoid worker exposure to asbestos fibres.*	Standard air conditioning.		HEPA filter system fitted for all occupied vehicles where friable ACM on-site.	HEPA filter system fitted for all occupied vehicles, filter replaced or clean down with HEPA vacuum cleaner post work.	*NZ GAMAS Table 7*
MANAGEMENT OF CONTAMINATED MATERIAL							
Stockpiles of impacted soils		OBJECTIVE: *To minimise the release of asbestos fibres into air.*	Stockpiles should be avoided where possible to ensure that exposed areas of soil are minimised. All temporary stockpiled asbestos contaminated material which is created and not proposed to be immediately moved should be covered. Stockpiles shall be located on an impermeable surface within an area protected by erosion and sediment controls. Consider covering stockpiles with polythene.				*NZ GAMAS Section 6.6*

16 Sinton Road, Whenuapai, Auckland
Asbestos Controls

Scenario (NZ GAMAS 2017 definitions)	Control Measure Objectives	Unlicensed Asbestos Work	Asbestos-related Work	Class B: non-friable	Class A: friable	*Source Guideline Reference*
FA/AF % w/w in soil		≤ 0.001	> 0.001	> 0.01	> 1	
ACM % w/w		≤ 0.01%	> 0.01	> 1	-	
Scale, soil volume		≤ NESCS	> NESCS	-	-	
Asbestos in air		< 0.01 f/mL in air	< 0.01 f/mL in air	≥ 0.01 f/mL in air	≥ 0.01 f/mL in air	
Used PPE	*Asbestos contaminated material is to be appropriately transported and disposed in a location where the material presents no unacceptable human health risk.* *To track the movement of contaminated materials.*	All disposable PPE used during remediation of asbestos impacted soil should be placed in a 200 micron HDPE plastic bag within the decontamination area. The bag should be taped closed (in a goose neck fashion) after each item is added and kept damp via the addition of water. Once full, the bag should be double bagged (200 micron HDPE) and labelled "Asbestos hazard – wear respirator and protective clothing while handling contents".				*NZ GAMAS Section 6.6*
Contaminated Soil		The location of any soils retained on-site shall be recorded on as built drawings. The receiving facility should be contacted in advance of the soil disposal to verify the requirements for receiving the wastes. Trucks shall have their loads securely covered during off-site transport of material. Waste manifests should be completed and retained for all off-site disposal of soils. Site records shall be cross checked against receipts of soil disposal from the receiving facility. The bins / skips or trucks shall be loaded within the site where runoff and possible spills during loading will be controlled and contained.				*NZ GAMAS Section 6.6*
		Special waste bins / skips or trucks, approved for the transport of ACM to the appointed licensed landfill facility shall be placed on-site. The bins / skips or trucks will be lined / wrapped in accordance with requirements of receiving facility. It is recommended that any soil which contains asbestos in concentrations >0.001% w/w is considered hazardous and the controls stated in the Land Transport Rules adopted. For asbestos soil waste in significant quantities, hazard label signage should be displayed on the vehicles transporting the soil for disposal.	Special waste bins / skips or trucks, approved for the transport of ACM to the appointed licensed landfill facility shall be placed on-site. The bins / skips or trucks will be lined with 200 micron sealed plastic. It is recommended that any soil which contains asbestos in concentrations >0.001% w/w is considered hazardous and the controls stated in the Land Transport Rules adopted. For asbestos soil waste in significant quantities, hazard label signage should be displayed on the vehicles transporting the soil for disposal.		
Contaminated Water		Water used for cleaning asbestos-contaminated equipment (including vehicles) shall be placed into a drum or skip and disposed of at an appropriately licensed facility. If excessive water is applied, ponding or runoff may occur which could permit the transport and accumulation of asbestos fines outside of the site. Water from the work area should be retained inside the boundary of the site and wash water directed back into excavations and the site.				*NZ GAMAS Section 6.6*

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Project Number 23849.000.004

Preliminary and Detailed Environmental Site Investigation

15 Clarks Lane, Hobsonville, Auckland

Submitted to:
Cabra Developments Limited
Unit 9B, Foundry Road
Silverdale
Auckland 0932

Contents

Tables

Appendices

ENGEO Document Control:

Report Title	Preliminary and Detailed Environmental Site Investigation - 15 Clarks Lane, Hobsonville			
Project No.	23849.000.004	**Doc ID**	01	
Client	Cabra Developments Limited	**Client Contact**	Duncan Unsworth	
Distribution (PDF)	Duncan Unsworth, Cabra Developments Limited			
Date	**Revision Details / Status**	**Author**	**Reviewer**	**WP**
30/10/2023	Issued to Client	CD	JR	DF

SQEP Certifying Statement

I certify that the site has been assessed in accordance with current New Zealand Regulations and guidance documents and that this report has been prepared in general accordance with the Ministry for the Environment's Contaminated Land Management Guidelines No. 1: Reporting on Contaminated Sites in New Zealand, 2021.

I am considered by ENGEO Limited to be a suitably qualified and experienced practitioner (SQEP) able to certify reports pursuant to the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011, based on the company's definition of a SQEP as given below.

Report Reviewer

30 October 2023

ENGEO Limited requires that a SQEP has the following Qualifications / Experience:

- *Tertiary science or engineering qualification relevant to environmental assessment.*
- *A minimum of 10 years of relevant experience.*
- *Registration with a professional body that assess and certifies environmental professionals in the competency criteria of training, experience, professional conduct and ethical behaviour.*

1 Introduction

ENGEO Ltd was requested by Cabra Developments Limited to undertake an environmental investigation of the property at 15 Clarks Lane, Hobsonville, Auckland (herein referred to as 'the site'; shown in attached Figure 1). This work has been carried out in accordance with the signed agreement dated 2 August 2023. The purpose of the assessment is to support a Resource Consent application for the proposed redevelopment of the site.

We have been provided with a draft masterplan for the property which indicates that redevelopment comprises demolition of the existing buildings to allow construction of a residential estate.

This environmental investigation has been undertaken to satisfy the requirements of the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (the "NESCS"). This investigation provides information regarding the presence of land contaminants that may pose a risk to future site users and site redevelopment workers. The results of this investigation have been used to evaluate whether remediation is necessary prior to site redevelopment, and to assess the requirement for Resource Consent under the NESCS.

This investigation also addresses the requirements of regional regulations covering discharges to the environment from contaminated sites during and post-redevelopment works; namely, the Auckland Unitary Plan (AUP; Auckland Council, 2016).

This investigation was undertaken in general accordance with the Ministry for the Environment (MfE) Contaminated Land Management Guidelines (CLMG) No. 1: Reporting on Contaminated Sites in New Zealand (MfE, 2021a) and CLMG No 5: Site Investigation and Analysis of Soils (MfE, 2021b). The investigation was supervised, and the report reviewed and approved by a suitably qualified and experienced contaminated land practitioner in accordance with national environmental regulations for soil contamination. A geotechnical assessment at the site is occurring concurrently (ENGEO, 2023).

1.1 Objectives of the Assessment

The objective of the preliminary site investigation (PSI) was to gather information relating to the current and historical potentially contaminating activities at the site. The works comprised review of historical site information and review / assessment of information gathered during the site walkover undertaken on 22 August 2023.

This intrusive investigation was undertaken to assess:

- The type, extent, and concentration of contaminants of potential concern identified during the desktop assessment.
- Whether the identified contaminants of concern pose a potential unacceptable risk to human health or identified environmental receptors and soil is suitable to remain on-site.

Note: Whilst this investigation provides an assessment of the site under contaminated land regulations (i.e., the NESCS and the AUP), the results can be used for disposal characterisation purposes. Additional testing may be required or recommended to fully inform disposal options for excess site material.

2 Site Information

Site information is summarised in Table 1.

Table 1: Site Information

Item	Description
Legal Description	LOT 2 DP 92753
Current Land Use	Rural residential
Proposed Land Use	Residential
Site Area	Approximately 3.4 hectares
Territorial Authority	Auckland Council
Zoning (AUP)	Future Urban Zone
Geology	The site is mapped by GNS Science (GNS, 2001) as being underlain by Puketoka Formation alluvium in the southern portion of the site, comprising pumiceous mud, sand, and gravel with lenses of muddy peat and lignite. The northern portion of the site is mapped as being underlain by East Coast Bays Formation, comprising alternating sandstone and mudstone with variable volcanic content
Topography	The eastern portion of the site slopes gently down to the west / northwest, and the western third slopes to the west.
Hydrology	An overland flow path is mapped by Auckland Council as flowing east to west through the southern portion of the site, into the Waiarohia Inlet, a tributary of the Waitakere Harbour.
Hydrogeology	A groundwater assessment was not completed as part of this investigation; however, groundwater seepage was observed at a depth between 1.8 m and 3.6 m below ground level (m bgl). Based on the topography of the site, the mapped overland flow path and the nearest watercourse, shallow groundwater likely flows in a west / northwest direction.

3 Site History

ENGEO reviewed aerial photographs, property file documentation and Auckland Council's response to a contamination enquiry. Relevant information obtained during this review is summarised below.

3.1 Aerial Photographs

Aerial photographs dating from 1940 to 2023 have been reviewed (refer to Appendix 1). The aerial photographs were sourced from Auckland Council GeoMaps, Retrolens and Nearmap. Relevant visible features on the site and surrounding area are summarised in Table 2.

Table 2: Aerial Photograph Summary

Date	Description
1940	The site and surrounding area comprise agricultural land. The site itself appears to be used for grazing. A small structure (presumably a shed for storage of agricultural equipment / stock / hay) is present in the northwest portion of the site. A residential development is present to the southeast of the site.
1950	The small structure in the north of the site appears to have been removed; a lighter area immediately east of the shed location is visible, possibly remnant building materials though not possible to state definitively. No other significant changes to the site are noted.
1963	A shelterbelt or fence divides the northern and southern portions of the site; grazing is observed in the north. Earthworks are observed on land directly east of the site.
1980	A minor area of bare ground (likely an access track across the stream) is observed on the southwest boundary. Two linear features are observed on the neighbouring site to the east, where earthworks were previously observed.
1988	Shelterbelts have been planted throughout the site, separating grazing areas. The southeast portion of the site appears to be subject to horticultural activity. The octagonal shaped dwelling referenced in property file documents is observed in the northwest corner of site. A tributary of the Waitemata Harbour intersects the site at the centre of the western boundary and runs along the western boundary. This area is demarcated by shelterbelts and darker vegetation. Directly to the west of the site, a residential building and ancillary buildings have been constructed, which are still present today.
1996	The shelterbelts throughout the site have been cleared, and the land appears to be pasture. A large shed had been constructed to the south of the dwelling, along the western boundary. A small building is present to the east of the dwelling, the location of a pump shed identified in property file documentation. Additional structures have been constructed on properties to the east, south and west of the site.
2000	The majority of the site had been converted into vineyard. The small building (possible pump shed) in the northern portion of the site is no longer visible. Minor earthworks appear to have occurred to the east of the dwelling. No significant changes to the surrounding land.

Date	Description
2004	The octagonal shaped dwelling in the north has been relocated approximately 80 meters south, with a new structure taking its place. No significant changes to the surrounding area are observed.
2017	A circular feature is observed near the western boundary (likely a burn pile), in the southern portion of the site. No significant changes to the surrounding area are observed.
2019	A small mound (likely burn pile) is observed at the centre of the western portion of the site. No significant changes to the surrounding area are observed.
2020	The mound has been removed. No other significant changes are observed.
2021	The vineyards have been cleared and the mound at the northern end appears to be comprised of vegetation. No significant changes to the surrounding area are observed.
2023	No significant changes to the site or surrounding area.

3.2 Property File Review

The property file held by Auckland Council was reviewed on 18 August 2023. A summary of the information potentially relevant to this investigation is provided in Table 3.

Table 3: Property File Summary

Date	Description
1971	Building permit to construct a four bay hay barn.
1982	Waitemata City Council document relating to the erection of a new dwelling indicates that the is currently being developed as a ‘productive horticultural unit’.
1993	Waitakere City Council resource consent documents to build a barn / storage shed. Document indicates the site is a vineyard.
2001	An Assessment of Effects to support the relocation of an existing dwelling and construction of new dwelling indicates that the site is still developed with grape vines. The dwelling to be relocated is an octagonal shaped building (relocation observed in 2004 aerial photograph); an implement / storage shed is also noted to be present to the southwest of the dwelling. A small greenhouse is identified to the south of the new dwelling.

Date	Description
2002	An environmental site assessment report prepared by Environmental & Earth Sciences Limited (dated 2 August 2002) was provided to the Council to support the consent for construction of the new dwelling. Four soil samples (comprising 10 sub-samples each) were collected across the site and analysed for arsenic, copper, lead, and organochlorine pesticides (OCPs). The report states that all results were below the Auckland Regional Council's 'protocol investigation levels'. A review of data indicates that the concentration of arsenic, copper and lead in the four samples analysed were below background concentrations, and a detectable concentration of OCPs was recorded in each sample.

3.3 Auckland Council Site Contamination Enquiry

The Site Contamination Enquiry response prepared by Auckland Council was received and reviewed on 18 August 2023 (Appendix 3).

There is no contamination information held within Auckland Council's records for the site. Due to the age of the site buildings, there is potential for these buildings to contain or have contained asbestos and / or lead-based paints.

In preparing the response, Auckland Council reviewed records within 200 m of the site for pollution incidents, bores, contaminated site and air discharges, closed landfills and identified HAIL activities. A summary of records is provided in Table 4; however, these features discussed in these records are not considered to present a significant potential risk to the proposed redevelopment activities.

Table 4: Site Contamination Enquiry Response Summary

Date	Description
2016	Council's records identify 'HAIL sites' at the following addresses. No details of the nature of activities are included is in the response, however base of the aerial review (Section 3.1) likely relate to historical horticultural activities. • 6 and 12 Sinton Road • 4-6 Ockleston Landing • Brigham Creek Road
1980s - 2008	• Three consents relating to construction and water take from a dam at 6 Sinton Road. The water take appears to be for irrigation of crops. • Wastewater discharge consent to discharge treated domestic wastewater to ground at 3 Clarks Lane

4 Current Site Conditions

The site walkover and intrusive investigation works were completed on 22 August 2023 by ENGEO environmental scientists.

Observations of conditions present at the site are summarised in Table 5. Photographs taken during the site visit are included in Appendix 3.

Table 5: Current Site Conditions

Site Conditions	Comments
Overview	The site is as expected based on findings from the desktop review. The majority of the site is grassed, aside from the gravel driveway and building footprints. Two standalone dwellings, and a large shed with a smaller attached lean-to are present in the northwest quadrant of the site. The large shed appeared to have living quarters at the northern end.
Surrounding Land Use	The site is located in a rural residential area, with the Waiarohia Inlet to the north.
Site Building(s)	All of the external building materials appeared to be in good condition. The two dwellings are constructed of wood, metal, and stone, and the large shed and lean-to were metal clad. Construction materials (timber, PVC pipe and piping) were observed beneath the southernmost dwelling.
Interview with Site Personnel	No formal interview was undertaken. Anecdotal information from the current tenant indicates that diesel has been used on the northernmost piles of vegetation as a fuel for igniting a fire. We were also informed that throughout vineyard operations, the grapevines were sprayed with copper and sulphates, and no organic pesticides were used.
Potential Sources of Contamination	A small volume of fuels and oils were observed around and within the lean-to shed and smaller shed to the southwest of the large shed in the western portion of the site. The smaller shed had a timber floor, whilst the lean-to was an earthen floor. Of the four potential piles observed in the historical aerials, three were observed on-site. Domestic waste (burnt paper, plastic, hessian sack) and partially burned vegetation were present in the piles. Fill material was encountered in the small gully approximately at the centre of the site, and a small, isolated area in a former building footprint in the north of the site. Additional small pockets were occasionally noted within the former vineyard. There was no evidence of building debris observed at the surface in the vicinity of the former buildings.
Potential for On - Or - Off - Site Migration of Contaminants	Whilst overland flow may form a pollution pathway towards the northwest, it is more likely that most rainfall will infiltrate the ground due to the lack of significant hardstanding areas at the site. Contaminant transport (if relevant) would therefore more likely be into the ground and then via groundwater flow, rather than surface water flow.
Limitations	The northern site boundary is lined with trees / shrubs. Minimal access around this area may result in limitations regarding visibility of potential contamination. A significant portion of the large shed was inaccessible during the investigation.

5 Potential HAIL Activities

If current or historical activities included on the Hazardous Activities and Industries List (HAIL; MfE, 2011a) are identified at a site the NESCS may apply. Based on the information reviewed as part of this environmental investigation and observations during the site walkovers, the following activities listed on the HAIL may have been historically and / or are currently present at the site:

- HAIL ID A10: *Persistent pesticide bulk storage or use including sport turfs, market gardens, orchards, glass houses or spray sheds* – Due to the majority of the site being used as a vineyard, it is possible that agrichemicals were applied and / or treated timber posts were used.
- HAIL ID I: *Any other land that has been subject to the intentional or accidental release of a hazardous substance in sufficient quantity that it could be a risk to human health or the environment* –
    - Due to the age of the former site buildings, it is possible that asbestos products were present within building materials. Construction materials containing asbestos may result in contamination of adjacent soils during cutting of asbestos-containing building material (e.g., for service installation), weathering of exterior building material and / or demolition. An assessment of external construction materials did not indicate that the existing buildings comprise potential asbestos containing material (PACM).
    - It is possible that lead-based paint[1], may have been used on buildings at the site, which has the potential to contaminate surrounding soils during maintenance activities (e.g., for service installation) and / or weathering of exterior building material.
    - It is possible that isolated areas of soil contamination have occurred during burning of piles of vegetation historically and currently.
    - A small volume of fuels and oils were observed around and within the lean-to shed and smaller shed to the southwest of the large shed in the western portion of the site. Areas of stained soil indicated that minor leaks or spills have occurred.

Fill material (including thick layers of buried topsoil) was encountered in isolated areas of the site; however, based on observation this material appears to be reworked / site derived material. Although likely to not present a significant risk to future site users, it is recommended that this material is assessed, however this is not likely to represent a HAIL activity (e.g., HAIL ID G3).

[1] The use of white lead in paint was banned in 1979, however some special-purpose paints may still contain red lead. WorkSafe recommends that if a building was built in the 1980s or earlier, it is best to presume that it has been painted with lead-based paint. (Guidelines for the Management of Lead-based Paint, Revised September 2013 by the Ministry of Health and the Ministry of Business, Innovation and Employment).

6 Preliminary Conceptual Site Model

A preliminary conceptual site model (CSM) has been developed to assess the potential exposure pathways present at the site. A contamination conceptual site model consists of three primary components. For a contaminant to present a risk to human health or an environmental receptor, all three components are required to be present and connected. The three components of a conceptual site model are:

- Source of contamination.
- An exposure route, where the receptor and contaminants come into contact (e.g., ingestion, inhalation, dermal contact).
- Receptor(s) that may be exposed to the contaminants.

The preliminary CSM based on the findings of the desktop investigation and observations during the walkover is summarised in Table 6.

Table 6: Preliminary Conceptual Site Model

Potential source of contamination	Primary Contaminants of concern	Possible extent of contamination	Potential Pathway	Potential Receptor
Potential persistent pesticide application and treated timber posts in horticultural areas *(HAIL ID: A10)*	Heavy metals / metalloids and organochlorine pesticides (OCPs)	Shallow soil in the footprint of horticultural areas	Soil ingestion, inhalation of dust, and / or dermal contact	Future site users / site redevelopment workers Surrounding residents
			Leaching of contaminants	Surrounding environment
Potential lead-based paint on former and existing buildings *(HAIL ID: I)*	Lead	Shallow soil within and adjacent to the current and former dwelling footprints	Soil ingestion, inhalation of dust, and / or dermal contact	Future site users / site redevelopment workers Surrounding residents
			Leaching of contaminants	Surrounding environment
Building materials containing asbestos (former) *(HAIL ID: I)*	Asbestos fines and fibrous asbestos	Shallow soil within the former building footprints	Inhalation of asbestos fibres released from impacted soils / dust	Future site users / site redevelopment workers Surrounding residents

Potential source of contamination	Primary Contaminants of concern	Possible extent of contamination	Potential Pathway	Potential Receptor
Leaks and spills during use of fuels and oils *(HAIL ID: I)*	Heavy metals / metalloids, polycyclic aromatic hydrocarbons (PAHs) and petroleum hydrocarbons (TPHs)	Shallow soil within the lean-to and smaller shed	Soil ingestion, produce ingestion, inhalation of dust, and / or dermal contact	Future site users / site redevelopment workers Surrounding residents
			Leaching of contaminants	Surrounding environment
Burning of vegetation and domestic rubbish in piles on site *(HAIL ID: I)*	Heavy metals / metalloids and polycyclic aromatic hydrocarbons (PAHs)	Shallow soil in the footprint of piles	Soil ingestion, produce ingestion, inhalation of dust, and / or dermal contact	Future site users / site redevelopment workers Surrounding residents
			Leaching of contaminants	Surrounding environment

7 Intrusive Investigation

ENGEO completed an intrusive investigation at the site on 22 August 2023.

7.1 Methodology

A judgmental sampling approach was adopted to investigate potential HAIL activities at the site (as indicated in Figure 1). Based on the potential sources of contamination on-site, contamination (if present) was expected to be in shallow soils; therefore, the investigation comprised hand augers to a maximum depth of 2.5 m.

A summary of the investigation method and proposed analysis suite for each area of concern is provided in Table 7. Refer to Figure 2 for investigation locations.

Table 7: Investigation Methodology

Area of Concern	Investigation Location	Proposed Analysis Suite
Historical horticultural area	CS01-A to C CS02-A to C CS03-A to C CS04-A to C	Heavy metals / metalloids and OCPs
Likely position of timber posts in historical horticultural area	S12 to S16	Heavy metals / metalloids
Former / existing burn piles	S01, S02 and S09	Heavy metals / metalloids and semi-volatile organic compounds (SVOCs)
Potential leaks / spills of fuels and oils	S03, S04, and S05	Heavy metals / metalloids, TPH and PAHs
Soil adjacent to current buildings	S05 to S08	Heavy metals / metalloids
Former building footprints	S10, S11, S17 and S18	Heavy metals / metalloids and asbestos
Potential fill material	S10, S17 and CS03C	Heavy metals / metalloids and asbestos

[1] Samples collected from horticultural areas were composited by the laboratory into four, three-point composite samples. The chain of custody appended provides a summary of the samples included in the composite.

Fieldwork and sampling were undertaken in general accordance with the procedures for the appropriate handling of potentially contaminated soils as described in the MfE Contaminated Land Management Guidelines No.5: Site Investigation and Analysis of Soils (MfE, 2021b).

The following was undertaken during the investigation:

- All soil samples were screened for visual and olfactory evidence of contamination.
- Samples were placed into laboratory supplied containers using a new pair of nitrile gloves for each sample. The containers were capped, labelled with a unique identifier, and placed into an insulated container and kept cool prior to transport to Eurofins New Zealand under a standard chain of custody.
- Prior to the collection of each sample, the equipment was decontaminated using a triple wash procedure with potable water, Decon 90 solution and deionized water.
- The soil samples were logged in general accordance with the New Zealand Geotechnical Society Inc. ‘Guidelines for the Field Classification of Soil and Rock for Engineering Purposes’ December 2005.

7.2 Site Observations

Ground conditions encountered during the intrusive investigation are summarised in Table 8. Table 8 also provides a summary of the soil samples collected and selected analysis suite. Refer to attached Figure 2 for sample locations. Note: the geotechnical investigation report includes detailed logs of general site conditions (ENGEO, 2023).

No visual evidence of contamination was observed during soil sampling. A hydrocarbon odour was noted during sampling around the lean-to shed (vicinity of S04) and location S09.

Table 8: Soil Sample Summary

Area of Concern	Investigation Location (Sample ID)	Sample Depth (m bgs)	Material Type	Requested Analyses
Former / existing piles	S01	0 – 0.2	Dark brown clayey silt with occasional charcoal (Note: hydrocarbon odour noted at S09).	Heavy metals / metalloids and SVOCs
	S02	0 – 0.3		
	S09	0 – 0.2		
Potential leaks / spills of fuels and oils	S04	0 – 0.1	Dark brown clayey silt	Heavy metals / metalloids, TPHs and PAHs
Soil adjacent to current buildings	S05	0 – 0.1	Dark brown clayey silt	Heavy metals / metalloids
	S06	0 – 0.1		
	S07	0 – 0.2		
	S08	0 – 0.2		
Former building footprints	S10	0 – 0.15	Dark brown clayey silt	Asbestos
	S10	0.15 – 0.55	Potential fill (likely reworked native soil)	Heavy metals / metalloids and asbestos
	S10	0.55 – 0.7	Buried Topsoil	Heavy metals / metalloids
	S17	0 – 0.1	Dark brown clayey silt	Heavy metals / metalloids
	S17	0.1 – 0.3	Potential fill (likely reworked native soil)	Heavy metals / metalloids and asbestos
	S17	0.3 – 0.5	Buried Topsoil	Asbestos

Area of Concern	Investigation Location (Sample ID)	Sample Depth (m bgs)	Material Type	Requested Analyses
Historical horticultural area	CS01A to CS01C	0 – 0.2	Dark brown clayey silt	Heavy metals / metalloids and OCPs
	CS02A to CS02C	0 – 0.25		
	CS03A to CS03C	0 – 0.1		
	CS04A to CS04C	0 – 0.2		
Likely position of timber posts in historical horticultural area	S12	0 - 0.15	Dark brown clayey silt	Heavy metals / metalloids
		0.15 – 0.25	Yellowish brown clayey silt intermixed with dark brown	Heavy metals / metalloids
	S16	0 - 0.2	Dark brown clayey silt	Heavy metals / metalloids
		0.2 – 0.3	Yellowish orange silty clay with dark red mottles	Heavy metals / metalloids
Potential fill material	S10	0.15 – 0.55	Potential fill (likely reworked native soil)	Heavy metals / metalloids and asbestos
		0.55 – 0.7	Buried Topsoil	Heavy metals / metalloids
	S17	0.1 – 0.3	Fill	Heavy metals / metalloids and asbestos
		0.3 – 0.5	Buried Topsoil	Asbestos
	CS03 C	0.3 – 0.4	Potential fill (likely reworked native soil)	Heavy metals / metalloids
		1.2 – 1.3	Buried Topsoil	Heavy metals / metalloids and OCPs

Note: In some instances, samples were collected but not analysed – refer to the chain of custody for a full list of samples collected. Sample location S10 and S17 were used for the assessment of the potential impact of former building footprints and potential fill material.

7.3 Assessment Criteria

Analytical results were assessed to determine consenting requirements and options for disposal of any soil which may be taken off-site.

Human Health Criteria

The following criteria were used to assess the risk to future site users:

- Development plans have not been finalised, the soil contaminant standards from the Methodology for Deriving Contaminants in Soil to Protect Human Health ("the Methodology"; MfE, 2011b) for high-density residential land use have been selected based on the anticipated land use.
- The soil guideline values for high-density residential land use from the New Zealand Guidelines for Assessing and Managing Asbestos in Soil (GAMAS; BRANZ, 2017).
- In accordance with Contaminated Land Management Guidelines No.2 – Hierarchy and Application in New Zealand of Environmental Guideline Values (CLMG 2; MfE, 2011b) for contaminants not listed above.

As discussed in Section 3.2.1 of the Methodology (MfE, 2011), the NESCS does not assess a maintenance or excavation worker exposure scenario as the risks to those workers is more appropriately managed under New Zealand health and safety legislation. Therefore, potential risks to contractors responsible for carrying out the earthworks and future maintenance are not further assessed.

Surrounding populations are considered to be adequately protected on the basis that the risks to earthworks contractors will be managed, and on the basis that the long-term risk to future site users is acceptable.

Environmental Criteria

In the Auckland region, potential discharges to the environment from land containing elevated levels of contaminants are managed through the AUP (AUP, 2016). Therefore, the Auckland Council permitted activity criteria referenced in this report were adopted from the AUP.

Groundwater discharges from the site have not been assessed as part of this investigation, however if groundwater impacts are suspected, then they may require assessment under Section E30.6.2.1 of the AUP.

Background Criteria

To assess the results against the natural background levels:

- Background levels for non-volcanic soils in the Auckland region (AC, 2001).
- The laboratory limit of reporting (LOR) for other contaminants (except asbestos), where no natural background level of a given contaminant is available, or where the natural background limit is below the limit of reporting. The recorded presence of asbestos below the LOR is also considered an exceedance of the natural background levels.

8.2 Soil Analysis Results

The soil results summary table included in Appendix 4 compares soil contaminant concentrations in the samples tested with the adopted investigation criteria. Full analytical laboratory reports are included in Appendix 5. Soil sample locations are shown in appended Figure 3.

