

***DETAILED SITE INVESTIGATION  
REMEDIACTION ACTION PLAN  
&  
ASSESSMENT OF ENVIRONMENTAL EFFECTS  
RUAKAKA SERVICE CENTRE  
RUAKAKA***

**For the Attention of:**

Ruakaka Developments Limited

C/ - Ballu Khan

Reference: FES 1359.002 February 2021 R1



### Company Information

Focus Environmental Services Limited  
PO Box 11455  
Ellerslie  
Auckland 1542  
Telephone: +64 9 579 4155  
Email: mail@focusenvironmental.co.nz

### Quality Information

Project Name DSI, RAP & AEE R1  
Ruakaka Service Centre, Ruakaka  
Project Number 1359.001  
File Reference M:\2020 Jobs\Ruakaka Service Centre\DSI\01 Report\1359.002\_DSI\_PS\_DRAFT.docx  
Date February 2021

Author

Paula Stevenson  
Environmental Scientist

Reviewed

Elliot Dillon-Herzog  
Environmental Scientist

Authorised

David O'Reilly  
Principal Environmental Consultant

### Distribution List

Parties	Copies
Ruakaka Developments Limited	1
Focus Environmental Services Limited	1



## Contents

Executive Summary	1
1.0 Scope	3
2.0 Site Identification	4
3.0 Site Topography	5
4.0 Geology and Hydrology	5
5.0 Regulatory Framework	6
5.1 The National Environmental Standard	6
5.2 Proposed Regional Plan for Northland	6
6.0 Background	7
7.0 Site Walkover and Inspection	7
8.0 Potentially Contaminating Activities or Land Uses	7
9.0 Conceptual Model of Exposure Pathways	8
10.0 Sampling and Analysis Plan and Sampling Method	9
11.0 Field Sampling Quality Assurance	10
12.0 Laboratory Quality Assurance	11
13.0 Basis for Guideline Values	12
14.0 Quality Control	13
14.1 Laboratory Verification	13
15.0 Soil Sampling Results	14
15.1 Heavy Metals	14
15.2 Organochlorine Pesticides	15
15.3 Polycyclic Aromatic Hydrocarbons	16
15.4 Asbestos	16
16.0 Extent of Contamination	17
17.0 Revised Conceptual Model of Exposure Pathways	18
18.0 Regulatory Requirements	19
18.1 The National Environmental Standard	19
19.0 Remediation Action Plan	21
19.1 Remediation Criteria	21
19.2 Work Programme	22
19.1 Establishment and Site Preparation	23
19.3 Odour Control	24
20.0 Assessment of Environmental Effects	25



20.4	Dewatering Procedures	27
21.0	Conclusions and Recommendations	30

#### Figures

Figure 1 – Site Location Plan

Figure 2 – Site Features Plan

Figure 3-1 – Composite Sample Location Plan

Figure 3-2 – Discrete Sample Location Plan

Figure 4-1 – Inferred Area and Depth of Asbestos Contamination

Figure 4 – Inferred Area and Depth of Heavy Metal Contamination

Figure 5 – Proposed Validation Sampling Plan

#### Appendices

Appendix A – Proposed Scheme Plan

Appendix B – Hand Auger Logs and Photographs

Appendix C – RPD Calculations

Appendix D – Laboratory Transcripts

## Executive Summary

Focus Environmental Services Limited was contracted by Ruakaka Developments Limited to carry out a Detailed Site Investigation, Remediation Action Plan & Assessment of Environmental Effects (hence forth referred to as the DSI, RAP & AEE) for the property of the Ruakaka Service Centre, Ruakaka.

This DSI, RAP & AEE has been prepared in general accordance with the requirements of the Contaminated Land Management Guidelines No. 1 and No.5 (Ministry for the Environment, 2011).

It is proposed that the site will be redeveloped into a group of commercial buildings and as part of the redevelopment, the site will undergo a change of land use and disturbance of soils, therefore the rules of the National Environmental Standard (NES) for Assessing and Managing Contaminants in Soil to Protect Human Health apply. As the site is to be redeveloped for commercial purposes then the Soil Contaminant Standards for health (SCS<sub>(health)</sub>) for commercial land use as outlined in the NES are considered relevant. Additionally, in order to accurately perform a risk assessment and to assess whether any discharges from contaminated land will result in significant adverse effects on the environment, and as there are currently no environmental guideline values available for the Northland Region, the discharge criteria of the Auckland Unitary Plan: Operative in Part (AUP: OP), is considered relevant and has been adopted as the site assessment criteria.

The history of the site has been described in the report titled '*Preliminary Site Investigation, Ruakaka Service Station, Ruakaka*' dated March 2020 and prepared by Focus Environmental Services Limited (henceforth referred to as the PSI).

In brief, the PSI recommended a Detailed Site Investigation (DSI) to characterise the potential contamination associated with the use and maintenance of lead-based paint, demolition of historic structures and deterioration of structures potentially containing asbestos, spray drift of agrichemicals from historic horticulture on neighbouring sites, spray race activities and uncertified filling.

Following the PSI, the intrusive investigation was carried out by Focus Environmental Services Limited personnel on the 2<sup>nd</sup> of June 2020, where a total of twenty-eight discrete surface soil samples and two representative samples of fill were taken from across the site.

The samples were analysed for contaminants that could be present due to the potentially hazardous activities carried out at the site. The results of the site investigation have indicated that the activities carried out at the site have impacted the site soils. Elevated concentrations of heavy metals and asbestos fibres were detected in the site soils.

In addition, concentrations of lead were detected in the site soils at specific locations at levels elevated above the adopted environmental assessment criteria, the discharge criteria of the Auckland Unitary Plan: Operative in Part (AUP: OP).

Visual evidence of asbestos was identified, in addition to the site soils containing concentrations of asbestos fibres elevated above the adopted human health criteria for the site in two site locations.

Due to the elevated levels of contaminants detected, the site of the Ruakaka Service Centre, Ruakaka will require remediation of the affected soils prior to being redeveloped. The estimated volume of soil requiring remediation is 1305.3 m<sup>3</sup>. It should be noted that this volume may change during the remedial process.

A restricted discretionary consent is required under Regulation 10 of the NES as the proposed subdivision, change of use and soil disturbance do not meet the requirements of a permitted activity under Regulation 8 of the NES, and as this DSI for the piece of land has shown that the soil contamination does exceed the applicable standard for commercial land use.

The Proposed Regional Plan for Northland does not contain environmental guideline values. In order to accurately perform a risk assessment and to assess whether any discharges from contaminated land will result in significant adverse effects on the environment, and as there are currently no environmental guideline values available for the Northland Region, the discharge criteria of the Auckland Unitary Plan: Operative in Part (AUP: OP), is considered relevant and has been adopted as the site assessment criteria. It is therefore recommended that the site be remediated to the AUP: OP permitted activity discharge criteria to reduce the risk of adverse effects on the environment.

Additionally, the contaminated land rules of the Proposed Regional Plan for Northland (Chapter C.6.8) should be considered. The remediation of contaminated land under section C.6.8.3 of the Proposed Regional Plan for Northland is a Controlled activity and therefore consent under the Proposed Regional Plan for Northland may be required for the current proposal. However, it should be noted that at the time of writing this report, sections of the Plan are currently under appeal and are therefore not operative.

The objective of this Remediation Action Plan is to ensure that the soils contaminated above the adopted site assessment criteria are handled, removed in a controlled manner and disposed of to Puwera landfill. All earthworks required as part of the remedial works should be carried out in accordance with this Remediation Action Plan.

An assessment of the effects which may occur as a result of the proposed works has been made in order to mitigate any potential adverse environmental and/or human health effects. If the controls outlined in this Remediation Action Plan are implemented during the development works it is considered that the effects on the environment and human health are likely to be effectively mitigated.

Submitted By,



---

David O'Reilly  
Principal Environmental Consultant  
Focus Environmental Services Limited

## 1.0 Scope

- 1.1 This report has been prepared at the request of Ruakaka Developments Limited (“the Client”) in terms of the Focus Environmental Services Limited Agreement (“Agreement”).
- 1.2 The following report is based on:
  - *Information provided by the client*
  - *The report titled ‘Preliminary Site Investigation Ruakaka Service Centre, Ruakaka’ dated March 2020 and prepared by Focus Environmental Services Limited;*
  - *The report titled ‘Preliminary Geotechnical Investigation Report Corner of SH1 and Port Marsden Highway (SH15A) Ruakaka’ dated August 2019 and prepared by ENGEO Limited;*
  - *A site walkover and inspection; and*
  - *Site investigation and soil sampling.*
- 1.3 We have not independently verified the information provided to us by the Client or its completeness. We do not express an opinion on the accuracy or the reliability of such information.
- 1.4 No warranties are given, intended or implied.
- 1.5 Opinion, inferences, assumptions and interpretations made in this report should not be construed as legal opinion.
- 1.6 Where an assessment is given in this report, the Client must also rely upon their own judgement, knowledge and assessment of the subject of this report before undertaking any action.
- 1.7 This report must not be used in any other context or for any other purpose other than that for which it has been prepared without the prior written consent of Focus Environmental Services Limited.
- 1.8 This report is strictly confidential and intended for the sole use of the Client and shall not be disclosed without the prior written consent of Focus Environmental Services Limited.

## 2.0 Site Identification

The Ruakaka Service Centre area consists of four properties of approximately 17.86 ha across State Highway 1 and Port Marsden Highway, Ruakaka as shown in Figure 1 attached. The legal descriptions of the sites are outlined in Table 1 below. The Ruakaka Service Centre is located at national grid reference 1729143mE and 6027496mN.

