



Audrey Campbell-Frear

DETAILED SITE INVESTIGATION (PSI/DSI)

482-484 Kerikeri Road

DOCUMENT CONTROL

Version	Date	Comments

Version	Issued For	Prepared By	Reviewed & Authorised By
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EXECUTIVE SUMMARY

A contamination detailed site investigation (DSI) has been conducted for the site located at 482-484 Kerikeri Road, Kerikeri

The objectives of the assessment were to determine the contamination status of soils at the site, and to subsequently assess compliance with the National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health (NESCS) for the proposed development site.

The investigation comprises a DSI (i.e., intrusive soil sampling investigation). Evidence from the PSI indicate that **HAIL A10**: 'Persistent pesticide bulk storage or use including sport turfs, market gardens, orchards, glass houses or spray sheds', **HAIL E1**: 'Asbestos products manufacture or disposal including sites with buildings containing asbestos products known to be in a deteriorated condition', and **HAIL 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' (lead from paint) are more likely than not to have occurred at the site.

Soil sampling was therefore carried out to provide an indication of the level of contamination in the soil (if any) from contaminants commonly associated with these activities undertaken at the site.

Soil testing indicates that contamination present at the site exceeds the applicable soil contaminant standards applicable for a 'Rural Residential/Lifestyle Block 25% Produce' land-use.

Accordingly, under a restricted discretionary activity consent from Far North District Council, a Remedial Action Plan (RAP) is required for the safe removal / management of the contaminated soil, followed by a Site Validation Report (SVR) upon completion of the remediation phase. Alternatively, under an Ongoing Site Management Plan (OSMP) (which remains on council file), contaminants can remain onsite if they are appropriately managed and consented.

A resource consent will be required before groundworks can commence. As per Regulation 10 (2)(c) the regulatory authority must be provided a copy of this report.

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1 INTRODUCTION

LDE has been engaged by Audrey Campbell-Frear to undertake a soil contamination Detailed Site Investigation (DSI) for the site located at 482 – 484 Kerikeri Road, Kerikeri. LDE understands that the site is to undergo soil disturbance that do not meet the permitted activity conditions (Regulation 8) of the National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health (NESCS).

Based on the findings of the PSI, further investigation was required to establish if soil contamination exceeds the applicable standard and to determine if the site is restricted discretionary or controlled under the NESCS.

This site investigation has been prepared in accordance with the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2021. It has been managed by a suitably qualified and experienced practitioner (SQEP); carried out in general accordance with the Contaminated Land Management Guidelines No.1- Reporting on Contaminated Sites in New Zealand (revised 2021) and Contaminated Land Management Guidelines No.5: Site Investigation and Analysis of Soils (revised 2021).

1.1 Investigation Objectives

The objectives of the investigation are to:

- Determine if soil contamination associated with the HAIL Activities identified in the PSI exceeds the applicable standard and to identify if the site is restricted discretionary or controlled under the NESCS.
- Delineate the extent (vertically and horizontally) of the contamination on the site.

Based on the conceptual site model and taking into consideration the methodology for deriving soil contaminant standards (SCS) and the proposed development at the site, our investigation was designed to establish if site soils exhibit contaminant concentrations exceeding the soils contaminant standards applicable to the *'Rural Residential/Lifestyle Block 25% Produce'* land-use scenario.

1.2 Site Identification

The site is located at 482-484 Kerikeri Road, Kerikeri approximately 2.3 kms to the south-west of Kerikeri town centre. The site is zoned Rural Production. The site comprises approximately 4.34 ha of land and is legally described as Lot 1 DP 154181 and Part Lot 6 DP 25904. Figure 1 and Table 1 show the site location and land parcel details, respectively.



Figure 1. Site Location. Source: LINZ Data service¹.

¹ <https://data.gns.cri.nz/geology/> Retrieved December 2023.

Table 1. Site Details.

Detail	Description
Site Address	482-484 Kerikeri Road, Kerikeri
Legal Description	Lot 1 DP 154181 and Part Lot 6 DP 25904
Area	4.34 ha
Owners	Audrey Campbell-Frear
Proposed Site Use	Eco-community

2 SITE DESCRIPTION

2.1 Environmental Setting

2.1.1 Geology

The New Zealand Geology Web Map by GNS² Science identifies the site as being underlain by 'Kerikeri Volcanic Group Late Miocene basalt of Kaikohe - Bay of Islands Volcanic Field' described as 'Basalt lava, volcanic plugs and minor tuff.'

S-Maps Online³ are not available for this site, information on the site soils was therefore obtained from the Landcare Research Soils Map Viewer⁴.

The Landcare Research Soils Map Viewer identifies the soils as Orthic Oxidic. These soils are a type of clayey soils that have formed as a result of weathering over extensive periods of time in volcanic ash or dark volcanic rock. They contain appreciable amounts of iron and aluminium oxides and have low reserves of potassium, magnesium, calcium and phosphorus. They are only known in the Auckland and Northland regions of New Zealand and cover less than 1% of the land area. They are one of the three soil groups under the Oxidic Soils order, along with Perchley Oxidic Soils and Nodular Oxidic Soils. Orthic Oxidic Soils are deep soils that do not have any prominent features such as waterlogging or iron oxide nodules. They are easy to dig and have fine structure and low plasticity.

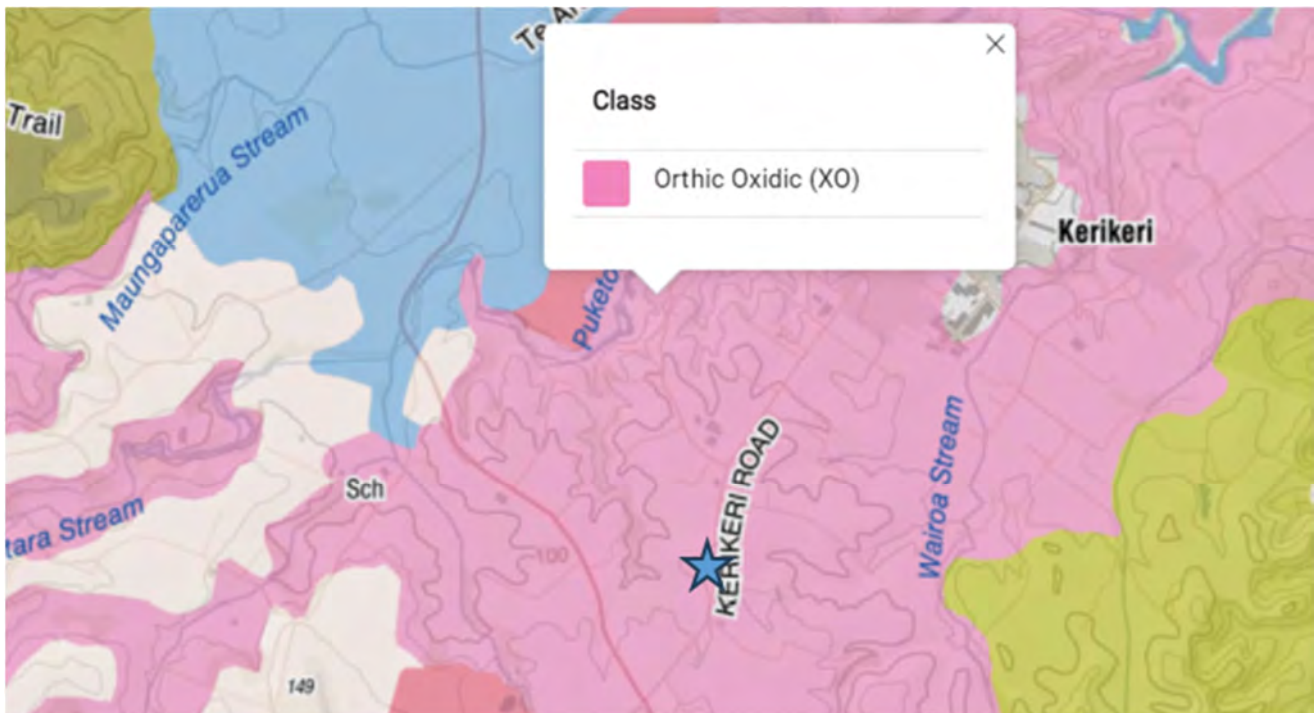


Figure 2. Soils map of the investigation area. Location designated by blue star.

2.1.2 Hydrology

The Puketotara Stream is the nearest body of water from the property and is located approximately 1.1km southeast of the property at its closest point. An unnamed tributary of the Wairoa Stream is also located approximately 1.3 km west of the site.