A summary of the chemical and asbestos testing results is provided below:

- An elevated arsenic concentration was reported in the topsoil sample collected from an area where vegetation is being stockpiled in the southwest portion of the site. The result exceeds the adopted human health and environmental criterion and will require remediation. The source is likely associated with the vegetation and domestic waste that is / was stockpiled and burned here, and it is considered likely that it is isolated in extent. The impacted soil is likely limited to the footprint of the pile.
- Surface soil which appeared to be visually impacted by hydrocarbons was observed in the lean-to shed where fuel storage and refuelling of machinery appeared to occur. Whilst the concentrations in a surface soil sample analysed did not exceed human health or environmental criteria, it is recommended that visually impacted material is removed from this area for aesthetic purposes.
- No asbestos was detected in the samples analysed.
- Concentrations of heavy metals / metalloids (arsenic, copper and nickel) and petroleum hydrocarbons were recorded that exceed background concentrations in samples collected from soil in the shed and stockpile of vegetation in the western portion of the site. This material is not consistent with Auckland Councils definition of cleanfill and would need to be disposed of at an appropriately licenced managed fill or landfill site if it is removed from the site. Additionally, whilst concentrations of contaminant in samples collected from the other piles did not exceed assessment criteria, it is recommended that a surface soil scrape is undertaken, and material disposed as managed / controlled fill material.

7.4 Laboratory Quality Assurance and Quality Control

Eurofins are accredited by International Accreditation New Zealand (IANZ) for the analyses performed. Additionally, Eurofins are accredited to AS-4964-2004: *Method for Qualitative Identification of Asbestos in Bulk Storage* for the analysis of suspected asbestos in soil samples, and to the international standards NZ ISO/IEC 17207:2018 *General requirements for the competence testing and calibration laboratories* in accordance with The Building Research Association New Zealand (BRANZ) Guidelines for Assessing and Managing Asbestos in Soil.

Our review of the laboratory QA reports indicated that the relative percent difference (RPD) in the laboratory's duplicate samples were within acceptable limits.

7.4.1 Conceptual Site Model

The preliminary CSM from Section 6 has been updated based on the findings of the intrusive investigation and is summarised in Table 9.

Table 9: Conceptual Site Model

Potential source of contamination	Potential Pathway	Potential Receptor	Acceptable Risk?
Potential persistent pesticide application in horticultural areas *Heavy metals / metalloids and organochlorine pesticides (OCPs)* *(HAIL ID: A10)*	Soil ingestion, inhalation of dust, and / or dermal contact	Future site users / site redevelopment workers Surrounding residents	**Yes** The reported concentration of relevant contaminants of concern were below human health and environmental criteria, however the application of copper sprays, and the detection of OCPs during an assessment undertaken in 2002 Environmental & Earth Sciences Limited indicates that this HAIL activity applies to the site.
	Leaching of contaminants	Surrounding environment	
Potential lead-based paint on former and existing buildings *Lead* *(HAIL ID: I)*	Soil ingestion, inhalation of dust, and / or dermal contact	Future site users / site redevelopment workers Surrounding residents	**Yes** Lead concentrations were below human health and environmental criteria.
	Leaching of contaminants	Surrounding environment	
Building materials containing asbestos (former buildings) *Asbestos fines and fibrous asbestos (HAIL ID: I)*	Inhalation of asbestos fibres released from impacted soils / dust	Future site users / site redevelopment workers Surrounding residents	**Yes** No asbestos was detected in the samples analysed.
Leaks and spills during use of fuels and oils *Heavy metals / metalloids and petroleum hydrocarbons (TPHs)* *(HAIL ID: I)*	Soil ingestion, inhalation of dust, and / or dermal contact	Future site users / site redevelopment workers Surrounding residents	**Yes** The reported concentration of relevant contaminants of concern were below human health and environmental criteria. However, it is recommended that visually impacted material is removed from this area.
	Leaching of contaminants	Surrounding environment	**Yes** The concentration of contaminants of concern were below environmental criteria.

Potential source of contamination	Potential Pathway	Potential Receptor	Acceptable Risk?
Burning of vegetation and domestic rubbish in piles on-site *Heavy metals / metalloids and polycyclic aromatic hydrocarbons (PAHs) (HAIL ID: I)*	Soil ingestion, inhalation of dust, and / or dermal contact	Future site users / site redevelopment workers Surrounding residents	**No** The reported concentration of relevant contaminants of concern exceeded the human health criteria at one location (S02, which will require remediation). Whilst concentrations of contaminant in samples collected from the other piles did not exceed assessment criteria, it is recommended that a surface soil scrape is undertaken, and material disposed as managed / controlled fill material.
	Leaching of contaminants	Surrounding environment	**Yes** The concentration of arsenic in the sample from the burn pile exceeded the environmental standard. Given the small area it is unlikely that there would be an adverse effect on the environment.

8 Regulatory Context

In Auckland, soil disturbance and change of land use on sites with potentially contaminated soils are covered by two contaminated land regulations:

- Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (NESCS, 2011).
- Auckland Unitary Plan.

8.1 The NESCS

The intent of the NESCS is to protect the human health of the site's end users, the site redevelopment workers and the surrounding populations.

8.1.1 Applicability

The NESCS may apply to specific activities on sites where an activity on the HAIL (MfE, 2011a) has, or is more likely than not to have occurred. The activities to which the NESCS applies are listed in Table 10, which is based on the template provided in the Users' Guide: National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health ("the Users' Guide"; MfE, 2012). This table and the results of analysis of soil samples from the site (refer to Section 7.4) confirms the NESCS applies to the site.

Table 10: Applicability of NESCS

NESCS Checklist	
Is an activity described on the HAIL currently being undertaken on the piece of land to which this application applies?	Yes
Has an activity described on the HAIL ever been undertaken on the piece of land to which this application applies?	Yes
Is it more likely than not that an activity described on the HAIL is being or has been undertaken on the piece of land to which this application applies?	Yes
If 'Yes' to any of the above, then the NES for Assessing and Managing Contaminants in Soil to Protect Human Health may apply. Check the five activities to which the NES applies:	
Is the activity you propose to undertake removing or replacing a fuel storage system or parts of it?	No
Is the activity you propose to undertake sampling soil?	No
Is the activity you propose to undertake disturbing soil?	Yes
Is the activity you propose to undertake subdividing land?	Unknown
Is the activity you propose to undertake changing the use of the land?	Yes
If also 'Yes' to any of the above activities, then the NES for Assessing and Managing Contaminants in Soil to Protect Human Health is likely to apply.	

8.1.2 Consenting Requirements

Contaminant concentrations were detected in one sample which exceed the relevant human health criterion. ENGEO has not been provided with proposed soil disturbance or disposal volumes. If earthworks will not meet the permitted activity criteria outlined in Table 11, based on the results of analysis of samples described in this report, soil disturbance, soil disposal and changing will be a restricted discretionary activity consent under Regulation 10 of the NESCS will be required for the site. Table 11 demonstrates compliance with the conditions for a restricted discretionary activity consent.

Table 11: NESCS Restricted Discretionary Activity Criteria

Restricted discretionary activity criteria (Regulation 10(2))	
(a) a detailed site investigation of the piece of land must exist	Meets criterion. A DSI (this report) has been prepared for the site.
b) the report on the detailed site investigation must state that the soil contamination exceeds the applicable standard in regulation 7:	The concentration of arsenic in one soil sample exceeds the relevant standard.
(c) the consent authority must have the report	Meets criterion. We understand the DSI will be submitted to Auckland Council.
(d) conditions arising from the application of subclause (3), if there are any, must be complied with.	Meets criterion. Conditions arising out of subclause 3 (matters over which control is reserved) will be included in the resource consent for the works.

8.2 Regional Plan

8.2.1 Consenting Requirements

The AUP (AC, 2016) sets out consent requirements for managing discharges to the environment from land containing elevated concentrations of contaminants.

With the exception of one sample from a pile where burning is understood to have occurred, none of the results of chemical analysis of samples from the site presented in Section 8.2 exceeded the relevant regional environmental discharge criteria. On this basis it is considered that soil at the site is not “land containing elevated levels of contaminants’ as defined in the AUP. It is therefore considered that Section E30 of the AUP does not apply to the site and no consent relating to land contamination under the AUP is required.

9 Conclusions

Based on the information reviewed as part of this investigation and observations during the walkover, activities listed on the HAIL may have been historically and / or are currently present on-site.

The intrusive investigation has identified that:

- An elevated arsenic concentration was reported in the topsoil sample collected from an area where vegetation is being stockpiled in the southwest portion of the site. The result exceeds the adopted human health criterion and will require remediation. The source is likely associated with the vegetation that is / was stockpiled here, indicating that it is likely an isolated occurrence. The impacted soil is likely limited to the footprint of the pile.
- Surface soil which appeared to be visually impacted by hydrocarbons was observed in the lean-to shed when fuel storage and refuelling of machinery appeared to occur. Whilst the concentrations in a surface soil sample analysed do not exceed human health or environmental criteria, it is recommended that visually impacted material is removed from this area. Depending on the extent of remediation required, further assessment may be required.
- No asbestos was detected in the samples analysed.

The NESCS may apply to specific activities on sites where an activity on the HAIL (MfE, 2011a) has, or is more likely than not to have occurred. Based on the results of this investigation, we consider that HAIL ID A10 and HAIL ID I apply to the site. As the permitted disturbance volume, removal volume and / or time frame is unlikely to be complied with, and the results of analysis of samples described in this report identified contaminant concentrations in the soils above the human health criteria, a restricted discretionary activity consent under Regulation 10 of the NESCS will be required for the site if permitted activity volumes cannot be met.

With one exception in a small pile where burning is believed to have occurred, the results of chemical analysis of samples from the site presented in Section 8.2 do not exceed the relevant regional environmental discharge criteria. On this basis it is considered that soil at the site is not “land containing elevated levels of contaminants’ as defined in the AUP. It is therefore considered that Section E30 of the AUP does not apply to the site and no consent relating to land contamination under the AUP is required.

10 Recommendations

10.1 Remediation Action Plan

It is recommended that the earthworks for the planned redevelopment be managed in accordance with the RAP that has been prepared for the site. The RAP outlines remediation and validation requirements for soil impacted by contaminants above the human health and environmental discharge criteria, as well as monitoring and management procedures for the balance of the earthworks due to the potential for encountering unidentified contamination.

10.2 Closure Reporting

Following completion of remediation works a Site Validation Report (SVR) should be prepared to document the remediation works and validation works. The SVR should also confirm that works have been undertaken in general accordance with the RAP.

10.3 Disposal Options

The objective of the investigation was to satisfy the requirements of the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (NESCS); however, the results can be used to inform disposal options. The findings of this investigation indicate that large areas of the site are likely to be considered “cleanfill” for disposal purposes (AUP, 2016). The presence of metals / metalloids and hydrocarbons above regional background concentrations in the shed and stockpile of vegetation mean that excess soil generated during redevelopment works in these areas cannot be considered “cleanfill” for disposal purposes or reused at another earthworks site. Note that it is likely that shallow / deeper soil can be classified as cleanfill; however, additional testing prior to, or as part of, redevelopment works is required to confirm this.

11 Limitations

i. We have prepared this report in accordance with the brief as provided. This report has been prepared for the use of our client, Cabra Developments Limited, their professional advisers and the relevant Territorial Authorities in relation to the specified project brief described in this report. No liability is accepted for the use of any part of the report for any other purpose or by any other person or entity.

ii. The recommendations in this report are based on the ground conditions indicated from published sources, site assessments and subsurface investigations described in this report based on accepted normal methods of site investigations. Only a limited amount of information has been collected to meet the specific financial and technical requirements of the client's brief and this report does not purport to completely describe all the site characteristics and properties. The nature and continuity of the ground between test locations has been inferred using experience and judgement and it should be appreciated that actual conditions could vary from the assumed model.

iii. Subsurface conditions relevant to construction works should be assessed by contractors who can make their own interpretation of the factual data provided. They should perform any additional tests as necessary for their own purposes.

iv. This Limitation should be read in conjunction with the Engineering NZ/ACENZ Standard Terms of Engagement.

v. This report is not to be reproduced either wholly or in part without our prior written permission.

We trust that this information meets your current requirements. Please do not hesitate to contact the undersigned on (09) 972 2205 if you require any further information.

Report prepared by

Claire Davies, CEnvP

Associate Environmental Consultant

Report reviewed by

Jamie Rhodes, CEnvP (SC)

Associate Environmental Engineer

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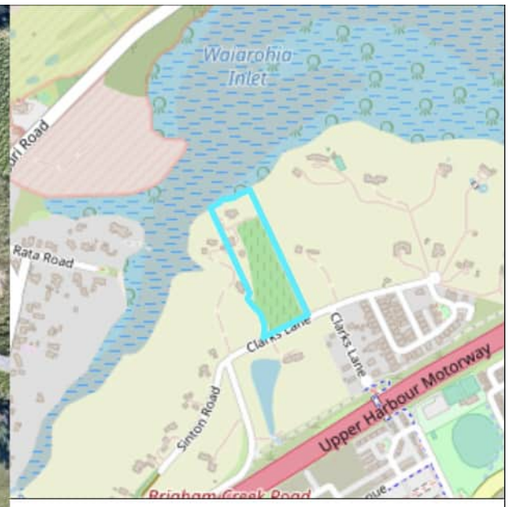
FIGURES



Legend

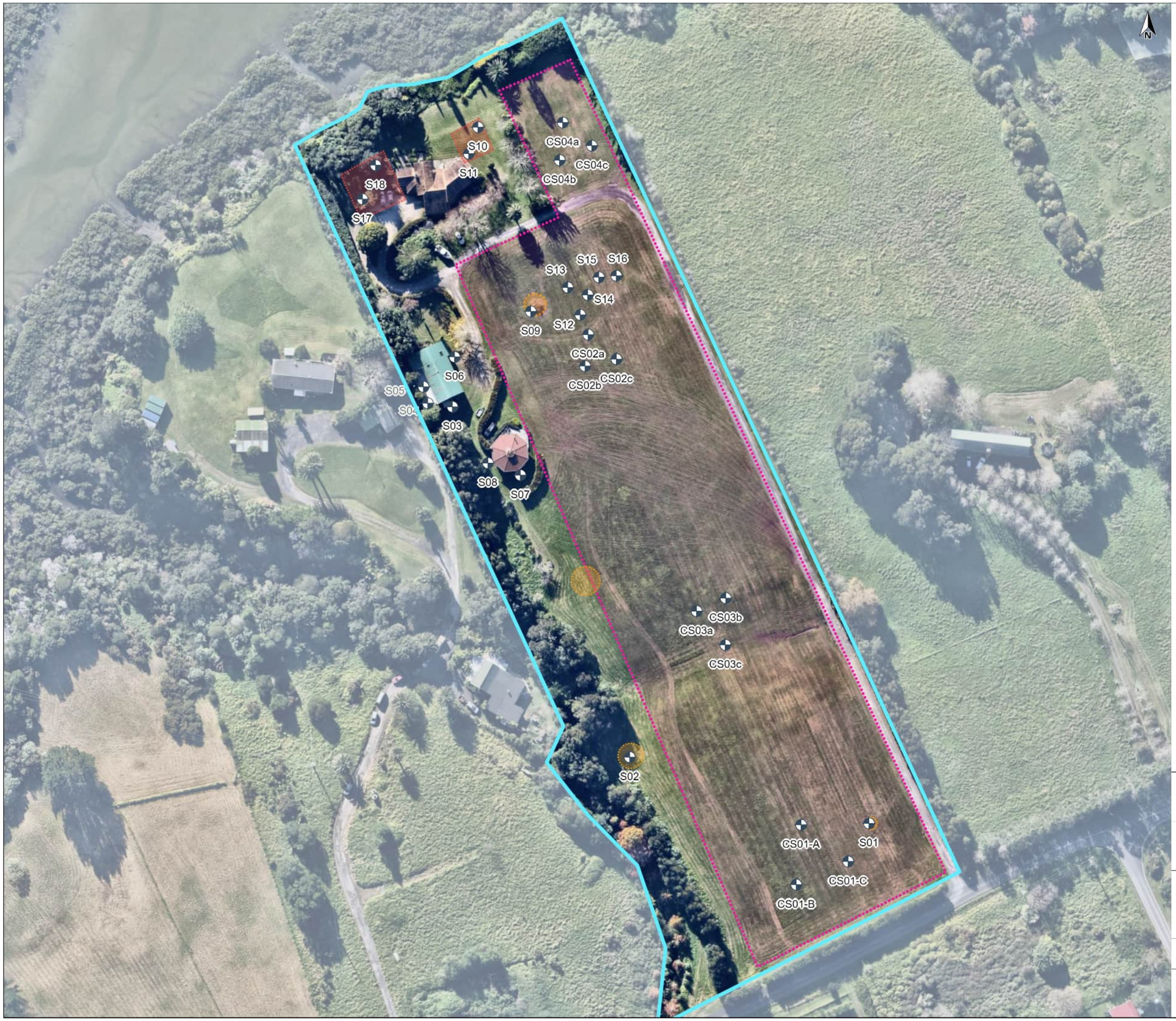
- Site Boundary
- Area of Filling (approximate)
- Existing/Former Stockpiles
- Former Building Footprints
- Former Vineyard Area

0 25 m 50 m

ENGEO

Produced by **Datanest.earth**

Title: Site Location and Key Features		
Client: Cabra Developments Limited		
Project: 15 Clarks Lane, Whenuapai	Drawn: CD	Figure No.: 1 Size: A3
Date: 30-10-2023	Checked: JR	
Proj No.: 23849.000.001_02	Scale: 1:1874	Version: 1.0



Legend

- Site Boundary
- Environmental Investigation Location
- Existing/Former Stockpiles
- Former Building Footprints
- Former Vineyard Area

0 25 m 50 m

ENGEO

Produced by **Datanest.earth**

Title:
Environmental Investigation Location Plan

Client: Cabra Developments Limited		Figure No.: 2 Size: A3
Project: 15 Clarks Lane, Whenuapai	Drawn: CD	
Date: 30-10-2023	Checked: JR	
Proj No.: 23849.000.001_02	Scale: 1:1250	Version: 1.0

APPENDIX 1:

Council Documentation

15/08/2023

Engeo Limited
8 Greydene Place
Auckland

Attention: Jack Hammond

Dear Jack,

Site Contamination Enquiry – *15 Clarks Lane, Hobsonville*

This letter is in response to your enquiry requesting available site contamination information within Auckland Council records for the above site. Please note this report does not constitute a site investigation report; such reports are required to be prepared by a (third-party) Suitably Qualified and Experienced Practitioner.

The following details are based on information available to the Contamination, Air & Noise Team in the Resource Consent Department. The details provided may be from former regional council information, as well as property information held by the former district/city councils. For completeness the relevant property file should also be requested to obtain all historical records and reports via 09 3010101 or online at:

https://www.aucklandcouncil.govt.nz/buying-property/order-property-report/Pages/order-property-file.aspx.

1. Hazardous Activities and Industries List (HAIL) Information

This list published by the Ministry for the Environment (MfE) comprises activities and industries that are considered likely to cause land contamination as a result of hazardous substance use, storage, and/or disposal.

There is no contamination information held within Council's records for the site (15 Clarks Lane, Hobsonville.)

An environmental assessment dated 2002, indicated the site had been utilised as a vineyard established in the 1990's. Four soil samples (10 subsamples incorporated) were collected and heavy metals were below background concentrations, traces of DDT were detected, however total DDT was below the permitted activities criteria.

Please note:

- *If you are demolishing any building that may have asbestos containing materials (ACM) in it, you have obligations under the Health and Safety at Work (Asbestos) Regulations 2016 for the management and removal of asbestos, including the need to engage a Competent Asbestos Surveyor to confirm the presence or absence of any ACM.*
- *Paints used on external parts of properties up until the mid-1970's routinely contained lead, a poison and a persistent environmental pollutant. You are advised to ensure that soils affected by old, peeling or flaking paint are assessed in relation to the proposed use of the property, including high risk use by young children.*

2. Consents and Incidents Information (200m radius of the selected site)

The Council database was searched for records of the following activities within approximately 200 metres of the site and results are displayed in Figure 1 below:

- Pollution Incidents (including air discharges, oil or diesel spills)
- Bores
- Contaminated site and air discharges, and industrial trade process consents
- Closed Landfills
- Air quality permitted activities
- Identified HAIL activities

Figure 1: Selected Consents, Incidents and HAIL activities within approximately 200m of the subject site

Legend:

Relevant details of any pollution incidents and consents and HAIL activities are appended to this letter (Attachment A). Please refer to the column titled 'Property Address' on the spreadsheet to aid in identifying corresponding data on the map.

For any identified HAIL sites, please refer to the tab "HAIL activities" for more information (Column C and D include HAIL activity details where these are available).

Please note:

The HAIL activity hatching in Figure 1 only reflects whether a site has been identified as a HAIL site (both verified and non-verified) by the Council and the type of HAIL associated with the site. This does not confirm whether the site has been formally investigated or the contamination status of the property (e.g. contaminated, remediated etc.). Additionally, due to limitations within Council's records, the specific HAIL activity is not included in the data for all properties. For further information on any of these known HAIL sites, a subsequent site contamination enquiry can be lodged for the specific property (up to 5 adjacent properties can be covered in one request).

While the Auckland Council has carried out the above search using its best practical endeavours, it does not warrant its completeness or accuracy and disclaims any responsibility or liability in respect of the information. If you or any other person wishes to act or to rely on this information, or make any financial commitment based upon it, it is recommended that you seek appropriate technical and/or professional advice.

If you wish to clarify anything in this letter that relates to this site, please contact contaminatedsites@aucklandcouncil.govt.nz. Any follow up requests for information on other sites must go through the online order process.

Should you wish to request any of the files referenced above and/or listed in the attached spreadsheet for viewing, please contact the Auckland Council Call Centre on 301 0101 and note you are requesting former Auckland Regional Council records (the records department requires three working days' notice to ensure the files will be available).

Please note Auckland Council cost recovers officer's time for all site enquiries. As such an invoice for $128 for the time involved in this enquiry will follow shortly.

Yours Sincerely,

Contamination, Air and Noise Team
Specialist Unit | Resource Consents
Auckland Council

APPLICATION_NUMBER	FILE_REFERENCE	ACTIVITY	APPLICANT	APPLICATION_STATUS	LODGED_DATE	PROCESSING_OFFICER	PURPOSE	WORKS_DESCRIPTION	EASTING	NORTHING	ACTIVITY_ID	ACTIVITY_STATUS	ACTIVITY_DESCRIPTION	SITE_NAME	SITE_DESCRIPTION	DATE_CREATED	PROPERTY_ADDRESS	LOC_TYP
35722	20602	Wastewater Discharge	NZ Transport Agency ****use 5781**** *	Withdrawn	20080411	_Nicholas Browne			1746920	5926710	21030	Proposed	To discharge treated wastewater from a 3 bedroom house. - Appl legal description does not match up with	Transit - Lot 7	Appl legal description does not match up with d/base - needs checking	2/06/2017	3 Clarks Lane Hobsonville Waitakere	Point

CONSENT_NUMBER	FILE_REFERENCE	ACTIVITY	CONSENT_HOLDER	CONSENT_STATUS	GRANTED_DATE	REVIEW_DATE	EXPIRY_DATE	PROCESSING_OFFICER	PURPOSE	WORKS_DESCRIPTION	EASTING	NORTHING	ACTIVITY_ID	ACTIVITY_STATUS	ACTIVITY_DESCRIPTION	SITE_NAME	SITE_DESCRIPTION	DATE_CREATED	PROPERTY_ADDRESS	LOC_TYP	MONITORING_OFFICER	PREVIOUS_INSPECTION_DATE	NEXT_INSPECTION_DATE
S190	KR854971	Dam	WH OCKLESTON & CO LTD	Replaced	19860704		19911231		ASSORTED CROPS		1746700	5926680	309	Existing	ASSORTED CROPS		6 SINTON RD, HOBSONVILLE	2/06/2017	6 Sinton Road Hobsonville Waitakere	Point		Invalid Date	Invalid Date
S191	AKB54972	Take	WH OCKLESTON & CO LTD	Cancelled	19860704		19911231		To take from a Dam up to 160 cmpd for - Pastoral	dam	1746700	5926680	2186		To take from a Dam up to 160 cmpd for - Pastoral		6 Sinton Rd, Hobsonville	2/06/2017	6 SINTON RD HOBSONVILLE Waitakere City	Point		Invalid Date	Invalid Date
9046	KR924071	Dam	Anthony Gerard Koenen & Janet Stephanie Koenen	Expired	19930525	19961231	20060531	_Michelle Daly	To Dam an unnamed tributary of the Waiarohia inlet.	A 6 metre high earth dam, located approximately 25 metres east of Sinton Road, Hobsonville.	1746700	5926680	309	Existing	ASSORTED CROPS		6 SINTON RD, HOBSONVILLE	2/06/2017	6 Sinton Road Hobsonville Waitakere	Point		Invalid Date	Invalid Date
11214	54/27/123	Coastal Structure	United Networks Ltd	Expired	19761208		19960930		licence provides for overhead cables OVER THE WAIACHIA CREEK.	POWERLINE CROSSING (112M OVER CREEK).	1746500	5927000	20615		(Previously pipeline 868)		WAIROHIA CREEK, WHENUAPAI, HOBSONVILLE	2/06/2017		Point		Invalid Date	Invalid Date

SAPSiteID	PropertyAddress	HAILCode	HAILDescription	ValidFrom
11132817	12 Sinton Road Hobsonville			1/06/2016
11134463	4-6 Ockleston Landing Hobsonville			1/06/2016
11143991	Brigham Creek Road Whenuapai			1/06/2016
30003910	Brigham Creek Road Whenuapai			1/06/2016
30003919	Brigham Creek Road Whenuapai			1/06/2016
11134039	6 Sinton Road Hobsonville			1/01/1900
11134039	6 Sinton Road Hobsonville			1/01/1900

PERMITTED_ACTIVITY_ID	FILE_REFERENCE	PERMITTED_ACTIVITY_HOLDER	PERMITTED_ACTIVITY_TYPE	ACTIVITY	CONSENT_STATUS	GRANTED_DATE	REVIEW_DATE	EXPIRY_DATE	PROCESSING_OFFICER	PURPOSE	WORKS_DESCRIPTION	EASTING	NORTHING	ACTIVITY_ID	ACTIVITY_STATUS	ACTIVITY_DESCRIPTION	SITE_NAME	SITE_DESCRIPTION	DATE_CREATED	PROPERTY_ADDRESS	LOC_TYP
51942	20602		Wastewater Discharge	Wastewater Discharge	Assessment Completed				_Nicholas Browne	WS121307		1746920	5926710	21030	Proposed	To discharge treated wastewater from a 3 bedroom house. - Appl legal description does not match up with d/base - needs	Transit - Lot 7	Appl legal description does not match up with d/base - needs checking	2/06/2017	3 Clarks Lane Hobsonville Waitakere	Point

APPENDIX 2:

Aerial Photographs

1940 (Retrolens NZ)

1950 (Retrolens NZ)

1963 (Retrolens NZ)

1980 (Retrolens NZ)

1988 (Retrolens NZ)

1996 (Auckland Council GeoMaps)

2000 (Auckland Council GeoMaps)

2004 (Auckland Council GeoMaps)

2017 (Nearmap)

2019 (Nearmap)

2020 (Nearmap)

2021 (Nearmap)

2023 (Nearmap)

APPENDIX 3:

Site Photographs

Photo 1: View across western portion of the site.

Photo 2: View west, along the northern boundary.

Photo 3: View across the central portion of the site, facing north.

Photo 4: View of the stockpile in the western portion of the site (investigation location S02).

Photo 5: Small metal shed located to the southwest of the large shed (pictured in the background). Small volumes of fuel and oil observed in the small shed.

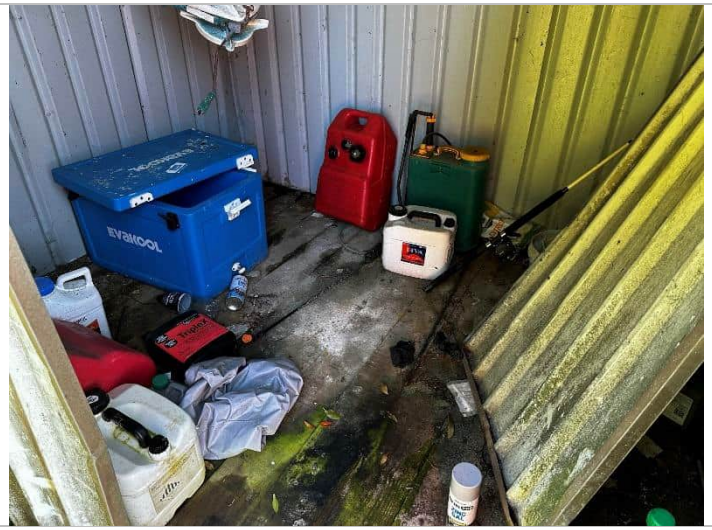


Photo 6: Interior of the small shed. Containers were located on a timber floor.