**Table 1: Site Identification Details**

Physical Address	Legal Description	Area (ha)
0 Port Marsden Highway	Part Lot 2 DP 185432	4.018
2581 State Highway 1	Part Lot 1 DP 185432	3.757
0 Port Marsden Highway	Part Lot 3 DP 185432	3.672
0 State Highway 1	Part Lot 4 DP 185432	2.683

The site is irregular in shape and is zoned 'Countryside Living' under the Whangarei District Council (WDC) District Plan.

The current proposal relates to the proposed development of the Ruakaka Service Centre, comprised of restaurants, retail, service stations and associated parking. The proposed scheme plan is presented as Appendix A.

### 3.0 Site Topography

The property of the Ruakaka Service Centre has a predominantly flat landscape. With a steep slope surrounding the stream in the western portion of the site.

### 4.0 Geology and Hydrology

Published geological maps<sup>1</sup> indicate the site is underlain with alluvial deposits of the Tauranga Group. A description of the underlying geologies is presented in Table 2 below.

**Table 2: Geology of Ruakaka Service Centre**

<b>Key name</b>	OIS1 (Holocene) river deposits
<b>Simple name</b>	Holocene river deposits
<b>Main rock name</b>	Mud
<b>Description</b>	Unconsolidated to poorly consolidated mud, sand, gravel and peat deposits of alluvial, colluvial and lacustrine origins
<b>Subsidiary rocks</b>	Sand gravel peat
<b>Key group</b>	Holocene sediments
<b>Stratigraphic lexicon name</b>	Tauranga Group
<b>Absolute age (min)</b>	0.0 million years
<b>Absolute age (max)</b>	0.014 million years
<b>Rock group</b>	mudstone
<b>Rock class</b>	Clastic sediment

No groundwater investigation was completed as part of this investigation.

The nearest surface water body to the site is an unnamed tributary of the Ruakaka River is located in the northern portion of the site.

---

<sup>1</sup> Geology of the Auckland Area (Institute of Geological & Nuclear Sciences 1:25,000 geological map 3, 2011)

## **5.0 Regulatory Framework**

### **5.1 The National Environmental Standard**

The Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (NES) came into effect on the 1<sup>st</sup> of January 2012 and supersedes any District Plan rules that related to contaminated land. Any Regional Plan rules relating to contaminated land are still applicable.

In brief, the objective of the NES is to ensure that land affected by contaminants is identified and assessed and, if necessary, remediated or managed to protect human health. The NES only applies to the activities: removing or replacing all, or part of, a fuel storage system; sampling the soil; disturbing the soil; subdividing the land; and changing the land use, and where an activity or industry described in the Hazardous Activities and Industries List (HAIL) is being, has been, or is more likely than not to have been undertaken on the piece of land.

The NES also contains reference to the soil contaminant standards for human health (SCS<sub>s(health)</sub>), for a variety of land use scenarios along with reference to best practice reporting documents.

### **5.2 Proposed Regional Plan for Northland**

The Proposed Regional Plan for Northland (Appeals Version 29 July 2019) was published in 2019 by Northland Regional Council in accordance with the Resource Management Act 1991 (the RMA). It is a combined regional air, land, water and coastal plan.

In brief, the objective of the Proposed Regional Plan for Northland is to manage land containing elevated levels of contaminants to protect human health and the environment and to enable the effective use of the land.

The contaminated land rules of the Proposed Regional Plan for Northland (Chapter C.6.8) should be considered. It should be noted that at the time of writing this report sections of the Plan are currently under appeal and are therefore not operative. Furthermore, the Proposed Regional Plan for Northland does not contain environmental guideline values.

Additionally, in order to accurately perform a risk assessment and to assess whether any discharges from contaminated land will result in significant adverse effects on the environment, and as there are currently no environmental guideline values available for the Northland Region, the discharge criteria of the Auckland Unitary Plan: Operative in Part (AUP: OP), is considered relevant and has been adopted as the site assessment criteria.

It should be noted that remediation of contaminated land under section C.6.8.3 of the Proposed Regional Plan for Northland is a controlled activity. If remediation of the site soils it required, a controlled activity consent under the Proposed Regional Plan for Northland may be required for the proposal.

## 6.0 Background

The history of the site has been described in the report titled '*Preliminary Site Investigation, Ruakaka Service Station, Ruakaka*' dated March 2020 and prepared by Focus Environmental Services Limited (henceforth referred to as the PSI).

In brief, the PSI recommended a Detailed Site Investigation to characterise the potential contamination associated with the use and maintenance of lead-based paint, demolition of historic structures and deterioration of structures potentially containing asbestos, spray drift of agrichemicals from historic horticulture on neighbouring sites, spray race activities and uncertified filling.

This document is intended to confirm the contamination status of the site and should be read in conjunction with the PSI.

## 7.0 Site Walkover and Inspection

During the Detailed Site Investigation, no additional HAIL activities were identified on the site. The site features plan is presented in Figure 2.

## 8.0 Potentially Contaminating Activities or Land Uses

Following a review of the history and the available information relating to the subject site the numerous potentially contaminating activities were identified, the activities are outlined in Table 3 below.

**Table 3: Potentially Contaminating Activities**

Activity Description	HAIL Category
Maintenance and Use of Lead Based Paint	I
Demolition of Historic Structures Potentially Containing Asbestos	E1
Spray drift of agrichemicals from historic horticulture on neighbouring property	H/A10
Spray Race Activities	A8
Uncertified Filling	G3

## 9.0 Conceptual Model of Exposure Pathways

The assessment provided in Table 4 below expands on the potential sources of contamination identified within the area of the proposed development (as identified above) and exposure pathways and was based on the potential effects of the change of land use and soil disturbance activities on human health and the environment associated with the proposed development of a commercial service centre.

**Table 4: Conceptual Site Model: Ruakaka Service Centre, Ruakaka**

Potential Source	Potential Pathways	Potential Receptors	Assessment
Contaminated Soil	Dermal Contact with Contaminated Soils	Human Health - Commercial/Industrial Outdoor Worker	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.
	Ingestion of Contaminated Soils	Human Health - Commercial/Industrial Outdoor Worker	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.
	Inhalation of Vapours/Fibres	Human Health - Commercial/Industrial Outdoor Worker	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.
	Surface Water Run-off	Ecological Receptors - Unnamed Tributary Ruakaka River	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.
	Migration of Groundwater	Ecological Receptors - Unnamed Tributary Ruakaka River	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.

## 10.0 Sampling and Analysis Plan and Sampling Method

Environmental Sampling was carried out in accordance with the Contaminated Land Management Guidelines No.5 (MfE, 2011).

A total of twenty-eight discrete soil samples were collected from across the site and two samples of PACM fragments were collected. All samples were sent under full chain of custody documentation to an IANZ accredited laboratory. Sampling and Analysis information is provided in Table 5 below.

**Table 5: Discrete Sample Analysis Information: Ruakaka Service Centre, Ruakaka**

Sample Name	Sample Depth	Number of Samples	HAIL Activity	Analysis Suite
COMP01 (A-D) & COMP02 (A-D)	0.15m	2 Composite samples (4:1)	Historical Horticulture	<ul style="list-style-type: none"> <li>Total recoverable Arsenic, Copper &amp; Lead; and</li> <li>Organochlorine Pesticides</li> </ul>
SP01	0.15	1	Spray Race	<ul style="list-style-type: none"> <li>Total recoverable Arsenic, Copper &amp; Lead; and</li> <li>Organochlorine Pesticides</li> </ul>
PACM01 & PACM02	-	2	PACM Demolition Debris	<ul style="list-style-type: none"> <li>Qualitative Asbestos in Bulk (Presence/Absence)</li> </ul>
HB01, HB02, HB03, HB04, HB05, HB06, ASB01 & ASB02	0.15m	8	ACM Demolition Debris	<ul style="list-style-type: none"> <li>Semi-quantitative asbestos in soil (NZ Guidelines).</li> </ul>
PB01, PB02, PB03, HB01, HB02, HB03, HB04, HB05 & HB06	0.15m	9	Application of Lead Based Paint	<ul style="list-style-type: none"> <li>Total recoverable Lead</li> </ul>

In addition, two hand augers (HA01 & HA02) were completed to a maximum depth of 0.6m below ground level (bgl). Representative samples of the fill material were obtained from 0.2m to 0.5m bgl. Both hand auger locations were inspected for visual and olfactory evidence of contamination and were photographed and logged in accordance with NZ Geotechnical Society Guidelines.

A total of two representative samples collected from the two hand auger locations, and one duplicate sample collected for quality control purposes, were sent under full chain of custody documentation to an IANZ accredited laboratory. Sampling and Analysis information is provided in Table 6 below.

**Table 6: Hand Auger Sample Analysis Information: Ruakaka Service Centre, Ruakaka**

Sample Name	Sample Depth	HAIL Activity	Analysis Suite
HA01 0.2m	0.2-0.5m	Uncertified Filling	<ul style="list-style-type: none"> <li>• Total recoverable Arsenic, Cadmium, Chromium, Copper, Lead, Nickel &amp; Zinc,</li> <li>• Polycyclic Aromatic Hydrocarbons,</li> <li>• Organochlorine Pesticides; and</li> <li>• Semi-quantitative asbestos in soil (NZ Guidelines).</li> </ul>
HA01 0.2m DUP			
HA02 0.2m			

Furthermore, a visual inspection for ACM was undertaken at each hand auger location. The visual inspection was undertaken in accordance with the 'New Zealand Guidelines for Assessing and Managing Asbestos in Soil' (BRANZ Limited, 2017).

The hand auger logs and photographs are attached as Appendix B.

The sample location plan is presented as Figure 4.

## 11.0 Field Sampling Quality Assurance

All sampling implements were triple washed between samples using clean tap water, followed by a solution of laboratory grade phosphate free detergent (Decon 90), and a final rinse with water.

Clean, latex gloves were worn when handling each sample. Samples were stored in laboratory cleaned glass jars and immediately placed in an iced cooler. The samples were transported under chain of custody documentation to an IANZ accredited laboratory for analysis.