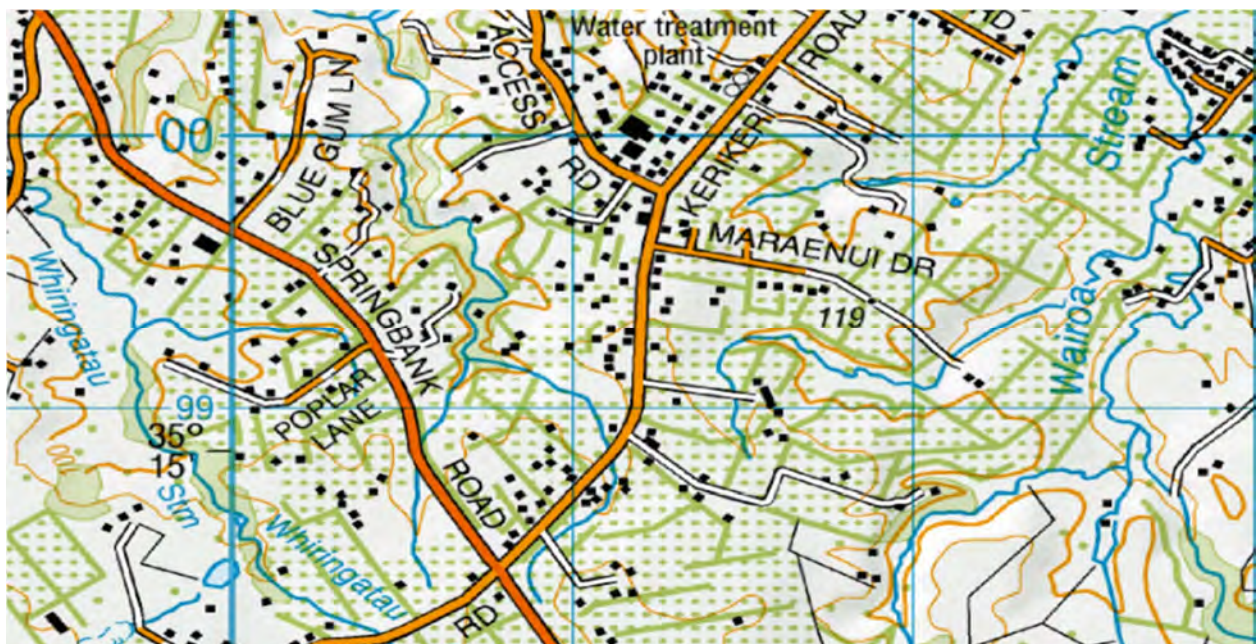


Figure 3. Topo map showing nearby waterbodies. Source LINZ / MapsPast².

² <http://www.mapspast.org.nz/>. Retrieved December 2023.

2.2 Site Layout and Current Site Uses

The site is predominantly vegetated with major and minor dwellings scattered throughout. The vegetation on site is made up of orchards consisting of fruit trees. There is also a playground and fruit shop along the eastern boundary of the site.



Figure 4. Annotated location map showing the current site layout. Source: LINZ Data service³.

³ <https://data.linz.govt.nz/> Retrieved December 2023.



Figure 5. Development Plan (Source: supplied by client).

2.3 Surrounding Land Uses

Table 2 documents the surrounding land uses of the site.

Table 2. Surrounding Land Uses

Direction	Description
North	Rural property with orchards and horticultural activity.
East	Residential with commercial property with restaurants and large impervious surfaces (car parks) to the southeast.
South	Rural residential property.
West	Rural residential property with dense vegetation and stream.

2.4 Site Inspection

Site sampling was undertaken at the site on 7th December 2023. The site is generally flat with some undulation in the eastern portion of the site. During the sampling a glass house with deteriorated cladding was encountered, along with a burn pit, a stockpile with concrete debris and orcharding which was expected.



Figure 6. Glasshouse encountered on site.



Figure 7. Deteriorated cladding of glasshouse.



Figure 8. Stockpile with minor fragments of concrete.



Figure 9. Burn pit encountered.



Figure 10. Homogenous orcharding on site.

3 PSI RISK ASSESSMENT

This section uses a Conceptual Site Model (CSM) to assess the currently available information from the PSI:

- whether there has been (or is more likely than not to have been) a potentially contaminating land use.
- the nature and source of potential or likely contaminants.
- the possible locations of contamination.
- known or potential exposure pathways by which identified receptors could be exposed to the contaminants whilst undertaking the current or proposed future land use.
- known or potential human and ecological receptors that could be exposed to contaminants.
- if the project is covered by the NESCS Regulations.
- if further investigation in the form of a DSI is required

3.1 Conceptual Site Model

The preliminary site CSM is provided in Table 3 and Figure 11. A human health risk can only occur where there is a complete pathway between contaminant source and a receptor. Building floors and paved or sealed areas will largely or completely prevent contact with underlying soils and therefore, direct exposure pathways are or will be incomplete for such areas.

Table 3. Conceptual Site Model at the PSI stage.

HAIL, Potential Contaminants and Location	Receptors	Potential Pathways
A10 - Persistent pesticide use from likely orchard identified in the 1953 - 2023 dated aerial imagery.	Construction workers	Inhalation of dust (containing asbestos fibers)
	Future site users	Inhalation of dust (containing asbestos fibers)
	Workers at soil disposal sites	Inhalation of dust (containing asbestos fibers) during placement at an offsite disposal site.
E1 - Asbestos containing material (ACM) in the footprint of the existing building	Construction workers	Exposure via inhalation of contaminated dust or ingestion and skin contact (dermal).
	Future site users	Ingestion or skin contact with exposed soil
	Workers at off-site soil disposal sites	Inhalation of contaminated dust during placement at offsite disposal site.
	Ecological receptors	Discharges to air / water / land.
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. Lead contamination from deteriorated paint on buildings.	Construction workers	Ingestion, inhalation, dermal contact.
	Future site users	Ingestion, inhalation, dermal contact.
	Workers at off-site soil disposal sites	Ingestion, inhalation, dermal contact.
	Ecological receptors	Sediment runoff, shallow groundwater flows



Figure 11. CSM plan showing areas of HAIL and potential areas of contamination.

4 SAMPLING AND ANALYSIS PLAN

The field investigation was undertaken on 7th December 2023 by an LDE contaminated land scientist. Each one of the sample locations was selected based on the proposed development, site history, site characteristics. Discrete samples from locations S1 to S33 at selective depths between ground level and 200mm below ground level (bgl) were collected across the development site. All samples were tested for heavy metals, and OCPs with one sample (GH1) analysed for asbestos. The sample locations and details are shown in Figure 12 and Table 4.a

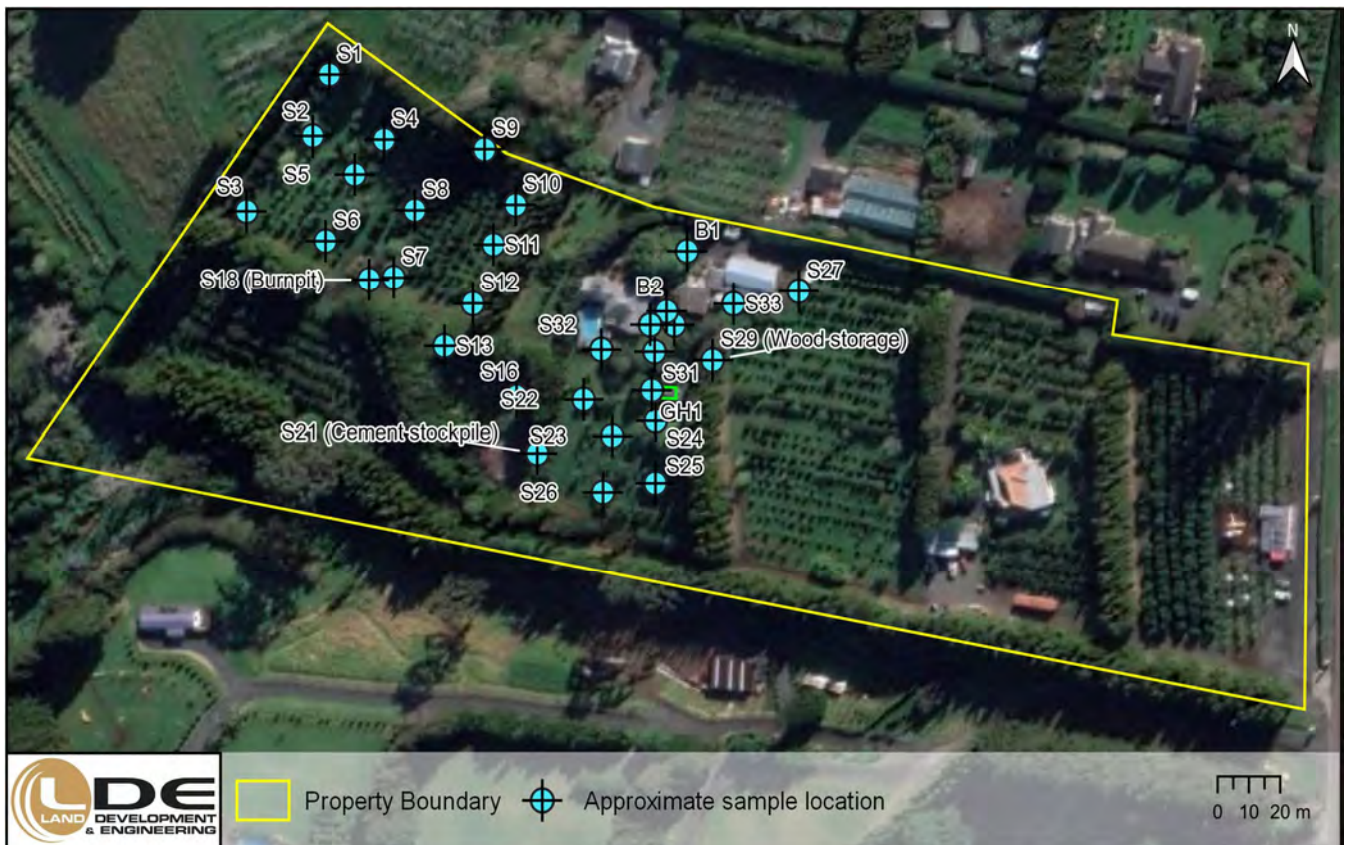


Figure 12. Soil sampling site plan. The approximate soil sampling locations are shown in yellow. Source: LINZ Data service (annotated image).