Photo 7: View of entrance to the lean-to shed. Small volumes of oils and fuels were stored next to the entrance of the lean-to, on the earthen floor.

Photo 8: View of southernmost timber clad dwelling, located in the western portion of the site.

Photo 9: Construction materials (timber, PVC pipe and piping) observed beneath the dwelling.

Photo 10: Potential living quarters at the northern end of the large shed.

Photo 11: Dwelling in northern portion of site.

Photo 12: View of northwwestern portion of the site, facing east. Dwelling shown in Photo 11 is in the background.

APPENDIX 4:

Results Summary

Results Table A: Comparison of Soil Results to Assessment Criteria

				Heavy Metals/Metalloids								Polycyclic Aromatic Hydrocarbons	Total Petroleum Hydrocarbons				Organochlorine Pesticides	Semi-Volatile Organic Compounds	Asbestos	
Sample Name	Depth (m bgl)	Sample ID	Date	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc	All PAHs	C7-C9	C10-C14	C15-C36	Total C7-C36	All OCPs	All SVOCs	Asbestos Containing Material (ACM)	Asbestos Fines / Friable Asbestos (AF/FA)
S01	0.0 - 0.2	S01 0.0 - 0.2	22-Aug-23	1.5	0.19	5.6	27	5.8	0.05	2.3	24	-	-	-	-	-	-	<LOR	-	-
S02	0.0 - 0.3	S02 0.0 - 0.3	22-Aug-23	126	0.22	27	47	9.2	0.05	3.2	32	-	-	-	-	-	-	<LOR	-	-
S04	0.0 - 0.1	S04 0.0 - 0.1	22-Aug-23	8.5	0.2	15	43	15	0.08	13	130	<LOR	100	< 10	120000 **	120000	-	-	-	-
S05	0.0 - 0.1	S05 0.0 - 0.1	22-Aug-23	8.7	0.3	10	69	17	0.15	22	92	-	-	-	-	-	-	-	-	-
S06	0.0 - 0.1	S06 0.0 - 0.1	22-Aug-23	0.7	0.03	6.3	18	1.6	< 0.01	36	33	-	-	-	-	-	-	-	-	-
S07	0.0 -0.2	S07 0.0 - 0.2	22-Aug-23	4.2	0.62	11	25	13	0.22	4	22	-	-	-	-	-	-	-	-	-
S08	0.0 - 0.2	S08 0.0 - 0.2	22-Aug-23	3.7	0.64	10	13	9.4	0.19	3.3	21	-	-	-	-	-	-	-	-	-
S09	0.0 - 0.2	S09 0.0 - 0.2	22-Aug-23	5.6	0.44	8.2	29	9.2	0.15	3.4	47	-	-	-	-	-	-	<LOR	-	-
S10	0.0 - 0.15	S10 0.0 - 0.15	22-Aug-23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NAD	NAD
	0.15 - 0.55	S10 0.15 - 0.55	22-Aug-23	2	0.05	12	5.7	5.1	0.15	3.3	8.8	-	-	-	-	-	-	-	NAD	NAD
	0.55 - 0.7	S10 0.55 - 0.7	22-Aug-23	0.6	0.03	2.5	1.9	2.3	0.06	0.7	< 5	-	-	-	-	-	-	-	-	-
S12	0.0 - 0.15	S12 0.0 - 0.15	22-Aug-23	2.1	0.44	7.4	19	8.8	0.2	3.1	23	-	-	-	-	-	-	-	-	-
	0.15 - 0.25	S12 0.15 - 0.25	22-Aug-23	2	0.17	5.2	6.7	7.2	0.25	2.5	14	-	-	-	-	-	-	-	-	-
S15	0.0 - 0.2	S15 0.0 - 0.2	22-Aug-23	1.2	0.4	5.6	19	5.1	0.06	1.9	12	-	-	-	-	-	-	-	-	-
	0.2 - 0.3	S15 0.2 - 0.3	22-Aug-23	1.3	0.03	2.6	1.8	5.4	0.14	1.5	< 5	-	-	-	-	-	-	-	-	-
S17	0.0 - 0.1	S17 0.0 - 0.1	22-Aug-23	1.6	0.26	7.3	11	7.4	0.06	3.4	13	-	-	-	-	-	-	-	-	-
	0.1 - 0.3	S17 0.1 - 0.3	22-Aug-23	1.9	0.11	9.7	7	5.7	0.08	3.8	130	-	-	-	-	-	-	-	NAD	NAD
	0.3 - 0.5	S17 0.3 - 0.5	22-Aug-23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NAD	NAD
CS01A - CS01C	0.0 - 0.2	CS01 (composite of CS01A 0.0-0.2 CS01B 0.0-0.2 and CS01C 0.0-0.1)	22-Aug-23	1.4	0.22	6.5	18	6.4	0.06	1.6	14	-	-	-	-	-	<LOR	-	-	-
CS02A - CS02C	0.0 - 0.25	(composite of CS02A 0.0-0.2 CS02B 0.0-0.15 and CS02C 0.0-0.25)	22-Aug-23	3.1	0.5	8.9	21	9.7	0.18	3.9	26	-	-	-	-	-	<LOR	-	-	-
CS03A - CS03C	0.0 - 0.1	(Composite of CS03A 0.0-0.1 CS03B 0.0-0.1 AND CS03C 0.0-0.1)	22-Aug-23	1.5	0.29	4.8	25	7	0.1	2.2	33	-	-	-	-	-	<LOR	-	-	-
CS03C	0.3 - 0.4	CS03C 0.3 - 0.4	22-Aug-23	1.7	0.33	5.9	19	6.7	0.06	2	12	-	-	-	-	-	-	-	-	-
	1.2 - 1.3	CS03C 1.2-1.3	22-Aug-23	1.1	0.02	11	5.2	6.1	0.08	3.8	6.4	-	-	-	-	-	<LOR	-	-	-
CS04A - CS04C	0.0 - 0.2	(composite of CS04A 0.0-0.2 CS04B 0.0-0.2 and CS04C 0.0-0.15)	22-Aug-23	1.3	0.05	5.3	5.9	13	0.15	2.3	22	-	-	-	-	-	<LOR	-	-	-
Assessment Criteria:																				
Human Health Criteria (High-Density Residential) [1]				45	230	1500	10000	500	1000	1200	60000	various	2700	560	NA	-	various	various	0.04	0.001
Human Health Criteria (Residential) [1]				20	3	460	10000	210	310	400	7400	various	2700	560	NA	-	various	various	0.01	0.001
Environmental Criteria (Auckland Unitary Plan) [2]				100	7.5	400	325	250	0.75	105	400	various	NA [11]	NA [11]	NA [11]	-	various	various	-	-
Background Criteria (Auckland - Non-Volcanic) [3]				0.4 - 12	< 0.1 - 0.65	2 - 55	1 - 45	< 5 - 65	<0.03 - 0.45	0.9 - 35	9 - 180	< LOR	< LOR	< LOR	< LOR	< LOR	< LOR	< LOR	< LOR	< LOR

Notes:

All results and criteria are presented in mg/kg dry weight basis, except asbestos which is reported as %w/w
Full results are included in the laboratory reports
LOR: Limit of Reporting. Results below LOR or background are shown in grey text
- : not analysed or no applicable criteria

1: MfE (2011) Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health (High-Density Residential Land Use), or selected in accordance with CLMG No. 2
2: Permitted activity standards selected in accordance with Section E30.6.1.4 of the Auckland Unitary Plan (Auckland Council, 2016).
3: Background Ranges of Trace Elements in Auckland Soils (Non-Volcanic Range). Table E30.6.1.4.2 of the AUP (Auckland Council, 2016).
4. Assumes soil pH of 5.
5. Criteria for Chromium (VI) conservatively selected.
6. NEPM (1999) Health Investigation Levels. Residential B criteria listed.
7. New Zealand Guidelines for Assessing and Managing Asbestos in Soil (BRANZ, 2017) High-Density Residential Land Use.
8. New Zealand Guidelines for Assessing and Managing Asbestos in Soil (BRANZ, 2017) All Land Uses
9. Petroleum Hydrocarbon Guidelines (MfE, 2011). Criteria from Table 4.13 (All Pathways) for Residential land use, Silty Clay and contamination depth < 1m
10. Petroleum Hydrocarbon Guidelines (MfE, 2011). Criteria for Protection of Groundwater Quality from Table 4.20 for Silty Clay; contamination depth < 1m and groundwater depth 2m
11. NA indicates estimated criterion exceeds 20,000 mg/kg, at which the residual separate phase is expected to be formed. However, we note that no separate phase hydrocarbons were observed during the investigaiton.

APPENDIX 5:

Analytical Reports and Chain of Custody Documentation

ENGEO Ltd
8 Greydene Place
Takapuna
Auckland 0622

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

Attention: **Claire Davies**

Report **1020238-S**
Project name 15 CLARKS LANE
Project ID 23849.000.004
Received Date Aug 25, 2023

Client Sample ID			**S01 0.0-0.2**	**S02 0.0-0.3**	**S04 0.0-0.1**	**S05 0.0-0.1**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins Sample No.			**K23-Au0065200**	**K23-Au0065201**	**K23-Au0065202**	**K23-Au0065203**
Date Sampled			**Aug 22, 2023**	**Aug 22, 2023**	**Aug 22, 2023**	**Aug 22, 2023**
Test/Reference	LOR	Unit				
Semivolatile Organics						
1-Chloronaphthalene	0.5	mg/kg	< 0.5	< 0.5	-	-
Total PAH*	0.1	mg/kg	< 0.1	< 0.1	-	-
1-Naphthylamine	0.5	mg/kg	< 0.5	< 0.5	-	-
1.2-Dichlorobenzene	0.5	mg/kg	< 0.5	< 0.5	-	-
1.2.3-Trichlorobenzene	0.5	mg/kg	< 0.5	< 0.5	-	-
1.2.3.4-Tetrachlorobenzene	0.5	mg/kg	< 0.5	< 0.5	-	-
1.2.3.5-Tetrachlorobenzene	0.5	mg/kg	< 0.5	< 0.5	-	-
1.2.4-Trichlorobenzene	0.5	mg/kg	< 0.5	< 0.5	-	-
1.2.4.5-Tetrachlorobenzene	0.5	mg/kg	< 0.5	< 0.5	-	-
1.3-Dichlorobenzene	0.5	mg/kg	< 0.5	< 0.5	-	-
1.3.5-Trichlorobenzene	0.5	mg/kg	< 0.5	< 0.5	-	-
1.4-Dichlorobenzene	0.5	mg/kg	< 0.5	< 0.5	-	-
2-Chloronaphthalene	0.5	mg/kg	< 0.5	< 0.5	-	-
2-Chlorophenol	0.5	mg/kg	< 0.5	< 0.5	-	-
2-Fluorobiphenyl (surr.)	1	%	55	63	-	-
2-Methyl-4.6-dinitrophenol	5	mg/kg	< 5	< 5	-	-
2-Methylnaphthalene	0.5	mg/kg	< 0.5	< 0.5	-	-
2-Methylphenol (o-Cresol)	0.2	mg/kg	< 0.2	< 0.2	-	-
2-Naphthylamine	0.5	mg/kg	< 0.5	< 0.5	-	-
2-Nitroaniline	0.5	mg/kg	< 0.5	< 0.5	-	-
2-Nitrophenol	1	mg/kg	< 1	< 1	-	-
2-Picoline	0.5	mg/kg	< 0.5	< 0.5	-	-
2.3.4.6-Tetrachlorophenol	5	mg/kg	< 5	< 5	-	-
2.4-Dichlorophenol	0.5	mg/kg	< 0.5	< 0.5	-	-
2.4-Dimethylphenol	0.5	mg/kg	< 0.5	< 0.5	-	-
2.4-Dinitrophenol	5	mg/kg	< 5	< 5	-	-
2.4-Dinitrotoluene	0.5	mg/kg	< 0.5	< 0.5	-	-
2.4.5-Trichlorophenol	1	mg/kg	< 1	< 1	-	-
2.4.6-Tribromophenol (surr.)	1	%	INT	INT	-	-
2.4.6-Trichlorophenol	1	mg/kg	< 1	< 1	-	-
2.6-Dichlorophenol	0.5	mg/kg	< 0.5	< 0.5	-	-
2.6-Dinitrotoluene	0.5	mg/kg	< 0.5	< 0.5	-	-
3&4-Methylphenol (m&p-Cresol)	0.4	mg/kg	< 0.4	< 0.4	-	-
3-Methylcholanthrene	0.5	mg/kg	< 0.5	< 0.5	-	-
3.3'-Dichlorobenzidine	0.5	mg/kg	< 0.5	< 0.5	-	-

Client Sample ID			S01 0.0-0.2	S02 0.0-0.3	S04 0.0-0.1	S05 0.0-0.1
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			K23-Au0065200	K23-Au0065201	K23-Au0065202	K23-Au0065203
Date Sampled			Aug 22, 2023	Aug 22, 2023	Aug 22, 2023	Aug 22, 2023
Test/Reference	LOR	Unit				
Semivolatile Organics						
4-Aminobiphenyl	0.5	mg/kg	< 0.5	< 0.5	-	-
4-Bromophenyl phenyl ether	0.5	mg/kg	< 0.5	< 0.5	-	-
4-Chloro-3-methylphenol	1	mg/kg	< 1	< 1	-	-
4-Chlorophenyl phenyl ether	0.5	mg/kg	< 0.5	< 0.5	-	-
4-Nitrophenol	5	mg/kg	< 5	< 5	-	-
4.4'-DDD	0.01	mg/kg	< 0.01	< 0.01	-	-
4.4'-DDE	0.01	mg/kg	< 0.01	< 0.01	-	-
4.4'-DDT	0.01	mg/kg	< 0.01	< 0.01	-	-
7.12-Dimethylbenz(a)anthracene	0.5	mg/kg	< 0.5	< 0.5	-	-
a-HCH	0.01	mg/kg	< 0.01	< 0.01	-	-
Acenaphthene	0.03	mg/kg	< 0.03	< 0.03	-	-
Acenaphthylene	0.03	mg/kg	< 0.03	< 0.03	-	-
Acetophenone	0.5	mg/kg	< 0.5	< 0.5	-	-
Aldrin	0.01	mg/kg	< 0.01	< 0.01	-	-
Aniline	0.5	mg/kg	< 0.5	< 0.5	-	-
Anthracene	0.03	mg/kg	< 0.03	< 0.03	-	-
b-HCH	0.01	mg/kg	< 0.01	< 0.01	-	-
Benz(a)anthracene	0.03	mg/kg	< 0.03	< 0.03	-	-
Benzo(a)pyrene	0.03	mg/kg	< 0.03	< 0.03	-	-
Benzo(a)pyrene TEQ (lower bound)*	0.03	mg/kg	< 0.03	< 0.03	-	-
Benzo(a)pyrene TEQ (medium bound)*	0.03	mg/kg	0.04	0.04	-	-
Benzo(a)pyrene TEQ (upper bound)*	0.03	mg/kg	0.08	0.08	-	-
Benzo(b&j)fluoranthene[N07]	0.03	mg/kg	< 0.03	< 0.03	-	-
Benzo(g.h.i)perylene	0.03	mg/kg	< 0.03	< 0.03	-	-
Benzo(k)fluoranthene	0.03	mg/kg	< 0.03	< 0.03	-	-
Benzyl chloride	0.5	mg/kg	< 0.5	< 0.5	-	-
Bis(2-chloroethoxy)methane	0.5	mg/kg	< 0.5	< 0.5	-	-
Bis(2-chloroisopropyl)ether	0.5	mg/kg	< 0.5	< 0.5	-	-
Bis(2-ethylhexyl)phthalate	0.5	mg/kg	< 0.5	< 0.5	-	-
Butyl benzyl phthalate	0.5	mg/kg	< 0.5	< 0.5	-	-
Chrysene	0.03	mg/kg	< 0.03	< 0.03	-	-
d-HCH	0.01	mg/kg	< 0.01	< 0.01	-	-
Di-n-butyl phthalate	0.5	mg/kg	< 0.5	< 0.5	-	-
Di-n-octyl phthalate	0.5	mg/kg	< 0.5	< 0.5	-	-
Dibenz(a.h)anthracene	0.03	mg/kg	< 0.03	< 0.03	-	-
Dibenz(a.j)acridine	0.5	mg/kg	< 0.5	< 0.5	-	-
Dibenzofuran	0.5	mg/kg	< 0.5	< 0.5	-	-
Dieldrin	0.01	mg/kg	< 0.01	< 0.01	-	-
Diethyl phthalate	0.5	mg/kg	< 0.5	< 0.5	-	-
Dimethyl phthalate	0.5	mg/kg	< 0.5	< 0.5	-	-
Dimethylaminoazobenzene	0.5	mg/kg	< 0.5	< 0.5	-	-
Diphenylamine	0.5	mg/kg	< 0.5	< 0.5	-	-
Endosulfan I	0.01	mg/kg	< 0.01	< 0.01	-	-
Endosulfan II	0.01	mg/kg	< 0.01	< 0.01	-	-
Endosulfan sulphate	0.01	mg/kg	< 0.01	< 0.01	-	-
Endrin	0.01	mg/kg	< 0.01	< 0.01	-	-
Endrin aldehyde	0.01	mg/kg	< 0.01	< 0.01	-	-
Endrin ketone	0.01	mg/kg	< 0.01	< 0.01	-	-
Fluoranthene	0.03	mg/kg	< 0.03	< 0.03	-	-

Client Sample ID			S01 0.0-0.2	S02 0.0-0.3	S04 0.0-0.1	S05 0.0-0.1
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			K23-Au0065200	K23-Au0065201	K23-Au0065202	K23-Au0065203
Date Sampled			Aug 22, 2023	Aug 22, 2023	Aug 22, 2023	Aug 22, 2023
Test/Reference	LOR	Unit				
Semivolatile Organics						
Fluorene	0.03	mg/kg	< 0.03	< 0.03	-	-
g-HCH (Lindane)	0.01	mg/kg	< 0.01	< 0.01	-	-
Heptachlor	0.01	mg/kg	< 0.01	< 0.01	-	-
Heptachlor epoxide	0.01	mg/kg	< 0.01	< 0.01	-	-
Hexachlorobenzene	0.01	mg/kg	< 0.01	< 0.01	-	-
Hexachlorobutadiene	0.5	mg/kg	< 0.5	< 0.5	-	-
Hexachlorocyclopentadiene	0.5	mg/kg	< 0.5	< 0.5	-	-
Hexachloroethane	0.5	mg/kg	< 0.5	< 0.5	-	-
Indeno(1.2.3-cd)pyrene	0.03	mg/kg	< 0.03	< 0.03	-	-
Methoxychlor	0.01	mg/kg	< 0.01	< 0.01	-	-
N-Nitrosodibutylamine	0.5	mg/kg	< 0.5	< 0.5	-	-
N-Nitrosodipropylamine	0.5	mg/kg	< 0.5	< 0.5	-	-
N-Nitrosopiperidine	0.5	mg/kg	< 0.5	< 0.5	-	-
Naphthalene	0.1	mg/kg	< 0.1	< 0.1	-	-
Nitrobenzene	0.5	mg/kg	< 0.5	< 0.5	-	-
Nitrobenzene-d5 (surr.)	1	%	66	66	-	-
Pentachlorobenzene	0.5	mg/kg	< 0.5	< 0.5	-	-
Pentachloronitrobenzene	0.5	mg/kg	< 0.5	< 0.5	-	-
Pentachlorophenol	1	mg/kg	< 1	< 1	-	-
Phenanthrene	0.03	mg/kg	< 0.03	< 0.03	-	-
Phenol	0.5	mg/kg	< 0.5	< 0.5	-	-
Phenol-d6 (surr.)	1	%	69	65	-	-
Pronamide	0.5	mg/kg	< 0.5	< 0.5	-	-
Pyrene	0.03	mg/kg	< 0.03	< 0.03	-	-
Trifluralin	0.5	mg/kg	< 0.5	< 0.5	-	-
Metals M8 (NZ MfE)						
Arsenic	0.1	mg/kg	1.5	120	8.5	8.7
Cadmium	0.01	mg/kg	0.19	0.22	0.20	0.30
Chromium	0.1	mg/kg	5.6	27	15	10
Copper	0.1	mg/kg	27	47	43	69
Lead	0.1	mg/kg	5.8	9.2	15	17
Mercury	0.01	mg/kg	0.05	0.05	0.08	0.15
Nickel	0.1	mg/kg	2.3	3.2	13	22
Zinc	5	mg/kg	24	32	130	92
Sample Properties						
% Moisture	1	%	33	25	17	22
Total Petroleum Hydrocarbons (NZ MfE 1999)						
TPH-SG C7-C9	5	mg/kg	-	-	100	-
TPH-SG C10-C14	10	mg/kg	-	-	< 10	-
TPH-SG C15-C36	20	mg/kg	-	-	120000	-
TPH-SG C7-C36 (Total)	35	mg/kg	-	-	120000	-
Polycyclic Aromatic Hydrocarbons (NZ MfE)						
Acenaphthene	0.03	mg/kg	-	-	< 0.3	-
Acenaphthylene	0.03	mg/kg	-	-	< 0.3	-
Anthracene	0.03	mg/kg	-	-	< 0.3	-
Benz(a)anthracene	0.03	mg/kg	-	-	< 0.3	-
Benzo(a)pyrene	0.03	mg/kg	-	-	< 0.3	-
Benzo(a)pyrene TEQ (lower bound)*	0.03	mg/kg	-	-	< 0.3	-

Client Sample ID			S01 0.0-0.2	S02 0.0-0.3	S04 0.0-0.1	S05 0.0-0.1
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			K23-Au0065200	K23-Au0065201	K23-Au0065202	K23-Au0065203
Date Sampled			Aug 22, 2023	Aug 22, 2023	Aug 22, 2023	Aug 22, 2023
Test/Reference	LOR	Unit				
Polycyclic Aromatic Hydrocarbons (NZ MfE)						
Benzo(a)pyrene TEQ (medium bound)*	0.03	mg/kg	-	-	0.4	-
Benzo(a)pyrene TEQ (upper bound)*	0.03	mg/kg	-	-	0.8	-
Benzo(b&j)fluoranthene[N07]	0.03	mg/kg	-	-	< 0.3	-
Benzo(g.h.i)perylene	0.03	mg/kg	-	-	< 0.3	-
Benzo(k)fluoranthene	0.03	mg/kg	-	-	< 0.3	-
Chrysene	0.03	mg/kg	-	-	< 0.3	-
Dibenz(a.h)anthracene	0.03	mg/kg	-	-	< 0.3	-
Fluoranthene	0.03	mg/kg	-	-	< 0.3	-
Fluorene	0.03	mg/kg	-	-	< 0.3	-
Indeno(1.2.3-cd)pyrene	0.03	mg/kg	-	-	< 0.3	-
Naphthalene	0.1	mg/kg	-	-	< 0.3	-
Phenanthrene	0.03	mg/kg	-	-	< 0.3	-
Pyrene	0.03	mg/kg	-	-	< 0.3	-
Total PAH*	0.1	mg/kg	-	-	< 0.3	-
p-Terphenyl-d14 (surr.)	1	%	-	-	INT	-
2-Fluorobiphenyl (surr.)	1	%	-	-	65	-

Client Sample ID			S06 0.0-0.1	S07 0.0-0.2	S08 0.0-0.2	S09 0.0-0.2
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			K23-Au0065204	K23-Au0065205	K23-Au0065206	K23-Au0065207
Date Sampled			Aug 22, 2023	Aug 22, 2023	Aug 22, 2023	Aug 22, 2023
Test/Reference	LOR	Unit				
Semivolatile Organics						
1-Chloronaphthalene	0.5	mg/kg	-	-	-	< 0.5
Total PAH*	0.1	mg/kg	-	-	-	< 0.1
1-Naphthylamine	0.5	mg/kg	-	-	-	< 0.5
1.2-Dichlorobenzene	0.5	mg/kg	-	-	-	< 0.5
1.2.3-Trichlorobenzene	0.5	mg/kg	-	-	-	< 0.5
1.2.3.4-Tetrachlorobenzene	0.5	mg/kg	-	-	-	< 0.5
1.2.3.5-Tetrachlorobenzene	0.5	mg/kg	-	-	-	< 0.5
1.2.4-Trichlorobenzene	0.5	mg/kg	-	-	-	< 0.5
1.2.4.5-Tetrachlorobenzene	0.5	mg/kg	-	-	-	< 0.5
1.3-Dichlorobenzene	0.5	mg/kg	-	-	-	< 0.5
1.3.5-Trichlorobenzene	0.5	mg/kg	-	-	-	< 0.5
1.4-Dichlorobenzene	0.5	mg/kg	-	-	-	< 0.5
2-Chloronaphthalene	0.5	mg/kg	-	-	-	< 0.5
2-Chlorophenol	0.5	mg/kg	-	-	-	< 0.5
2-Fluorobiphenyl (surr.)	1	%	-	-	-	70
2-Methyl-4.6-dinitrophenol	5	mg/kg	-	-	-	< 5
2-Methylnaphthalene	0.5	mg/kg	-	-	-	< 0.5
2-Methylphenol (o-Cresol)	0.2	mg/kg	-	-	-	< 0.2
2-Naphthylamine	0.5	mg/kg	-	-	-	< 0.5
2-Nitroaniline	0.5	mg/kg	-	-	-	< 0.5
2-Nitrophenol	1	mg/kg	-	-	-	< 1
2-Picoline	0.5	mg/kg	-	-	-	< 0.5
2.3.4.6-Tetrachlorophenol	5	mg/kg	-	-	-	< 5
2.4-Dichlorophenol	0.5	mg/kg	-	-	-	< 0.5

Client Sample ID			S06 0.0-0.1	S07 0.0-0.2	S08 0.0-0.2	S09 0.0-0.2
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			K23-Au0065204	K23-Au0065205	K23-Au0065206	K23-Au0065207
Date Sampled			Aug 22, 2023	Aug 22, 2023	Aug 22, 2023	Aug 22, 2023
Test/Reference	LOR	Unit				
Semivolatile Organics						
2.4-Dimethylphenol	0.5	mg/kg	-	-	-	< 0.5
2.4-Dinitrophenol	5	mg/kg	-	-	-	< 5
2.4-Dinitrotoluene	0.5	mg/kg	-	-	-	< 0.5
2.4.5-Trichlorophenol	1	mg/kg	-	-	-	< 1
2.4.6-Tribromophenol (surr.)	1	%	-	-	-	79
2.4.6-Trichlorophenol	1	mg/kg	-	-	-	< 1
2.6-Dichlorophenol	0.5	mg/kg	-	-	-	< 0.5
2.6-Dinitrotoluene	0.5	mg/kg	-	-	-	< 0.5
3&4-Methylphenol (m&p-Cresol)	0.4	mg/kg	-	-	-	< 0.4
3-Methylcholanthrene	0.5	mg/kg	-	-	-	< 0.5
3.3'-Dichlorobenzidine	0.5	mg/kg	-	-	-	< 0.5
4-Aminobiphenyl	0.5	mg/kg	-	-	-	< 0.5
4-Bromophenyl phenyl ether	0.5	mg/kg	-	-	-	< 0.5
4-Chloro-3-methylphenol	1	mg/kg	-	-	-	< 1
4-Chlorophenyl phenyl ether	0.5	mg/kg	-	-	-	< 0.5
4-Nitrophenol	5	mg/kg	-	-	-	< 5
4.4'-DDD	0.01	mg/kg	-	-	-	< 0.01
4.4'-DDE	0.01	mg/kg	-	-	-	< 0.01
4.4'-DDT	0.01	mg/kg	-	-	-	< 0.01
7.12-Dimethylbenz(a)anthracene	0.5	mg/kg	-	-	-	< 0.5
a-HCH	0.01	mg/kg	-	-	-	< 0.01
Acenaphthene	0.03	mg/kg	-	-	-	< 0.03
Acenaphthylene	0.03	mg/kg	-	-	-	< 0.03
Acetophenone	0.5	mg/kg	-	-	-	< 0.5
Aldrin	0.01	mg/kg	-	-	-	< 0.01
Aniline	0.5	mg/kg	-	-	-	< 0.5
Anthracene	0.03	mg/kg	-	-	-	< 0.03
b-HCH	0.01	mg/kg	-	-	-	< 0.01
Benz(a)anthracene	0.03	mg/kg	-	-	-	< 0.03
Benzo(a)pyrene	0.03	mg/kg	-	-	-	< 0.03
Benzo(a)pyrene TEQ (lower bound)*	0.03	mg/kg	-	-	-	< 0.03
Benzo(a)pyrene TEQ (medium bound)*	0.03	mg/kg	-	-	-	0.04
Benzo(a)pyrene TEQ (upper bound)*	0.03	mg/kg	-	-	-	0.08
Benzo(b&j)fluoranthene[N07]	0.03	mg/kg	-	-	-	< 0.03
Benzo(g.h.i)perylene	0.03	mg/kg	-	-	-	< 0.03
Benzo(k)fluoranthene	0.03	mg/kg	-	-	-	< 0.03
Benzyl chloride	0.5	mg/kg	-	-	-	< 0.5
Bis(2-chloroethoxy)methane	0.5	mg/kg	-	-	-	< 0.5
Bis(2-chloroisopropyl)ether	0.5	mg/kg	-	-	-	< 0.5
Bis(2-ethylhexyl)phthalate	0.5	mg/kg	-	-	-	< 0.5
Butyl benzyl phthalate	0.5	mg/kg	-	-	-	< 0.5
Chrysene	0.03	mg/kg	-	-	-	< 0.03
d-HCH	0.01	mg/kg	-	-	-	< 0.01
Di-n-butyl phthalate	0.5	mg/kg	-	-	-	< 0.5
Di-n-octyl phthalate	0.5	mg/kg	-	-	-	< 0.5
Dibenz(a.h)anthracene	0.03	mg/kg	-	-	-	< 0.03
Dibenz(a.j)acridine	0.5	mg/kg	-	-	-	< 0.5
Dibenzofuran	0.5	mg/kg	-	-	-	< 0.5
Dieldrin	0.01	mg/kg	-	-	-	< 0.01