## 12.0 Laboratory Quality Assurance

Routine laboratory quality assurance procedures include analysis of laboratory blanks and spiked samples. All analyses were carried out using industry standard methods as follows:

- Total Recoverable Metals - Samples dried and passed through a 2 mm sieve followed by acid digestion and analysis by ICPMS. In accordance with in-house procedure based on US EPA method 200.8.
- Organo-chlorine pesticides - Samples are extracted with hexane, pre-concentrated then analysed by GC-MSMS. (Chlordane (sum) is calculated from the main actives in technical Chlordane: Chlordane, Nonachlor and Heptachlor).
- Polycyclic Aromatic Hydrocarbons - Solvent extraction, silica cleanup, followed by GC-MS analysis. Benzo[a]pyrene toxic equivalence (TEQ) is calculated according to 'Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health'. Ministry for the Environment. 2011.(In accordance with in-house procedure).
- Asbestos - AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples
- Semi - Quantitative Asbestos in Soil - Sample analysis was performed using polarised light microscopy with dispersion staining in accordance with AS4964-2004 Method for the qualitative identification of asbestos in soil samples.

## 13.0 Basis for Guideline Values

It is proposed that the site will be developed for residential land use, therefore the guideline values of the Soil Contaminant Standards for health (SCS<sub>(health)</sub>) for commercial land use as outlined in the National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health (NES) are considered relevant and have been adopted as the site assessment criteria.

In addition, as there are no environmental guideline values outline in the Proposed Regional Plan for Northland, the discharge criteria of the Auckland Unitary Plan: Operative in Part (AUP: OP), is considered relevant and has been adopted as the site assessment criteria.

Furthermore, as the NES does not contain a reference value for asbestos in soil, in accordance with the hierarchy described in the Contaminated Land Management Guidelines No. 2 – Hierarchy and Application in New Zealand of Environmental Guideline Values (MfE, 2011), the soil guideline value for asbestos in New Zealand, taken from the New Zealand Guidelines for Assessing and Managing Asbestos in Soil (BRANZ Limited, 2017) of 0.001% combined fibrous asbestos and asbestos fines (FA/AF) and/or 0.01% asbestos containing material (ACM) has been adopted as the site assessment criteria.

Additionally, due to the lack of data the concentrations of heavy metals detected will be compared to the maximum background levels for non-volcanic soils in Auckland<sup>2</sup> (TP153). The relevant values of the above guidelines have been reproduced in Table 7 below.

**Table 7: Site Assessment Criteria: Ruakaka Service Centre, Ruakaka (mg/kg)**

Parameter	NES (SCS <sub>(health)</sub> )	AUP: OP	TP153
Arsenic	70	100	12
Cadmium	1,300	7.5	0.65
Chromium	6,300	400	55
Copper	NL	325	45
Lead	3,300	250	65
Nickel	6,000 <sup>1</sup>	105	35
Zinc	400,000 <sup>1</sup>	400	180
Total DDT	1,000	12	-
Dieldrin	160	0.5 <sup>2</sup>	-
BaP eq.	35	20	-
Asbestos	0.001% <sup>3</sup> /0.05% <sup>4</sup>	-	-
Visual ACM	No Visual Evidence of ACM <sup>5</sup>	-	-

**Note:** NL = Not Limited. This is where the derived values exceed 10,000mg/kg; 1. = No Soil Contaminant Standards for health (SCS<sub>(health)</sub>) given, guideline values derived in accordance with the Contaminated

<sup>2</sup> Background Concentrations of Inorganic Elements in Soils from the Auckland Region, Technical Publication No.153, Auckland Regional Council, 2001.

Land Management Guidelines number 2 – Hierarchy and Application in New Zealand of Environmental Guideline Values (MfE, 2011), and taken from the National Environment Protection (Assessment of Site Contamination) Measure 1999 for Low Density Residential land use, 2= Soil Guideline Values to protect on-site ecological receptors taken from Ministry for the Environment Guidelines for Identifying, Investigating and Managing Risks Associated with Former Sheep-dip Sites, November 2006.; 3 = Soil guideline values for asbestos in Soil of 0.001% combined fibrous asbestos and asbestos fines (FA/AF), taken from the New Zealand Guidelines for Assessing and Managing Asbestos in Soil (BRANZ Limited, 2017); 4= Soil guideline values for asbestos in Soil of 0.05% asbestos containing material (ACM), taken from the New Zealand Guidelines for Assessing and Managing Asbestos in Soil (BRANZ Limited, 2017). 5= No visual evidence of asbestos containing material in the upper 0.1m of soil in accordance with New Zealand Guidelines for Assessing and Managing Asbestos in Soil (BRANZ Limited, 2017).

Furthermore, the natural background levels of organo-chlorine pesticides, polycyclic aromatic hydrocarbons and asbestos (visual evidence, AF & FA) are considered to be below the analytical levels of detection and hence the detection of these analytes would restrict material from being classified as cleanfill material.

## 14.0 Quality Control

### 14.1 Laboratory Verification

One sample (HA01 0.2m) was selected at random for duplicate analysis and Relative Percentage Difference (RPD) calculations. In accordance with the Contaminated Land Management Guidelines No.5 (MfE, 2011) an RPD value of less than 30-50% is generally considered acceptable. If the results were below the laboratory detection limits the RPD was not calculated. The results of the RPD analysis is presented in Table 8 below.

**Table 8: RPD Summary: Ruakaka Service Centre, Ruakaka**

Parameter	HA01 0.2m (RPD %)
Arsenic	18.18
Cadmium	1.29
Chromium	22.22
Copper	14.11
Lead	33.96
Nickel	22.22
Zinc	6.86

**Note:** Results in *Italics* exceed 30% RPD. Results in **red** exceed 50% RPD.

The RPD values calculated for all the analytes were less than or within the acceptable range. Therefore, based on the results of the RPD analysis, the sample results are likely to be relatively consistent and repeatable.

The RPD calculations are presented as Appendix C.

## 15.0 Soil Sampling Results

Tabulated soil sampling results are presented in Tables 9-13 below and laboratory transcripts are provided in Appendix D.

### 15.1 Heavy Metals

**Table 9: Heavy Metals Results: Ruakaka Service Centre, Ruakaka (mg/kg).**

Sample	As	Cd	Cr	Cu	Pb	Ni	Zn
PB01	-	-	-	-	250	-	-
PB02	-	-	-	-	182	-	-
PB03	-	-	-	-	<b>660</b>	-	-
HB01	-	-	-	-	<b>2,000</b>	-	-
HB02	-	-	-	-	16.2	-	-
HB03	-	-	-	-	12.0	-	-
HB04	-	-	-	-	33	-	-
HB05	-	-	-	-	19.2	-	-
HB06	-	-	-	-	35	-	-
SP01	22	-	-	40	31	-	-
COMP01	<2	-	-	13	18.2	-	-
COMP02	<2	-	-	11	13.6	-	-
HA01 0.2m	5	<i>0.78</i>	12	<i>191</i>	<b>310</b>	4	<i>181</i>
HA02 0.2m	<2	0.17	5	6	9.1	<2	16

**Note:** Results in **red** exceed the Soil Contaminant Standards for health (SCS<sub>(health)</sub>) for commercial/industrial land use. Results in **Bold** exceed the adopted environmental assessment criteria. Results in *Italics* exceed the maximum Auckland background concentrations for non-volcanic soils outlined in the Auckland Regional Council Technical Publication No.153, Oct 2001.

The concentrations of arsenic detected in sample SP01 was elevated above the maximum Auckland background concentrations for non-volcanic soils. The concentrations of arsenic detected in all samples analysed were below the SCS<sub>(health)</sub> for commercial/industrial land use as outlined in the NES and the adopted environmental assessment criteria.

The concentrations of cadmium detected in sample HA01 0.2m was elevated above the maximum Auckland background concentrations for non-volcanic soils. The concentrations of cadmium detected in both samples analysed were below the SCS<sub>(health)</sub> for commercial/industrial land use as outlined in the NES and the adopted environmental assessment criteria.

The concentrations of chromium detected in both samples analysed were below the maximum Auckland background concentrations for non-volcanic soils, the SCS<sub>(health)</sub> for commercial/industrial land use as outlined in the NES and the adopted environmental assessment criteria.

The concentrations of copper detected in sample HA01 0.2m was elevated above the maximum Auckland background concentrations for non-volcanic soils. The concentrations of copper detected in all of the samples analysed were below the SCSs(health) for commercial/industrial land use as outlined in the NES and the adopted environmental assessment criteria.

The concentrations of lead detected in samples PB01, PB02, PB03, HB01 and HA01 0.2m were elevated above the maximum Auckland background concentrations for non-volcanic soils. The concentrations of lead detected in samples PB03, HB01 and HA01 0.2m were also elevated above the adopted environmental assessment criteria. The concentrations of lead detected in all samples analysed were below the SCSs(health) for commercial/industrial land use as outlined in the NES.

The concentrations of nickel detected in both samples analysed were below the maximum Auckland background concentrations for non-volcanic soils, the adopted human health criteria and the adopted environmental assessment criteria.

The concentrations of zinc detected in sample HA01 0.2m was elevated above the maximum Auckland background concentrations for non-volcanic soils. The concentrations of zinc detected in both samples analysed were below the SCSs(health) for commercial/industrial land use as outlined in the NES and the adopted environmental assessment criteria.

## 15.2 Organochlorine Pesticides

**Table 10: Organochlorine Pesticide Results: Ruakaka Service Centre, Ruakaka (mg/kg).**

Sample	Total DDT	Dieldrin
SP01	<0.4	<0.05
COMP01	<0.11	<0.016
COMP02	<0.11	<0.016
HA01 0.2m	<0.09	<0.013
HA02 0.2m	<0.09	<0.013

**Note:** \* = Residual levels of contaminants detected. Results in **red** exceed the Soil Contaminant Standards for health (SCS<sub>(health)</sub>) for commercial/industrial land use. Results in **Bold** exceed the adopted environmental assessment criteria. Results in *Italics* exceed the cleanfill criteria.