Table 4. Sample Details.

Test Pit / Borehole	Depth (mm)	Description	Analysis	Rational
S1	0 to 100	Topsoil	Heavy metals, OCPs	Orcharding
S2	100-200	Topsoil	Heavy metals, OCPs	Orcharding
S3	0 to 100	Topsoil	Heavy metals, OCPs	Orcharding
S4	100-200	Topsoil	Heavy metals, OCPs	Orcharding
S5	0 to 100	Topsoil	Heavy metals, OCPs	Orcharding
S6	100-200	Topsoil	Heavy metals, OCPs	Orcharding
S7	0 to 100	Topsoil	Heavy metals, OCPs	Orcharding
S8	100-200	Topsoil	Heavy metals, OCPs	Orcharding
S9	0 to 100	Topsoil	Heavy metals, OCPs	Orcharding
S10	100-200	Topsoil	Heavy metals, OCPs	Orcharding
S11	0 to 100	Topsoil	Heavy metals, OCPs	Orcharding
S12	100-200	Topsoil	Heavy metals, OCPs	Orcharding
S13	0 to 100	Topsoil	Heavy metals, OCPs	Orcharding
S16	100-200	Topsoil	Heavy metals, OCPs	Orcharding
S18 (Burnpit)		Burned fragments with charred topsoil	Heavy metals, OCPs	Burnpit
S21 (Stockpile)		Clayey silt with concrete	Heavy metals, OCPs	Orcharding
S22	0 to 100	Topsoil	Heavy metals, OCPs	Orcharding
S23	100-200	Topsoil	Heavy metals, OCPs	Orcharding

Test Pit / Borehole	Depth (mm)	Description	Analysis	Rational
S24	0 to 100	Topsoil	Heavy metals, OCPs	Orcharding
S25	100-200	Topsoil	Heavy metals, OCPs	Orcharding
S26	0 to 100	Topsoil	Heavy metals, OCPs	Orcharding
S27	100-200	Topsoil	Heavy metals, OCPs	Orcharding
S29	0 to 100	Topsoil	Heavy metals, OCPs	Orcharding
S30	100-200	Topsoil	Heavy metals, OCPs	Orcharding
S31	0 to 100	Topsoil	Heavy metals, OCPs	Orcharding
S32	100-200	Topsoil	Heavy metals, OCPs	Orcharding
S33	0 to 100	Topsoil	Heavy metals, OCPs	Orcharding
B1	0 to 100	Topsoil	Heavy metals, OCPs	Historical building
B2	0 to 100	Topsoil	Heavy metals, OCPs	Historical building
B3	0 to 100	Topsoil	Heavy metals, OCPs	Historical building
GH-1	0 to 100	Topsoil	Asbestos	ACM present and in a degraded condition on Greenhouse.
GH-FRAG	N/A	Building fragment	Asbestos	ACM present and in a degraded condition on Greenhouse.

4.1 Quality Assurance and Quality Control

4.1.1 Field QA/QC

The following procedures were adopted during soil investigation works:

- All fieldwork was carried out in compliance with a project specific Health and Safety Plan prepared for the site works.
- All works were conducted by trained LDE staff with precautions including implementation of procedures for the appropriate handling of potentially contaminated material.
- Prior to sampling, and between sample locations, equipment used to retrieve samples was cleaned by washing with potable water to minimise the chance of cross contamination.
- Soil samples were collected using a hand trowel / hand auger.
- A clean pair of nitrile gloves was also used for each sample location. All samples were placed into labelled laboratory supplied sample containers.
- Additional laboratory containers were taken to the site as a contingency for grab samples (one-off samples of material or soil that are of interest and observed by the sampler during a site inspection or sampling event) including soil stains, burn patches or pits, filled areas, and treated timber stockpiles.
- Following collection, all samples were transported, under standard chain of custody procedures, to an IANZ accredited laboratory (Hills Laboratories) for analysis. The chain of custody documentation is attached in Appendix B.

4.1.2 Laboratory QA/QC

Laboratory reports from Hills Laboratories have been included in Appendix B. These include the analytical methods and detection limits used by the laboratory and the laboratory accreditation for analytical methods used.

All Laboratory Analysis was completed through Hills Laboratories. Hills Laboratories are accredited by International Accreditation New Zealand (IANZ), which represents New Zealand in the International Laboratory Accreditation Cooperation (ILAC). Through the ILAC Mutual Recognition Arrangement (ILAC-MRA) this accreditation is internationally recognised.

4.2 Background Concentrations, Soil Contaminant Standards (SCSs) and Guideline Values (SGVs)

4.2.1 Human Health

The NESCS references the Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health (MfE, 2011). This is a national risk-based methodology for deriving soil contaminant concentrations protective of human health. Soil Contaminant Standards (SCS) and Soil Guideline Values (SGVs) have been selected in accordance with regulation 7.

Regulation 7 states that if the contaminant of concern is a priority contaminant⁴ and the land use fits within an exposure scenario adopted in the Methodology⁵, the applicable standard is the soil contaminant standard for the priority contaminant. If the contaminant of concern is a priority contaminant and the land use does not fit within an exposure scenario adopted in the Methodology, the applicable standard is whichever of the following is more appropriate in the circumstances:

- a) the guideline value derived in accordance with the methods and guidance on site-specific risk assessment provided in the Methodology:
- b) the soil contaminant standard for the priority contaminant of the exposure scenario adopted in the Methodology with greater assumed exposure than the actual exposure.

If the contaminant of concern is not a priority contaminant, the applicable standard is whichever of the following is more appropriate in the circumstances:

- a) the guideline value derived in accordance with the methods and guidance on site-specific risk assessment provided in the Methodology:

⁴ a contaminant for which the Methodology derives a soil contaminant standard.

⁵ The current edition of the Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health.

- b) a guideline value for the protection of human health that is chosen in accordance with the current edition of Contaminated Land Management Guidelines No. 2–Hierarchy and Application in New Zealand of Environmental Guideline.

Following the guidance, the Soil Contaminant Standards (SCS) for selected priority contaminants and for non-priority contaminants guidelines values were selected following Regulation 7 and the Contaminated Land Management Guidelines No. 2: Hierarchy and Application in New Zealand of Environmental Guideline Values (Revised 2021) as screening criteria for the risk to humans at the site and to inform on-site management actions. If exceeded, further investigation and a Tier 2 assessment would be considered.

No applicable New Zealand guideline criteria exist for some of the tested metals (i.e., nickel and zinc) and therefore Health Investigation Level (HIL) values from the Australian Guideline on the Investigation Levels for Soil and Groundwater have been used under the residential land-use scenario as outlined in the MfE document.

The soil samples were tested at the laboratory for total chromium. However, the methodology document distinguishes between the stable chromium III and the potentially toxic and less stable chromium VI. For the purposes of this analysis all total chromium results have been conservatively compared to the chromium VI.

Asbestos results are compared against the New Zealand Guidelines for Assessing and Managing Asbestos in Soils (NZ GAMAS) for Fibrous Asbestos (FA), Asbestos Fines (AF) and Asbestos Containing Materials (ACM).

4.2.2 Environmental

Soil results have also been compared against the permitted activity soil acceptance criteria under E30 of the Auckland Unitary Plan⁶ to determine resource consent requirements.

All results are compared against the Predicted Background Soil Concentrations (Landcare Research Limited)⁷ to determine if soil concentrations are anthropologically affected and the applicability of the NESCS.

4.2.3 Landfill Acceptance

The Class A and Class B landfill acceptance criteria from MfE have been used to determine appropriate disposal methods for contaminated material. Where results have exceeded the screening criteria then a TCLP analysis has been completed for comparison against the concentration in leachate limits. Sample locations with TCLP results exceeding the concentration in leachate limits will require treated prior to being removed from site.

⁶ <https://unitaryplan.aucklandcouncil.govt.nz/Images/Auckland%20Unitary%20Plan%20Operative/Chapter%20E%20Auckland-wide/5.%20Environmental%20Risk/E30%20Contaminated%20land.pdf>

⁷ <https://iris.scinfo.org.nz/layer/48470-pbc-predicted-background-soil-concentrations-new-zealand/>

4.3 Results

4.3.1 Heavy Metals

Table 5 summarises the laboratory results of soil samples tested for heavy metals. There were numerous samples (notably for cadmium at S13, S30, S31, S8, S12, S23, and S24) that exceed the '*Rural Residential/Lifestyle Block 25% Produce*' land-use scenario but meet the '*Rural Residential/Lifestyle Block 10% Produce*'. There are also numerous exceedances of the Predicted Background Soil Concentrations and landfill acceptance criteria. The full lab results are included in Appendix B.

Most of the highly elevated metals (B3, S33, S32 and S30) are associated with the halo of the existing building footprints. The exceptions are S18 which is a burn area, S27 which has elevated arsenic and copper (likely position of a former treated timber post) and S24 which may have been a temporary storage location for building materials due to the elevations of arsenic, cadmium, copper, lead and zinc.

Two of the composites were elevated for cadmium, these were retested individually at the laboratory, where cadmium was found to be elevated at S8, S12, S23 and S24 when compared to the '*Rural Residential/Lifestyle Block 25% Produce*'. It is noted that all of these samples meet the '*Rural Residential/Lifestyle Block 10% Produce*' SCS.