Client Sample ID			S06 0.0-0.1	S07 0.0-0.2	S08 0.0-0.2	S09 0.0-0.2
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			K23-Au0065204	K23-Au0065205	K23-Au0065206	K23-Au0065207
Date Sampled			Aug 22, 2023	Aug 22, 2023	Aug 22, 2023	Aug 22, 2023
Test/Reference	LOR	Unit				
Semivolatile Organics						
Diethyl phthalate	0.5	mg/kg	-	-	-	< 0.5
Dimethyl phthalate	0.5	mg/kg	-	-	-	< 0.5
Dimethylaminoazobenzene	0.5	mg/kg	-	-	-	< 0.5
Diphenylamine	0.5	mg/kg	-	-	-	< 0.5
Endosulfan I	0.01	mg/kg	-	-	-	< 0.01
Endosulfan II	0.01	mg/kg	-	-	-	< 0.01
Endosulfan sulphate	0.01	mg/kg	-	-	-	< 0.01
Endrin	0.01	mg/kg	-	-	-	< 0.01
Endrin aldehyde	0.01	mg/kg	-	-	-	< 0.01
Endrin ketone	0.01	mg/kg	-	-	-	< 0.01
Fluoranthene	0.03	mg/kg	-	-	-	< 0.03
Fluorene	0.03	mg/kg	-	-	-	< 0.03
g-HCH (Lindane)	0.01	mg/kg	-	-	-	< 0.01
Heptachlor	0.01	mg/kg	-	-	-	< 0.01
Heptachlor epoxide	0.01	mg/kg	-	-	-	< 0.01
Hexachlorobenzene	0.01	mg/kg	-	-	-	< 0.01
Hexachlorobutadiene	0.5	mg/kg	-	-	-	< 0.5
Hexachlorocyclopentadiene	0.5	mg/kg	-	-	-	< 0.5
Hexachloroethane	0.5	mg/kg	-	-	-	< 0.5
Indeno(1.2.3-cd)pyrene	0.03	mg/kg	-	-	-	< 0.03
Methoxychlor	0.01	mg/kg	-	-	-	< 0.01
N-Nitrosodibutylamine	0.5	mg/kg	-	-	-	< 0.5
N-Nitrosodipropylamine	0.5	mg/kg	-	-	-	< 0.5
N-Nitrosopiperidine	0.5	mg/kg	-	-	-	< 0.5
Naphthalene	0.1	mg/kg	-	-	-	< 0.1
Nitrobenzene	0.5	mg/kg	-	-	-	< 0.5
Nitrobenzene-d5 (surr.)	1	%	-	-	-	60
Pentachlorobenzene	0.5	mg/kg	-	-	-	< 0.5
Pentachloronitrobenzene	0.5	mg/kg	-	-	-	< 0.5
Pentachlorophenol	1	mg/kg	-	-	-	< 1
Phenanthrene	0.03	mg/kg	-	-	-	< 0.03
Phenol	0.5	mg/kg	-	-	-	< 0.5
Phenol-d6 (surr.)	1	%	-	-	-	68
Pronamide	0.5	mg/kg	-	-	-	< 0.5
Pyrene	0.03	mg/kg	-	-	-	< 0.03
Trifluralin	0.5	mg/kg	-	-	-	< 0.5
Metals M8 (NZ MfE)						
Arsenic	0.1	mg/kg	0.7	4.2	3.7	5.6
Cadmium	0.01	mg/kg	0.03	0.62	0.64	0.44
Chromium	0.1	mg/kg	6.3	11	10	8.2
Copper	0.1	mg/kg	18	25	13	29
Lead	0.1	mg/kg	1.6	13	9.4	9.2
Mercury	0.01	mg/kg	< 0.01	0.22	0.19	0.15
Nickel	0.1	mg/kg	36	4.0	3.3	3.4
Zinc	5	mg/kg	33	22	21	47
Sample Properties						
% Moisture	1	%	12	30	27	29

Client Sample ID			S10 0.15-0.55	S10 0.55-0.7	S12 0.0-0.15	S12 0.15-0.25
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			K23-Au0065209	K23-Au0065210	K23-Au0065211	K23-Au0065212
Date Sampled			Aug 22, 2023	Aug 22, 2023	Aug 22, 2023	Aug 22, 2023
Test/Reference	LOR	Unit				
Metals M8 (NZ MfE)						
Arsenic	0.1	mg/kg	2.0	0.6	2.1	2.0
Cadmium	0.01	mg/kg	0.05	0.03	0.44	0.17
Chromium	0.1	mg/kg	12	2.5	7.4	5.2
Copper	0.1	mg/kg	5.7	1.9	19	6.7
Lead	0.1	mg/kg	5.1	2.3	8.8	7.2
Mercury	0.01	mg/kg	0.15	0.06	0.20	0.25
Nickel	0.1	mg/kg	3.3	0.7	3.1	2.5
Zinc	5	mg/kg	8.8	< 5	23	14
Sample Properties						
% Moisture	1	%	23	21	28	27

Client Sample ID			S15 0.0-0.2	S15 0.2-0.3	S17 0.0-0.1	S17 0.1-0.3
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			K23-Au0065213	K23-Au0065214	K23-Au0065215	K23-Au0065216
Date Sampled			Aug 22, 2023	Aug 22, 2023	Aug 22, 2023	Aug 22, 2023
Test/Reference	LOR	Unit				
Metals M8 (NZ MfE)						
Arsenic	0.1	mg/kg	1.2	1.3	1.6	1.9
Cadmium	0.01	mg/kg	0.40	0.03	0.26	0.11
Chromium	0.1	mg/kg	5.6	2.6	7.3	9.7
Copper	0.1	mg/kg	19	1.8	11	7.0
Lead	0.1	mg/kg	5.1	5.4	7.4	5.7
Mercury	0.01	mg/kg	0.06	0.14	0.06	0.08
Nickel	0.1	mg/kg	1.9	1.5	3.4	3.8
Zinc	5	mg/kg	12	< 5	13	130
Sample Properties						
% Moisture	1	%	27	24	32	21

Client Sample ID			CS01 (composite of CS01A 0.0-0.2 CS01B 0.0-0.2 AND CS01C 0.0-0.1)	CS02 (composite of CS02A 0.0-0.2 CS02B 0.0-0.15 AND CS02C 0.0-0.25)	CS03 (composite of CS03A 0.0-0.1 CS03B 0.0-0.1 AND CS03C 0.0-0.1)	CS04 (composite of CS04A 0.0-0.2 CS04B 0.0-0.2 AND CS04C 0.0-0.15)
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			K23-Au0065218	K23-Au0065219	K23-Au0065220	K23-Au0065221
Date Sampled			Aug 22, 2023	Aug 22, 2023	Aug 22, 2023	Aug 22, 2023
Test/Reference	LOR	Unit				
Metals M8 (NZ MfE)						
Arsenic	0.1	mg/kg	1.4	3.1	1.5	1.7
Cadmium	0.01	mg/kg	0.22	0.50	0.29	0.33
Chromium	0.1	mg/kg	6.5	8.9	4.8	5.9
Copper	0.1	mg/kg	18	21	25	19
Lead	0.1	mg/kg	6.4	9.7	7.0	6.7
Mercury	0.01	mg/kg	0.06	0.18	0.10	0.06
Nickel	0.1	mg/kg	1.6	3.9	2.2	2.0
Zinc	5	mg/kg	14	26	33	12

Client Sample ID			CS01 (composite of CS01A 0.0-0.2 CS01B 0.0-0.2 AND CS01C 0.0-0.1)	CS02 (composite of CS02A 0.0-0.2 CS02B 0.0-0.15 AND CS02C 0.0-0.25)	CS03 (composite of CS03A 0.0-0.1 CS03B 0.0-0.1 AND CS03C 0.0-0.1)	CS04 (composite of CS04A 0.0-0.2 CS04B 0.0-0.2 AND CS04C 0.0-0.15)
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins Sample No.			**K23-Au0065218**	**K23-Au0065219**	**K23-Au0065220**	**K23-Au0065221**
Date Sampled			**Aug 22, 2023**	**Aug 22, 2023**	**Aug 22, 2023**	**Aug 22, 2023**
Test/Reference	LOR	Unit				
Sample Properties						
% Moisture	1	%	33	36	36	28
Organochlorine Pesticides (NZ MfE)						
2.4'-DDD	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
2.4'-DDE	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
2.4'-DDT	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
4.4'-DDD	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
4.4'-DDE	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
4.4'-DDT	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
DDT + DDE + DDD (Total)*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
a-HCH	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aldrin	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
b-HCH	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Chlordanes - Total	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
cis-Chlordane	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
d-HCH	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Dieldrin	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Endosulfan I	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Endosulfan II	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Endosulfan sulphate	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Endrin	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Endrin aldehyde	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Endrin ketone	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
g-HCH (Lindane)	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Heptachlor	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Heptachlor epoxide	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Hexachlorobenzene	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Methoxychlor	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Toxaphene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
trans-Chlordane	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Dibutylchlorendate (surr.)	1	%	50	55	57	INT
Tetrachloro-m-xylene (surr.)	1	%	56	60	58	55

Client Sample ID			CS03 C 0.3-0.4	CS03 C 1.2-1.3
Sample Matrix			**Soil**	**Soil**
Eurofins Sample No.			**K23-Au0065222**	**K23-Au0065223**
Date Sampled			**Aug 22, 2023**	**Aug 22, 2023**
Test/Reference	LOR	Unit		
Metals M8 (NZ MfE)				
Arsenic	0.1	mg/kg	1.1	1.3
Cadmium	0.01	mg/kg	0.02	0.05
Chromium	0.1	mg/kg	11	5.3
Copper	0.1	mg/kg	5.2	5.9
Lead	0.1	mg/kg	6.1	13
Mercury	0.01	mg/kg	0.08	0.15

Client Sample ID			CS03 C 0.3-0.4	CS03 C 1.2-1.3
Sample Matrix			Soil	Soil
Eurofins Sample No.			K23-Au0065222	K23-Au0065223
Date Sampled			Aug 22, 2023	Aug 22, 2023
Test/Reference	LOR	Unit		
Metals M8 (NZ MfE)				
Nickel	0.1	mg/kg	3.8	2.3
Zinc	5	mg/kg	6.4	22
Sample Properties				
% Moisture	1	%	26	25
Organochlorine Pesticides (NZ MfE)				
2.4'-DDD	0.01	mg/kg	-	< 0.01
2.4'-DDE	0.01	mg/kg	-	< 0.01
2.4'-DDT	0.01	mg/kg	-	< 0.01
4.4'-DDD	0.01	mg/kg	-	< 0.01
4.4'-DDE	0.01	mg/kg	-	< 0.01
4.4'-DDT	0.01	mg/kg	-	< 0.01
DDT + DDE + DDD (Total)*	0.01	mg/kg	-	< 0.01
a-HCH	0.01	mg/kg	-	< 0.01
Aldrin	0.01	mg/kg	-	< 0.01
b-HCH	0.01	mg/kg	-	< 0.01
Chlordanes - Total	0.01	mg/kg	-	< 0.01
cis-Chlordane	0.01	mg/kg	-	< 0.01
d-HCH	0.01	mg/kg	-	< 0.01
Dieldrin	0.01	mg/kg	-	< 0.01
Endosulfan I	0.01	mg/kg	-	< 0.01
Endosulfan II	0.01	mg/kg	-	< 0.01
Endosulfan sulphate	0.01	mg/kg	-	< 0.01
Endrin	0.01	mg/kg	-	< 0.01
Endrin aldehyde	0.01	mg/kg	-	< 0.01
Endrin ketone	0.01	mg/kg	-	< 0.01
g-HCH (Lindane)	0.01	mg/kg	-	< 0.01
Heptachlor	0.01	mg/kg	-	< 0.01
Heptachlor epoxide	0.01	mg/kg	-	< 0.01
Hexachlorobenzene	0.01	mg/kg	-	< 0.01
Methoxychlor	0.01	mg/kg	-	< 0.01
Toxaphene	0.5	mg/kg	-	< 0.5
trans-Chlordane	0.01	mg/kg	-	< 0.01
Dibutylchlorendate (surr.)	1	%	-	65
Tetrachloro-m-xylene (surr.)	1	%	-	54

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Semivolatile Organics	Auckland	Sep 01, 2023	14 Days
- Method: LTM-ORG-2190 SVOC in Water & Soil by GC-MS			
Metals M8 (NZ MfE)	Auckland	Sep 14, 2023	28 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			
Total Petroleum Hydrocarbons (NZ MfE 1999)	Auckland	Sep 01, 2023	14 Days
- Method: LTM-ORG-2010 TRH and BTEX in Soil and Water by GC FID and PT GCMS			
Polycyclic Aromatic Hydrocarbons (NZ MfE)	Auckland	Sep 01, 2023	14 Days
- Method: LTM-ORG-2130 PAH and Phenols in Soil and Water by GC MSMS			
Organochlorine Pesticides (NZ MfE)	Auckland	Sep 01, 2023	14 Days
- Method: LTM-ORG-2220 OCP & PCB in Soil and Water by GCMSMS			
% Moisture	Auckland	Aug 25, 2023	14 Days
- Method: LTM-GEN-7080 Moisture Content in Soil by Gravimetry			

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NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	Site# 25079 & 25289
Site# 1254	Site# 25403	Site# 18217	Site# 25466	Site# 20794	

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Company Name: ENGEO Ltd - NI
Address: 8 Greydene Place
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Auckland 0622

Project Name: 15 CLARKS LANE
Project ID: 23849.000.004

Order No.:
Report #: 1020238
Phone: 0011 64 9 9722 205
Fax:

Received: Aug 25, 2023 3:30 PM
Due: Sep 1, 2023
Priority: 5 Day
Contact Name: Claire Davies

Eurofins Analytical Services Manager : Katyana Gausel

Sample Detail						Asbestos - AS4964	HOLD	Moisture Set	Total Petroleum Hydrocarbons (NZ MfE 1999)	Organochlorine Pesticides (NZ MfE)	Metals M8 (NZ MfE)	Polycyclic Aromatic Hydrocarbons (NZ MfE)	Semivolatile Organics
Auckland Laboratory - IANZ# 1327						X	X	X	X	X	X	X	X
Christchurch Laboratory - IANZ# 1290													
Tauranga Laboratory - IANZ# 1402													
External Laboratory													
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**								
1	S01 0.0-0.2	Aug 22, 2023		Soil	K23-Au0065200			X			X		X
2	S02 0.0-0.3	Aug 22, 2023		Soil	K23-Au0065201			X			X		X
3	S04 0.0-0.1	Aug 22, 2023		Soil	K23-Au0065202			X	X		X	X	
4	S05 0.0-0.1	Aug 22, 2023		Soil	K23-Au0065203			X			X		
5	S06 0.0-0.1	Aug 22, 2023		Soil	K23-Au0065204			X			X		
6	S07 0.0-0.2	Aug 22, 2023		Soil	K23-Au0065205			X			X		
7	S08 0.0-0.2	Aug 22, 2023		Soil	K23-Au0065206			X			X		
8	S09 0.0-0.2	Aug 22, 2023		Soil	K23-Au0065207			X			X		X
9	S10 0.0-0.15	Aug 22, 2023		Soil	K23-Au0065208	X							
10	S10 0.15-0.55	Aug 22, 2023		Soil	K23-Au0065209	X		X			X		
11	S10 0.55-0.7	Aug 22, 2023		Soil	K23-Au0065210			X			X		

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NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	Site# 25079 & 25289
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Project ID: 23849.000.004

Order No.:
Report #: 1020238
Phone: 0011 64 9 9722 205
Fax:

Received: Aug 25, 2023 3:30 PM
Due: Sep 1, 2023
Priority: 5 Day
Contact Name: Claire Davies

Eurofins Analytical Services Manager : Katyana Gausel

Sample Detail						Asbestos - AS4964	HOLD	Moisture Set	Total Petroleum Hydrocarbons (NZ MfE 1999)	Organochlorine Pesticides (NZ MfE)	Metals M8 (NZ MfE)	Polycyclic Aromatic Hydrocarbons (NZ MfE)	Semivolatile Organics
Auckland Laboratory - IANZ# 1327						X	X	X	X	X	X	X	X
Christchurch Laboratory - IANZ# 1290													
Tauranga Laboratory - IANZ# 1402													
12	S12 0.0-0.15	Aug 22, 2023		Soil	K23-Au0065211			X			X		
13	S12 0.15-0.25	Aug 22, 2023		Soil	K23-Au0065212			X			X		
14	S15 0.0-0.2	Aug 22, 2023		Soil	K23-Au0065213			X			X		
15	S15 0.2-0.3	Aug 22, 2023		Soil	K23-Au0065214			X			X		
16	S17 0.0-0.1	Aug 22, 2023		Soil	K23-Au0065215			X			X		
17	S17 0.1-0.3	Aug 22, 2023		Soil	K23-Au0065216	X		X			X		
18	S17 0.3-0.5	Aug 22, 2023		Soil	K23-Au0065217	X							
19	CS01 (composite of CS01A 0.0-0.2 CS01B 0.0-0.2 AND CS01C 0.0-0.1)	Aug 22, 2023		Soil	K23-Au0065218			X		X	X		
20	CS02 (composite of CS02A 0.0-0.2	Aug 22, 2023		Soil	K23-Au0065219			X		X	X		

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NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	Site# 25079 & 25289
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Project Name: 15 CLARKS LANE
Project ID: 23849.000.004

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Report #: 1020238
Phone: 0011 64 9 9722 205
Fax:

Received: Aug 25, 2023 3:30 PM
Due: Sep 1, 2023
Priority: 5 Day
Contact Name: Claire Davies

Eurofins Analytical Services Manager : Katyana Gausel

Sample Detail						Asbestos - AS4964	HOLD	Moisture Set	Total Petroleum Hydrocarbons (NZ MfE 1999)	Organochlorine Pesticides (NZ MfE)	Metals M8 (NZ MfE)	Polycyclic Aromatic Hydrocarbons (NZ MfE)	Semivolatile Organics
Auckland Laboratory - IANZ# 1327						X	X	X	X	X	X	X	X
Christchurch Laboratory - IANZ# 1290													
Tauranga Laboratory - IANZ# 1402													
	CS02B 0.0-0.15 AND CS02C 0.0-0.25)												
21	CS03 (composite of CS03A 0.0-0.1 CS03B 0.0-0.1 AND CS03C 0.0-0.1)	Aug 22, 2023		Soil	K23-Au0065220			X		X	X		
22	CS04 (composite of CS04A 0.0-0.2 CS04B 0.0-0.2 AND CS04C 0.0-0.15)	Aug 22, 2023		Soil	K23-Au0065221			X		X	X		
23	CS03 C 0.3-0.4	Aug 22, 2023		Soil	K23-Au0065222			X			X		

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NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	Site# 25079 & 25289
Site# 1254	Site# 25403	Site# 18217	Site# 25466	Site# 20794	

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Project Name: 15 CLARKS LANE
Project ID: 23849.000.004

Order No.:
Report #: 1020238
Phone: 0011 64 9 9722 205
Fax:

Received: Aug 25, 2023 3:30 PM
Due: Sep 1, 2023
Priority: 5 Day
Contact Name: Claire Davies

Eurofins Analytical Services Manager : Katyana Gausel

Sample Detail						Asbestos - AS4964	HOLD	Moisture Set	Total Petroleum Hydrocarbons (NZ MfE 1999)	Organochlorine Pesticides (NZ MfE)	Metals M8 (NZ MfE)	Polycyclic Aromatic Hydrocarbons (NZ MfE)	Semivolatile Organics
Auckland Laboratory - IANZ# 1327						X	X	X	X	X	X	X	X
Christchurch Laboratory - IANZ# 1290													
Tauranga Laboratory - IANZ# 1402													
24	CS03 C 1.2-1.3	Aug 22, 2023		Soil	K23-Au0065223			X		X	X		
25	S01 0.2-0.3	Aug 22, 2023		Soil	K23-Au0065224		X						
26	S02 0.3-.04	Aug 22, 2023		Soil	K23-Au0065225		X						
27	S03 0.0-0.3	Aug 22, 2023		Soil	K23-Au0065226		X						
28	S07 0.2-0.3	Aug 22, 2023		Soil	K23-Au0065227		X						
29	S07 0.3-0.5	Aug 22, 2023		Soil	K23-Au0065228		X						
30	S08 0.2-0.4	Aug 22, 2023		Soil	K23-Au0065229		X						
31	S09 0.2-0.3	Aug 22, 2023		Soil	K23-Au0065230		X						
32	S10 0.7-1.2	Aug 22, 2023		Soil	K23-Au0065231		X						
33	S11 0.0-0.1	Aug 22, 2023		Soil	K23-Au0065232		X						
34	S11 0.1-0.3	Aug 22, 2023		Soil	K23-Au0065233		X						
35	S12 0.25-0.4	Aug 22, 2023		Soil	K23-Au0065234		X						
36	S13 0.0-0.2	Aug 22, 2023		Soil	K23-Au0065235		X						

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NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	Site# 25079 & 25289
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Project Name: 15 CLARKS LANE
Project ID: 23849.000.004

Order No.:
Report #: 1020238
Phone: 0011 64 9 9722 205
Fax:

Received: Aug 25, 2023 3:30 PM
Due: Sep 1, 2023
Priority: 5 Day
Contact Name: Claire Davies

Eurofins Analytical Services Manager : Katyana Gausel

Sample Detail						Asbestos - AS4964	HOLD	Moisture Set	Total Petroleum Hydrocarbons (NZ MfE 1999)	Organochlorine Pesticides (NZ MfE)	Metals M8 (NZ MfE)	Polycyclic Aromatic Hydrocarbons (NZ MfE)	Semivolatile Organics
Auckland Laboratory - IANZ# 1327						X	X	X	X	X	X	X	X
Christchurch Laboratory - IANZ# 1290													
Tauranga Laboratory - IANZ# 1402													
37	S13 0.2-0.4	Aug 22, 2023		Soil	K23-Au0065236		X						
38	S14 0.0-0.2	Aug 22, 2023		Soil	K23-Au0065237		X						
39	S14 0.2-0.4	Aug 22, 2023		Soil	K23-Au0065238		X						
40	S15 0.3-0.5	Aug 22, 2023		Soil	K23-Au0065239		X						
41	S16 0.0-0.2	Aug 22, 2023		Soil	K23-Au0065240		X						
42	S16 0.2-0.35	Aug 22, 2023		Soil	K23-Au0065241		X						
43	S16 0.35-0.5	Aug 22, 2023		Soil	K23-Au0065242		X						
44	S17 0.5-0.9	Aug 22, 2023		Soil	K23-Au0065243		X						
45	S18 0.0-0.6	Aug 22, 2023		Soil	K23-Au0065244		X						
46	S18 0.6-0.9	Aug 22, 2023		Soil	K23-Au0065245		X						
47	CS01-A-0.0-0.2	Aug 22, 2023		Soil	K23-Au0068197		X						
48	CS01-A-0.2-0.3	Aug 22, 2023		Soil	K23-Au0068198		X						

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NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	Site# 25079 & 25289
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Site# 2370

Company Name: ENGEO Ltd - NI
Address: 8 Greydene Place
Takapuna
Auckland 0622

Project Name: 15 CLARKS LANE
Project ID: 23849.000.004

Order No.:
Report #: 1020238
Phone: 0011 64 9 9722 205
Fax:

Received: Aug 25, 2023 3:30 PM
Due: Sep 1, 2023
Priority: 5 Day
Contact Name: Claire Davies

Eurofins Analytical Services Manager : Katyana Gausel

Sample Detail						Asbestos - AS4964	HOLD	Moisture Set	Total Petroleum Hydrocarbons (NZ MfE 1999)	Organochlorine Pesticides (NZ MfE)	Metals M8 (NZ MfE)	Polycyclic Aromatic Hydrocarbons (NZ MfE)	Semivolatile Organics
Auckland Laboratory - IANZ# 1327						X	X	X	X	X	X	X	X
Christchurch Laboratory - IANZ# 1290													
Tauranga Laboratory - IANZ# 1402													
49	CS01-B-0.0-0.2	Aug 22, 2023		Soil	K23-Au0068199		X						
50	CS01-B-0.2-0.3	Aug 22, 2023		Soil	K23-Au0068200		X						
51	CS01-C-0.0-0.2	Aug 22, 2023		Soil	K23-Au0068201		X						
52	CS01-C-0.2-0.3	Aug 22, 2023		Soil	K23-Au0068202		X						
53	CS02-A-0.0-0.2	Aug 22, 2023		Soil	K23-Au0068203		X						
54	CS02-A-0.2-0.3	Aug 22, 2023		Soil	K23-Au0068204		X						
55	CS02-B-0.0-0.15	Aug 22, 2023		Soil	K23-Au0068205		X						
56	CS02-B-0.15-0.25	Aug 22, 2023		Soil	K23-Au0068206		X						

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Auckland Laboratory - IANZ# 1327						X	X	X	X	X	X	X	X
Christchurch Laboratory - IANZ# 1290													
Tauranga Laboratory - IANZ# 1402													
57	CS02-C-0.0-0.25	Aug 22, 2023		Soil	K23-Au0068207		X						
58	CS02-C-0.25-0.35	Aug 22, 2023		Soil	K23-Au0068208		X						
59	CS03-A-0.0-0.1	Aug 22, 2023		Soil	K23-Au0068209		X						
60	CS03-A-0.2-0.3	Aug 22, 2023		Soil	K23-Au0068210		X						
61	CS03-B-0.0-0.1	Aug 22, 2023		Soil	K23-Au0068211		X						
62	CS03-B-0.2-0.3	Aug 22, 2023		Soil	K23-Au0068212		X						
63	CS03-C-0.0-0.1	Aug 22, 2023		Soil	K23-Au0068213		X						
64	CS03-C-2.1-2.2	Aug 22, 2023		Soil	K23-Au0068214		X						

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Auckland Laboratory - IANZ# 1327						X	X	X	X	X	X	X	X
Christchurch Laboratory - IANZ# 1290													
Tauranga Laboratory - IANZ# 1402													
65	CS04-A-0.0-0.2	Aug 22, 2023		Soil	K23-Au0068215		X						
66	CS04-A-0.2-0.3	Aug 22, 2023		Soil	K23-Au0068216		X						
67	CS04-B-0.0-0.2	Aug 22, 2023		Soil	K23-Au0068217		X						
68	CS04-B-0.2-0.3	Aug 22, 2023		Soil	K23-Au0068218		X						
69	CS04-C-0.0-0.15	Aug 22, 2023		Soil	K23-Au0068219		X						
70	CS04-C-0.15-0.3	Aug 22, 2023		Soil	K23-Au0068220		X						
71	CS04-C-0.3-0.5	Aug 22, 2023		Soil	K23-Au0068221		X						
72	HA06-0.1-0.5	Aug 22, 2023		Soil	K23-Au0072611		X						
Test Counts						4	48	22	1	5	22	1	3

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

Units

mg/kg: milligrams per kilogram	**mg/L:** milligrams per litre	**µg/L:** micrograms per litre
ppm: parts per million	**ppb:** parts per billion	**%:** Percentage
org/100 mL: Organisms per 100 millilitres	**NTU:** Nephelometric Turbidity Units	**MPN/100 mL:** Most Probable Number of organisms per 100 millilitres
CFU: Colony forming unit		

Terms

APHA	American Public Health Association
COC	Chain of Custody
CP	Client Parent - QC was performed on samples pertaining to this report
CRM	Certified Reference Material (ISO17034) - reported as percent recovery.
Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
LOR	Limit of Reporting.
LCS	Laboratory Control Sample - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
SRA	Sample Receipt Advice
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
TBTO	Tributyltin oxide (*bis*-tributyltin oxide) - individual tributyltin compounds cannot be identified separately in the environment however free tributyltin was measured and its values were converted stoichiometrically into tributyltin oxide for comparison with regulatory limits.
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Toxic Equivalency Quotient or Total Equivalence
QSM	US Department of Defense Quality Systems Manual Version 5.4
US EPA	United States Environmental Protection Agency
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC - Acceptance Criteria

The acceptance criteria should be used as a guide only and may be different when site specific Sampling Analysis and Quality Plan (SAQP) have been implemented

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR: No Limit

Results between 10-20 times the LOR: RPD must lie between 0-50%

Results >20 times the LOR: RPD must lie between 0-30%

NOTE: pH duplicates are reported as a range not as RPD

Surrogate Recoveries: Recoveries must lie between 20-130% for Speciated Phenols & 50-150% for PFAS. SVOCs recoveries 20 – 150%

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.4 where no positive PFAS results have been reported have been reviewed and no data was affected.