The concentrations of organo-chlorine pesticides in all samples analysed were below the analytical levels of detection and therefore below the cleanfill criteria, SCS<sub>(health)</sub> for commercial/industrial land use as outlined in the NES and the discharge criteria of the AUP: OP.

## 15.3 Polycyclic Aromatic Hydrocarbons

**Table 11: Polycyclic Aromatic Hydrocarbon Results: Ruakaka Service Centre, Ruakaka (mg/kg).**

Sample	BaP eq.
HA01 0.2m	<0.04
HA02 0.3m	<0.04

**Note:** \* = Residual levels of contaminants detected. Results in **red** exceed the Soil Contaminant Standards for health (SCS<sub>(health)</sub>) for commercial/industrial land use. Results in **Bold** exceed the adopted environmental assessment criteria. Results in *Italics* exceed the cleanfill criteria.

The concentrations of polycyclic-aromatic hydrocarbons in both samples analysed were below the analytical levels of detection and therefore below the cleanfill criteria, SCS<sub>(health)</sub> for commercial/industrial land use as outlined in the NES and the discharge criteria of the AUP: OP.

## 15.4 Asbestos

**Table 12: Asbestos in bulk results: Ruakaka Service Centre, Ruakaka (mg/kg).**

Sample	Sample Type	Asbestos Type
PACM01	Fibre Board	No Asbestos Detected
PACM02	Fibre Cement	<i>Chrysotile (White Asbestos) Amosite (Brown Asbestos)</i>

**Note:** ND = Not Detected.

Asbestos in the form of Chrysotile and Amosite were detected in sample PACM02.

**Table 13: Asbestos in Soil Results (Semi-Quantitative, %)**

Sample	Asbestos Type	Asbestos (FA/AF %)	Asbestos (% ACM)
HB01	Asbestos Not Detected	<0.001	<0.001
HB02	Asbestos Not Detected	<0.001	<0.001
HB03	Asbestos Not Detected	<0.001	<0.001
HB04	Asbestos Not Detected	<0.001	<0.001
HB05	Asbestos Not Detected	<0.001	<0.001
HB06	Asbestos Not Detected	<0.001	<0.001
ASB01	<i>Amosite (Brown Asbestos) &amp; Chrysotile (White Asbestos)</i>	<b>0.004</b>	<0.001
ASB02	<i>Amosite (Brown Asbestos) &amp; Chrysotile (White Asbestos)</i>	<b>0.031</b>	<0.001

**Note:** \* - denotes residual concentrations detected. Results in **red** exceed the adopted human health criteria. Results in *Italics* exceed the cleanfill criteria.

The concentrations of asbestos fibres detected in samples ASB01 and ASB02 were elevated above the adopted human health criteria.

## 16.0 Extent of Contamination

The results of the sample analysis indicate that the site soils in the central and northern areas of the site are contaminated above the adopted human health criteria for asbestos fibres and visual asbestos and above the adopted environmental assessment criteria for lead.

The surface samples ASB01 & ASB02 taken from the areas of observed PACM in the soil profile was elevated above the adopted human health criteria for asbestos fibres. In addition to containing visual evidence of asbestos containing material within the soil profiles of these areas (Area 1 & Area 2).

The surface sample PB03, taken from taken from the soils surrounding the garage contained concentrations lead elevated above the adopted environmental assessment criteria. The surface sample HB01, taken from the vicinity of historical building (1) contained concentrations of lead elevated above the adopted environmental assessment criteria. The representative sample HA01 0.2m collected from the fill material in hand auger location 1 to the north of the dwelling contains concentrations of lead elevated above the adopted human health criteria for the site (Area 3).

The estimated volume required to remove the contaminated soils from the site is presented in Table 14 below.

**Table 14: Extent of Contamination: Ruakaka Service Centre, Ruakaka**

	Area (m <sup>2</sup> )	Depth (m)	Contaminant	Quantity (m <sup>3</sup> )
Area 1	92.7	0.3	Asbestos	27.81
Area 2	275.1	0.3	Asbestos	82.53
Area 3	2,555	0.5	Pb	1,277.5
Total Volume				1,305.3
Total Tonnes (m <sup>3</sup> x 1.5)				<b>1,957.9 t</b>

Area 2 is encompassed within Area 3 so the total volume recommended for remediation is 1305.3 m<sup>3</sup>. The inferred extent of the contaminated soil at the site is presented in Figures 4-1 and 4-2. The extent of Area 3 is based on the extent of fill taken from the provided geotechnical information. This estimate is based on the sampling and results available following the site investigation and it should be noted that the volume may increase or decrease following inspection, delineation sampling and validation sampling.

**All contaminated materials removed from site will require disposal to Puwera landfill or an alternative suitably licensed landfill facility.**

In addition, due to the low-level contamination identified within the site soils in the vicinity of the spray race, the site soils from this area are not suitable for classification as cleanfill and any topsoil removed from this area of the site will require disposal to a suitably licensed managed fill facility, unless further sampling and analysis demonstrate otherwise.

## 17.0 Revised Conceptual Model of Exposure Pathways

The revised conceptual site model provided in Table 15 below expands on the potential sources of contamination identified within the area of the proposed development (as identified above) and exposure pathways and was based on the potential effects of the change of land use and soil disturbance activities on human health and the environment associated with the proposed development of a commercial service centre.

**Table 15: Revised Conceptual Site Model: Ruakaka Service Centre, Ruakaka**

Potential Source	Potential Pathways	Potential Receptors	Assessment
Contaminated Soil	Dermal Contact with Contaminated Soils	Human Health - Commercial/Industrial Outdoor Worker	Incomplete: No concentrations of contaminants detected in exceedance of the SCS Commercial/industrial worker
	Ingestion of Contaminated Soils	Human Health - Commercial/Industrial Outdoor Worker	Incomplete: No concentrations of contaminants detected in exceedance of the SCS Commercial/industrial worker
	Inhalation of Vapours/Fibres	Human Health - Commercial/Industrial Outdoor Worker	Potentially Complete: Remediation or management of the contaminated area required.
	Surface Water Run-off	Ecological Receptors - Unnamed Tributary Ruakaka River	Potentially Complete: Remediation or management of the contaminated area required.
	Migration of Groundwater	Ecological Receptors - Unnamed Tributary Ruakaka River	Potentially Complete: Remediation or management of the contaminated area required.

## 18.0 Regulatory Requirements

### 18.1 The National Environmental Standard

Due to the potentially contaminating land uses identified above, it is considered that an activity described in the HAIL is being, has been, or is more likely than not to have been undertaken at the site.

Resource Consent will therefore likely be required for the site under the District Plan, following the introduction of the National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health (NES).

In reference to the NES the following assessment was made in determining the activity status of the proposed works:

- The land is covered by the NES under regulation 5.7(b) 'an activity or industry described in the HAIL has been undertaken on it'.
- The activity is changing the use of a piece of land under regulation 5(6) 'means changing it to a use that, because the land is described in subclause (7), is reasonably likely to harm human health'.
- The activity of changing use does not comply with regulation 8(4).
- The activity is disturbing soil under regulation 5(4)(a) 'means disturbing the soil of the piece of land for a particular purpose'.
- The activity does comply with regulation 8(3)(c) 'the volume of the disturbance of the soil of the piece of land must be no more than 25m<sup>3</sup> per 500m<sup>2</sup> and '...a maximum of 5 m<sup>3</sup> per 500 m<sup>2</sup> of soil may be taken away'.
- A detailed site investigation for the piece of land does exist.

A restricted discretionary consent is required under Regulation 10 of the NES as the proposed change of use and soil disturbance do not meet the requirements of a permitted activity under Regulation 8 of the NES, and as this detailed site investigation for the piece of land has shown that the soil contamination does exceed the applicable standard for residential land use.

### 18.2 Proposed Regional Plan for Northland

The Proposed Regional Plan for Northland (Appeals Version 29 July 2019) was published in 2019 by Northland Regional Council in accordance with the Resource Management Act 1991 (the RMA). It is a combined regional air, land, water and coastal plan.

The Proposed Regional Plan for Northland does not contain environmental guideline values. In order to accurately perform a risk assessment and to assess whether any discharges from contaminated land will result in significant adverse effects on the environment, and as there are currently no environmental guideline values available for the Northland Region, the discharge criteria of the Auckland Unitary Plan: Operative in Part (AUP: OP), is considered relevant and has been adopted as the site assessment criteria. It is therefore recommended that the site soils be remediated to the AUP: OP guidelines to reduce the risk of adverse effects on the environment.

Additionally, the contaminated land rules of the Proposed Regional Plan for Northland (Chapter C.6.8) should be considered. The remediation of contaminated land under section C.6.8.3 of the Proposed Regional Plan for Northland is a Controlled activity and

therefore consent under the Proposed Regional Plan for Northland may be required for the current proposal.

It should be noted that at the time of writing this report sections of the Plan are currently under appeal and are therefore not operative.

## 19.0 Remediation Action Plan

Due to the concentration of asbestos fibres identified in the site soils, in accordance with the New Zealand Guidelines for Assessing and Managing Asbestos in Soil (BRANZ Limited, 2017), the soils within Areas 1 & 2 will require removal by a Class B licensed asbestos removalist.

This Remediation Action Plan & Assessment of Environmental Effects (RAP & AEE) provides the soil specific management controls to be implemented at the site to ensure that any adverse effects on human health, as a result of the removal of asbestos and heavy metal contaminated soils identified at the site, will be effectively mitigated.