Table 5. Laboratory tests (heavy metal) compared against the soil contaminant standard (SCS) for a 'Rural Residential/Lifestyle Block 25% Produce' land-use.

Sample ID	Depth (mm)	Sample Description	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc
S13	0-100	Topsoil	3	1.31	23	114	8.8	0.12	14	83
S16	100-200	Topsoil	4	0.18	21	37	8.5	0.19	9	60
S18	N/A	Burned fragments with charred topsoil	2,000	4	1,020	1,840	1,500	< 0.10	20	2,900
S21	N/A	Clayey silt with concrete	2	< 0.10	16	23	6.4	0.19	6	31
S22	0-100	Topsoil	5	0.78	21	125	10.8	0.17	10	116
S27	100-200	Topsoil	146	0.29	59	132	22	< 0.10	8	186
S29	0-100	Topsoil	10	0.54	27	75	19.8	0.13	9	68
S30	100-200	Topsoil	8	1.1	17	52	101	< 0.2	8	550
S31	0-100	Topsoil	11	0.82	25	95	88	0.13	10	147
S32	100-200	Topsoil	15	0.63	27	149	117	0.2	10	240
S33	0-100	Topsoil	29	0.61	25	74	260	0.19	10	1,550
B1	0-100	Topsoil	14	0.3	29	44	84	< 0.2	11	147
B2	0-100	Topsoil	9	0.27	21	84	54	0.15	8	126
B3	0-100	Topsoil	80	1.27	47	130	500	0.14	19	3,000
Composite of S1, S4, S9 & S10	0-100, 100-200	Topsoil	5	0.57	23	83	14.1	0.22	11	110
Composite of S2, S3, S5 & S6	0-100, 100-200	Topsoil	8	0.38	28	52	10.5	0.17	10	80
Composite of S7, S8, S11 & S12	0-100, 100-200	Topsoil	4	0.86	23	72	7.7	0.15	15	70
Composite of S23, S24, S25 & S26	0-100, 100-200	Topsoil	11	1.31	26	131	86	0.12	12	138
Rural residential / lifestyle block 25% produce ¹			17	0.8	290	>10,000	160	200	400 ²	8,000 ²
Predicted background soil concentrations ³			8.87	0.51	128.5	25.27	56.34	–	77.34	295.8
Screening criteria Class A landfills ⁴			100	20	100	100	100	4	200	200
Screening criteria Class B landfills ⁴			10	2	10	10	10	0.4	20	20

Notes: All results and standard values are presented in mg/kg (dry weight). All metals tested for 'Total Recoverable' at screen level. Depths are mm below ground level.

1. Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health. Ministry for the Environment, 2011.
2. Residential A values – Guideline on the Investigation Levels for Soil and Groundwater. NEPC, 2013.
3. [Predicted Background Soil Concentrations, New Zealand, Landcare Research Limited.](#)
4. Module 2: Hazardous Waste Guidelines, Landfill Waste Acceptance Criteria and Landfill Classification. Ministry for the Environment, 2004.

Table 6. Individual composite laboratory tests (heavy metal) compared against the soil contaminant standard (SCS) for a 'Rural Residential/Lifestyle Block 25% Produce' land-use.

Sample ID	Depth (mm)	Sample Description	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc
S7	100-200	Topsoil	8	< 0.10	42	19	26	-	20	59
S8	0-100	Topsoil	5	0.81	22	64	7.6	-	13	91
S11	100-200	Topsoil	6	0.15	18	38	7.8	-	11	136
S12	0-100	Topsoil	3	0.95	22	73	6.5	-	16	59
S23	100-200	Topsoil	4	1.23	20	193	11.5	-	15	86
S24	0-100	Topsoil	23	2.2	31	230	104	-	11	220
S25	100-200	Topsoil	4	0.47	15	91	6.6	-	9	50
S26	0-100	Topsoil	4	0.69	18	68	7.9	-	10	61
Rural residential / lifestyle block 25% produce ¹			17	0.8	290	>10,000	160	200	400 ²	8,000 ²
Predicted background soil concentrations ³			8.87	0.51	128.5	25.27	56.34	–	77.34	295.8
Screening criteria Class A landfills ⁴			100	20	100	100	100	4	200	200
Screening criteria Class B landfills ⁴			10	2	10	10	10	0.4	20	20

Notes: All results and standard values are presented in mg/kg (dry weight). All metals tested for 'Total Recoverable' at screen level. Depths are mm below ground level.

1. Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health. Ministry for the Environment, 2011.
2. Residential A values – Guideline on the Investigation Levels for Soil and Groundwater. NEPC, 2013.
3. [Predicted Background Soil Concentrations, New Zealand, Landcare Research Limited.](#)
4. Module 2: Hazardous Waste Guidelines, Landfill Waste Acceptance Criteria and Landfill Classification. Ministry for the Environment, 2004.

4.4 Organochlorine Pesticide (OCP) Results

Table 7 summarises OCP results. OCPs in all samples were below the guideline values. The laboratory transcripts are appended in Appendix B.

Table 7. Laboratory test results for OCP.

Sample ID	Depth (mm)	Total DDT	Dieldrin	Aldrin	Aldrin+Dieldrin
S13	0-100	< 0.10	< 0.016	< 0.016	<0.055
S16	100-200	< 0.09	< 0.015	< 0.015	<0.055
S18	N/A	< 0.12	< 0.02	< 0.02	<0.055
S21	N/A	< 0.09	< 0.015	< 0.015	<0.055
S22	0-100	< 0.09	< 0.014	< 0.014	<0.055
S27	100-200	< 0.10	< 0.017	< 0.017	<0.055
S29	0-100	< 0.09	< 0.015	< 0.015	<0.055
S30	100-200	< 0.11	0.023	< 0.018	0.023
S31	0-100	< 0.09	< 0.015	< 0.015	<0.055
S32	100-200	0.21	< 0.015	< 0.015	<0.055
S33	0-100	< 0.09	< 0.015	< 0.015	<0.055
BH1	0-100	< 0.09	< 0.014	< 0.014	<0.055
BH2	0-100	< 0.10	< 0.016	< 0.016	<0.055
BH4	0-100	< 0.09	< 0.014	< 0.014	<0.055
Composite of S1, S4, S9 & S10	0-100, 100-200	< 0.09	< 0.015	< 0.015	<0.055
Composite of S2, S3, S5 & S6	0-100, 100-200	< 0.10	< 0.016	< 0.016	<0.055
Composite of S7, S8, S11, S12	0-100, 100-200	< 0.09	< 0.014	< 0.014	<0.055
Composite of S23, S24,S25,S26	0-100, 100-200	< 0.09	< 0.015	< 0.015	<0.055
Rural residential / lifestyle block 25% produce¹		45.0	1.1	1.1	1.1

Notes: All results and standard values are presented in mg/kg (dry weight). Depths are mm below ground level.
Total DDT = sum of DDT, DDD, and DDE.
DDT = dichlorodiphenyltrichloroethane.
DDD = dichlorodiphenyldichloroethane.
DDE = dichlorodiphenyldichloroethylene

4.5 Asbestos Results

Table 8 shows the semi-quantitative asbestos analysis completed for the site. The laboratory transcripts are appended in Appendix B.

Table 8. Asbestos Semi-Quantitative Analysis.

Sample ID	Depth (mm)	Trace Asbestos (Presence / Absence)	Asbestos (Presence / Absence)
GH1	0-100	Present	Present
GH-FRAG	N/A	Present	Present
Rural residential / lifestyle block 25% produce¹			

5 DSI RISK ASSESSMENT

This section uses a Conceptual Site Model (CSM) to assess the currently available information presented in this report to determine:

- if the project is covered by the NESCS Regulations.
- if soil contamination exceeds the applicable standard and to identify if the site is restricted discretionary or controlled under the NESCS.

5.1 DSI Conceptual Site Model

The DSI CSM is provided in Table 9 and Figure 13. A human health risk can only occur where there is a complete pathway between contaminant source and a receptor. Building floors and paved or sealed areas will largely or completely prevent contact with underlying soils and therefore, direct exposure pathways are or will be incomplete for such areas.

Table 9. Conceptual Site Model at the DSI stage.

HAIL, Potential Contaminants and Location	Receptors	Pathways (Complete / Incomplete)
A10 - Persistent pesticide use from likely orchard identified in the 1953 - 2023 dated aerial imagery.	Construction workers	Incomplete - Levels detected are unlikely to be a risk to construction workers health.
	Future site users	Complete – Ingestion from site grown produce. Contamination was detected above the SCS or SGVs.
	Workers at soil disposal sites	Incomplete - - Levels detected are unlikely to be a risk to the health of workers at soil disposal sites.
	Ecological receptors	Potentially Complete (if not appropriately managed) - Dust sediment or surface water runoff during earthworks. Contamination was detected above the SCS or SGVs.
E1 - Asbestos containing material (ACM) in the footprint of the existing building	Construction workers	Complete - Inhalation of dust (containing asbestos fibres). Contamination was detected above the SCS or SGVs.
	Future site users	Complete - Inhalation of dust (containing asbestos fibres). Contamination was detected above the SCS or SGVs.
	Workers at soil disposal sites	Complete - Inhalation of dust (containing asbestos fibers) during placement at an offsite disposal site. Contamination was detected above the SCS or SGVs.
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. Lead contamination from deteriorated paint on buildings.	Construction workers	Complete (Burn Area) - Exposure via inhalation of contaminated dust or ingestion and skin contact (dermal). Contamination was detected above the SCS or SGVs.
	Future site users	Complete - Ingestion or skin contact with exposed soil. Contamination was detected above the SCS or SGVs.