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore, laboratory analysis is unlikely to be completed within holding time.Analysis will begin as soon as possible after sample receipt.
4. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of recovery the term "INT" appears against that analyte.
5. For Matrix Spikes and LCS results a dash "-" in the report means that the specific analyte was not added to the QC sample.
6. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Semivolatile Organics							
1-Chloronaphthalene	mg/kg	< 0.5			0.5	Pass	
1-Naphthylamine	mg/kg	< 0.5			0.5	Pass	
1.2-Dichlorobenzene	mg/kg	< 0.5			0.5	Pass	
1.2.3-Trichlorobenzene	mg/kg	< 0.5			0.5	Pass	
1.2.3.4-Tetrachlorobenzene	mg/kg	< 0.5			0.5	Pass	
1.2.3.5-Tetrachlorobenzene	mg/kg	< 0.5			0.5	Pass	
1.2.4-Trichlorobenzene	mg/kg	< 0.5			0.5	Pass	
1.2.4.5-Tetrachlorobenzene	mg/kg	< 0.5			0.5	Pass	
1.3-Dichlorobenzene	mg/kg	< 0.5			0.5	Pass	
1.3.5-Trichlorobenzene	mg/kg	< 0.5			0.5	Pass	
1.4-Dichlorobenzene	mg/kg	< 0.5			0.5	Pass	
2-Chloronaphthalene	mg/kg	< 0.5			0.5	Pass	
2-Chlorophenol	mg/kg	< 0.5			0.5	Pass	
2-Methyl-4.6-dinitrophenol	mg/kg	< 5			5	Pass	
2-Methylnaphthalene	mg/kg	< 0.5			0.5	Pass	
2-Methylphenol (o-Cresol)	mg/kg	< 0.2			0.2	Pass	
2-Naphthylamine	mg/kg	< 0.5			0.5	Pass	
2-Nitroaniline	mg/kg	< 0.5			0.5	Pass	
2-Nitrophenol	mg/kg	< 1			1	Pass	
2-Picoline	mg/kg	< 0.5			0.5	Pass	
2.3.4.6-Tetrachlorophenol	mg/kg	< 5			5	Pass	
2.4-Dichlorophenol	mg/kg	< 0.5			0.5	Pass	
2.4-Dimethylphenol	mg/kg	< 0.5			0.5	Pass	
2.4-Dinitrophenol	mg/kg	< 5			5	Pass	
2.4-Dinitrotoluene	mg/kg	< 0.5			0.5	Pass	
2.4.5-Trichlorophenol	mg/kg	< 1			1	Pass	
2.4.6-Trichlorophenol	mg/kg	< 1			1	Pass	
2.6-Dichlorophenol	mg/kg	< 0.5			0.5	Pass	
2.6-Dinitrotoluene	mg/kg	< 0.5			0.5	Pass	
3&4-Methylphenol (m&p-Cresol)	mg/kg	< 0.4			0.4	Pass	
3-Methylcholanthrene	mg/kg	< 0.5			0.5	Pass	
3.3'-Dichlorobenzidine	mg/kg	< 0.5			0.5	Pass	
4-Aminobiphenyl	mg/kg	< 0.5			0.5	Pass	
4-Bromophenyl phenyl ether	mg/kg	< 0.5			0.5	Pass	
4-Chloro-3-methylphenol	mg/kg	< 1			1	Pass	
4-Chlorophenyl phenyl ether	mg/kg	< 0.5			0.5	Pass	
4-Nitrophenol	mg/kg	< 5			5	Pass	
4.4'-DDD	mg/kg	< 0.01			0.01	Pass	
4.4'-DDE	mg/kg	< 0.01			0.01	Pass	
4.4'-DDT	mg/kg	< 0.01			0.01	Pass	
7.12-Dimethylbenz(a)anthracene	mg/kg	< 0.5			0.5	Pass	
a-HCH	mg/kg	< 0.01			0.01	Pass	
Acenaphthene	mg/kg	< 0.03			0.03	Pass	
Acenaphthylene	mg/kg	< 0.03			0.03	Pass	
Acetophenone	mg/kg	< 0.5			0.5	Pass	
Aldrin	mg/kg	< 0.01			0.01	Pass	
Aniline	mg/kg	< 0.5			0.5	Pass	
Anthracene	mg/kg	< 0.03			0.03	Pass	
b-HCH	mg/kg	< 0.01			0.01	Pass	
Benz(a)anthracene	mg/kg	< 0.03			0.03	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Benzo(a)pyrene	mg/kg	< 0.03			0.03	Pass	
Benzo(b&j)fluoranthene	mg/kg	< 0.03			0.03	Pass	
Benzo(g.h.i)perylene	mg/kg	< 0.03			0.03	Pass	
Benzo(k)fluoranthene	mg/kg	< 0.03			0.03	Pass	
Benzyl chloride	mg/kg	< 0.5			0.5	Pass	
Bis(2-chloroethoxy)methane	mg/kg	< 0.5			0.5	Pass	
Bis(2-chloroisopropyl)ether	mg/kg	< 0.5			0.5	Pass	
Bis(2-ethylhexyl)phthalate	mg/kg	< 0.5			0.5	Pass	
Butyl benzyl phthalate	mg/kg	< 0.5			0.5	Pass	
Chrysene	mg/kg	< 0.03			0.03	Pass	
d-HCH	mg/kg	< 0.01			0.01	Pass	
Di-n-butyl phthalate	mg/kg	< 0.5			0.5	Pass	
Di-n-octyl phthalate	mg/kg	< 0.5			0.5	Pass	
Dibenz(a.h)anthracene	mg/kg	< 0.03			0.03	Pass	
Dibenz(a.j)acridine	mg/kg	< 0.5			0.5	Pass	
Dibenzofuran	mg/kg	< 0.5			0.5	Pass	
Dieldrin	mg/kg	< 0.01			0.01	Pass	
Diethyl phthalate	mg/kg	< 0.5			0.5	Pass	
Dimethyl phthalate	mg/kg	< 0.5			0.5	Pass	
Dimethylaminoazobenzene	mg/kg	< 0.5			0.5	Pass	
Diphenylamine	mg/kg	< 0.5			0.5	Pass	
Endosulfan I	mg/kg	< 0.01			0.01	Pass	
Endosulfan II	mg/kg	< 0.01			0.01	Pass	
Endosulfan sulphate	mg/kg	< 0.01			0.01	Pass	
Endrin	mg/kg	< 0.01			0.01	Pass	
Endrin aldehyde	mg/kg	< 0.01			0.01	Pass	
Endrin ketone	mg/kg	< 0.01			0.01	Pass	
Fluoranthene	mg/kg	< 0.03			0.03	Pass	
Fluorene	mg/kg	< 0.03			0.03	Pass	
g-HCH (Lindane)	mg/kg	< 0.01			0.01	Pass	
Heptachlor	mg/kg	< 0.01			0.01	Pass	
Heptachlor epoxide	mg/kg	< 0.01			0.01	Pass	
Hexachlorobenzene	mg/kg	< 0.01			0.01	Pass	
Hexachlorobutadiene	mg/kg	< 0.5			0.5	Pass	
Hexachlorocyclopentadiene	mg/kg	< 0.5			0.5	Pass	
Hexachloroethane	mg/kg	< 0.5			0.5	Pass	
Indeno(1.2.3-cd)pyrene	mg/kg	< 0.03			0.03	Pass	
Methoxychlor	mg/kg	< 0.01			0.01	Pass	
N-Nitrosodibutylamine	mg/kg	< 0.5			0.5	Pass	
N-Nitrosodipropylamine	mg/kg	< 0.5			0.5	Pass	
N-Nitrosopiperidine	mg/kg	< 0.5			0.5	Pass	
Naphthalene	mg/kg	< 0.1			0.1	Pass	
Nitrobenzene	mg/kg	< 0.5			0.5	Pass	
Pentachlorobenzene	mg/kg	< 0.5			0.5	Pass	
Pentachloronitrobenzene	mg/kg	< 0.5			0.5	Pass	
Pentachlorophenol	mg/kg	< 1			1	Pass	
Phenanthrene	mg/kg	< 0.03			0.03	Pass	
Phenol	mg/kg	< 0.5			0.5	Pass	
Pronamide	mg/kg	< 0.5			0.5	Pass	
Pyrene	mg/kg	< 0.03			0.03	Pass	
Trifluralin	mg/kg	< 0.5			0.5	Pass	
Method Blank							
Metals M8 (NZ MfE)							
Arsenic	mg/kg	< 0.1			0.1	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Cadmium	mg/kg	< 0.01			0.01	Pass	
Chromium	mg/kg	< 0.1			0.1	Pass	
Copper	mg/kg	< 0.1			0.1	Pass	
Lead	mg/kg	< 0.1			0.1	Pass	
Mercury	mg/kg	< 0.01			0.01	Pass	
Nickel	mg/kg	< 0.1			0.1	Pass	
Zinc	mg/kg	< 5			5	Pass	
Method Blank							
Total Petroleum Hydrocarbons (NZ MfE 1999)							
TPH-SG C7-C9	mg/kg	< 5			5	Pass	
TPH-SG C10-C14	mg/kg	< 10			10	Pass	
TPH-SG C15-C36	mg/kg	< 20			20	Pass	
TPH-SG C7-C36 (Total)	mg/kg	< 35			35	Pass	
Method Blank							
Organochlorine Pesticides (NZ MfE)							
2.4'-DDD	mg/kg	< 0.01			0.01	Pass	
2.4'-DDE	mg/kg	< 0.01			0.01	Pass	
2.4'-DDT	mg/kg	< 0.01			0.01	Pass	
cis-Chlordane	mg/kg	< 0.01			0.01	Pass	
Toxaphene	mg/kg	< 0.5			0.5	Pass	
trans-Chlordane	mg/kg	< 0.01			0.01	Pass	
LCS - % Recovery							
Semivolatile Organics							
1-Chloronaphthalene	%	96			70-130	Pass	
1-Naphthylamine	%	71			70-130	Pass	
1.2-Dichlorobenzene	%	115			70-130	Pass	
1.2.3-Trichlorobenzene	%	91			70-130	Pass	
1.2.3.4-Tetrachlorobenzene	%	81			70-130	Pass	
1.2.3.5-Tetrachlorobenzene	%	84			70-130	Pass	
1.2.4-Trichlorobenzene	%	108			70-130	Pass	
1.2.4.5-Tetrachlorobenzene	%	86			70-130	Pass	
1.3-Dichlorobenzene	%	122			70-130	Pass	
1.3.5-Trichlorobenzene	%	103			70-130	Pass	
1.4-Dichlorobenzene	%	113			70-130	Pass	
2-Chloronaphthalene	%	92			70-130	Pass	
2-Chlorophenol	%	104			25-130	Pass	
2-Methylnaphthalene	%	87			70-130	Pass	
2-Methylphenol (o-Cresol)	%	82			25-130	Pass	
2-Naphthylamine	%	72			70-130	Pass	
2-Nitroaniline	%	87			70-130	Pass	
2-Picoline	%	86			70-130	Pass	
2.3.4.6-Tetrachlorophenol	%	99			70-130	Pass	
2.4-Dichlorophenol	%	88			25-130	Pass	
2.4-Dimethylphenol	%	77			25-130	Pass	
2.4.5-Trichlorophenol	%	89			25-130	Pass	
2.6-Dichlorophenol	%	89			25-130	Pass	
2.6-Dinitrotoluene	%	95			70-130	Pass	
3&4-Methylphenol (m&p-Cresol)	%	93			25-130	Pass	
3-Methylcholanthrene	%	76			70-130	Pass	
4-Aminobiphenyl	%	102			70-130	Pass	
4-Chlorophenyl phenyl ether	%	70			70-130	Pass	
4.4'-DDD	%	125			70-130	Pass	
4.4'-DDE	%	104			70-130	Pass	
4.4'-DDT	%	126			70-130	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
7.12-Dimethylbenz(a)anthracene	%	70			70-130	Pass	
a-HCH	%	77			70-130	Pass	
Acenaphthene	%	95			70-130	Pass	
Acenaphthylene	%	80			70-130	Pass	
Acetophenone	%	88			70-130	Pass	
Aldrin	%	98			70-130	Pass	
Anthracene	%	84			70-130	Pass	
b-HCH	%	103			70-130	Pass	
Benz(a)anthracene	%	110			70-130	Pass	
Benzo(a)pyrene	%	84			70-130	Pass	
Benzo(b&j)fluoranthene	%	98			70-130	Pass	
Benzo(g.h.i)perylene	%	82			70-130	Pass	
Benzo(k)fluoranthene	%	78			70-130	Pass	
Benzyl chloride	%	85			70-130	Pass	
Bis(2-chloroethoxy)methane	%	84			70-130	Pass	
Bis(2-chloroisopropyl)ether	%	84			70-130	Pass	
Bis(2-ethylhexyl)phthalate	%	81			70-130	Pass	
Butyl benzyl phthalate	%	83			70-130	Pass	
Chrysene	%	71			70-130	Pass	
d-HCH	%	97			70-130	Pass	
Di-n-butyl phthalate	%	73			70-130	Pass	
Di-n-octyl phthalate	%	105			70-130	Pass	
Dibenz(a.h)anthracene	%	74			70-130	Pass	
Dibenz(a.j)acridine	%	79			70-130	Pass	
Dibenzofuran	%	88			70-130	Pass	
Dieldrin	%	101			70-130	Pass	
Diethyl phthalate	%	89			70-130	Pass	
Dimethyl phthalate	%	98			70-130	Pass	
Dimethylaminoazobenzene	%	96			70-130	Pass	
Diphenylamine	%	75			70-130	Pass	
Endosulfan I	%	112			70-130	Pass	
Endosulfan II	%	128			70-130	Pass	
Endosulfan sulphate	%	117			70-130	Pass	
Endrin	%	115			70-130	Pass	
Endrin aldehyde	%	100			70-130	Pass	
Endrin ketone	%	102			70-130	Pass	
Fluoranthene	%	87			70-130	Pass	
Fluorene	%	87			70-130	Pass	
g-HCH (Lindane)	%	77			70-130	Pass	
Heptachlor	%	78			70-130	Pass	
Heptachlor epoxide	%	89			70-130	Pass	
Hexachlorobenzene	%	109			70-130	Pass	
Hexachlorobutadiene	%	84			70-130	Pass	
Hexachlorocyclopentadiene	%	87			70-130	Pass	
Hexachloroethane	%	111			70-130	Pass	
Indeno(1.2.3-cd)pyrene	%	81			70-130	Pass	
Methoxychlor	%	110			70-130	Pass	
N-Nitrosodipropylamine	%	125			70-130	Pass	
N-Nitrosopiperidine	%	110			70-130	Pass	
Naphthalene	%	91			70-130	Pass	
Nitrobenzene	%	83			70-130	Pass	
Pentachlorobenzene	%	86			70-130	Pass	
Pentachloronitrobenzene	%	71			70-130	Pass	
Pentachlorophenol	%	71			25-130	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Phenanthrene	%	86			70-130	Pass	
Phenol	%	88			25-130	Pass	
Pyrene	%	92			70-130	Pass	
Trifluralin	%	74			70-130	Pass	
LCS - % Recovery							
Metals M8 (NZ MfE)							
Arsenic	%	96			80-120	Pass	
Cadmium	%	101			80-120	Pass	
Chromium	%	91			80-120	Pass	
Copper	%	91			80-120	Pass	
Lead	%	86			80-120	Pass	
Mercury	%	92			80-120	Pass	
Nickel	%	89			80-120	Pass	
Zinc	%	82			80-120	Pass	
LCS - % Recovery							
Total Petroleum Hydrocarbons (NZ MfE 1999)							
TPH-SG C7-C36 (Total)	%	129			70-130	Pass	
LCS - % Recovery							
Organochlorine Pesticides (NZ MfE)							
2.4'-DDD	%	95			70-130	Pass	
2.4'-DDE	%	103			70-130	Pass	
2.4'-DDT	%	108			70-130	Pass	
cis-Chlordane	%	106			70-130	Pass	
trans-Chlordane	%	99			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Semivolatile Organics				Result 1					
b-HCH	K23-Se0007352	NCP	%	71			70-130	Pass	
Benzo(b&j)fluoranthene	K23-Se0007352	NCP	%	71			70-130	Pass	
Hexachlorobenzene	K23-Se0007352	NCP	%	90			70-130	Pass	
Spike - % Recovery									
Metals M8 (NZ MfE)				Result 1					
Cadmium	K23-Au0065201	CP	%	111			75-125	Pass	
Chromium	K23-Au0065201	CP	%	109			75-125	Pass	
Copper	K23-Au0065201	CP	%	119			75-125	Pass	
Lead	K23-Au0065201	CP	%	107			75-125	Pass	
Nickel	K23-Au0065201	CP	%	99			75-125	Pass	
Zinc	K23-Au0065201	CP	%	110			75-125	Pass	
Spike - % Recovery									
Total Petroleum Hydrocarbons (NZ MfE 1999)				Result 1					
TPH-SG C7-C36 (Total)	K23-Au0075153	NCP	%	128			70-130	Pass	
Spike - % Recovery									
Metals M8 (NZ MfE)				Result 1					
Arsenic	K23-Au0065207	CP	%	111			75-125	Pass	
Cadmium	K23-Au0065207	CP	%	89			75-125	Pass	
Chromium	K23-Au0065207	CP	%	111			75-125	Pass	
Copper	K23-Au0065207	CP	%	108			75-125	Pass	
Lead	K23-Au0065207	CP	%	100			75-125	Pass	
Mercury	K23-Au0065207	CP	%	111			75-125	Pass	
Nickel	K23-Au0065207	CP	%	100			75-125	Pass	
Zinc	K23-Au0065207	CP	%	94			75-125	Pass	
Spike - % Recovery									
Metals M8 (NZ MfE)				Result 1					
Arsenic	K23-Au0065212	CP	%	93			75-125	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Cadmium	K23-Au0065212	CP	%	97			75-125	Pass	
Chromium	K23-Au0065212	CP	%	95			75-125	Pass	
Copper	K23-Au0065212	CP	%	99			75-125	Pass	
Lead	K23-Au0065212	CP	%	93			75-125	Pass	
Mercury	K23-Au0065212	CP	%	117			75-125	Pass	
Nickel	K23-Au0065212	CP	%	90			75-125	Pass	
Zinc	K23-Au0065212	CP	%	104			75-125	Pass	
Spike - % Recovery									
Metals M8 (NZ MfE)				Result 1					
Arsenic	K23-Au0065219	CP	%	99			75-125	Pass	
Chromium	K23-Au0065219	CP	%	101			75-125	Pass	
Copper	K23-Au0065219	CP	%	99			75-125	Pass	
Lead	K23-Au0065219	CP	%	83			75-125	Pass	
Mercury	K23-Au0065219	CP	%	95			75-125	Pass	
Nickel	K23-Au0065219	CP	%	93			75-125	Pass	
Zinc	K23-Au0065219	CP	%	87			75-125	Pass	
Spike - % Recovery									
Semivolatile Organics				Result 1					
1-Chloronaphthalene	K23-Au0065223	CP	%	107			70-130	Pass	
1.2-Dichlorobenzene	K23-Au0065223	CP	%	107			70-130	Pass	
1.2.3-Trichlorobenzene	K23-Au0065223	CP	%	83			70-130	Pass	
1.2.3.4-Tetrachlorobenzene	K23-Au0065223	CP	%	91			70-130	Pass	
1.2.3.5-Tetrachlorobenzene	K23-Au0065223	CP	%	93			70-130	Pass	
1.2.4-Trichlorobenzene	K23-Au0065223	CP	%	111			70-130	Pass	
1.2.4.5-Tetrachlorobenzene	K23-Au0065223	CP	%	95			70-130	Pass	
1.3-Dichlorobenzene	K23-Au0065223	CP	%	115			70-130	Pass	
1.3.5-Trichlorobenzene	K23-Au0065223	CP	%	108			70-130	Pass	
1.4-Dichlorobenzene	K23-Au0065223	CP	%	106			70-130	Pass	
2-Chloronaphthalene	K23-Au0065223	CP	%	101			70-130	Pass	
2-Methylnaphthalene	K23-Au0065223	CP	%	99			70-130	Pass	
2-Nitroaniline	K23-Au0065223	CP	%	89			70-130	Pass	
2.6-Dinitrotoluene	K23-Au0065223	CP	%	105			70-130	Pass	
3-Methylcholanthrene	K23-Au0065223	CP	%	99			70-130	Pass	
4-Aminobiphenyl	K23-Au0065223	CP	%	83			70-130	Pass	
4-Bromophenyl phenyl ether	K23-Au0065223	CP	%	89			70-130	Pass	
4-Chlorophenyl phenyl ether	K23-Au0065223	CP	%	86			70-130	Pass	
4.4'-DDD	K23-Au0065223	CP	%	102			70-130	Pass	
4.4'-DDE	K23-Au0065223	CP	%	86			70-130	Pass	
4.4'-DDT	K23-Au0065223	CP	%	104			70-130	Pass	
7.12-Dimethylbenz(a)anthracene	K23-Au0065223	CP	%	85			70-130	Pass	
a-HCH	K23-Au0065223	CP	%	73			70-130	Pass	
Acenaphthene	K23-Au0065223	CP	%	106			70-130	Pass	
Acenaphthylene	K23-Au0065223	CP	%	100			70-130	Pass	
Acetophenone	K23-Au0065223	CP	%	100			70-130	Pass	
Aldrin	K23-Au0065223	CP	%	82			70-130	Pass	
Anthracene	K23-Au0065223	CP	%	118			70-130	Pass	
Benz(a)anthracene	K23-Au0065223	CP	%	109			70-130	Pass	
Benzo(a)pyrene	K23-Au0065223	CP	%	97			70-130	Pass	
Benzo(g.h.i)perylene	K23-Au0065223	CP	%	96			70-130	Pass	
Benzo(k)fluoranthene	K23-Au0065223	CP	%	97			70-130	Pass	
Benzyl chloride	K23-Au0065223	CP	%	101			70-130	Pass	
Bis(2-chloroethoxy)methane	K23-Au0065223	CP	%	101			70-130	Pass	
Bis(2-chloroisopropyl)ether	K23-Au0065223	CP	%	108			70-130	Pass	
Bis(2-ethylhexyl)phthalate	K23-Au0065223	CP	%	101			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Butyl benzyl phthalate	K23-Au0065223	CP	%	85			70-130	Pass	
Chrysene	K23-Au0065223	CP	%	74			70-130	Pass	
d-HCH	K23-Au0065223	CP	%	78			70-130	Pass	
Di-n-butyl phthalate	K23-Au0065223	CP	%	99			70-130	Pass	
Di-n-octyl phthalate	K23-Au0065223	CP	%	124			70-130	Pass	
Dibenz(a.h)anthracene	K23-Au0065223	CP	%	99			70-130	Pass	
Dibenz(a.j)acridine	K23-Au0065223	CP	%	87			70-130	Pass	
Dibenzofuran	K23-Au0065223	CP	%	92			70-130	Pass	
Dieldrin	K23-Au0065223	CP	%	84			70-130	Pass	
Diethyl phthalate	K23-Au0065223	CP	%	93			70-130	Pass	
Dimethyl phthalate	K23-Au0065223	CP	%	106			70-130	Pass	
Dimethylaminoazobenzene	K23-Au0065223	CP	%	96			70-130	Pass	
Diphenylamine	K23-Au0065223	CP	%	90			70-130	Pass	
Endosulfan I	K23-Au0065223	CP	%	82			70-130	Pass	
Endosulfan II	K23-Au0065223	CP	%	95			70-130	Pass	
Endosulfan sulphate	K23-Au0065223	CP	%	86			70-130	Pass	
Endrin	K23-Au0065223	CP	%	85			70-130	Pass	
Endrin aldehyde	K23-Au0065223	CP	%	102			70-130	Pass	
Endrin ketone	K23-Au0065223	CP	%	85			70-130	Pass	
Fluoranthene	K23-Au0065223	CP	%	96			70-130	Pass	
Fluorene	K23-Au0065223	CP	%	101			70-130	Pass	
g-HCH (Lindane)	K23-Au0065223	CP	%	73			70-130	Pass	
Heptachlor	K23-Au0065223	CP	%	113			70-130	Pass	
Heptachlor epoxide	K23-Au0065223	CP	%	70			70-130	Pass	
Hexachlorobutadiene	K23-Au0065223	CP	%	103			70-130	Pass	
Hexachlorocyclopentadiene	K23-Au0065223	CP	%	114			70-130	Pass	
Hexachloroethane	K23-Au0065223	CP	%	112			70-130	Pass	
Indeno(1.2.3-cd)pyrene	K23-Au0065223	CP	%	97			70-130	Pass	
Methoxychlor	K23-Au0065223	CP	%	75			70-130	Pass	
N-Nitrosodibutylamine	K23-Au0065223	CP	%	89			70-130	Pass	
N-Nitrosodipropylamine	K23-Au0065223	CP	%	126			70-130	Pass	
N-Nitrosopiperidine	K23-Au0065223	CP	%	102			70-130	Pass	
Naphthalene	K23-Au0065223	CP	%	104			70-130	Pass	
Nitrobenzene	K23-Au0065223	CP	%	91			70-130	Pass	
Pentachlorobenzene	K23-Au0065223	CP	%	92			70-130	Pass	
Pentachloronitrobenzene	K23-Au0065223	CP	%	75			70-130	Pass	
Phenanthrene	K23-Au0065223	CP	%	112			70-130	Pass	
Pronamide	K23-Au0065223	CP	%	87			70-130	Pass	
Pyrene	K23-Au0065223	CP	%	99			70-130	Pass	
Trifluralin	K23-Au0065223	CP	%	93			70-130	Pass	
Spike - % Recovery									
Metals M8 (NZ MfE)				Result 1					
Arsenic	K23-Au0065223	CP	%	89			75-125	Pass	
Cadmium	K23-Au0065223	CP	%	95			75-125	Pass	
Chromium	K23-Au0065223	CP	%	95			75-125	Pass	
Copper	K23-Au0065223	CP	%	92			75-125	Pass	
Lead	K23-Au0065223	CP	%	91			75-125	Pass	
Mercury	K23-Au0065223	CP	%	109			75-125	Pass	
Nickel	K23-Au0065223	CP	%	89			75-125	Pass	
Zinc	K23-Au0065223	CP	%	100			75-125	Pass	
Spike - % Recovery									
Organochlorine Pesticides (NZ MfE)				Result 1					
2.4'-DDD	K23-Au0065223	CP	%	81			70-130	Pass	
2.4'-DDE	K23-Au0065223	CP	%	89			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
2.4'-DDT	K23-Au0065223	CP	%	82			70-130	Pass	
cis-Chlordane	K23-Au0065223	CP	%	87			70-130	Pass	
trans-Chlordane	K23-Au0065223	CP	%	77			70-130	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
Metals M8 (NZ MfE)				Result 1	Result 2	RPD			
Arsenic	K23-Au0065200	CP	mg/kg	1.5	1.8	17	30%	Pass	
Cadmium	K23-Au0065200	CP	mg/kg	0.19	0.20	4.1	30%	Pass	
Chromium	K23-Au0065200	CP	mg/kg	5.6	5.9	6.3	30%	Pass	
Copper	K23-Au0065200	CP	mg/kg	27	28	4.5	30%	Pass	
Lead	K23-Au0065200	CP	mg/kg	5.8	6.8	14	30%	Pass	
Mercury	K23-Au0065200	CP	mg/kg	0.05	0.07	27	30%	Pass	
Nickel	K23-Au0065200	CP	mg/kg	2.3	2.1	9.8	30%	Pass	
Zinc	K23-Au0065200	CP	mg/kg	24	24	1.1	30%	Pass	
Duplicate									
Total Petroleum Hydrocarbons (NZ MfE 1999)				Result 1	Result 2	RPD			
TPH-SG C7-C9	K23-Au0073252	NCP	mg/kg	< 5	< 5	<1	30%	Pass	
TPH-SG C10-C14	K23-Au0073252	NCP	mg/kg	< 10	< 10	<1	30%	Pass	
TPH-SG C15-C36	K23-Au0073252	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
TPH-SG C7-C36 (Total)	K23-Au0073252	NCP	mg/kg	< 35	< 35	<1	30%	Pass	
Duplicate									
Sample Properties				Result 1	Result 2	RPD			
% Moisture	K23-Au0065204	CP	%	12	15	20	30%	Pass	
Duplicate									
Metals M8 (NZ MfE)				Result 1	Result 2	RPD			
Arsenic	K23-Au0065211	CP	mg/kg	2.1	2.3	9.1	30%	Pass	
Cadmium	K23-Au0065211	CP	mg/kg	0.44	0.44	1.0	30%	Pass	
Chromium	K23-Au0065211	CP	mg/kg	7.4	8.2	11	30%	Pass	
Copper	K23-Au0065211	CP	mg/kg	19	18	5.5	30%	Pass	
Lead	K23-Au0065211	CP	mg/kg	8.8	9.1	2.7	30%	Pass	
Mercury	K23-Au0065211	CP	mg/kg	0.20	0.21	7.5	30%	Pass	
Nickel	K23-Au0065211	CP	mg/kg	3.1	3.6	16	30%	Pass	
Zinc	K23-Au0065211	CP	mg/kg	23	22	2.3	30%	Pass	
Duplicate									
Sample Properties				Result 1	Result 2	RPD			
% Moisture	K23-Au0065215	CP	%	32	32	<1	30%	Pass	
Duplicate									
Semivolatile Organics				Result 1	Result 2	RPD			
1-Chloronaphthalene	K23-Au0065221	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1-Naphthylamine	K23-Au0065221	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.2-Dichlorobenzene	K23-Au0065221	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.2.3-Trichlorobenzene	K23-Au0065221	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.2.3.4-Tetrachlorobenzene	K23-Au0065221	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.2.3.5-Tetrachlorobenzene	K23-Au0065221	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.2.4-Trichlorobenzene	K23-Au0065221	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.2.4.5-Tetrachlorobenzene	K23-Au0065221	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.3-Dichlorobenzene	K23-Au0065221	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.3.5-Trichlorobenzene	K23-Au0065221	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.4-Dichlorobenzene	K23-Au0065221	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
2-Chloronaphthalene	K23-Au0065221	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
2-Methylnaphthalene	K23-Au0065221	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
2-Naphthylamine	K23-Au0065221	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
2-Nitroaniline	K23-Au0065221	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
2-Picoline	K23-Au0065221	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	