It is therefore considered that this RAP & AEE meets the requirements of the National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health (NES).

In order to meet the requirements of the Health and Safety at Work (Asbestos) Regulations (MBIE, 2016), it is recommended that the selected contractor incorporates the procedures set out in this RAP & AEE into site-specific asbestos removal control plan and that the works are carried out in accordance with the Approved Code of Practice for the Management, Removal of Asbestos (WorkSafe New Zealand, 2016).

Following the removal of any asbestos contaminated soils or ACM, a certificate of clearance is to be produced by a suitably licensed asbestos assessor.

Should any ACM be discovered during any future works, its removal from the site shall be conducted in accordance with the Health and Safety at Work (Asbestos) Regulations (MBIE, 2016) and the Approved Code of Practice for the Management and Removal of Asbestos (WorkSafe New Zealand, 2016).

### 19.1 Remediation Criteria

The objectives for the remediation of the site are to remediate the affected soils to levels below the applicable guideline values (as specified in Table 7) to address the immediate human health and environmental concerns at the site. Remediation of the site in the areas shown in Figures 4-1 and 4-2 will be necessary to achieve compliance with the above guidelines.

The remediation strategy for the site will involve the machine excavation and loading of the affected site soils prior to transport and disposal. The site will then be subject to a process of validation whereby the remaining soils will be sampled to confirm that the objectives of the remediation for the site have been achieved.

The remediation criteria for the site are presented in Tables 16 & 17 below.

**Table 16: Remediation criteria for Area 1 & 2 - Ruakaka Service Centre, Ruakaka (mg/kg).**

Parameter	Value
Asbestos	<0.001% <sup>1</sup> /0.01% <sup>2</sup>
	No visible evidence of asbestos on surface soil <sup>3</sup>

1 = Soil guideline values for asbestos in Soil of 0.001% combined fibrous asbestos and asbestos fines (FA/AF), taken from the New Zealand Guidelines for Assessing and Managing Asbestos in Soil (BRANZ Limited, 2017); 2 = Soil guideline values for asbestos in Soil of 0.01% asbestos containing material (ACM), taken from the New Zealand Guidelines for Assessing and Managing Asbestos in Soil (BRANZ Limited, 2017). 3= No visual evidence of asbestos containing material in the upper 0.1m of soil in accordance with New Zealand Guidelines for Assessing and Managing Asbestos in Soil (BRANZ Limited, 2017).

**Table 17: Remediation criteria for Area 3- Ruakaka Service Centre, Ruakaka (mg/kg).**

Parameter	Value
Lead	250

As stated above, the remediation of the asbestos contaminated soils in Area 1 & 2 is required to be undertaken under the supervision of a Class B licensed asbestos removalist. It is recommended that a licensed asbestos removalist is present for the duration of the removal works to ensure that the procedures outlined in this plan and the ARCP are adhered to in order to mitigate the potential effects on human health.

Following the removal of any visual evidence of asbestos containing material (Area 1 & Area 2), a third-party clearance certificate will be obtained by a licensed asbestos assessor.

## 19.2 Work Programme

It is considered that the health & safety and environmental controls, as detailed below, will be sufficient to ensure that any adverse human health and/or environmental effects, as a result of the contaminated soils identified at the site, will be effectively mitigated.

A contractor experienced in remediation of contaminated sites will undertake the earthworks, excavation & disposal of contaminated soils at the site.

The contractor will:

- Prior to works occurring, install a 3.0m fenced buffer where possible surrounding each inferred area of contamination.
- Prepare a site-specific Asbestos Removal Control Plan and notify WorkSafe of the remediation of the asbestos contaminated soils (Areas 1 & 2).
- Provide adequate Personal Protective Equipment (PPE) and Respiratory Protective Equipment (RPE) to all staff involved in the removal works.
- Install facilities on site which include a clean area for staff, a decontamination unit and washing facilities.
- Connect a water source and/or misting system to control any dusts that may be generated as a result of the works. This misting system must be capable of reaching all areas of the site during the ground-breaking works.
- Engage a third-party asbestos assessor and complete asbestos fibre monitoring one day prior to and during the remedial works in remediation areas 1 & 2.
- Install sediment and erosion controls for the development works in accordance with industry best practice (Auckland Council's Erosion and Sediment Control Guide for Land Disturbing Activities<sup>3</sup>).
- Ensure that the soils within area 1 & 2 are sufficiently wet prior to starting works.
- Machine excavate the contaminated soils from the site and load the materials onto waiting trucks.

---

<sup>3</sup> Auckland Council, Erosion & Sediment Control Guide for Land Disturbing Activities in the Auckland Region, June 2016, Guideline Document 2016/005.

- Asbestos contaminated soils will be loaded into trucks lined with 200µm heavy-gauge polythene and wrapped.
- Ensure that the trucks leaving the site have their contents wrapped, are fitted with close fitting tarpaulins and have sealed tailgates.
- Once the trucks have been inspected to ensure that the tarpaulins are properly fitted and the tires are free from any soil materials, transport contaminated soils to Puwera landfill and retain any weighbridge dockets obtained.
- Obtain certificate of clearance by a suitably licensed asbestos assessor or a competent person for the areas of asbestos contaminated soils.
- Carry out the validation process and undertake any further remedial works required to achieve the remediation goals.
- Prior to plant being removed from the asbestos removal area, a visual assessment for the presence of asbestos, visible debris and soil shall be carried out by a qualified asbestos assessor and a clearance certificate issued.
- Once all contaminated soil has been removed, clearance certificate obtained and the remediation goals achieved then the site will be reinstated with clean fill materials if required and the site stabilized.

## 19.1 Establishment and Site Preparation

Prior to works commencing the contractor should be familiar with this remediation action plan (RAP) which outlines all environmental and health & safety controls to be implemented when dealing with the contaminated soils

No unauthorised access to the remedial area will be allowed during the removal of the contaminated soils. Access to the site and the contaminated materials will be restricted during the project.

In addition, the asbestos contaminated area of the site will be fenced off to enclose the work areas. No unauthorised access to the asbestos works areas (Area 1 & 2), will be allowed during the entirety of the works. Access to the site and the contaminated materials will be restricted during the project.

Appropriate warning signage shall be posted in visible locations during the works and surrounding the contaminated material. All visitors and contractors will sign in and out of the site each day during the removal of the asbestos containing soils.

## 19.2 Asbestos Fibre Monitoring

In order to confirm that the mitigation controls are sufficient in the areas of asbestos remediation (Area 1 & 2) asbestos fiber monitoring is required to confirm that asbestos in air is below trace level (0.01 f/ml).

Asbestos fiber monitoring shall be completed by a third-party asbestos assessor for the first day during works.

In the event that trace levels are exceeded, cease works, dampen, cover and fence off (barrier tape) the area of works and contact the Contaminated Land Specialist.

### 19.3 Odour Control

It is considered unlikely that nuisance odour will be an issue on site. However, in the event that there may be odorous materials encountered, where possible these will be loaded as soon as possible onto the removal trucks. If this is not possible the odorous material will be covered with no-odorous material prior to being loaded.

### 19.4 Excavation, Haulage and Disposal of Materials

Excavation works will not commence at the site until all the environmental controls have been put in place. The exposed excavated areas will be kept to a minimum to minimise the risk of erosion due to storm water runoff. Where possible, the excavated materials will be loaded directly onto the removal trucks.

All trucks carting asbestos contaminated soils should be lined with 200µm heavy-gauge polythene. All trucks with asbestos contaminated soils (Area 1 & 2) will have their contents wrapped.

All trucks will be fitted with close fitting tarpaulins and have sealed tailgates. All trucks will be inspected prior to leaving the loading area, to ensure that no loose contaminated materials leave the site. During loading wheel covers will be used where possible and any loose materials will be collected for later disposal.

All materials leaving the site will be disposed of to Puwera landfill or an alternative suitably licensed disposal facility and will be tracked by way of weighbridge docketts which include the disposal location and the weight of the load. Furthermore, prior to the materials being removed from site the contractor will confirm the transportation route and a revision to this RAP may be made.

### 19.5 Validation Sampling

Following the excavation of the asbestos contaminated materials (Area 1 & 2) a clearance certificate will be produced by a suitably licensed asbestos assessor or a competent person. Following receipt of the clearance certificate, the base and side walls of all the excavated remediation areas will be sampled by a suitably qualified and experienced practitioner and the soils analysed by an accredited laboratory to determine if the remediation works have been successful.

Site validation sampling for all remediation areas will be completed at a frequency sufficient to meet the requirements of the Contaminated Land Management Guidelines No.5 (MfE, 2011) by a suitably qualified and experienced contaminated land professional.

During the remedial works of Area 3, a SQEP shall be present on site and complete in-situ screening of the heavy metal contaminated area. Screening will be completed using a hand-held X-ray Fluorescence analyser (XRF) in an attempt to delineate and reduce the remediation area. Following delineation, validation samples from the base and side walls from Area 3 will be collected and sent for laboratory analysis at an accredited laboratory to confirm the extents of the remediation area and to determine if the remediation works have been successful.

The proposed validation sampling plan is shown in Figure 5 attached.

The clearance certificate and the results of all validation sampling will be included in the site validation report.

## **19.6 Clean Fill Validation (If Required)**

Any materials imported onto the site if required to reinstate the ground will have to be tested to ensure their suitability as clean fill materials. Imported materials are to be sampled at a rate of at least 1 sample per 500m<sup>3</sup> for heavy metals, polycyclic aromatic hydrocarbons, organochlorine pesticides and asbestos. Alternatively, dockets confirming that imported hardfill has been sourced from a commercial quarry may also be provided to Northland Regional Council in lieu of sampling. Any soil material imported to the site shall comply with the definition of 'cleanfill material', as per the Proposed Regional Plan for Northland.