HAIL, Potential Contaminants and Location	Receptors	Pathways (Complete / Incomplete)
	Workers at off-site soil disposal sites	Complete - Contamination was detected above the SCS or SGVs.
	Ecological receptors	Potentially Complete (if not appropriately managed) - Dust sediment or surface water runoff during earthworks. Contamination was detected above the SCS or SGVs.

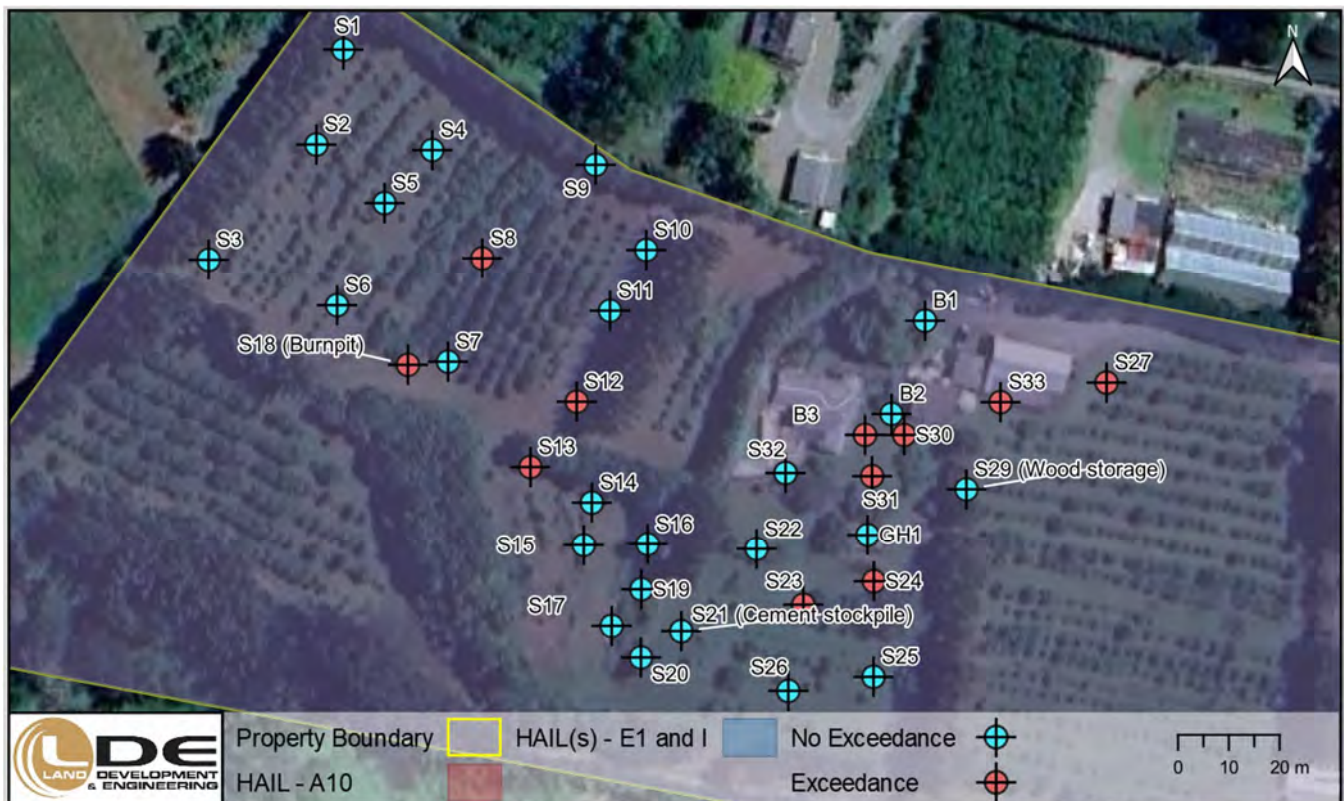


Figure 13. CSM plan showing areas of contamination. The approximate soil sampling locations are shown in yellow and the samples with exceedances above the adopted NESCS SCS are shown in red.

5.1.1 NESCS Application

As per Regulation 10(2)(b), soil contamination exceeds the applicable standard in Regulation 7 (refer to section 4.2.1 for description of each human health standard selected and the section 4.3 for results showing exceedances of the human health standards). As a result, LDE considers the site to be restricted discretionary under the NESCS.

6 CONCLUSIONS AND RECOMMENDATIONS

Activities on the MfE HAIL were identified at the site. These included **HAIL A10**: 'Persistent pesticide bulk storage or use including sport turfs, market gardens, orchards, glass houses or spray sheds', **HAIL E1**: 'Asbestos products manufacture or disposal including sites with buildings containing asbestos products known to be in a deteriorated condition', and **HAIL 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' (lead from paint) are more likely than not to have occurred at the site. Soil sampling and analysis was therefore undertaken to identify if these activities have contributed to soil contamination that would be unacceptable for the proposed development.

Soil testing indicates that contamination present at the site exceeds the applicable soil contaminant standards applicable for a 'Rural Residential/Lifestyle Block 25% Produce' land-use.

Accordingly, under a restricted discretionary activity consent from Far North Regional Council, a Remedial Action Plan (RAP) is required for the safe removal / management of the contaminated soil, followed by a Site Validation Report (SVR) upon completion of the remediation phase. Alternatively, under an Ongoing Site Management Plan (OSMP) (which remains on council file), some contaminants can remain onsite if they are appropriately managed and consented. ***A resource consent will be required before groundworks can commence. As per Regulation 10 (2)(c) the regulatory authority must be provided a copy of this report.***

There may be an option to adopt the 'Rural Residential/Lifestyle Block 10% Produce' land-use SCS for some areas of the site affected by elevated cadmium, which will be further explored in the RAP and OSMP.

6.1 Site Investigation Certifying Statement

The document signatories of LDE certify that:

1. This preliminary and detailed site investigation meets the requirements of the Resource Management (National Environmental Standard for assessing and managing contaminants in soil to protect human health) Regulations 2011 because it has been:
 - a. done by a suitably qualified and experienced practitioner, and
 - b. done in accordance with the current edition of Contaminated land management guidelines No 5 – Site investigation and analysis of soils, and
 - c. reported on in accordance with the current edition of Contaminated land management guidelines No 1 – Reporting on contaminated sites in New Zealand, and
 - d. the report is certified by a suitably qualified and experienced practitioner.

This detailed site investigation concludes that:

- a. For activities under Regulation 10 of the NESCS] does exceed the applicable standard in Regulation 7 of the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations.

Evidence of the qualifications and experience of the suitably qualified and experienced practitioner(s) (SQEPs) who have done this investigation and have certified this report is included in Appendix C.

7 LIMITATIONS

This investigation presents a preliminary and detailed site investigations of the potential for ground contamination, prepared exclusively for Audrey Campbell-Frear and Far North District Council with respect to the brief given to us.

Information, opinions, and recommendations contained in it cannot be used for any other purpose or by any other entity without our review and written consent. LDE Ltd accepts no liability or responsibility whatsoever for or in respect of any use or reliance upon this report by any third party.

Opinions given in this report are based on a review of existing data, evidence gathered during a site walkover, anecdotal information, and specific soil sampling at discrete locations. There is still some possibility that contaminating activities have taken place or contamination at the site is more than that described in this report and LDE should be contacted immediately if the conditions are suspected to differ from that described.

8 REFERENCES

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- NEPC. (2013). *National Environment Protection (Assessment of Site Contamination) Measure*. Canberra: National Environmental Protection Council.
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- PDP. (2015). *Guidance for Analysis of Soil Contamination Using a Portable X-Ray Fluorescence Spectrometer*. Auckland: PATTLE DELAMORE PARTNERS LTD.
- WasteMinz. (2018). *Technical Guidelines for Disposal to Land*. Auckland: Waste Management Institute New Zealand.

APPENDIX A

LABORATORY TEST RESULTS AND CHAIN OF CUSTODY RECORDS

Certificate of Analysis

Page 1 of 2

Client:	Land Development & Engineering Limited	Lab No:	3426640	A2Pv1
Contact:	Austen Heuvel	Date Received:	11-Dec-2023	
	C/- Land Development & Engineering Limited	Date Reported:	14-Dec-2023	
	201 Victoria Street West	Quote No:	115238	
	Auckland Central	Order No:		
	Auckland 1010	Client Reference:	25575	
		Add. Client Ref:	Sampled: 07/12/23	
		Submitted By:	Austen Heuvel	

Sample Type: Soil

Sample Name:	GH1
Lab Number:	3426640.1
Asbestos Presence / Absence	Chrysotile (White Asbestos) detected.
As Received Weight g	202.6
Dry Weight g	138.1
Sample Fraction >10mm* g dry wt	1.5
Sample Fraction <10mm to >2mm* g dry wt	64.7
Sample Fraction <2mm* g dry wt	71.6
<2mm Subsample Weight* g dry wt	53.7
Description of Asbestos Form Presence / Absence Testing	ACM debris, Loose fibres
Weight of Asbestos in >10mm Sample Fraction g dry wt	< 0.00001
Weight of Asbestos in <10mm to >2mm Sample Fraction g dry wt	0.2405
Weight of Asbestos in <2mm Sample Fraction g dry wt	0.03788

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.