Duplicate									
Semivolatile Organics				Result 1	Result 2	RPD			
2.4-Dinitrotoluene	K23-Au0065221	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
2.6-Dinitrotoluene	K23-Au0065221	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
3-Methylcholanthrene	K23-Au0065221	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
3.3'-Dichlorobenzidine	K23-Au0065221	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
4-Aminobiphenyl	K23-Au0065221	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
4-Bromophenyl phenyl ether	K23-Au0065221	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
4-Chlorophenyl phenyl ether	K23-Au0065221	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
4.4'-DDD	K23-Au0065221	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
4.4'-DDE	K23-Au0065221	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
4.4'-DDT	K23-Au0065221	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
7.12-Dimethylbenz(a)anthracene	K23-Au0065221	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
a-HCH	K23-Au0065221	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
Acenaphthene	K23-Au0065221	CP	mg/kg	< 0.03	< 0.03	<1	30%	Pass	
Acenaphthylene	K23-Au0065221	CP	mg/kg	< 0.03	< 0.03	<1	30%	Pass	
Acetophenone	K23-Au0065221	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Aldrin	K23-Au0065221	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
Aniline	K23-Au0065221	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Anthracene	K23-Au0065221	CP	mg/kg	< 0.03	< 0.03	<1	30%	Pass	
b-HCH	K23-Au0065221	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
Benz(a)anthracene	K23-Au0065221	CP	mg/kg	< 0.03	< 0.03	<1	30%	Pass	
Benzo(a)pyrene	K23-Au0065221	CP	mg/kg	< 0.03	< 0.03	<1	30%	Pass	
Benzo(b&j)fluoranthene	K23-Au0065221	CP	mg/kg	< 0.03	< 0.03	<1	30%	Pass	
Benzo(g.h.i)perylene	K23-Au0065221	CP	mg/kg	< 0.03	< 0.03	<1	30%	Pass	
Benzo(k)fluoranthene	K23-Au0065221	CP	mg/kg	< 0.03	< 0.03	<1	30%	Pass	
Benzyl chloride	K23-Au0065221	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Bis(2-chloroethoxy)methane	K23-Au0065221	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Bis(2-chloroisopropyl)ether	K23-Au0065221	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Bis(2-ethylhexyl)phthalate	K23-Au0065221	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Chrysene	K23-Au0065221	CP	mg/kg	< 0.03	< 0.03	<1	30%	Pass	
d-HCH	K23-Au0065221	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
Di-n-butyl phthalate	K23-Au0065221	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Di-n-octyl phthalate	K23-Au0065221	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Dibenz(a.h)anthracene	K23-Au0065221	CP	mg/kg	< 0.03	< 0.03	<1	30%	Pass	
Dibenz(a.j)acridine	K23-Au0065221	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Dibenzofuran	K23-Au0065221	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Dieldrin	K23-Au0065221	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
Diethyl phthalate	K23-Au0065221	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Dimethyl phthalate	K23-Au0065221	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Dimethylaminoazobenzene	K23-Au0065221	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Diphenylamine	K23-Au0065221	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Endosulfan I	K23-Au0065221	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
Endosulfan II	K23-Au0065221	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
Endosulfan sulphate	K23-Au0065221	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
Endrin	K23-Au0065221	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
Endrin aldehyde	K23-Au0065221	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
Endrin ketone	K23-Au0065221	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
Fluoranthene	K23-Au0065221	CP	mg/kg	< 0.03	< 0.03	<1	30%	Pass	
Fluorene	K23-Au0065221	CP	mg/kg	< 0.03	< 0.03	<1	30%	Pass	
g-HCH (Lindane)	K23-Au0065221	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
Heptachlor	K23-Au0065221	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
Heptachlor epoxide	K23-Au0065221	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
Hexachlorobenzene	K23-Au0065221	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
Hexachlorobutadiene	K23-Au0065221	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Hexachlorocyclopentadiene	K23-Au0065221	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	

Duplicate									
Semivolatile Organics				Result 1	Result 2	RPD			
Hexachloroethane	K23-Au0065221	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Indeno(1.2.3-cd)pyrene	K23-Au0065221	CP	mg/kg	< 0.03	< 0.03	<1	30%	Pass	
Methoxychlor	K23-Au0065221	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
N-Nitrosodibutylamine	K23-Au0065221	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
N-Nitrosodipropylamine	K23-Au0065221	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
N-Nitrosopiperidine	K23-Au0065221	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Naphthalene	K23-Au0065221	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Nitrobenzene	K23-Au0065221	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Pentachlorobenzene	K23-Au0065221	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Pentachloronitrobenzene	K23-Au0065221	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Phenanthrene	K23-Au0065221	CP	mg/kg	< 0.03	< 0.03	<1	30%	Pass	
Pronamide	K23-Au0065221	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Pyrene	K23-Au0065221	CP	mg/kg	< 0.03	< 0.03	<1	30%	Pass	
Trifluralin	K23-Au0065221	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Duplicate									
Organochlorine Pesticides (NZ MfE)				Result 1	Result 2	RPD			
2.4'-DDD	K23-Au0065221	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
2.4'-DDE	K23-Au0065221	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
2.4'-DDT	K23-Au0065221	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
cis-Chlordane	K23-Au0065221	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
trans-Chlordane	K23-Au0065221	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
Duplicate									
Metals M8 (NZ MfE)				Result 1	Result 2	RPD			
Arsenic	K23-Au0065222	CP	mg/kg	1.1	1.2	11	30%	Pass	
Cadmium	K23-Au0065222	CP	mg/kg	0.02	0.02	24	30%	Pass	
Chromium	K23-Au0065222	CP	mg/kg	11	11	2.9	30%	Pass	
Copper	K23-Au0065222	CP	mg/kg	5.2	6.0	13	30%	Pass	
Lead	K23-Au0065222	CP	mg/kg	6.1	6.6	8.3	30%	Pass	
Mercury	K23-Au0065222	CP	mg/kg	0.08	0.10	16	30%	Pass	
Nickel	K23-Au0065222	CP	mg/kg	3.8	4.2	9.9	30%	Pass	
Zinc	K23-Au0065222	CP	mg/kg	6.4	7.2	12	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
N07	Please note:- These two PAH isomers closely co-elute using the most contemporary analytical methods and both the reported concentration (and the TEQ) apply specifically to the total of the two co-eluting PAHs

Authorised by:

Katyana Gausel	Analytical Services Manager
Raymond Siu	Senior Analyst-Metal
Raymond Siu	Senior Analyst-Organic
Sophie Bush	Senior Analyst-Asbestos

Raymond Siu
Senior Instrument Chemist (Key Technical Personnel)

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates IANZ accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

Certificate of Analysis

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All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

ENGEO Ltd
8 Greydene Place
Takapuna
Auckland 0622

Attention:	Claire Davies
Report	1020238-AID
Project Name	15 CLARKS LANE
Project ID	23849.000.004
Received Date	Aug 25, 2023
Date Reported	Sep 18, 2023

Methodology:

Asbestos Fibre Identification	Conducted in accordance with the Australian Standard AS 4964 – 2004: Method for the Qualitative Identification of Asbestos in Bulk Samples and in-house Method LTM-ASB-8020 by polarised light microscopy (PLM) and dispersion staining (DS) techniques. *NOTE: Positive Trace Analysis results indicate the sample contains detectable respirable fibres.*
Unknown Mineral Fibres	Mineral fibres of unknown type, as determined by PLM with DS, may require another analytical technique, such as Electron Microscopy, to confirm unequivocal identity. *NOTE: While Actinolite, Anthophyllite and Tremolite asbestos may be detected by PLM with DS, due to variability in the optical properties of these materials, AS4964 requires that these are reported as UMF unless confirmed by an independent technique.*
Subsampling Soil Samples	The whole sample submitted is first dried and then passed through a 10mm sieve followed by a 2mm sieve. All fibrous matter greater than 10mm, greater than 2mm as well as the material passing through the 2mm sieve are retained and analysed for the presence of asbestos. If the sub 2mm fraction is greater than approximately 30 to 60g then a sub-sampling routine based on ISO 3082:2009(E) is employed. *NOTE: Depending on the nature and size of the soil sample, the sub-2 mm residue material may need to be sub-sampled for trace analysis, in accordance with AS 4964-2004.*
Bonded asbestos-containing material (ACM)	The material is first examined and any fibres isolated for identification by PLM and DS. Where required, interfering matrices may be removed by disintegration using a range of heat, chemical or physical treatments, possibly in combination.The resultant material is then further examined in accordance with AS 4964 - 2004. *NOTE: Even after disintegration it may be difficult to detect the presence of asbestos in some asbestos-containing bulk materials using PLM and DS. This is due to the low grade or small length or diameter of the asbestos fibres present in the material, or to the fact that very fine fibres have been distributed intimately throughout the materials. Vinyl/asbestos floor tiles, some asbestos-containing sealants and mastics, asbestos-containing epoxy resins and some ore samples are examples of these types of material, which are difficult to analyse.*
Limit of Reporting	The performance limitation of the AS 4964 (2004) method for non-homogeneous samples is around 0.1 g/kg (equivalent to 0.01% (w/w)). Where no asbestos is found by PLM and DS, including Trace Analysis, this is considered to be at the nominal reporting limit of 0.01% (w/w). The NEPM screening level of 0.001% (w/w) is intended as an on-site determination, not a laboratory Limit of Reporting (LOR), per se. Examination of a large sample size (e.g. 500 mL) may improve the likelihood of detecting asbestos, particularly AF, to aid assessment against the NEPM criteria. Gravimetric determinations to this level of accuracy are outside of AS 4964 and hence IANZ Accreditation does not cover the performance of this service (non-IANZ results shown with an asterisk). *NOTE: NATA News March 2014, p.7, states in relation to AS 4964: "This is a qualitative method with a nominal reporting limit of 0.01 % " and that currently in Australia "there is no validated method available for the quantification of asbestos".This report is consistent with the analytical procedures and reporting recommendations in the NEPM and the WA DoH.*

Project Name 15 CLARKS LANE
Project ID 23849.000.004
Date Sampled Aug 22, 2023
Report 1020238-AID

Client Sample ID	Eurofins Sample No.	Date Sampled	Sample Description	Result
S10 0.0-0.15	23-Au0065208	Aug 22, 2023	Approximate Sample 204g Sample consisted of: Fine grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.
S10 0.15-0.55	23-Au0065209	Aug 22, 2023	Approximate Sample 481g Sample consisted of: Fine grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.
S17 0.1-0.3	23-Au0065216	Aug 22, 2023	Approximate Sample 440g Sample consisted of: Fine grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.
S17 0.3-0.5	23-Au0065217	Aug 22, 2023	Approximate Sample 537g Sample consisted of: Fine grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Asbestos - LTM-ASB-8020	Auckland	Aug 31, 2023	Indefinite

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Penrose,	Rolleston,	Gate Pa,
Auckland 1061	Christchurch 7675	Tauranga 3112
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IANZ# 1327	IANZ# 1290	IANZ# 1402

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Dandenong South	Grovedale	Girraween	Mitchell	Murarrie	Mayfield West NSW 2304
VIC 3175	VIC 3216	NSW 2145	ACT 2911	QLD 4172	Tel: +61 2 4968 8448
Tel: +61 3 8564 5000	Tel: +61 3 8564 5000	Tel: +61 2 9900 8400	Tel: +61 2 6113 8091	Tel: +61 7 3902 4600	NATA# 1261
NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	Site# 25079 & 25289
Site# 1254	Site# 25403	Site# 18217	Site# 25466	Site# 20794	

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Site# 2370

Company Name: ENGEO Ltd - NI
Address: 8 Greydene Place
Takapuna
Auckland 0622

Project Name: 15 CLARKS LANE
Project ID: 23849.000.004

Order No.:
Report #: 1020238
Phone: 0011 64 9 9722 205
Fax:

Received: Aug 25, 2023 3:30 PM
Due: Sep 1, 2023
Priority: 5 Day
Contact Name: Claire Davies

Eurofins Analytical Services Manager : Katyana Gausel

Sample Detail						Asbestos - AS4964	HOLD	Moisture Set	Total Petroleum Hydrocarbons (NZ MfE 1999)	Organochlorine Pesticides (NZ MfE)	Metals M8 (NZ MfE)	Polycyclic Aromatic Hydrocarbons (NZ MfE)	Semivolatile Organics
Auckland Laboratory - IANZ# 1327						X	X	X	X	X	X	X	X
Christchurch Laboratory - IANZ# 1290													
Tauranga Laboratory - IANZ# 1402													
External Laboratory													
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**								
1	S01 0.0-0.2	Aug 22, 2023		Soil	K23-Au0065200			X			X		X
2	S02 0.0-0.3	Aug 22, 2023		Soil	K23-Au0065201			X			X		X
3	S04 0.0-0.1	Aug 22, 2023		Soil	K23-Au0065202			X	X		X	X	
4	S05 0.0-0.1	Aug 22, 2023		Soil	K23-Au0065203			X			X		
5	S06 0.0-0.1	Aug 22, 2023		Soil	K23-Au0065204			X			X		
6	S07 0.0-0.2	Aug 22, 2023		Soil	K23-Au0065205			X			X		
7	S08 0.0-0.2	Aug 22, 2023		Soil	K23-Au0065206			X			X		
8	S09 0.0-0.2	Aug 22, 2023		Soil	K23-Au0065207			X			X		X
9	S10 0.0-0.15	Aug 22, 2023		Soil	K23-Au0065208	X							
10	S10 0.15-0.55	Aug 22, 2023		Soil	K23-Au0065209	X		X			X		
11	S10 0.55-0.7	Aug 22, 2023		Soil	K23-Au0065210			X			X		

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NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	Site# 25079 & 25289
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Site# 2370

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Auckland Laboratory - IANZ# 1327						X	X	X	X	X	X	X	X
Christchurch Laboratory - IANZ# 1290													
Tauranga Laboratory - IANZ# 1402													
12	S12 0.0-0.15	Aug 22, 2023		Soil	K23-Au0065211			X			X		
13	S12 0.15-0.25	Aug 22, 2023		Soil	K23-Au0065212			X			X		
14	S15 0.0-0.2	Aug 22, 2023		Soil	K23-Au0065213			X			X		
15	S15 0.2-0.3	Aug 22, 2023		Soil	K23-Au0065214			X			X		
16	S17 0.0-0.1	Aug 22, 2023		Soil	K23-Au0065215			X			X		
17	S17 0.1-0.3	Aug 22, 2023		Soil	K23-Au0065216	X		X			X		
18	S17 0.3-0.5	Aug 22, 2023		Soil	K23-Au0065217	X							
19	CS01 (composite of CS01A 0.0-0.2 CS01B 0.0-0.2 AND CS01C 0.0-0.1)	Aug 22, 2023		Soil	K23-Au0065218			X		X	X		
20	CS02 (composite of CS02A 0.0-0.2	Aug 22, 2023		Soil	K23-Au0065219			X		X	X		

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NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	Site# 25079 & 25289
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Auckland Laboratory - IANZ# 1327						X	X	X	X	X	X	X	X
Christchurch Laboratory - IANZ# 1290													
Tauranga Laboratory - IANZ# 1402													
	CS02B 0.0-0.15 AND CS02C 0.0-0.25)												
21	CS03 (composite of CS03A 0.0-0.1 CS03B 0.0-0.1 AND CS03C 0.0-0.1)	Aug 22, 2023		Soil	K23-Au0065220			X		X	X		
22	CS04 (composite of CS04A 0.0-0.2 CS04B 0.0-0.2 AND CS04C 0.0-0.15)	Aug 22, 2023		Soil	K23-Au0065221			X		X	X		
23	CS03 C 0.3-0.4	Aug 22, 2023		Soil	K23-Au0065222			X			X		

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NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	Site# 25079 & 25289
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Company Name: ENGEO Ltd - NI
Address: 8 Greydene Place
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Auckland 0622

Project Name: 15 CLARKS LANE
Project ID: 23849.000.004

Order No.:
Report #: 1020238
Phone: 0011 64 9 9722 205
Fax:

Received: Aug 25, 2023 3:30 PM
Due: Sep 1, 2023
Priority: 5 Day
Contact Name: Claire Davies

Eurofins Analytical Services Manager : Katyana Gausel

Sample Detail						Asbestos - AS4964	HOLD	Moisture Set	Total Petroleum Hydrocarbons (NZ MfE 1999)	Organochlorine Pesticides (NZ MfE)	Metals M8 (NZ MfE)	Polycyclic Aromatic Hydrocarbons (NZ MfE)	Semivolatile Organics
Auckland Laboratory - IANZ# 1327						X	X	X	X	X	X	X	X
Christchurch Laboratory - IANZ# 1290													
Tauranga Laboratory - IANZ# 1402													
24	CS03 C 1.2-1.3	Aug 22, 2023		Soil	K23-Au0065223			X		X	X		
25	S01 0.2-0.3	Aug 22, 2023		Soil	K23-Au0065224		X						
26	S02 0.3-.04	Aug 22, 2023		Soil	K23-Au0065225		X						
27	S03 0.0-0.3	Aug 22, 2023		Soil	K23-Au0065226		X						
28	S07 0.2-0.3	Aug 22, 2023		Soil	K23-Au0065227		X						
29	S07 0.3-0.5	Aug 22, 2023		Soil	K23-Au0065228		X						
30	S08 0.2-0.4	Aug 22, 2023		Soil	K23-Au0065229		X						
31	S09 0.2-0.3	Aug 22, 2023		Soil	K23-Au0065230		X						
32	S10 0.7-1.2	Aug 22, 2023		Soil	K23-Au0065231		X						
33	S11 0.0-0.1	Aug 22, 2023		Soil	K23-Au0065232		X						
34	S11 0.1-0.3	Aug 22, 2023		Soil	K23-Au0065233		X						
35	S12 0.25-0.4	Aug 22, 2023		Soil	K23-Au0065234		X						
36	S13 0.0-0.2	Aug 22, 2023		Soil	K23-Au0065235		X						

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Auckland Laboratory - IANZ# 1327						X	X	X	X	X	X	X	X
Christchurch Laboratory - IANZ# 1290													
Tauranga Laboratory - IANZ# 1402													
37	S13 0.2-0.4	Aug 22, 2023		Soil	K23-Au0065236		X						
38	S14 0.0-0.2	Aug 22, 2023		Soil	K23-Au0065237		X						
39	S14 0.2-0.4	Aug 22, 2023		Soil	K23-Au0065238		X						
40	S15 0.3-0.5	Aug 22, 2023		Soil	K23-Au0065239		X						
41	S16 0.0-0.2	Aug 22, 2023		Soil	K23-Au0065240		X						
42	S16 0.2-0.35	Aug 22, 2023		Soil	K23-Au0065241		X						
43	S16 0.35-0.5	Aug 22, 2023		Soil	K23-Au0065242		X						
44	S17 0.5-0.9	Aug 22, 2023		Soil	K23-Au0065243		X						
45	S18 0.0-0.6	Aug 22, 2023		Soil	K23-Au0065244		X						
46	S18 0.6-0.9	Aug 22, 2023		Soil	K23-Au0065245		X						
47	CS01-A-0.0-0.2	Aug 22, 2023		Soil	K23-Au0068197		X						
48	CS01-A-0.2-0.3	Aug 22, 2023		Soil	K23-Au0068198		X						

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Auckland Laboratory - IANZ# 1327						X	X	X	X	X	X	X	X
Christchurch Laboratory - IANZ# 1290													
Tauranga Laboratory - IANZ# 1402													
49	CS01-B-0.0-0.2	Aug 22, 2023		Soil	K23-Au0068199		X						
50	CS01-B-0.2-0.3	Aug 22, 2023		Soil	K23-Au0068200		X						
51	CS01-C-0.0-0.2	Aug 22, 2023		Soil	K23-Au0068201		X						
52	CS01-C-0.2-0.3	Aug 22, 2023		Soil	K23-Au0068202		X						
53	CS02-A-0.0-0.2	Aug 22, 2023		Soil	K23-Au0068203		X						
54	CS02-A-0.2-0.3	Aug 22, 2023		Soil	K23-Au0068204		X						
55	CS02-B-0.0-0.15	Aug 22, 2023		Soil	K23-Au0068205		X						
56	CS02-B-0.15-0.25	Aug 22, 2023		Soil	K23-Au0068206		X						

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Auckland Laboratory - IANZ# 1327						X	X	X	X	X	X	X	X
Christchurch Laboratory - IANZ# 1290													
Tauranga Laboratory - IANZ# 1402													
57	CS02-C-0.0-0.25	Aug 22, 2023		Soil	K23-Au0068207		X						
58	CS02-C-0.25-0.35	Aug 22, 2023		Soil	K23-Au0068208		X						
59	CS03-A-0.0-0.1	Aug 22, 2023		Soil	K23-Au0068209		X						
60	CS03-A-0.2-0.3	Aug 22, 2023		Soil	K23-Au0068210		X						
61	CS03-B-0.0-0.1	Aug 22, 2023		Soil	K23-Au0068211		X						
62	CS03-B-0.2-0.3	Aug 22, 2023		Soil	K23-Au0068212		X						
63	CS03-C-0.0-0.1	Aug 22, 2023		Soil	K23-Au0068213		X						
64	CS03-C-2.1-2.2	Aug 22, 2023		Soil	K23-Au0068214		X						

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Auckland Laboratory - IANZ# 1327						X	X	X	X	X	X	X	X
Christchurch Laboratory - IANZ# 1290													
Tauranga Laboratory - IANZ# 1402													
65	CS04-A-0.0-0.2	Aug 22, 2023		Soil	K23-Au0068215		X						
66	CS04-A-0.2-0.3	Aug 22, 2023		Soil	K23-Au0068216		X						
67	CS04-B-0.0-0.2	Aug 22, 2023		Soil	K23-Au0068217		X						
68	CS04-B-0.2-0.3	Aug 22, 2023		Soil	K23-Au0068218		X						
69	CS04-C-0.0-0.15	Aug 22, 2023		Soil	K23-Au0068219		X						
70	CS04-C-0.15-0.3	Aug 22, 2023		Soil	K23-Au0068220		X						
71	CS04-C-0.3-0.5	Aug 22, 2023		Soil	K23-Au0068221		X						
72	HA06-0.1-0.5	Aug 22, 2023		Soil	K23-Au0072611		X						
Test Counts						4	48	22	1	5	22	1	3

Internal Quality Control Review and Glossary General

1. QC data may be available on request.
2. All soil results are reported on a dry basis, unless otherwise stated.
3. Samples were analysed on an 'as received' basis.
4. Information identified on this report with the colour **blue** indicates data provided by customer that may have an impact on the results.
5. This report replaces any interim results previously issued.

Holding Times

Please refer to the most recent version of the 'Sample Preservation and Container Guide' for holding times (QS3001).
If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported. Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

Units

% w/w:	Percentage weight-for-weight basis, e.g. of asbestos in asbestos-containing finds in soil samples (**% w/w**)
F/fld	Airborne fibre filter loading as Fibres (**N**) per Fields counted (**n**)
F/mL	Airborne fibre reported concentration as Fibres per millilitre of air drawn over the sampler membrane (**C**)
g, kg	Mass, e.g. of whole sample (**M**) or asbestos-containing find within the sample (**m**)
g/kg	Concentration in grams per kilogram
L, mL	Volume, e.g. of air as measured in AFM (**V** = **r** x **t**)
L/min	Airborne fibre sampling Flowrate as litres per minute of air drawn over the sampler membrane (**r**)
min	Time (**t**), e.g. of air sample collection period

Calculations

Airborne Fibre Concentration: $C = \left(\frac{A}{a}\right) \times \left(\frac{N}{n}\right) \times \left(\frac{1}{r}\right) \times \left(\frac{1}{t}\right) = K \times \left(\frac{N}{n}\right) \times \left(\frac{1}{V}\right)$

Asbestos Content (as asbestos): $\%\, w/w = \frac{(m \times P_A)}{M}$

Weighted Average (of asbestos): $\%_{WA} = \sum \frac{(m \times P_A)_x}{x}$

Terms

%asbestos	Estimated percentage of asbestos in a given matrix. May be derived from knowledge or experience of the material, informed by HSG264 *Appendix 2*, else assumed to be 15% in accordance with WA DOH *Appendix 2* (**P_A**).
ACM	Asbestos Containing Materials. Asbestos contained within a non-asbestos matrix, typically presented in bonded (non-friable) condition. For the purposes of the NEPM and WA DOH, ACM corresponds to material larger than 7 mm x 7 mm.
AF	Asbestos Fines. Asbestos contamination within a soil sample, as defined by WA DOH. Includes loose fibre bundles and small pieces of friable and non-friable material such as asbestos cement fragments mixed with soil. Considered under the NEPM as equivalent to “non-bonded / friable”.
AFM	Airborne Fibre Monitoring, e.g. by the MFM.
Amosite	Amosite Asbestos Detected. Amosite may also refer to Fibrous Grunerite or Brown Asbestos. Identified in accordance with AS 4964-2004.
AS	Australian Standard.
Asbestos Content (as asbestos)	Total % w/w asbestos content in asbestos-containing finds in a soil sample (**% w/w)**.
Chrysotile	Chrysotile Asbestos Detected. Chrysotile may also refer to Fibrous Serpentine or White Asbestos. Identified in accordance with AS 4964-2004.
COC	Chain of Custody.
Crocidolite	Crocidolite Asbestos Detected. Crocidolite may also refer to Fibrous Riebeckite or Blue Asbestos. Identified in accordance with AS 4964-2004.
Dry	Sample is dried by heating prior to analysis.
DS	Dispersion Staining. Technique required for Unequivocal Identification of asbestos fibres by PLM.
FA	Fibrous Asbestos. Asbestos containing material that is wholly or in part friable, including materials with higher asbestos content with a propensity to become friable with handling, and any material that was previously non-friable and in a severely degraded condition. For the purposes of the NEPM and WA DOH, FA generally corresponds to material larger than 7 mm x 7 mm, although FA may be more difficult to visibly distinguish and may be assessed as AF.
Fibre Count	Total of all fibres (whether asbestos or not) meeting the counting criteria set out in the NOHSC:3003
Fibre ID	Fibre Identification. Unequivocal identification of asbestos fibres according to AS 4964-2004. Includes Chrysotile, Amosite (Grunerite) or Crocidolite asbestos.
Friable	Asbestos-containing materials of any size that may be broken or crumbled by hand pressure. For the purposes of the NEPM, this includes both AF and FA. It is outside of the laboratory’s remit to assess degree of friability.
HSG248	UK HSE HSG248, *Asbestos: The Analysts Guide*, 2nd Edition (2021).
HSG264	UK HSE HSG264, *Asbestos: The Survey Guide* (2012).
ISO (also ISO/IEC)	International Organization for Standardization / International Electrotechnical Commission.
K Factor	Microscope constant (**K**) as derived from the effective filter area of the given AFM membrane used for collecting the sample (**A**) and the projected eyepiece graticule area of the specific microscope used for the analysis (**a**).
LOR	Limit of Reporting.
MFM (also NOHSC:3003)	Membrane Filter Method. As described by the Australian Government National Occupational Health and Safety Commission, *Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres*, 2nd Edition [NOHSC:3003(2005)].
NEPM (also ASC NEPM)	National Environment Protection (Assessment of Site Contamination) Measure, (2013, as amended).
Organic	Organic Fibres Detected. Organic may refer to Natural or Man-Made Polymeric Fibres. Identified in accordance with AS 4964-2004.
PCM	Phase Contrast Microscopy. As used for Fibre Counting according to the MFM.
PLM	Polarised Light Microscopy. As used for Fibre Identification and Trace Analysis according to AS 4964-2004.
Sampling	Unless otherwise stated Eurofins are not responsible for sampling equipment or the sampling process.
SMF	Synthetic Mineral Fibre Detected. SMF may also refer to Man Made Vitreous Fibres. Identified in accordance with AS 4964-2004.
SRA	Sample Receipt Advice.
Trace Analysis	Analytical procedure used to detect the presence of respirable fibres (particularly asbestos) in a given sample matrix.
UK HSE HSG	United Kingdom, Health and Safety Executive, Health and Safety Guidance, publication.
UMF	Unidentified Mineral Fibre Detected. Fibrous minerals that are detected but have not been unequivocally identified by PLM with DS according the AS 4964-2004. May include (but not limited to) Actinolite, Anthophyllite or Tremolite asbestos.
WA DOH	Reference document for the NEPM. Government of Western Australia, *Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia* (updated 2021), including Appendix Four: *Laboratory analysis*
Weighted Average	Combined average % w/w asbestos content of all asbestos-containing finds in the given aliquot or total soil sample (**$\%_{WA}$**).