All imported materials shall be sourced from a site which has been determined by a Suitably Qualified Contaminated Land Professional to have had no known history of potentially contaminating activities, as detailed on the Ministry for the Environment's Hazardous Activities and Industries List (HAIL); or adequately investigated by a Suitably Qualified Contaminated Land Professional, in accordance with Contaminated Land Management Guidelines (Ministry for the Environment, 2011) to meet the 'Cleanfill material' definition as prescribed in the Proposed Regional Plan for Northland.

## **20.0 Assessment of Environmental Effects**

The following sections deal with the potential adverse effects which could have a negative impact on the environment and or human health as a result of the remediation project. If the controls outlined in this RAP are implemented during the development works the effects on the environment are likely to be effectively mitigated.

The required site management controls are detailed below and include, but should not be limited to, the following: dust control, health and safety measures, stormwater, erosion and sediment control, odour control and contingency measures

### **20.1 Dust Control**

During the disturbance process, the areas of asbestos contamination (Areas 1 & 2) should be adequately wet. Soil should have water applied at the point of contact. The excavator or other excavation equipment should handle the material wet.

A continuous water supply should be available at all times. The water source and/or misting system should be capable of applying water or a water mist directly to the materials to minimize dust and prevent fibre emissions. This misting system must be capable of reaching all areas of the remediation area during the ground-breaking works.

Additionally, the addition of surfactants to water within the areas 1 & 2 is recommended during remedial works.

For areas of chemical contamination, if conditions are dry during the remedial works dust deposition could occur. Dust will be controlled in accordance with the Good Practice Guidelines for Assessing and Managing the Environmental Effects of Dust Emissions, Ministry for the Environment (2016). In order to mitigate against the effects of dust regular damping down of soil with a misting system will be required.

## 20.1 Health and Safety Measures

The level of asbestos specific PPE and RPE shall be determined by the asbestos removalist, however, in order to minimise the potential effects or the likelihood of cumulative effects, all personnel likely to come into contact with asbestos contaminated soils (Area 1 & 2) all personal shall be provided with and wear the following PPE at all times when working in the asbestos contaminated areas of the site:

- Disposable coveralls (Type 5);
- Half-face P3 respirator with particulate filter;
- Steel toe capped gumboots or safety footwear with disposable overshoes;
- Nitrile gloves (if handling any contaminated soils is required);
- Hard Hat (if working around plant and excavators);
- Hearing protection (if required);
- Safety Glasses (to be worn in particularly dry weather conditions); and
- Safety Visibility Vest

All meal breaks are to be taken in designated clean areas following appropriate decontamination.

For the areas of heavy metal contamination, the level of soil contamination is unlikely to present a short-term risk to site workers. However, in order to minimise the potential effects or the likelihood of cumulative effects, all personnel likely to come into contact with contaminated soils during development works shall be provided with and wear the following PPE at all times when working on the site:

- Tyvek overalls (to be changed immediately if these become highly soiled);
- Dust masks (to be worn in particularly dry weather conditions);
- Approved safety footwear (rubber boots, work boots with toe protection);
- Gloves (if handling any contaminated soils is required);
- Hard Hat (if working around plant and excavators);
- Hearing protection (if required);
- Safety Glasses (to be worn in particularly dry weather conditions); and
- Safety Visibility Vest

All meal breaks are to be taken in designated clean areas or off site, with all personnel washing their hands and mouth area prior to eating, drinking or smoking. Used PPE is to be doffed by all personnel before leaving the site.

## **20.2 Stormwater, Erosion & Sediment Control**

Install sediment and erosion controls for the development works in accordance with industry best practice (Auckland Council's Erosion and Sediment Control Guide for Land Disturbing Activities<sup>4</sup>).

Earthworks are not to be carried out during periods of significant rainfall. Excavation will be carried out a rate that matches the rate at which soil can be carted off the site. Any contaminated water generated by rainfall impacting on contaminated soils will be retained within the excavation.

It is not anticipated that stockpiling of soils will be required. If required, soil stockpiles will be covered by tarpaulins if left overnight, and when rain is anticipated during the working day. Tarpaulins will be anchored at the edges. As a general management strategy, the size of stockpiles will be kept to a minimum by ensuring that as far as possible, excavation is carried out a rate that matches the rate at which soil is carted off the site.

## **20.3 Odour Control**

It is considered unlikely that nuisance odour will be an issue on site. However, in the event that there may be odorous materials encountered, where possible these will be loaded as soon as possible onto the removal trucks. If this is not possible the odorous material will be covered with non-odorous material prior to being loaded.

## **20.4 Dewatering Procedures**

If ground water or surface water collects within the excavation during the works, this water shall be allowed to soak into the ground. Any groundwater/leachate or surface run-off encountered within the excavation area requiring removal shall be considered as contaminated unless further sampling and analysis can prove otherwise, and shall either:

- Be disposed of by a licensed liquid waste contractor; or
- Pumped to sewer, provided relevant permits have been obtained; or
- Discharged to the stormwater system or surface waters provided testing demonstrates compliance with the Australian and New Zealand Environment Conservation Council (ANZECC) Guidelines for Fresh and Marine Water Quality (2000) for the protection of 95 percent of species.

---

<sup>4</sup> Auckland Council, Erosion & Sediment Control Guide for Land Disturbing Activities in the Auckland Region, June 2016, Guideline Document 2016/005.

## 20.5 Contingency Measures

The following contingency measures have been developed to support the contractor should the underlying contamination conditions vary significantly from the conditions outlined following the site investigation.

If any unexpected materials are identified during the excavation process, which differ from previous observations, and the site soil assessment (i.e. odorous, unusually coloured), the contractor shall immediately contact the environmental specialist to inspect the material and provide advice for the safe handling and disposal of the material.

Visual and olfactory indicators of contamination include the following:

- Asbestos containing materials (ACM) (board, pipe, free fibres or fragments)
- Demolition debris (polystyrene, steel and timber)
- Refuse materials (other than concrete or brick)
- Odour (petroleum, oil, creosote, solvent, sulphur, landfill gas)
- Discoloured soil (black/green staining is most common)
- Incinerator ash (black coarse sand)
- Gasworks wastes (clinker – black gravel, blue billy, black tar)
- Harmful non Cleanfill materials

If any potential ACM or unexpected materials are identified during site works, the area shall immediately be fenced off (barrier tape) with a 2.0m buffer zone, photographs taken and the Contaminated Land Specialist contacted. The Contaminated Land Specialist will then inspect the material and provide advice for the sampling and analysis, safe handling and disposal of the material

Following the discovery of any unexpected materials any environmental investigation is to be carried out in general accordance with the Contaminated Land Management Guidelines No. 1 and No.5 (MfE, 2011).

In the event that soils are found to contain concentrations of contaminants elevated above the relevant site acceptance criteria, the site soils will require remediation and subsequent validation.

All contaminated materials removed from site will require disposal to Puwera landfill or an alternative suitably licensed disposal facility and site validation sampling is to be completed at a frequency sufficient to meet the requirements of the Contaminated Land Management Guidelines No.5 (MfE, 2011).

In the event that asbestos containing materials are identified at the site, its removal from the site shall be conducted in accordance with the Health and Safety at Work (Asbestos) Regulations (MBIE, 2016) and the Approved Code of Practice for the Management and Removal of Asbestos (WorkSafe New Zealand, 2016).

Following the removal of any ACM, a certificate of clearance is to be produced by a suitably licensed asbestos assessor.

If ground water or surface water collects within the excavation during the works, this water shall be allowed to soak into the ground. Any perched groundwater, groundwater, or surface run-off encountered within the excavation area requiring removal shall be considered as potentially contaminated, and shall either be disposed of by a licensed liquid waste contractor, pumped to sewer, provided relevant permits

have been obtained, or discharged to the stormwater system or surface waters provided testing demonstrates compliance with the Australian and New Zealand Environment Conservation Council (ANZECC) Guidelines for Fresh and Marine Water Quality (2000) for the protection of 95 percent of species.

In the event that unexpected materials are encountered at the site, Northland Regional Council are to be notified of the nature and extent of the contamination along and provided with details of the management procedures undertaken at the site.

## **20.6 Equipment Decontamination & Clearance**

Following remediation of the asbestos contaminated soils (Area 1 & 2), remove visible debris and soil from all plant, paying attention to the tracks and bucket of excavators.

Prior to plant being removed from the site, a visual assessment for the presence of asbestos, visible debris and soil shall be carried out by an independent assessor or competent person.

Cleaning procedures should be conducted in such a manner as to ensure that all residual soil and contaminants are safely removed and disposed of.

## **20.7 Site Validation Report**

Following the proposed works, it is recommended that a site validation report is prepared. The site validation report should contain sufficient detail to address the following matters:

- A summary of the works undertaken including volume of soil removed from site;
- A summary of the air fibre monitoring, along with any validation testing undertaken, including tabulated analytical results;
- Clearance Certificates for the asbestos remediation areas;
- Copies of the disposal dockets for the material removed from the site;
- Records of any unexpected contamination encountered during the works, if applicable; and
- A summary of any additional soil sampling undertaken, tabulated analytical results, and interpretation of the results in the context of the current contaminated land regulatory requirements.

## 21.0 Conclusions and Recommendations

The history of the site has been described in the report titled '*Preliminary Site Investigation, Ruakaka Service Station, Ruakaka*' dated March 2020 and prepared by Focus Environmental Services Limited (henceforth referred to as the PSI).

In brief, the PSI recommended a Detailed Site Investigation (DSI) to characterise the potential contamination associated with the use and maintenance of lead-based paint, demolition of historic structures and deterioration of structures potentially containing asbestos, spray drift of agrichemicals from historic horticulture on neighbouring sites, spray race activities and uncertified filling.