Testing has been carried out under the assumption that the weight of asbestos in the sample is unaffected by the ashing process.

Analyst's Comments

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
Individual Tests			
Semi Quantitative Asbestos in Soil*	Based on approximately 100g of sample provided.	-	1
Semi Quantitative Asbestos in Soil			



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Sample Type: Soil			
Test	Method Description	Default Detection Limit	Sample No
As Received Weight	Measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland.	0.1 g	1
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland.	0.1 g	1
Sample Fraction >10mm*	Sample dried at 100 to 105°C, 10mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland.	0.1 g dry wt	1
Sample Fraction <10mm to >2mm*	Sample dried at 100 to 105°C, 10mm and 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland.	0.1 g dry wt	1
Sample Fraction <2mm*	Sample dried at 100 to 105°C, 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland.	0.1 g dry wt	1
Asbestos Presence / Absence	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0.01%	1
Description of Asbestos Form Presence / Absence Testing	Description of asbestos form and/or shape if present. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland.	-	1
Weight of Asbestos in >10mm Sample Fraction	Measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland.	0.00001 g dry wt	1
Weight of Asbestos in <10mm to >2mm Sample Fraction	Measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland.	0.00001 g dry wt	1
Weight of Asbestos in <2mm Sample Fraction	Measurement on analytical balance. Asbestos weight in <2mm subsample, if <2mm subsample weight is not "Entire Fraction". Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland.	0.00001 g dry wt	1

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

Testing was completed on 14-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.



Mahaleel (May) Alfante BSc, PGDipSci
Laboratory Technician - Asbestos

Certificate of Analysis

Page 1 of 6

Client:	Land Development & Engineering Limited	Lab No:	3426636	SPV2
Contact:	Austen Heuvel	Date Received:	11-Dec-2023	
	C/- Land Development & Engineering Limited	Date Reported:	22-Dec-2023	(Amended)
	201 Victoria Street West	Quote No:	115238	
	Auckland Central	Order No:		
	Auckland 1010	Client Reference:	25575	
		Submitted By:	Austen Heuvel	

Sample Type: Soil

Sample Name:		S7 07-Dec-2023	S8 07-Dec-2023	S11 07-Dec-2023	S12 07-Dec-2023	S13 07-Dec-2023
Lab Number:		3426636.7	3426636.8	3426636.10	3426636.11	3426636.12
Individual Tests						
Dry Matter	g/100g as rcvd	-	-	-	-	65
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	8	5	6	3	-
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	0.81	0.15	0.95	-
Total Recoverable Chromium	mg/kg dry wt	42	22	18	22	-
Total Recoverable Copper	mg/kg dry wt	19	64	38	73	-
Total Recoverable Lead	mg/kg dry wt	26	7.6	7.8	6.5	-
Total Recoverable Nickel	mg/kg dry wt	20	13	11	16	-
Total Recoverable Zinc	mg/kg dry wt	59	91	136	59	-
Heavy Metals with Mercury, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	-	-	-	-	3
Total Recoverable Cadmium	mg/kg dry wt	-	-	-	-	1.31
Total Recoverable Chromium	mg/kg dry wt	-	-	-	-	23
Total Recoverable Copper	mg/kg dry wt	-	-	-	-	114
Total Recoverable Lead	mg/kg dry wt	-	-	-	-	8.8
Total Recoverable Mercury	mg/kg dry wt	-	-	-	-	0.12
Total Recoverable Nickel	mg/kg dry wt	-	-	-	-	14
Total Recoverable Zinc	mg/kg dry wt	-	-	-	-	83
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	-	-	-	-	< 0.016
alpha-BHC	mg/kg dry wt	-	-	-	-	< 0.016
beta-BHC	mg/kg dry wt	-	-	-	-	< 0.016
delta-BHC	mg/kg dry wt	-	-	-	-	< 0.016
gamma-BHC (Lindane)	mg/kg dry wt	-	-	-	-	< 0.016
cis-Chlordane	mg/kg dry wt	-	-	-	-	< 0.016
trans-Chlordane	mg/kg dry wt	-	-	-	-	< 0.016
2,4'-DDD	mg/kg dry wt	-	-	-	-	< 0.016
4,4'-DDD	mg/kg dry wt	-	-	-	-	< 0.016
2,4'-DDE	mg/kg dry wt	-	-	-	-	< 0.016
4,4'-DDE	mg/kg dry wt	-	-	-	-	< 0.016
2,4'-DDT	mg/kg dry wt	-	-	-	-	< 0.016
4,4'-DDT	mg/kg dry wt	-	-	-	-	< 0.016
Total DDT Isomers	mg/kg dry wt	-	-	-	-	< 0.10
Dieldrin	mg/kg dry wt	-	-	-	-	< 0.016
Endosulfan I	mg/kg dry wt	-	-	-	-	< 0.016
Endosulfan II	mg/kg dry wt	-	-	-	-	< 0.016
Endosulfan sulphate	mg/kg dry wt	-	-	-	-	< 0.016
Endrin	mg/kg dry wt	-	-	-	-	< 0.016



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Sample Type: Soil						
Sample Name:		S7 07-Dec-2023	S8 07-Dec-2023	S11 07-Dec-2023	S12 07-Dec-2023	S13 07-Dec-2023
Lab Number:		3426636.7	3426636.8	3426636.10	3426636.11	3426636.12
Organochlorine Pesticides Screening in Soil						
Endrin aldehyde	mg/kg dry wt	-	-	-	-	< 0.016
Endrin ketone	mg/kg dry wt	-	-	-	-	< 0.016
Heptachlor	mg/kg dry wt	-	-	-	-	< 0.016
Heptachlor epoxide	mg/kg dry wt	-	-	-	-	< 0.016
Hexachlorobenzene	mg/kg dry wt	-	-	-	-	< 0.016
Methoxychlor	mg/kg dry wt	-	-	-	-	< 0.016
Sample Name:		S16 07-Dec-2023	S18 07-Dec-2023	S21 07-Dec-2023	S22 07-Dec-2023	S23 07-Dec-2023
Lab Number:		3426636.13	3426636.14	3426636.15	3426636.16	3426636.17
Individual Tests						
Dry Matter	g/100g as rcvd	68	49	70	71	-
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	-	-	-	-	4
Total Recoverable Cadmium	mg/kg dry wt	-	-	-	-	1.23
Total Recoverable Chromium	mg/kg dry wt	-	-	-	-	20
Total Recoverable Copper	mg/kg dry wt	-	-	-	-	193
Total Recoverable Lead	mg/kg dry wt	-	-	-	-	11.5
Total Recoverable Nickel	mg/kg dry wt	-	-	-	-	15
Total Recoverable Zinc	mg/kg dry wt	-	-	-	-	86
Heavy Metals with Mercury, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	4	2,000	2	5	-
Total Recoverable Cadmium	mg/kg dry wt	0.18	4.0	< 0.10	0.78	-
Total Recoverable Chromium	mg/kg dry wt	21	1,020	16	21	-
Total Recoverable Copper	mg/kg dry wt	37	1,840	23	125	-
Total Recoverable Lead	mg/kg dry wt	8.5	1,500	6.4	10.8	-
Total Recoverable Mercury	mg/kg dry wt	0.19	< 0.10	0.19	0.17	-
Total Recoverable Nickel	mg/kg dry wt	9	20	6	10	-
Total Recoverable Zinc	mg/kg dry wt	60	2,900	31	116	-
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	< 0.015	< 0.02	< 0.015	< 0.014	-
alpha-BHC	mg/kg dry wt	< 0.015	< 0.02	< 0.015	< 0.014	-
beta-BHC	mg/kg dry wt	< 0.015	< 0.02	< 0.015	< 0.014	-
delta-BHC	mg/kg dry wt	< 0.015	< 0.02	< 0.015	< 0.014	-
gamma-BHC (Lindane)	mg/kg dry wt	< 0.015	< 0.02	< 0.015	< 0.014	-
cis-Chlordane	mg/kg dry wt	< 0.015	< 0.02	< 0.015	< 0.014	-
trans-Chlordane	mg/kg dry wt	< 0.015	< 0.02	< 0.015	< 0.014	-
2,4'-DDD	mg/kg dry wt	< 0.015	< 0.02	< 0.015	< 0.014	-
4,4'-DDD	mg/kg dry wt	< 0.015	< 0.02	< 0.015	< 0.014	-
2,4'-DDE	mg/kg dry wt	< 0.015	< 0.02	< 0.015	< 0.014	-
4,4'-DDE	mg/kg dry wt	< 0.015	< 0.02	< 0.015	< 0.014	-
2,4'-DDT	mg/kg dry wt	< 0.015	< 0.02	< 0.015	< 0.014	-
4,4'-DDT	mg/kg dry wt	< 0.015	0.03	< 0.015	< 0.014	-
Total DDT Isomers	mg/kg dry wt	< 0.09	< 0.12	< 0.09	< 0.09	-
Dieldrin	mg/kg dry wt	< 0.015	< 0.02	< 0.015	< 0.014	-
Endosulfan I	mg/kg dry wt	< 0.015	< 0.02	< 0.015	< 0.014	-
Endosulfan II	mg/kg dry wt	< 0.015	< 0.02	< 0.015	< 0.014	-
Endosulfan sulphate	mg/kg dry wt	< 0.015	< 0.02	< 0.015	< 0.014	-
Endrin	mg/kg dry wt	< 0.015	< 0.02	< 0.015	< 0.014	-
Endrin aldehyde	mg/kg dry wt	< 0.015	< 0.02	< 0.015	< 0.014	-
Endrin ketone	mg/kg dry wt	< 0.015	< 0.02	< 0.015	< 0.014	-
Heptachlor	mg/kg dry wt	< 0.015	< 0.02	< 0.015	< 0.014	-
Heptachlor epoxide	mg/kg dry wt	< 0.015	< 0.02	< 0.015	< 0.014	-
Hexachlorobenzene	mg/kg dry wt	< 0.015	< 0.02	< 0.015	< 0.014	-
Methoxychlor	mg/kg dry wt	< 0.015	< 0.02	< 0.015	< 0.014	-