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Asbestos Counter/Identifier:

Elsie Xu	Senior Analyst-Asbestos

Authorised by:

Sophie Bush	Senior Analyst-Asbestos

Katyana Gausel
Senior Analyst-Asbestos (Key Technical Personnel)

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates ISO/IEC 17025:2017 accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

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Project Number 23849.000.004

Remediation Action Plan

15 Clarks Lane, Whenuapai, Auckland

Submitted to:
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Contents

Tables

Appendices

ENGEO Document Control:

Report Title	Remediation Action Plan - 15 Clarks Lane, Whenuapai			
Project No.	23849.000.004	**Doc ID**	02	
Client	Cabra Developments Limited	**Client Contact**	Duncan Unsworth	
Distribution (PDF)	Duncan Unsworth, Cabra Developments Limited			
Date	**Revision Details / Status**	**Author**	**Reviewer**	**WP**
31/10/2023	Issued to Client	CD	JR	DF

1 Introduction

ENGEO Ltd was requested by Cabra Developments Limited to prepare a Remediation Action Plan (RAP) for soil disturbance activities to be carried out at 15 Clarks Lane, Whenuapai, Auckland (herein referred to as 'the site'; shown on Figure 1) to support the application for Resource Consent for the development of a residential estate. This work has been carried out in accordance with the signed agreement dated 2 August 2023.

ENGEO completed a preliminary and detailed site investigation (PSI / DSI) for the site in October 2023 (ENGEO, 2023a). The investigation comprised a review of publicly available historical information relating to the site and recovery and analysis of soil samples. The results of analysis of soil samples recovered from the site indicate that potential contaminants of concern are present in soil at concentrations which exceed adopted criteria (discussed further in Section 3.1).

Table 1: Site Summary

Contaminants identified on-site	In an isolated area in the western portion of the site, the concentration of arsenic exceeded the adopted human health criterion. Surface soil in the lean-to shed on the western portion of the site was visually impacted with hydrocarbons.
Scope of Proposed Works	ENGEO understand that development of the residential estate will include the demolition of existing site structures to allow construction of the estate. No cut / fill plans have been provided to ENGEO at the time of writing this report.

This RAP contains:

- A summary of previous investigations completed at the site.
- Details of the proposed remediation works (removal of impacted soil and validation sampling).
- Management procedures to assist in:
    - Achieving a safe working environment for relevant personnel; and
    - Protecting the environment from contaminants in site discharges during the redevelopment works.

If not already undertaken, a pre-demolition asbestos survey of the site buildings will be required. If the surveys identify asbestos containing material in exterior building surfaces adjacent to exposed ground, soil samples shall be collected from this soil and analysed for asbestos (semi-quantitative). Additionally, if evidence of other actual or potential contamination is identified further testing of this soil may be required.

2 Objectives and Relevance of the RAP

2.1 Objective

The objectives of the RAP are to:

- Support an application for consent under the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (the "NESCS") and the AUP;
- Detail remedial actions for the site based on previous investigation(s);
- Outline requirements for oversight and validation during and following remedial works;
- Outline management for site soils; and
- Outline actions to be undertaken if unidentified contamination is encountered.

2.2 Relevance

This document has been prepared in general accordance with the Ministry for the Environment's (MfE's) Contaminated Land Management Guidelines No.1 – Reporting on Contaminated Sites in New Zealand (MfE, 2021) and should be read in conjunction with the PSI / DSI (ENGEO, 2023a) prepared for the site. This RAP has been prepared to fulfil the requirements of a site management plan and remedial action plan so all relevant information is available in one location to facilitate implementation on-site.

The information and recommendations provided herein are to augment the processes on-site and are not intended to relieve any contractor with control of the site or person conducting a business or undertaking (PCBU) associated with the site of their responsibility for the health and safety of their workers and contractors. Nor is it intended to relieve contractors undertaking work on the site of their responsibilities under the Health and Safety at Work Act 2015 and subsequent amendments.

The provisions of the RAP are mandatory for all persons entering the site and all contractor and sub-contractor employees who will be involved in implementing the procedures identified in this document.

The contractor shall develop a site-specific health and safety plan to complement this RAP and to address other health and safety requirements that may be applicable to their site works.

This RAP is considered suitable to provide controls based on the contamination identified during the previous investigation works (ENGEO, 2023a). If contamination is found that varies from what has been assumed in preparing this RAP, the RAP will need to be updated to account for the changed site understanding. If a revised RAP is prepared, it should be re-distributed to Council and the project team (Table 2) prior to earthworks commencing or as soon as practicable after such contamination is discovered.

Table 2: Assigned Responsibilities for Site Work

Role	Responsibility
Site Owner - Cabra Developments Limited	To distribute this RAP and be responsible for ensuring that the site works are undertaken in accordance with this document and any revisions to this document.
Site Contractor (main contractor / general earthworks) – *to be confirmed*	To distribute the RAP (including updated versions) to employees and subcontractors, and to ensure that the most up-to-date version of the RAP is available on-site at all times. To provide control and oversee the redevelopment works. It is recommended that a designated, suitably trained Site Supervisor is present to oversee the works. The Site Supervisor should address changes to site procedures, as necessary, should unanticipated conditions arise. This also includes ensuring that all site staff and subcontractors are aware of and comply with the procedures and health and safety requirements contained within this document. It is anticipated that this Site Supervisor would represent the main site contractor. Should an incident occur on-site which may result in discharges, the supervisor should take control of the situation and coordinate the efforts of all people on-site to minimise the impact. Worker and public Health and Safety concerns will take precedence over environmental discharges, should it be unsafe to employ controls or emergency measures immediately. As a minimum, the Site Supervisor should have received non-certified training in asbestos identification, safe handling and suitable controls, to ensure that if asbestos / asbestos containing materials (ACMs) are encountered they are identified and appropriately managed. Written evidence of the training shall be kept on record.
Contaminated Land Specialist – ENGEO	A company with Suitably Qualified and Experienced Practitioners (SQEPs) in contaminated land management shall be appointed to liaise with the contractor during the course of the works. A SQEP or their nominated representative from the Contaminated Land Specialist company shall: • Visit the site on at least two occasions during remedial works to assess the controls and procedures on-site, as they relate to this RAP. • Perform validation works. • Provide environmental support during site works (if required) and prepare an appropriate closure report at the completion of works.

3 Site Information and History

Two dwellings and a shed are location in the northwest portion of the site, near the western boundary. The balance of the site is grassed. The site setting is summarised in Table 3.

Table 3: Site Setting

Item	Description
Local Setting	The site is located in a rural residential area. Neighbouring land to the east, south, and west comprise rural residential land use. The Waiarohia Inlet is located to the north of the site.
Geology	The site is mapped by GNS Science as being underlain by Puketoka Formation alluvium in the southern portion of the site, comprising pumiceous mud, sand, and gravel with lenses of muddy peat and lignite. The northern portion of the site is mapped as being underlain by East Coast Bays Formation, comprising alternating sandstone and mudstone with variable volcanic content
Topography	The eastern portion of the site slopes gently down to the west / northwest, and the western third slopes to the west.
Hydrology	An overland flow path is mapped by Auckland Council as flowing east to west through the southern portion of the site, into the Waiarohia Inlet, a tributary of the Waitakere Harbour.
Hydrogeology	A groundwater assessment was not completed as part of this investigation; however, during the geotechnical investigation (ENGEO, 2023b) groundwater was encountered between 1.8 m and 3.6 m below ground level. Based on the topography of the site, the mapped overland flow path and the nearest watercourse, shallow groundwater likely flows in an east to west/northwest direction.

3.1 Previous Investigation

ENGEO completed a PSI / DSI at the site in October 2023 (ENGEO, 2023a).

Based on our desktop review and site observations, the site has historically been used as horticultural land from the early 1980s to 2020. Based on the aerial photograph review, stockpiling of vegetation, domestic waste and vineyard posts appears to be associated with this activity. The former and existing buildings were / are present in the northwest quadrant of the site. Leaks and spills from the use of fuels / oils, and filling (likely reworked native material) was observed during the intrusive investigation. Due to the historical land uses there was considered to be potential for metals, organochlorine pesticides (OCPs), hydrocarbons and asbestos to contaminate soils.

Findings of the intrusive investigation works are summarised below:

- An elevated arsenic concentration was reported in the topsoil sample collected from an area where vegetation is being stockpiled in the southwest portion of the site. The result exceeds the adopted human health criterion and will require remediation. The source is likely associated with the vegetation and domestic waste that is / was stockpiled and burned here, and it is considered likely that it is isolated in extent. The impacted soil is likely limited to the footprint of the pile.
- Surface soil which appeared to be visually impacted by hydrocarbons was observed in the lean-to shed where fuel storage and refuelling of machinery appeared to occur. Whilst the concentrations in a surface soil sample analysed did not exceed human health or environmental criteria, it is recommended that visually impacted material is removed from this area for aesthetic purposes.
- No asbestos was detected in the samples analysed.
- Concentrations of heavy metals / metalloids (arsenic, copper and nickel) and petroleum hydrocarbons were recorded that exceed background concentrations in samples collected from soil in the shed and stockpile of vegetation in the western portion of the site. This material is not consistent with Auckland Councils definition of cleanfill and would need to be disposed of at an appropriately licenced managed fill or landfill site if it is removed from the site. Additionally, whilst concentrations of contaminant in samples collected from the other piles did not exceed assessment criteria, it is recommended that a surface soil scrape is undertaken, and material disposed as managed / controlled fill material.

The summary of results table (extracted from the PSI / DSI (ENGEO, 2023a)) is included in Appendix 1, and a site investigation plan is included as Figure 1.

A conceptual site model was prepared based on the findings of the intrusive investigation and is summarised below.

Table 4: Conceptual Site Model

Potential source of contamination	Potential Pathway	Potential Receptor	Acceptable Risk?
Potential persistent pesticide application in horticultural areas *Heavy metals / metalloids and organochlorine pesticides (OCPs)* *(HAIL ID: A10)*	Soil ingestion, inhalation of dust, and / or dermal contact	Future site users / site redevelopment workers Surrounding residents	**Yes** The concentration of contaminants of concern were below human health and environmental criteria.
	Leaching of contaminants	Surrounding environment	
Potential lead-based paint on former and existing buildings *Lead* *(HAIL ID: I)*	Soil ingestion, inhalation of dust, and / or dermal contact	Future site users / site redevelopment workers Surrounding residents	**Yes** The concentration of contaminants of concern were below human health and environmental criteria.
	Leaching of contaminants	Surrounding environment	
Building materials containing asbestos (former buildings) *Asbestos fines and fibrous asbestos (HAIL ID: I)*	Inhalation of asbestos fibres released from impacted soils / dust	Future site users / site redevelopment workers Surrounding residents	**Yes** No asbestos was detected in the samples analysed.
Leaks and spills during use of fuels and oils *Heavy metals / metalloids and petroleum hydrocarbons (TPHs) (HAIL ID: I)*	Soil ingestion, inhalation of dust, and / or dermal contact	Future site users / site redevelopment workers Surrounding residents	**Yes** The concentration of contaminants of concern were below human health and environmental criteria. However, it is recommended that visually impacted material is removed from this area.
	Leaching of contaminants	Surrounding environment	**Yes** The concentration of contaminants of concern were below environmental criteria.

Potential source of contamination	Potential Pathway	Potential Receptor	Acceptable Risk?
Burning of vegetation and domestic rubbish in piles on-site *Heavy metals / metalloids and polycyclic aromatic hydrocarbons (PAHs) (HAIL ID: I)*	Soil ingestion, inhalation of dust, and / or dermal contact	Future site users / site redevelopment workers Surrounding residents	**No** The concentration of contaminants of concern exceeded the human health criteria at one location (S02, which will require remediation. whilst concentrations of contaminant in samples collected from the other piles did not exceed assessment criteria, it is recommended that a surface soil scrape is undertaken, and material disposed as managed / controlled fill material.
	Leaching of contaminants	Surrounding environment	**Yes** The concentration of contaminants of concern were below environmental criteria.

Note: HAIL IDs refer to activities included on the Hazardous Activities and Industries List (HAIL; MfE, 2011a).

4 Summary of Development Activities Relevant to this RAP

Site Preparation

Site preparation activities include site establishment (i.e., mobilisation, erecting fences, and establishing site security) and set-up of stormwater / silt control measures.

Earthworks

All soil disturbance works including topsoil stripping, excavations for utility installation, construction of building platforms, and foundation excavations.

5 Proposed Additional Investigation Works

Following demolition of buildings and removal of areas of hard standing a walkover inspection will be undertaken by a SQEP or their representative, working under their supervision, to identify any visual or olfactory evidence of contamination. If areas of potential concern are noted, soil samples will be recovered from those areas for analysis of an appropriate suite of potential contaminants.

6 Remedial Works

6.1 Remediation Options

The remedial objective is to reduce risk to future site users and environmental receptors associated with the presence of elevated concentrations of contaminants in some locations at the site. The following potential remediation options have been identified for this site.

Off-site Disposal

Removal and off-site disposal at an appropriately licensed landfill facility of soil that has been identified as containing concentrations of contaminants either above the adopted human health criteria or the environmental discharge criteria.

Off-site disposal at an appropriately licensed landfill facility permanently removes the risk to human health and environmental receptors associated with the soil identified as containing concentrations of contaminants above the adopted human health criteria or the environmental discharge criteria. This option also has the advantage that there is no requirement for long-term management.

Encapsulation / Capping / Re-use

This remedial strategy is considered to offer a more sustainable approach and can be equally or more protective than disposing of material at a landfill. This option involves the placement of a suitable capping layer over the area where impacted material is proposed to be retained *in situ*. The cap will generally consist of the following placed above the leveled site surface:

Beneath building foundations and external hard surfaced areas:

- Concrete slab;
- Damp proof membrane; and
- Fill material placed and compacted to a specified thickness and specification.

Beneath communal recreational / amenity soft landscaped areas:

- A minimum of 500 mm clean imported soil; and
- A warning layer of geotextile cloth.

This option avoids the cost of transportation and disposal of the material; however, groundwater monitoring may be required around areas identified as exceeding the environmental discharge criteria to verify that contamination hasn't impacted groundwater and to assess the need for a long-term discharge consent associated with the impacted material.

To ensure appropriate long-term management of the site, as-built drawings will need to be prepared. This can be accomplished by surveying the site, prior and post placement of the capping layer. The as-built survey plans will confirm the capping has been placed in accordance with the design and will also provide information regarding the depth to contaminated materials for future site excavation activities.

6.2 Remediation Strategy

As the identified contamination is likely limited to shallow soil, which is likely to be geotechnically unsuitable to remain *in situ*, and the estimated remedial volume is small, the preferred remedial strategy is off-site disposal.

6.3 Remediation Volume

Based on the results of the PSI / DSI, an estimate of the soil volume requiring remediation is provided in Table 5. The locations of the remedial areas are presented on Figure 1. The remedial area may extend (or reduce) if contamination is found that varies from what is currently known.

Table 5: Remedial Volume Estimation (based on current dataset)

Remedial Area	Sample exceeding relevant criteria	Exceedance	Estimated Area of Impact (m^2)	Estimated Depth of Impact (m below ground level)	Estimated Volume of Impacted Material (m^3)
RA1 (former stockpile)	S02	Arsenic	25 [1]	0.3 [2]	7.5
RA2 (shed lean-to)	Hydrocarbon impacted soil	-	50 [1]	0.3 [2]	15

Notes:

[1] Estimated area is likely conservative as the lateral extent of contamination has not been determined. The estimate assumes that impacted soil is limited to the area of stockpiled material (RA1) and visually impacted soil in the lean-to shed (RA2).

[2] Vertical extent of contamination is an estimate. Based on the source of contamination, the impact is considered likely limited to shallow soil. Successful remediation will be confirmed through validation sampling.

6.4 Remediation Controls

Any remedial earthworks shall be completed and validated prior to the bulk topsoil strip to minimise the potential for accidental mixing of impacted soils with non-impacted soils.

Earthworks involving disturbance of soils within the remedial areas should be undertaken in accordance with the controls in Section 7. During the remedial works, a Contaminated Land Specialist shall be engaged to visit the site to verify that earthworks are being conducted in accordance with the methodology, and controls listed within this document.

6.5 Validation and Oversight

Following removal of impacted soils, a Contaminated Land Specialist shall be engaged to collect validation samples (Remedial Area RA1). Samples from RA1 are to be collected from the base and sidewalls of the remedial area with a minimum of five samples collected; the planned validation sampling strategy may be amended based on site observations or upon discovery of additional information, however changes to the sampling strategy shall be justified by the Contaminated Land Specialist in the validation report. Samples shall be analysed at an accredited laboratory for arsenic.

The results shall be assessed against the remedial criteria presented in Table 6. If soil validation sampling indicates that the remaining soils exceed the remedial criteria, the Contaminated Land Specialist will advise further remedial actions to achieve the remedial objectives. If this requires a change to the remedial strategy, then this should be communicated to Auckland Council for approval in advance.

In addition to the above, following removal of impacted soils from (Remedial Area RA2) and the footprint of piles, a Contaminated Land Specialist shall be engaged to visually assess and screen soil using a Photoionization Detector.

6.6 Assessment Criteria

The remedial criteria have been selected from the lesser of the human health and environmental discharge criteria for each contaminant and are provided in Table 6 below.

Table 6: Adopted Remedial Criteria

Contaminant of Concern	Remedial Goal	Remedial Goal Source
Arsenic	20 mg / kg	Residential soil contaminant Standard from Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health (MfE, 2011b)

If additional unexpected contamination is encountered during the works, appropriate remedial criteria shall be selected from the Auckland Unitary Plan (AUP, 2016), the Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health (MfE, 2011b) and following MfE Contaminated Land Management Guidelines No. 2 (MfE, 2011c).

7 Site Management Practices and Controls

7.1 Controlled Soil

Concentrations of heavy metals / metalloids (copper and nickel) and hydrocarbons exceed background concentrations but are below the adopted human health and environmental criteria for the site. Some earthwork controls, as discussed in Section 7 are needed during disturbance of this material.

The material is not consistent with Auckland Council's definition of cleanfill and would need to be managed on site and / or be disposed of at an appropriately licenced managed fill or landfill site if it is removed from the site.

7.2 Earthworks Controls

The site management practices in Table 7 shall be implemented during ground-disturbing works in the remedial areas, and controlled soil. Many of the required control measures are standard construction site procedures; however, the relevance and effectiveness of these protocols shall be reviewed by the Site Supervisor on a daily basis during works in these areas of the site. The Site Controls summary in Appendix 2 provides an overview of controls required. It is anticipated that this will be displayed on-site for contractor reference.

Earthworks outside of the remedial areas can be managed under controls appropriate for similar earthworks activities on an uncontaminated site, however, care must be taken to identify potential unanticipated contamination (refer to Section 9).

During the works, a SQEP shall visit the site to observe site activities and confirm that the works are being performed in accordance with this RAP. The number of visits required will be subject to the staging and duration of works; however, at least two site visits will be performed.

Table 7: Site Management Practices

General Site Procedures	Contractor staff, subcontractors and visitors shall be inducted before entering the site or commencing work to ensure they are aware of the potential hazards relating to contaminated soil at the site. The following general safety procedures shall be followed by all staff entering or working in the immediate area of the earthworks: • Site workers shall avoid unnecessary contact with site soils. • Hands are to be washed prior to eating, drinking or smoking. All incidents shall be reported to the main contractor's health and safety advisor, or equivalent responsible person on-site.
Personal Protective Equipment (PPE)	To minimise the effects of potential contamination exposure via incidental ingestion of soil, skin contact or inhalation of dust anyone entering the remedial areas should wear the following PPE in addition to standard PPE requirements for construction sites (e.g. safety boots): • Disposable gloves if contact with soil is unavoidable. For the remainder of the site the following should be considered over-and-above standard PPE requirements for construction sites (e.g. safety boots): • P2 Dust mask (if visible dust is present). • Work gloves / Coveralls (if contact with soil unavoidable) • Goggles / safety glasses.

Boundary Controls		Security fencing and appropriate warning signs shall be erected around earthworks areas to prevent unauthorised access. Appropriate sediment control measures shall be implemented to minimise sediment runoff from the site. Minimum controls shall include: • A stabilised site entrance to minimise the movement of soil off-site. • Suitable sediment controls (e.g., silt fencing) placed around the perimeter of the works area and stormwater drains where there is a potential for runoff. Set up of clean and dirty areas to minimise tracking potentially impacted soils around the site and off-site. • Machinery used in the remedial areas should be cleaned of loose soil in a designated 'wash down' area (e.g., paved area or area of existing hardfill), including wheel/track washing (if appropriate), prior to leaving site. • Once loose soil has been removed, the cleaned item can be moved to the clean area. Any wastewater generated should not be discharged off-site and should be allowed to drain back into the site. • Imported rock / utilised in the 'wash down area' and / or 'truck loading area' (if relevant) should be disposed of as contaminated material, unless tested.
Stockpiling		Stockpiling of contaminated material shall be avoided. If temporary stockpiling of material is necessary, dust shall be controlled through wetting during the workday. If left overnight, the material shall be covered (e.g., with plastic) and protected by erosion / sediment controls (e.g., bunded). Stockpiles shall be located on an impermeable surface. If this is not possible, the underlying material should be considered potentially contaminated, and shall be managed / disposed of appropriately.
Groundwater	Site Specific Detail	A groundwater assessment was not completed as part of the previous investigation; however, observations during the geotechnical investigation (ENGEO, 2023b) indicates groundwater is variable. Dewatering may be required during earthworks, if dewatering is undertaken, disposal options are as follows.
	Discharge to Land On-site	Groundwater may be discharged to land on-site (either directly or after interim storage on-site), provided it complies with the permitted activity standards outlined in Section E4.6.1 and E4.6.2.5 of the Auckland Unitary Plan (AUP, 2016). These controls include restrictions on any changes to colour or visual clarity, odour emissions or effects on aquatic life.
	Discharge to Stormwater or Surface Water	Approval shall be sought from Auckland Council [for stormwater] or Watercare [for wastewater]) prior to discharge to the stormwater or wastewater network. Note: No free-phase hydrocarbons shall be permitted to be discharged into stormwater system.

Stormwater	Uncontrolled discharge of stormwater from earthworks sites is not permitted. If the on-site erosion and sediment control measures fail, a vacuum truck shall be called to site immediately so that the discharge of stormwater from site is eliminated. It may be necessary to test any such water removed off-site to identify an appropriate disposal site.
Dust	Dust shall be managed in accordance with consent requirements and relevant regulations. The contractor shall consider the following (as appropriate): • Limit vehicle access onto the excavated areas as far as possible. • Dampen surface soil using a water truck or portable water mist. Ensure that the volume of water used does not induce soil erosion, or cause surface ponding or runoff, that could discharge into natural water bodies or stormwater drains. • Use wind screens or avoid work during windy conditions. • Consider use of surfactants or polymers where a reliable source of water is not available. In the unlikely event that unsatisfactory dust emissions emanate from the site on a sustained basis or complaints are received in relation to the works, mitigation of the adverse effects shall be applied in accordance with the hierarchy of control described in the Health and Safety at Work Act 2015 (MBIE, 2015) - eliminate the risk, so far as is reasonably practicable; and if it is not reasonably practicable to eliminate a risk, to minimise those risks so far as is reasonably practicable. If the emission or discharges persist, professional advice shall be sought in order to define appropriate control measures. It is also recommended that consultation with appropriate council representatives be undertaken prior to recommencing works.
Odour	If excavated material is odorous, odour control measures shall be put in place. This could include covering the material with cleanfill, a polythene cover or instituting a deodoriser system.

Soil Disposal and Management	Trucks shall be loaded within the site where runoff and possible spills during loading will be controlled and contained. Loads must be securely covered before leaving site and during off-site transport. Soil must be taken directly to an appropriate soil disposal facility authorised to accept the contaminants present. No loaded trucks should be parked overnight anywhere other than on site or at the disposal facility (following their written agreement). Prior to acceptance, the results of the soil testing, may be requested by the receiving facility. Requirements for additional testing and truck lining / soil wrapping should be confirmed with the receiving landfill. Outside the remedial and controlled soil area (Figure 1), soil / fill material being disturbed during redevelopment earthworks is suitable to remain on-site. If off-site disposal is required, such material may comply with the Auckland Council definition of cleanfill material; however, further testing is required to confirm this.

8 Asbestos Controls

Based on the findings of the previous investigations it is currently not anticipated that soil impacted by asbestos is present at the site, however care must be taken to identify any potential asbestos containing material (ACM) during earthworks activities. The earthworks contractor shall contact the Contaminated Land Specialist if areas of potential contamination are discovered during works.

If asbestos is identified as part of the additional investigation works (Section 5) or during the redevelopment works (e.g., if asbestos cement pipes are encountered), the controls for the relevant asbestos works classification in Appendix 3 shall be implemented. As asbestos is considered primarily a human health contaminant, the objective of these asbestos controls is to eliminate personal exposure to airborne asbestos on and off-site, so far as reasonably practicable. The Health and Safety at Work (Asbestos) Regulations 2016 (herein referred to as 'the HSW(A)R') requires that if it is not reasonably practicable to eliminate personal exposure to airborne asbestos, exposure must be minimised, so far as is reasonably practicable. The Contaminated Land Specialist shall assess the appropriate level of asbestos controls to be implemented.

The control measures in Appendix 3 aim to address the Safe Work Practices specified in the ACOP (WorkSafe, 2016), and the NZ GAMAS (BRANZ, 2017); an asbestos removal plan will need to be prepared if asbestos pipes are identified. As the NZGAMAS (BRANZ, 2017) is referenced in the WorkSafe ACOP, the NZGAMAS (BRANZ, 2017) or higher level of controls are required to be adhered to.

9 Unanticipated Ground Conditions

Should any unanticipated contaminated material be uncovered during earthworks, works shall stop in that area and a SQEP from the Contaminated Land Specialist contacted to assess the potential risk and advise on what measures should be taken to manage the soil in that area.

Typical indicators of contamination include but are not limited to:

- Buried waste (for example drums or tanks with unknown liquid).
- Odour (petroleum hydrocarbons, solvent).
- Discoloured soil (black, purple, or green staining most common).
- Asbestos containing materials (ACM) as fragments visible to the naked eye.
- Uncontrolled fill material.

Examples of typical indicators of contamination have been provided in Table 8.

Table 8: Typical indicators of contamination

Uncontrolled Filling Building debris may contain asbestos or other contaminants.	 
Asbestos Containing Material Intact sheets, gaskets, fabric or pieces thereof, may be mixed with other material	
Separate-phase Hydrocarbons Black liquid, odours, sheen	

10 Documentation

In order to demonstrate that the requirements of this RAP have been adhered to, the documents listed in Table 9 should be forwarded to the Contaminated Land Specialist in the timeframes stipulated in the table. These documents will be included in a completion report for the site (discussed further in Section 11).

Table 9: Contractor Documentation

Prior to Earthworks Commencing	• Written confirmation from the proposed disposal site(s) confirming that they are able to accept excess material from the site and stating which type(s) of material. • For any material that is to be imported to the site as cleanfill on the basis of direct testing, a copy of the analytical laboratory test report must be provided prior to transport.