Following the PSI, the intrusive investigation was carried out by Focus Environmental Services Limited personnel on the 2<sup>nd</sup> of June 2020, where a total of twenty-eight discrete surface soil samples and two representative samples of fill were taken from across the site.

The samples were analysed for contaminants that could be present due to the potentially hazardous activities carried out at the site. The results of the site investigation have indicated that the activities carried out at the site have impacted the site soils. Elevated concentrations of heavy metals and asbestos fibres were detected in the site soils.

In addition, concentrations of lead were detected in the site soils at specific locations at levels elevated above the adopted environmental assessment criteria, the discharge criteria of the Auckland Unitary Plan: Operative in Part (AUP: OP).

Visual evidence of asbestos was identified, in addition to the site soils containing concentrations of asbestos fibres elevated above the adopted human health criteria for the site in two site locations.

Due to the elevated levels of contaminants detected, the site of the Ruakaka Service Centre, Ruakaka will require remediation of the affected soils prior to being redeveloped. The estimated volume of soil requiring remediation is 1305.3 m<sup>3</sup>. It should be noted that this volume may change during the remedial process.

A restricted discretionary consent is required under Regulation 10 of the NES as the proposed subdivision, change of use and soil disturbance do not meet the requirements of a permitted activity under Regulation 8 of the NES, and as this DSI for the piece of land has shown that the soil contamination does exceed the applicable standard for commercial land use.

The Proposed Regional Plan for Northland does not contain environmental guideline values. In order to accurately perform a risk assessment and to assess whether any discharges from contaminated land will result in significant adverse effects on the environment, and as there are currently no environmental guideline values available for the Northland Region, the discharge criteria of the Auckland Unitary Plan: Operative in Part (AUP: OP), is considered relevant and has been adopted as the site assessment criteria. It is therefore recommended that the site be remediated to the AUP: OP guidelines to reduce the risk of adverse effects on the environment.

Additionally, the contaminated land rules of the Proposed Regional Plan for Northland (Chapter C.6.8) should be considered. The remediation of contaminated land under section C.6.8.3 of the Proposed Regional Plan for Northland is a Controlled activity and therefore consent under the Proposed Regional Plan for Northland may be required for the current proposal. However, it should be noted that at the time of writing this report sections of the Plan are currently under appeal and are therefore not operative.

The objective of this Remediation Action Plan is to ensure that the soils contaminated above the adopted site assessment criteria are handled, removed in a controlled manner and disposed of to Puwera landfill. All earthworks required as part of the remedial works should be carried out in accordance with this Remediation Action Plan.

An assessment of the effects which may occur as a result of the proposed works has been made in order to mitigate any potential adverse environmental and/or human health effects. If the controls outlined in this Remediation Action Plan are implemented during the development works it is considered that the effects on the environment and human health are likely to be effectively mitigated.

## Figures

**Figure 1 - Site Location Plan**

**Figure 2 - Site Features Plan**

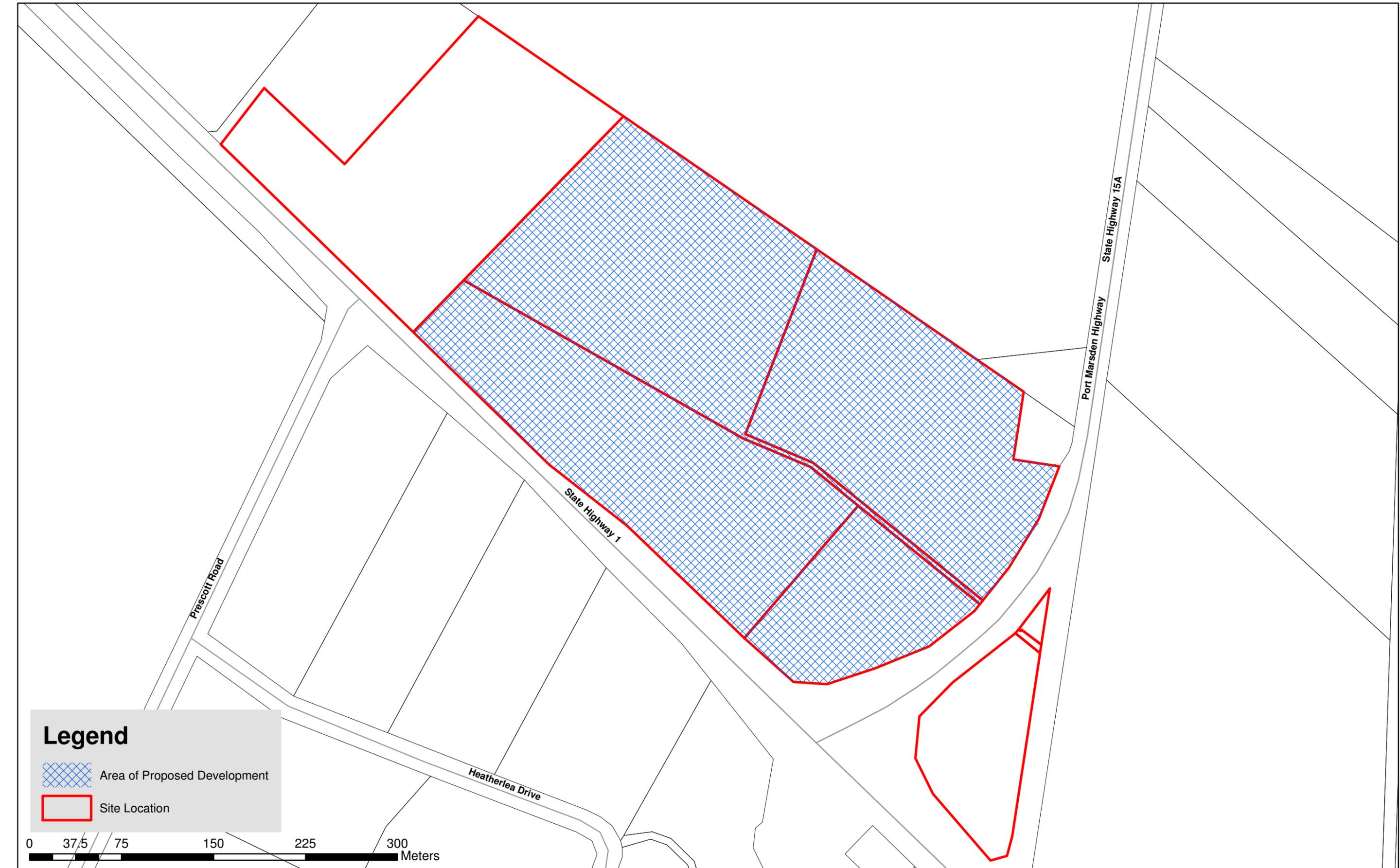
**Figure 3-1 - Composite Sample Location Plan**

**Figure 3-2 - Discrete Sample Location Plan**

**Figure 4-1 - Inferred Area and Depth of Asbestos Contamination**

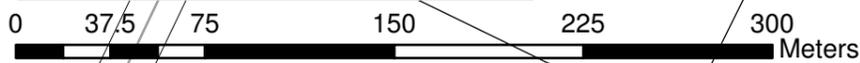
**Figure 4 - Inferred Area and Depth of Heavy Metal  
Contamination**

**Figure 5 - Proposed Validation Sampling Plan**



**Legend**

-  Area of Proposed Development
-  Site Location




Focus Environmental Services Limited  
 PO Box 11455  
 Ellerslie  
 Auckland 1542  
 Ph: +64 9 579 4155  
 www.focusenvironmental.co.nz

**Ruakaka Developments Limited**  
 Ruakaka Service Centre  
 Ruakaka,  
 New Zealand

**Figure 1: Site Location Plan**  
 DSI, RAP & AEE



1359.002

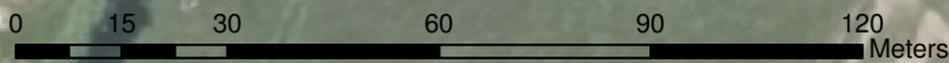
Drawing Number: 1359.002.01
Drawn By: PS
Checked By: DO'R
Date: 03/06/2020



### Legend

- Site Features
- Site Location

Site Feature	Description
1	Gravel Driveway
2	Building Platform
3	Dwelling
4	Dwelling Extension
5	Water Tank
6	Garage
7	Areas of Filling
8	Gravel Race
9	Historical Building
10	Shed (1)
11	Shed (2)
12	Raised Water Tank
13	PACM Observed in Soil
14	Potential Spray Race
15	Wooden Bridge
16	Stream




Focus Environmental Services Limited  
 PO Box 11455  
 Ellerslie  
 Auckland 1542  
 Ph: +64 9 579 4155  
 www.focusenvironmental.co.nz

**Ruakaka Developments Limited**  
 Ruakaka Service Centre  
 Ruakaka,  
 New Zealand

**Figure 2: Site Features Plan**  
 DSI, RAP & AEE



1359.002

Drawing Number: 1359.002.02
Drawn By: PS
Checked By: DO'R
Date: 03/06/2020



**Legend**

- Composite Sample Locations
- Composite Sample Areas
- Area of Proposed Development

0 20 40 80 120 160 Meters



Focus Environmental Services Limited  
 PO Box 11455  
 Ellerslie  
 Auckland 1542  
 Ph: +64 9 579 4155  
 www.focusenvironmental.co.nz

**Ruakaka Developments Limited**  
 Ruakaka Service Centre  
 Ruakaka,  
 New Zealand

**Figure 3-1: Composite Sample Location Plan**  
 DSI, RAP & AEE



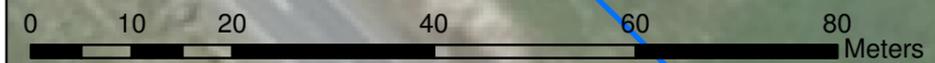
1359.002

Drawing Number: 1359.002.03-1
Drawn By: PS
Checked By: DO'R
Date: 03/06/2020



**Legend**

- Discrete Sample Locations
- ⊕ Hand Auger Locations
- Area of Proposed Development