Sample Type: Soil						
Sample Name:		S24 07-Dec-2023	S25 07-Dec-2023	S26 07-Dec-2023	S27 07-Dec-2023	S29 07-Dec-2023
Lab Number:		3426636.18	3426636.19	3426636.20	3426636.21	3426636.22
Individual Tests						
Dry Matter	g/100g as rcvd	-	-	-	61	66
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	23	4	4	-	-
Total Recoverable Cadmium	mg/kg dry wt	2.2	0.47	0.69	-	-
Total Recoverable Chromium	mg/kg dry wt	31	15	18	-	-
Total Recoverable Copper	mg/kg dry wt	230	91	68	-	-
Total Recoverable Lead	mg/kg dry wt	104	6.6	7.9	-	-
Total Recoverable Nickel	mg/kg dry wt	11	9	10	-	-
Total Recoverable Zinc	mg/kg dry wt	220	50	61	-	-
Heavy Metals with Mercury, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	-	-	-	146	10
Total Recoverable Cadmium	mg/kg dry wt	-	-	-	0.29	0.54
Total Recoverable Chromium	mg/kg dry wt	-	-	-	59	27
Total Recoverable Copper	mg/kg dry wt	-	-	-	132	75
Total Recoverable Lead	mg/kg dry wt	-	-	-	22	19.8
Total Recoverable Mercury	mg/kg dry wt	-	-	-	< 0.10	0.13
Total Recoverable Nickel	mg/kg dry wt	-	-	-	8	9
Total Recoverable Zinc	mg/kg dry wt	-	-	-	186	68
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	-	-	-	< 0.017	< 0.015
alpha-BHC	mg/kg dry wt	-	-	-	< 0.017	< 0.015
beta-BHC	mg/kg dry wt	-	-	-	< 0.017	< 0.015
delta-BHC	mg/kg dry wt	-	-	-	< 0.017	< 0.015
gamma-BHC (Lindane)	mg/kg dry wt	-	-	-	< 0.017	< 0.015
cis-Chlordane	mg/kg dry wt	-	-	-	< 0.017	< 0.015
trans-Chlordane	mg/kg dry wt	-	-	-	< 0.017	< 0.015
2,4'-DDD	mg/kg dry wt	-	-	-	< 0.017	< 0.015
4,4'-DDD	mg/kg dry wt	-	-	-	< 0.017	< 0.015
2,4'-DDE	mg/kg dry wt	-	-	-	< 0.017	< 0.015
4,4'-DDE	mg/kg dry wt	-	-	-	< 0.017	0.017
2,4'-DDT	mg/kg dry wt	-	-	-	< 0.017	< 0.015
4,4'-DDT	mg/kg dry wt	-	-	-	< 0.017	< 0.015
Total DDT Isomers	mg/kg dry wt	-	-	-	< 0.10	< 0.09
Dieldrin	mg/kg dry wt	-	-	-	< 0.017	< 0.015
Endosulfan I	mg/kg dry wt	-	-	-	< 0.017	< 0.015
Endosulfan II	mg/kg dry wt	-	-	-	< 0.017	< 0.015
Endosulfan sulphate	mg/kg dry wt	-	-	-	< 0.017	< 0.015
Endrin	mg/kg dry wt	-	-	-	< 0.017	< 0.015
Endrin aldehyde	mg/kg dry wt	-	-	-	< 0.017	< 0.015
Endrin ketone	mg/kg dry wt	-	-	-	< 0.017	< 0.015
Heptachlor	mg/kg dry wt	-	-	-	< 0.017	< 0.015
Heptachlor epoxide	mg/kg dry wt	-	-	-	< 0.017	< 0.015
Hexachlorobenzene	mg/kg dry wt	-	-	-	< 0.017	< 0.015
Methoxychlor	mg/kg dry wt	-	-	-	< 0.017	< 0.015
Sample Name:		S30 07-Dec-2023	S31 07-Dec-2023	S32 07-Dec-2023	S33 07-Dec-2023	B1 07-Dec-2023
Lab Number:		3426636.23	3426636.24	3426636.25	3426636.26	3426636.27
Individual Tests						
Dry Matter	g/100g as rcvd	56	67	67	68	72
Heavy Metals with Mercury, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	8	11	15	29	14
Total Recoverable Cadmium	mg/kg dry wt	1.1	0.82	0.63	0.61	0.3
Total Recoverable Chromium	mg/kg dry wt	17	25	27	25	29
Total Recoverable Copper	mg/kg dry wt	52	95	149	74	44
Total Recoverable Lead	mg/kg dry wt	101	88	117	260	84
Total Recoverable Mercury	mg/kg dry wt	< 0.2	0.13	0.20	0.19	< 0.2

Sample Type: Soil						
Sample Name:		S30 07-Dec-2023	S31 07-Dec-2023	S32 07-Dec-2023	S33 07-Dec-2023	B1 07-Dec-2023
Lab Number:		3426636.23	3426636.24	3426636.25	3426636.26	3426636.27
Heavy Metals with Mercury, Screen Level						
Total Recoverable Nickel	mg/kg dry wt	8	10	10	10	11
Total Recoverable Zinc	mg/kg dry wt	550	147	240	1,550	147
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	< 0.018	< 0.015	< 0.015	< 0.015	< 0.014
alpha-BHC	mg/kg dry wt	< 0.018	< 0.015	< 0.015	< 0.015	< 0.014
beta-BHC	mg/kg dry wt	< 0.018	< 0.015	< 0.015	< 0.015	< 0.014
delta-BHC	mg/kg dry wt	< 0.018	< 0.015	< 0.015	< 0.015	< 0.014
gamma-BHC (Lindane)	mg/kg dry wt	< 0.018	< 0.015	< 0.015	< 0.015	< 0.014
cis-Chlordane	mg/kg dry wt	< 0.018	< 0.015	< 0.015	< 0.015	< 0.014
trans-Chlordane	mg/kg dry wt	< 0.018	< 0.015	< 0.015	< 0.015	< 0.014
2,4'-DDD	mg/kg dry wt	< 0.018	< 0.015	< 0.015	< 0.015	< 0.014
4,4'-DDD	mg/kg dry wt	< 0.018	< 0.015	< 0.015	< 0.015	< 0.014
2,4'-DDE	mg/kg dry wt	< 0.018	< 0.015	< 0.015	< 0.015	< 0.014
4,4'-DDE	mg/kg dry wt	< 0.018	< 0.015	0.144	< 0.015	< 0.014
2,4'-DDT	mg/kg dry wt	< 0.018	< 0.015	< 0.015	< 0.015	< 0.014
4,4'-DDT	mg/kg dry wt	0.039	< 0.015	0.046	0.020	< 0.014
Total DDT Isomers	mg/kg dry wt	< 0.11	< 0.09	0.21	< 0.09	< 0.09
Dieldrin	mg/kg dry wt	0.023	< 0.015	< 0.015	< 0.015	< 0.014
Endosulfan I	mg/kg dry wt	< 0.018	< 0.015	< 0.015	< 0.015	< 0.014
Endosulfan II	mg/kg dry wt	< 0.018	< 0.015	< 0.015	< 0.015	< 0.014
Endosulfan sulphate	mg/kg dry wt	< 0.018	< 0.015	< 0.015	< 0.015	< 0.014
Endrin	mg/kg dry wt	< 0.018	< 0.015	< 0.015	< 0.015	< 0.014
Endrin aldehyde	mg/kg dry wt	< 0.018	< 0.015	< 0.015	< 0.015	< 0.014
Endrin ketone	mg/kg dry wt	< 0.018	< 0.015	< 0.015	< 0.015	< 0.014
Heptachlor	mg/kg dry wt	< 0.018	< 0.015	< 0.015	< 0.015	< 0.014
Heptachlor epoxide	mg/kg dry wt	< 0.018	< 0.015	< 0.015	< 0.015	< 0.014
Hexachlorobenzene	mg/kg dry wt	< 0.018	< 0.015	< 0.015	< 0.015	< 0.014
Methoxychlor	mg/kg dry wt	< 0.018	< 0.015	< 0.015	< 0.015	< 0.014
Sample Name:		B2 07-Dec-2023	BH4 07-Dec-2023	Composite of S1, S4, S9 & S10	Composite of S2, S3, S5 & S6	Composite of S7, S8, S11 & S12
Lab Number:		3426636.28	3426636.29	3426636.30	3426636.31	3426636.32
Individual Tests						
Dry Matter	g/100g as rcvd	64	73	67	64	70
Heavy Metals with Mercury, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	9	80	5	8	4
Total Recoverable Cadmium	mg/kg dry wt	0.27	1.27	0.57	0.38	0.86
Total Recoverable Chromium	mg/kg dry wt	21	47	23	28	23
Total Recoverable Copper	mg/kg dry wt	84	130	83	52	72
Total Recoverable Lead	mg/kg dry wt	54	500	14.1	10.5	7.7
Total Recoverable Mercury	mg/kg dry wt	0.15	0.14	0.22	0.17	0.15
Total Recoverable Nickel	mg/kg dry wt	8	19	11	10	15
Total Recoverable Zinc	mg/kg dry wt	126	3,000	110	80	70
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	< 0.016	< 0.014	< 0.015	< 0.016	< 0.014
alpha-BHC	mg/kg dry wt	< 0.016	< 0.014	< 0.015	< 0.016	< 0.014
beta-BHC	mg/kg dry wt	< 0.016	< 0.014	< 0.015	< 0.016	< 0.014
delta-BHC	mg/kg dry wt	< 0.016	< 0.014	< 0.015	< 0.016	< 0.014
gamma-BHC (Lindane)	mg/kg dry wt	< 0.016	< 0.014	< 0.015	< 0.016	< 0.014
cis-Chlordane	mg/kg dry wt	< 0.016	< 0.014	< 0.015	< 0.016	< 0.014
trans-Chlordane	mg/kg dry wt	< 0.016	< 0.014	< 0.015	< 0.016	< 0.014
2,4'-DDD	mg/kg dry wt	< 0.016	< 0.014	< 0.015	< 0.016	< 0.014
4,4'-DDD	mg/kg dry wt	< 0.016	< 0.014	< 0.015	< 0.016	< 0.014
2,4'-DDE	mg/kg dry wt	< 0.016	< 0.014	< 0.015	< 0.016	< 0.014
4,4'-DDE	mg/kg dry wt	< 0.016	< 0.014	< 0.015	< 0.016	< 0.014
2,4'-DDT	mg/kg dry wt	< 0.016	< 0.014	< 0.015	< 0.016	< 0.014