Within Two Weeks of Earthworks Being Completed (or on an ongoing basis during works)	• Daily site photographs showing the site entrance, the area of work, sediment control measures, other structural control measures and any stockpiles resulting from the works.
	• A site plan showing any areas where site-won controlled material has been reused.
	• **Disposal dockets** for each load of material that is removed from the site. The dockets should contain the following information:
	  ○ Date and time dispatched.
	  ○ Material description.
	  ○ The volume of material in the load.
	  ○ Haulage contractor details (name, address, contact person, contact telephone number).
	  ○ Truck and trailer registration number.
	  ○ The destination of material.
	• Documentation for **all imported fill** which shall include:
	  ○ Date and time dispatched.
	  ○ Address of source site.
	  ○ Type and proposed use of material.
	  ○ Weight and / or volume of material carried.
	  ○ Basis for treating the material as cleanfill (e.g., directly tested and confirmed to be cleanfill or directly sourced from a licensed quarry).
	• Information relating to any incidents or complaints and how these were managed.

11 Completion Reporting

A SVR will need to be prepared following remedial earthworks. The SVR should be prepared in accordance with MfE Contaminated Land Management Guideline No. 1 (MfE, 2021) by a Contaminated Land Specialist SQEP or their nominated representative, who has monitored the earthworks on-site. The report shall, as a minimum, include the following information:

- A description of the additional investigation works undertaken (if relevant) and the results thereof.
- A summary of the remedial works undertaken, including the location and dimensions of the excavations carried out and the volume of soil excavated and / or capping undertaken.
- Documentation relating to the disposal of contaminated soil / fill and used PPE.
- Documentation relating to the importation of cleanfill (if relevant).
- Results of validation works.
- A statement of whether soils remaining on-site are considered, based on the work undertaken, to present an unacceptable risk to human health or environmental receptors and the need for long term controls or consents.

12 Limitations

i. We have prepared this report in accordance with the brief as provided. This report has been prepared for the use of our client, Cabra Developments Limited, their professional advisers and the relevant Territorial Authorities in relation to the specified project brief described in this report. No liability is accepted for the use of any part of the report for any other purpose or by any other person or entity.

ii. The recommendations in this report are based on the ground conditions indicated from published sources, site assessments and subsurface investigations described in this report based on accepted normal methods of site investigations. Only a limited amount of information has been collected to meet the specific financial and technical requirements of the client's brief and this report does not purport to completely describe all the site characteristics and properties. The nature and continuity of the ground between test locations has been inferred using experience and judgement and it should be appreciated that actual conditions could vary from the assumed model.

iii. Subsurface conditions relevant to construction works should be assessed by contractors who can make their own interpretation of the factual data provided. They should perform any additional tests as necessary for their own purposes.

iv. This Limitation should be read in conjunction with the Engineering NZ/ACENZ Standard Terms of Engagement.

v. This report is not to be reproduced either wholly or in part without our prior written permission.

We trust that this information meets your current requirements. Please do not hesitate to contact the undersigned on (09) 972 2205 if you require any further information.

Report prepared by

Claire Davies, CEnvP

Associate Environmental Consultant

Report reviewed by

Jamie Rhodes, CEnvP (SC)

Associate Environmental Engineer

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WorkSafe, 2016. WorkSafe. WorkSafe Approved Code of Practice.

FIGURES

Legend

- Site Boundary
- Controlled / Managed Fill
- Estimated Remedial Works Area
- Environmental Investigation Location

0 25 m 50 m

ENGEO

Produced by **Datanest.earth**

Title: Soil Management Areas		
Client: Cabra Developments Limited		Figure No.: 1 Size: A3
Project: 15 Clarks Lane, Whenuapai	Drawn: CD	
Date: 24-10-2023	Checked: JR	
Proj No.: 23849.000.001_02	Scale: 1:1200	Version: Final

APPENDIX 1:

Soil Results

Results Table A: Comparison of Soil Results to Assessment Criteria

				Heavy Metals/Metalloids								Polycyclic Aromatic Hydrocarbons	Total Petroleum Hydrocarbons				Organochlorine Pesticides	Semi-Volatile Organic Compounds	Asbestos	
Sample Name	Depth (m bgl)	Sample ID	Date	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc	All PAHs	C7-C9	C10-C14	C15-C36	Total C7-C36	All OCPs	All SVOCs	Asbestos Containing Material (ACM)	Asbestos Fines / Friable Asbestos (AF/FA)
S01	0.0 - 0.2	S01 0.0 - 0.2	22-Aug-23	1.5	0.19	5.6	27	5.8	0.05	2.3	24	-	-	-	-	-	-	<LOR	-	-
S02	0.0 - 0.3	S02 0.0 - 0.3	22-Aug-23	126	0.22	27	47	9.2	0.05	3.2	32	-	-	-	-	-	-	<LOR	-	-
S04	0.0 - 0.1	S04 0.0 - 0.1	22-Aug-23	8.5	0.2	15	43	15	0.08	13	130	<LOR	100	< 10	120000 **	120000	-	-	-	-
S05	0.0 - 0.1	S05 0.0 - 0.1	22-Aug-23	8.7	0.3	10	69	17	0.15	22	92	-	-	-	-	-	-	-	-	-
S06	0.0 - 0.1	S06 0.0 - 0.1	22-Aug-23	0.7	0.03	6.3	18	1.6	< 0.01	36	33	-	-	-	-	-	-	-	-	-
S07	0.0 -0.2	S07 0.0 - 0.2	22-Aug-23	4.2	0.62	11	25	13	0.22	4	22	-	-	-	-	-	-	-	-	-
S08	0.0 - 0.2	S08 0.0 - 0.2	22-Aug-23	3.7	0.64	10	13	9.4	0.19	3.3	21	-	-	-	-	-	-	-	-	-
S09	0.0 - 0.2	S09 0.0 - 0.2	22-Aug-23	5.6	0.44	8.2	29	9.2	0.15	3.4	47	-	-	-	-	-	-	<LOR	-	-
S10	0.0 - 0.15	S10 0.0 - 0.15	22-Aug-23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NAD	NAD
	0.15 - 0.55	S10 0.15 - 0.55	22-Aug-23	2	0.05	12	5.7	5.1	0.15	3.3	8.8	-	-	-	-	-	-	-	NAD	NAD
	0.55 - 0.7	S10 0.55 - 0.7	22-Aug-23	0.6	0.03	2.5	1.9	2.3	0.06	0.7	< 5	-	-	-	-	-	-	-	-	-
S12	0.0 - 0.15	S12 0.0 - 0.15	22-Aug-23	2.1	0.44	7.4	19	8.8	0.2	3.1	23	-	-	-	-	-	-	-	-	-
	0.15 - 0.25	S12 0.15 - 0.25	22-Aug-23	2	0.17	5.2	6.7	7.2	0.25	2.5	14	-	-	-	-	-	-	-	-	-
S15	0.0 - 0.2	S15 0.0 - 0.2	22-Aug-23	1.2	0.4	5.6	19	5.1	0.06	1.9	12	-	-	-	-	-	-	-	-	-
	0.2 - 0.3	S15 0.2 - 0.3	22-Aug-23	1.3	0.03	2.6	1.8	5.4	0.14	1.5	< 5	-	-	-	-	-	-	-	-	-
S17	0.0 - 0.1	S17 0.0 - 0.1	22-Aug-23	1.6	0.26	7.3	11	7.4	0.06	3.4	13	-	-	-	-	-	-	-	-	-
	0.1 - 0.3	S17 0.1 - 0.3	22-Aug-23	1.9	0.11	9.7	7	5.7	0.08	3.8	130	-	-	-	-	-	-	-	NAD	NAD
	0.3 - 0.5	S17 0.3 - 0.5	22-Aug-23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NAD	NAD
CS01A - CS01C	0.0 - 0.2	CS01 (composite of CS01A 0.0-0.2 CS01B 0.0-0.2 and CS01C 0.0-0.1)	22-Aug-23	1.4	0.22	6.5	18	6.4	0.06	1.6	14	-	-	-	-	-	<LOR	-	-	-
CS02A - CS02C	0.0 - 0.25	(composite of CS02A 0.0-0.2 CS02B 0.0-0.15 and CS02C 0.0-0.25)	22-Aug-23	3.1	0.5	8.9	21	9.7	0.18	3.9	26	-	-	-	-	-	<LOR	-	-	-
CS03A - CS03C	0.0 - 0.1	(Composite of CS03A 0.0-0.1 CS03B 0.0-0.1 AND CS03C 0.0-0.1)	22-Aug-23	1.5	0.29	4.8	25	7	0.1	2.2	33	-	-	-	-	-	<LOR	-	-	-
CS03C	0.3 - 0.4	CS03C 0.3 - 0.4	22-Aug-23	1.7	0.33	5.9	19	6.7	0.06	2	12	-	-	-	-	-	-	-	-	-
	1.2 - 1.3	CS03C 1.2-1.3	22-Aug-23	1.1	0.02	11	5.2	6.1	0.08	3.8	6.4	-	-	-	-	-	<LOR	-	-	-
CS04A - CS04C	0.0 - 0.2	(composite of CS04A 0.0-0.2 CS04B 0.0-0.2 and CS04C 0.0-0.15)	22-Aug-23	1.3	0.05	5.3	5.9	13	0.15	2.3	22	-	-	-	-	-	<LOR	-	-	-
Assessment Criteria:																				
Human Health Criteria (High-Density Residential) [1]				45	230	1500	10000	500	1000	1200	60000	various	2700	560	NA	-	various	various	0.04	0.001
Human Health Criteria (Residential) [1]				20	3	460	10000	210	310	400	7400	various	2700	560	NA	-	various	various	0.01	0.001
Environmental Criteria (Auckland Unitary Plan) [2]				100	7.5	400	325	250	0.75	105	400	various	NA [11]	NA [11]	NA [11]	-	various	various	-	-
Background Criteria (Auckland - Non-Volcanic) [3]				0.4 - 12	< 0.1 - 0.65	2 - 55	1 - 45	< 5 - 65	<0.03 - 0.45	0.9 - 35	9 - 180	< LOR	< LOR	< LOR	< LOR	< LOR	< LOR	< LOR	< LOR	< LOR

Notes:

All results and criteria are presented in mg/kg dry weight basis, except asbestos which is reported as %w/w
Full results are included in the laboratory reports
LOR: Limit of Reporting. Results below LOR or background are shown in grey text
- : not analysed or no applicable criteria

1: MfE (2011) Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health (High-Density Residential Land Use), or selected in accordance with CLMG No. 2
2: Permitted activity standards selected in accordance with Section E30.6.1.4 of the Auckland Unitary Plan (Auckland Council, 2016).
3: Background Ranges of Trace Elements in Auckland Soils (Non-Volcanic Range). Table E30.6.1.4.2 of the AUP (Auckland Council, 2016).
4. Assumes soil pH of 5.
5. Criteria for Chromium (VI) conservatively selected.
6. NEPM (1999) Health Investigation Levels. Residential B criteria listed.
7. New Zealand Guidelines for Assessing and Managing Asbestos in Soil (BRANZ, 2017) High-Density Residential Land Use.
8. New Zealand Guidelines for Assessing and Managing Asbestos in Soil (BRANZ, 2017) All Land Uses
9. Petroleum Hydrocarbon Guidelines (MfE, 2011). Criteria from Table 4.13 (All Pathways) for Residential land use, Silty Clay and contamination depth < 1m
10. Petroleum Hydrocarbon Guidelines (MfE, 2011). Criteria for Protection of Groundwater Quality from Table 4.20 for Silty Clay; contamination depth < 1m and groundwater depth 2m
11. NA indicates estimated criterion exceeds 20,000 mg/kg, at which the residual separate phase is expected to be formed. However, we note that no separate phase hydrocarbons were observed during the investigaiton.

APPENDIX 2:

Site Controls

Site Controls Relating to Contamination

15 Clarks Lane, Hobsonville

SITE SUMMARY

Proposed works	Soil disturbance works associated with a residential development.
Contaminants identified on-site	Metals (arsenic) in an isolated area (RA1) at concentrations above the human health criterion. Soil visually impacted with hydrocarbons was observed in the lean-to shed (RA2).
Potential Risks to Site Workers	Incidental skin contact, ingestion of soil, or inhalation of dust should be avoided / mitigated through use of PPE and welfare measures.

KEY CONTACTS

Auckland Council Pollution Hotline	(09) 377 3107
WorkSafe	0800 030 040
Contaminated Land Specialist (ENGEO)	(09) 972 2205

HEALTH & SAFETY

All contractors and visitor shall be **inducted** before entering or commencing work to ensure they are **aware of the potential hazards** relating to contaminated soil at the site.

As a minimum, facilities to wash and dry hands prior to eating, drinking or vaping / smoking should be provided.

PPE / RPE *to minimise the effects of potential contamination exposure.* Along with standard PPE requirements for construction sites (e.g., safety boots) the following should be considered:

- ☐ P2 Dust mask.

In other areas the following should be considered:

- ☐ P2 Dust mask (if visible dust is present).
- ☐ Work gloves / Coveralls (if contact with soil unavoidable)
- ☐ Goggles / safety glasses (if visible dust is present)

UNEXPECTED DISCOVERY

Works shall be immediately stopped and the Contaminated Land Specialist contacted should any areas of potential contamination be discovered during works. Typical indicators of contamination are asbestos containing material, staining, odorous material, visible sheen on water.

MANAGED / CONTROLLED FILL *Soil is suitable to remain on-site however contaminant concentrations for disposal purposes exceed cleanfill criteria*

REMEDIAL WORKS AREA *Remediation of soils in accordance with the RAP is required due to exceedance of assessment criteria.*

- ☐ Estimated area is likely conservative as the lateral extent of contamination has nc been determined. The estimate assumes that impacted soil is limited to the area of stockpiled material (RA1) and visually impacted soil in the lean-to shed (RA2).
- ☐ Vertical extent of contamination is an estimate. Based on the source of contamination, the impact is considered likely limited to shallow soil. Successful remediation will be confirmed through validation sampling.

Non-shaded areas are considered likely **CLEANFILL** with no specific management requirements.

ADDITIONAL OVERSIGHT BY SQEP

- ☐ Observation and testing of soil / sub-base following removal of building platforms / hardstand.
- ☐ Validation sampling / Verification.

DAILY SITE CHECK *(take photographs to record check)*

- ☐ **Security fencing** and appropriate **warning signs** are in place.
- ☐ **Sediment control measures** in good condition and working as designed.
- ☐ Check site entrance and adjacent public road for silt / sediment deposition.
- ☐ Check integrity of stockpile controls (if applicable).
- ☐ Check excavations to see if **perched groundwater or surface water** requires removal. Approval from local authority is required to discharge to local network – refer to RAP.

GENERAL SITE CONTROLS

- ☐ Dust shall be managed in accordance with consent requirements and relevant regulations.
- ☐ If excavated material is **odorous**, odour control measures shall be put in place.
- ☐ If **perched groundwater or surface water** is encountered the controls in the RAP shall be implemented.
- ☐ If **temporary stockpiling of non-cleanfill material** is necessary, dust shall be controlled through wetting during the workday. If left overnight, the material shall be covered (e.g., with plastic) and protected by erosion / sediment controls (e.g., bunded).
- ☐ Stockpiles of non-cleanfill material shall be located either on an impermeable surface, or the underlying material should be considered potentially contaminated, and shall be managed in accordance with the RAP.
- ☐ Clean and dirty areas should be managed to prevent tracking potentially impacted soils around the site and off-site.
- ☐ Wastewater generated, or rock / soil utilised in a truck loading area should be disposed of as contaminated material, unless tested.

RECORD KEEPING

- ☐ Daily photographs to be made available on request.
- ☐ Disposal dockets for all material should be forwarded to the Contaminated Land Specialist.
- ☐ Fill imported to site shall meet the Auckland Council definition of cleanfill.
- ☐ The location of any contaminated soils retained on-site shall be recorded on as built drawings.

OFF-SITE DISPOSAL OF CONTAMINATED SOIL

- ☐ Trucks shall be loaded in a location within the site where runoff and possible spills during loading will be controlled and contained. Loads must be securely covered during off-site transport. Soil must be taken to an appropriate soil disposal facility authorised to accept the contaminants identified.
- ☐ Prior to acceptance the results of the soil testing may be requested by the receiving facility.
- ☐ Requirements for additional testing and truck lining / soil wrapping should be confirmed with the receiving landfill.
- ☐ Further testing may be required to assess whether deeper material is cleanfill / managed fill.

For details of the controls refer to the current site-specific RAP prepared by ENGEO. All site staff and subcontractors are aware of and comply with the procedures and health and safety requirements contained within this document.

APPENDIX 3:

Asbestos Controls

15 Clarks Lane, Whenuapai
Asbestos Controls

Scenario (NZ GAMAS 2017 definitions)	Control Measure Objectives	Unlicensed Asbestos Work	Asbestos-related Work	Class B: non-friable	Class A: friable	*Source Guideline Reference*
FA/AF % w/w in soil		≤ 0.001	> 0.001	> 0.01	> 1	
ACM % w/w		≤ 0.01%	> 0.01	> 1	-	
Scale, soil volume		≤ NESCS	> NESCS	-	-	
Asbestos in air		< 0.01 f/mL in air	< 0.01 f/mL in air	≥ 0.01 f/mL in air	≥ 0.01 f/mL in air	
REMOVAL WORKS RESPONSIBILITIES						
Remedial Works Supervision / Oversight	OBJECTIVE: *Undertake work by persons who have adequate knowledge and experience to assess the risks and implement appropriate control measures*	A Suitably Qualified and Experienced Practitioner (Contaminated Land – refer to NESCS)		Class B Supervisor	Class A Supervisor	*ACOP*
WorkSafe Notification		Not required		Notification five days before earthworks are to be undertaken		*ACOP*
Contractor License Requirements		Not required		Class B License	Class A License	*ACOP*
Training/Certification Requirements		Non-certified training in asbestos identification, safe handling and suitable controls. A copy of the training shall be kept on record.		Certified training for workers. Certified, competent supervisors.	Certified training for workers. Certified, competent supervisors. Certified safety management system.	*Figure 17 ACOP*
SITE SET-UP						
Boundary Controls	OBJECTIVE: *Prevent unauthorised access into works areas and accidental transport of contaminated soils on boots, clothing, equipment, skin, or in air / dust.*	Physical barriers must be in place to prevent unauthorised access.	Physical barriers must be in place to prevent unauthorised access. Warning signs must be present that clearly show that asbestos related works are underway.	Physical barriers must be in place to prevent unauthorised access. Polythene sheeting may be necessary to prevent spread of airborne fibres outside of works area. Warning signs must be present that clearly show that asbestos removal works are underway.	Physical barriers must be in place to prevent unauthorised access. Consider use of solid hoarding placed at a suitable distance beyond the works area, or full enclosure. Warning signs must be present that clearly show that asbestos removal works are underway.	*ACOP*
Personal Decontamination Facilities		Educate site workers to minimise contact with soil. Provide a boot wash and lidded and plastic lined bin for secure disposal of used PPE.	Basic disposable decontamination tent and boot wash.		Basic disposable wet decontamination tent or trailer.	*NZ GAMAS Table 6*
Dust / Asbestos Fibre Suppression	OBJECTIVE: *Minimise the release of asbestos fibres from soils.*	Minimise the size of the earthworks areas and time exposed to the elements. Stabilise exposed earth surfaces as soon as possible following works.				
		Spray mist water via localised points. Consider use of surfactants or polymers where a reliable source of water is not available. Consider implementing additional controls (as per Class B works) if sensitive receptors nearby (such as adjacent to busy centres, schools).		Spray mist water via localised points. Addition of surfactants and polymers where the location is sensitive (such as adjacent to busy centres, schools) or if a source of water is not readily available. Consider temporary cover of contaminated areas awaiting remediation.		*NZ GAMAS Table 6*

Scenario (NZ GAMAS 2017 definitions)		Control Measure Objectives	Unlicensed Asbestos Work	Asbestos-related Work	Class B: non-friable	Class A: friable	*Source Guideline Reference*
FA/AF % w/w in soil			≤ 0.001	> 0.001	> 0.01	> 1	
ACM % w/w			≤ 0.01%	> 0.01	> 1	-	
Scale, soil volume			≤ NESCS	> NESCS	-	-	
Asbestos in air			< 0.01 f/mL in air	< 0.01 f/mL in air	≥ 0.01 f/mL in air	≥ 0.01 f/mL in air	
OCCUPATIONAL HEALTH AND SAFETY							
Personal Protective Equipment & Respiratory Protective Equipment		OBJECTIVE: *Minimise workers exposure to asbestos fibres.* *Reduce accidental transport of asbestos contaminated soils off site on workers clothing, boots.*	Educate site workers to minimise contact with soil; to clean equipment and to undertake activities in a manner that reduces dust. Disposable P2 dust mask recommended.	Disposable coveralls rated type 5, category 3, nitrile gloves Steel toe capped gumboots are preferred as these can be readily washed down. Disposable overshoes can be used to prevent contamination of laces.	Half-face P3 respirator with particulate filter. Consider increasing to full-face if friable ACM present.	Full-face P3 respirator with particulate filter. Consider increasing to power-assisted if required.	*NZ GAMAS Table 6* *NZ GAMAS Table 6* *Refer to Part C section 14 of the ACOP and AS/NZS 1715:2009 for more information*
Contractor Health Monitoring		OBJECTIVE: *Mitigate risks to workers from the potentially harmful effects of asbestos through the workplace.*	The contractor must ensure that worker health monitoring is undertaken in accordance with the Asbestos Regulations Clause 15 and 16.		In accordance with the Asbestos Regulations Clause 15 and 16, a PCBU must ensure that health monitoring is provided to workers involved in more than four weeks of Class B work in any twelve-month period. Refer ACOP Section 16	In accordance with the Asbestos Regulations Clause 15 and 16, a PCBU must ensure that health monitoring is provided to workers involved in Class A work. Refer ACOP Section 16	*ACOP* *Section 16*
MONITORING PROCEDURES							
Air Monitoring	**Responsibility**	OBJECTIVE: *Provide a clear expectation of who is responsible for undertaking monitoring, and that the person has the appropriate skills and knowledge to do so.* *To provide verification that works have been safely undertaken.* *To provide early warning of potentially harmful levels of exposure.* *To identify when asbestos is present in air at a concentration that presents an*	SQEP / Competent Person		Independent Licensed Asbestos Assessor OR Independent Competent Person as defined within Section 30.4 of the ACOP	Independent Licensed Asbestos Assessor	*Section 30.4 of the ACOP*
	Requirement		Air monitoring is not required for Unlicensed Asbestos works, or Asbestos Related works (as defined under the NZ GAMAS) however it is recommended where possible to provide assurances regarding cross contamination and protection of workers.		If the SQEP or competent person considers that the trace level of 0.01 f/ml may be exceeded, then air monitoring must be undertaken.	Air monitoring must be conducted before and during Class A asbestos removal work.	*NZ GAMAS Section 5.5*

15 Clarks Lane, Whenuapai
Asbestos Controls

Scenario (NZ GAMAS 2017 definitions)		Control Measure Objectives	Unlicensed Asbestos Work	Asbestos-related Work	Class B: non-friable	Class A: friable	*Source Guideline Reference*
FA/AF % w/w in soil			≤ 0.001	> 0.001	> 0.01	> 1	
ACM % w/w			≤ 0.01%	> 0.01	> 1	-	
Scale, soil volume			≤ NESCS	> NESCS	-	-	
Asbestos in air			< 0.01 f/mL in air	< 0.01 f/mL in air	≥ 0.01 f/mL in air	≥ 0.01 f/mL in air	
	Compliance	*unacceptable risk to site workers and surrounding receptors.* *Undertake works by persons who have been trained to manage the risks associated with asbestos.* *Implement additional control measures when necessary.*	If the concentration exceeds 0.01 f/ml then works are Class B or Class A works under the NZ GAMAS definition.		All results shall be below 0.01 fibres / ml. < 0.01 f/ml – continue with works > 0.01 f/ml – investigate the cause and implement additional controls > 0.02 f/ml – stop works and investigate, notify WorkSafe >0.1 f/ml – Remedial works required. PCBUs with management or control of workplace are to ensure that exposure of a person at the workplace to airborne asbestos is eliminated so far as is reasonably practicable.		*Section 30 of the ACOP*
SITE CONTROLS							
Vehicle Decontamination	**Vehicle assessment before demobilisation from site**	OBJECTIVE: *Minimise the potential for accidental transport of contaminated soils or asbestos fibres out of the works areas on, or in vehicles.*	Minimise vehicle transport onto site areas containing asbestos soils, or in locations where asbestos fibres may be present in air. Visual assessment.		Visual (plus swab samples if friable ACM is elsewhere on-site – lagging, insulation, etc).	Visual plus swab samples, air sampling should be undertaken inside the cab.	*NZ GAMAS Table 7*
	Vehicle assessment completed by		Competent person or SQEP.		Independent licensed assessor or independent competent person (meeting the requirements of regulation 41(3) under the Asbestos Regulations).	Independent licensed assessor.	*NZ GAMAS Table 7*
	Truck/excavator air conditioning	OBJECTIVE: *To prevent the contamination of internal spaces of equipment where people work.* *To avoid worker exposure to asbestos fibres.*	Standard air conditioning.		HEPA filter system fitted for all occupied vehicles where friable ACM on-site.	HEPA filter system fitted for all occupied vehicles, filter replaced or clean down with HEPA vacuum cleaner post work.	*NZ GAMAS Table 7*
MANAGEMENT OF CONTAMINATED MATERIAL							
Stockpiles of impacted soils		OBJECTIVE: *To minimise the release of asbestos fibres into air.*	Stockpiles should be avoided where possible to ensure that exposed areas of soil are minimised. All temporary stockpiled asbestos contaminated material which is created and not proposed to be immediately moved should be covered. Stockpiles shall be located on an impermeable surface within an area protected by erosion and sediment controls. Consider covering stockpiles with polythene.				*NZ GAMAS Section 6.6*

15 Clarks Lane, Whenuapai
Asbestos Controls

Scenario (NZ GAMAS 2017 definitions)	Control Measure Objectives	Unlicensed Asbestos Work	Asbestos-related Work	Class B: non-friable	Class A: friable	*Source Guideline Reference*
FA/AF % w/w in soil		≤ 0.001	> 0.001	> 0.01	> 1	
ACM % w/w		≤ 0.01%	> 0.01	> 1	-	
Scale, soil volume		≤ NESCS	> NESCS	-	-	
Asbestos in air		< 0.01 f/mL in air	< 0.01 f/mL in air	≥ 0.01 f/mL in air	≥ 0.01 f/mL in air	
Used PPE	*Asbestos contaminated material is to be appropriately transported and disposed in a location where the material presents no unacceptable human health risk.* *To track the movement of contaminated materials.*	All disposable PPE used during remediation of asbestos impacted soil should be placed in a 200 micron HDPE plastic bag within the decontamination area. The bag should be taped closed (in a goose neck fashion) after each item is added and kept damp via the addition of water. Once full, the bag should be double bagged (200 micron HDPE) and labelled “Asbestos hazard – wear respirator and protective clothing while handling contents”.				*NZ GAMAS Section 6.6*
Contaminated Soil		The location of any soils retained on-site shall be recorded on as built drawings. The receiving facility should be contacted in advance of the soil disposal to verify the requirements for receiving the wastes. Trucks shall have their loads securely covered during off-site transport of material. Waste manifests should be completed and retained for all off-site disposal of soils. Site records shall be cross checked against receipts of soil disposal from the receiving facility. The bins / skips or trucks shall be loaded within the site where runoff and possible spills during loading will be controlled and contained.				*NZ GAMAS Section 6.6*
		Special waste bins / skips or trucks, approved for the transport of ACM to the appointed licensed landfill facility shall be placed on-site. The bins / skips or trucks will be lined / wrapped in accordance with requirements of receiving facility. It is recommended that any soil which contains asbestos in concentrations >0.001% w/w is considered hazardous and the controls stated in the Land Transport Rules adopted. For asbestos soil waste in significant quantities, hazard label signage should be displayed on the vehicles transporting the soil for disposal.	Special waste bins / skips or trucks, approved for the transport of ACM to the appointed licensed landfill facility shall be placed on-site. The bins / skips or trucks will be lined with 200 micron sealed plastic. It is recommended that any soil which contains asbestos in concentrations >0.001% w/w is considered hazardous and the controls stated in the Land Transport Rules adopted. For asbestos soil waste in significant quantities, hazard label signage should be displayed on the vehicles transporting the soil for disposal.		
Contaminated Water		Water used for cleaning asbestos-contaminated equipment (including vehicles) shall be placed into a drum or skip and disposed of at an appropriately licensed facility. If excessive water is applied, ponding or runoff may occur which could permit the transport and accumulation of asbestos fines outside of the site. Water from the work area should be retained inside the boundary of the site and wash water directed back into excavations and the site.				*NZ GAMAS Section 6.6*