Sample Type: Soil						
Sample Name:		B2 07-Dec-2023	BH4 07-Dec-2023	Composite of S1, S4, S9 & S10	Composite of S2, S3, S5 & S6	Composite of S7, S8, S11 & S12
Lab Number:		3426636.28	3426636.29	3426636.30	3426636.31	3426636.32
Organochlorine Pesticides Screening in Soil						
4,4'-DDT	mg/kg dry wt	< 0.016	< 0.014	< 0.015	< 0.016	< 0.014
Total DDT Isomers	mg/kg dry wt	< 0.10	< 0.09	< 0.09	< 0.10	< 0.09
Dieldrin	mg/kg dry wt	< 0.016	< 0.014	< 0.015	< 0.016	< 0.014
Endosulfan I	mg/kg dry wt	< 0.016	< 0.014	< 0.015	< 0.016	< 0.014
Endosulfan II	mg/kg dry wt	< 0.016	< 0.014	< 0.015	< 0.016	< 0.014
Endosulfan sulphate	mg/kg dry wt	< 0.016	< 0.014	< 0.015	< 0.016	< 0.014
Endrin	mg/kg dry wt	< 0.016	< 0.014	< 0.015	< 0.016	< 0.014
Endrin aldehyde	mg/kg dry wt	< 0.016	< 0.014	< 0.015	< 0.016	< 0.014
Endrin ketone	mg/kg dry wt	< 0.016	< 0.014	< 0.015	< 0.016	< 0.014
Heptachlor	mg/kg dry wt	< 0.016	< 0.014	< 0.015	< 0.016	< 0.014
Heptachlor epoxide	mg/kg dry wt	< 0.016	< 0.014	< 0.015	< 0.016	< 0.014
Hexachlorobenzene	mg/kg dry wt	< 0.016	< 0.014	< 0.015	< 0.016	< 0.014
Methoxychlor	mg/kg dry wt	< 0.016	< 0.014	< 0.015	< 0.016	< 0.014

Sample Name:		Composite of S23, S24, S25 & S26				
Lab Number:		3426636.33				
Individual Tests						
Dry Matter	g/100g as rcvd	67				
Heavy Metals with Mercury, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	11				
Total Recoverable Cadmium	mg/kg dry wt	1.31				
Total Recoverable Chromium	mg/kg dry wt	26				
Total Recoverable Copper	mg/kg dry wt	131				
Total Recoverable Lead	mg/kg dry wt	86				
Total Recoverable Mercury	mg/kg dry wt	0.12				
Total Recoverable Nickel	mg/kg dry wt	12				
Total Recoverable Zinc	mg/kg dry wt	138				
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	< 0.015				
alpha-BHC	mg/kg dry wt	< 0.015				
beta-BHC	mg/kg dry wt	< 0.015				
delta-BHC	mg/kg dry wt	< 0.015				
gamma-BHC (Lindane)	mg/kg dry wt	< 0.015				
cis-Chlordane	mg/kg dry wt	< 0.015				
trans-Chlordane	mg/kg dry wt	< 0.015				
2,4'-DDD	mg/kg dry wt	< 0.015				
4,4'-DDD	mg/kg dry wt	< 0.015				
2,4'-DDE	mg/kg dry wt	< 0.015				
4,4'-DDE	mg/kg dry wt	< 0.015				
2,4'-DDT	mg/kg dry wt	< 0.015				
4,4'-DDT	mg/kg dry wt	< 0.015				
Total DDT Isomers	mg/kg dry wt	< 0.09				
Dieldrin	mg/kg dry wt	< 0.015				
Endosulfan I	mg/kg dry wt	< 0.015				
Endosulfan II	mg/kg dry wt	< 0.015				
Endosulfan sulphate	mg/kg dry wt	< 0.015				
Endrin	mg/kg dry wt	< 0.015				
Endrin aldehyde	mg/kg dry wt	< 0.015				
Endrin ketone	mg/kg dry wt	< 0.015				
Heptachlor	mg/kg dry wt	< 0.015				
Heptachlor epoxide	mg/kg dry wt	< 0.015				
Hexachlorobenzene	mg/kg dry wt	< 0.015				
Methoxychlor	mg/kg dry wt	< 0.015				

Analyst's Comments

Amended Report: This certificate of analysis replaces report '3426636-SPv1' issued on 19-Dec-2023 at 4:27 pm.
Reason for amendment: Additional testing added as per clients request.

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%.	-	7-8, 10-33
Heavy Metals, 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	7-8, 10-11, 17-20
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	12-16, 21-33
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	12-16, 21-33
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	12-16, 21-33
Composite Environmental Solid Samples*	Individual sample fractions mixed together to form a composite fraction.	-	1-11, 17-20, 34

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

Testing was completed between 12-Dec-2023 and 22-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



Quote No

Primary Contact *Austen - Keweenaw*Submitted By *"*Client Name *L.D.E*Address *77 Peel Street**Chilborne* PostcodePhone *s 9(2)(a)* MobileEmail *s 9(2)(a)*

Charge To

Client Reference *25575*

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

ADDITIONAL INFORMATION

* please composite chosen samples and provide 1 result per comp group.

No.	Sample Name	Sample Material	Sample Location	Sample Date	Tests Required (if not as per Quote)
1	S1 (comp 1)	Soil		7/12	MM8 + OCP
2	S2 (comp 2)	Soil		7/12	
3	S3 (comp 2)	Soil		7/12	
4	S4 (comp 1)	Soil		7/12	
5	S5 (comp 2)	Soil		7/12	
6	S6 (comp 2)	Soil		7/12	
7	S7 (comp 3)	Soil		7/12	
8	S8 (comp 3)	Soil		7/12	
9	S9 (comp 1)	Soil		7/12	
10	S10 (comp 1)	Soil		7/12	
11	S11 (comp 3)	Soil		7/12	
12	S12 (comp 3)	Soil		7/12	

Temperature On Arrival

23 °C

Temperature was measured on one of more arbitrarily chosen samples in this batch.

Continued on next page

ANALYSIS REQUEST

RJ Hill Laboratories Limited
Ground Floor, 28 Heather Street
Parnell
Auckland 1052, New Zealand

Job No: Date Recv. 11-Dec-23 16:39

342 6640

Received by: Lya Avila



3134266404

0508 HILL LAB (44 555 22)

+64 7 858 2000

mail@hill-labs.co.nz

www.hill-labs.co.nz

CHAIN OF CUSTODY RECORD

Sent to
Hill Laboratories

Date & Time:

Name:

☐ Tick if you require COC to be emailed back.

Signature:

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:

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)
13	S13	Soil	7/12		Ump + OCP
14	S16	Soil	7/12		
15	S18	Soil	7/12		
16	S21	Soil	7/12		
17	S22	Soil	7/12		
18	S23	Soil	7/12		
19	S24	Soil	7/12		
20	S25	Soil	7/12		
21	S26	Soil	7/12		
22	S27	Soil	7/12		
23	S29	Soil	7/12		
24	S30	Soil	7/12		
25	S31	Soil	7/12		
26	S32	Soil	7/12		
27	S33	Soil	7/12		
28	B1	Soil	7/12		
29	B2	Soil	7/12		
30	B3	Soil	7/12		
31	GM1	Soil	7/12		↓ SQ (SQ)
32	GM-FRAG	BULK	7/12		ACM
33	BM4	Soil	7/12		Ump + OCP
34					
35					
36					
37					
38					
39					
40					

APPENDIX B

PRELIMINARY SITE INVESTIGATION