Focus Environmental Services Limited  
 PO Box 11455  
 Ellerslie  
 Auckland 1542  
 Ph: +64 9 579 4155  
 www.focusenvironmental.co.nz

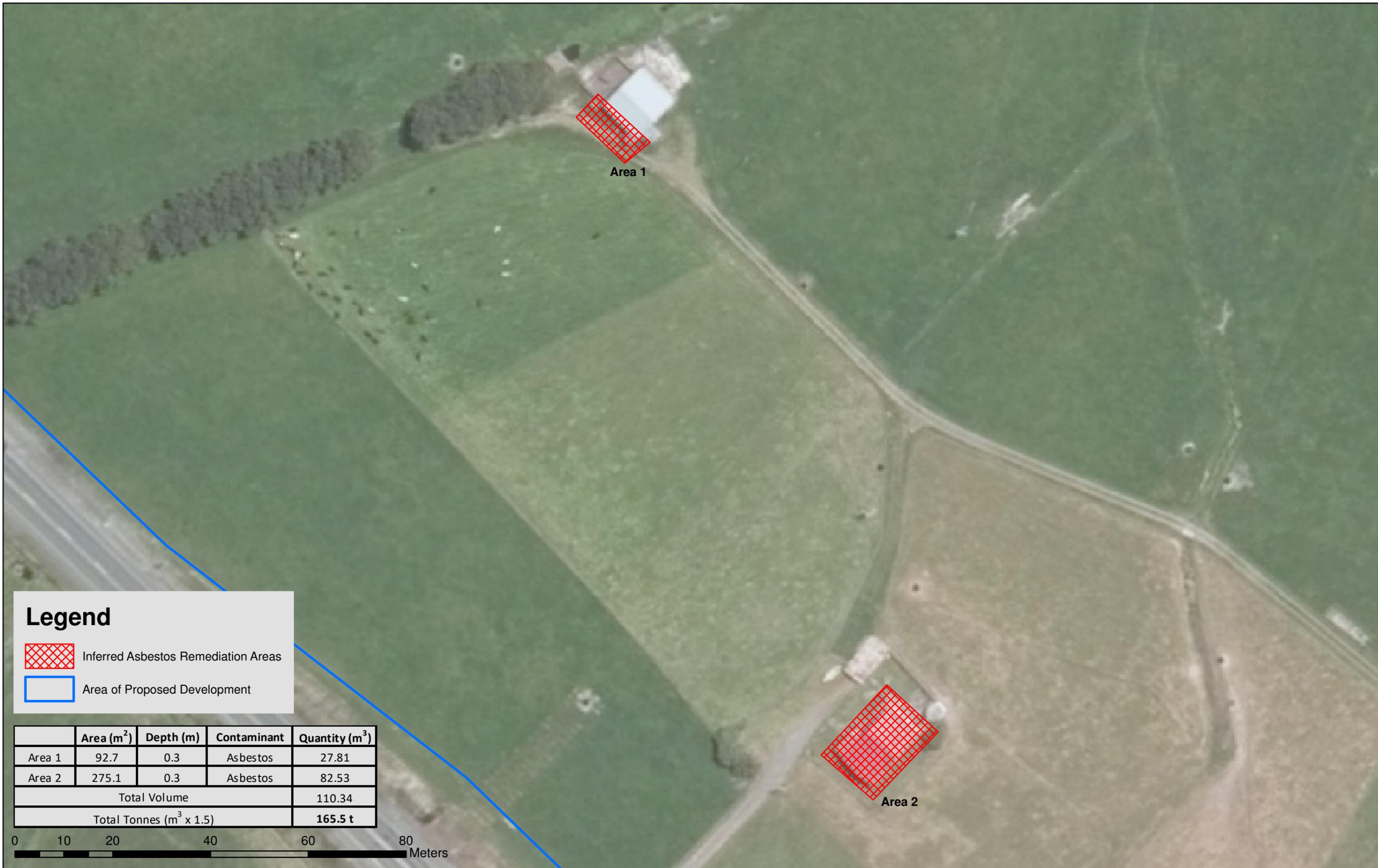
**Ruakaka Developments Limited**  
 Ruakaka Service Centre  
 Ruakaka,  
 New Zealand

**Figure 3-2: Discrete Sample Location Plan**  
 DSI, RAP & AEE



1359.002

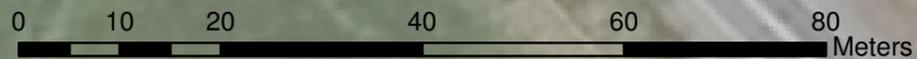
Drawing Number: 1359.002.03-2
Drawn By: PS
Checked By: DO'R
Date: 03/06/2020



### Legend

- Inferred Asbestos Remediation Areas
- Area of Proposed Development

	Area (m <sup>2</sup> )	Depth (m)	Contaminant	Quantity (m <sup>3</sup> )
Area 1	92.7	0.3	Asbestos	27.81
Area 2	275.1	0.3	Asbestos	82.53
Total Volume				110.34
Total Tonnes (m <sup>3</sup> x 1.5)				<b>165.5 t</b>




Focus Environmental Services Limited  
 PO Box 11455  
 Ellerslie  
 Auckland 1542  
 Ph: +64 9 579 4155  
 www.focusenvironmental.co.nz

**Ruakaka Developments Limited**  
 Ruakaka Service Centre  
 Ruakaka,  
 New Zealand

**Figure 4-1: Inferred Area and Depth of Asbestos Contamination**  
 DSI, RAP & AEE



1359.002

Drawing Number: 1359.002.04-1  
 Drawn By: PS  
 Checked By: DO'R  
 Date: 11/06/2020

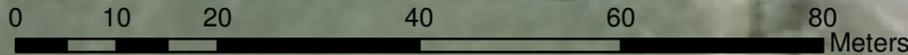


Inferred extent of heavy metal contamination is based on the extent of fill from provided geotechnical information. This area may change following further sampling and delineation.

### Legend

- Inferred Heavy Metal Remediation Area
- Area of Proposed Development

	Area (m <sup>2</sup> )	Depth (m)	Contaminant	Quantity (m <sup>3</sup> )
Area 3	2,555	0.5	Pb	1,277.50
Total Volume				<b>1916.25 t</b>




Focus Environmental Services Limited  
 PO Box 11455  
 Ellerslie  
 Auckland 1542  
 Ph: +64 9 579 4155  
 www.focusenvironmental.co.nz

**Ruakaka Developments Limited**  
 Ruakaka Service Centre  
 Ruakaka,  
 New Zealand

**Figure 4-2: Inferred Area and Depth of Heavy Metal Contamination**  
 DSI, RAP & AEE

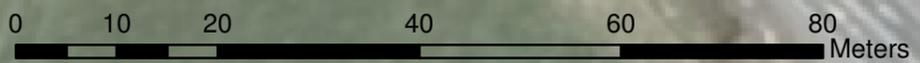


1359.002	Drawing Number: 1359.002.04-2
	Drawn By: PS
	Checked By: DO'R
	Date: 11/06/2020



**Legend**

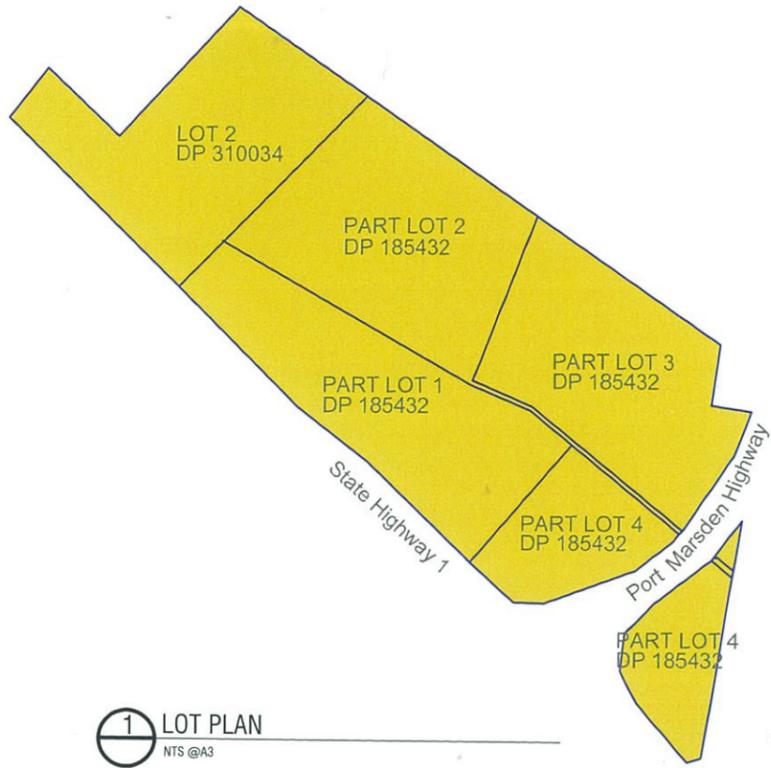
- Proposed Validation Samples
- Inferred Asbestos Remediation Areas
- Inferred Heavy Metal Remediation Area
- Area of Proposed Development



	Focus Environmental Services Limited PO Box 11455 Ellerslie Auckland 1542  Ph: +64 9 579 4155 www.focusenvironmental.co.nz	<b>Ruakaka Developments Limited</b>  Ruakaka Service Centre Ruakaka, New Zealand	<b>Figure 5: Proposed Validation Sampling Plan</b>  DSI, RAP & AEE		Drawing Number: 1359.002.05
	1359.002	Checked By: DO'R	Date: 11/06/2020		

## Appendices





1 LOT PLAN  
NTS @A3



2 SITE PLAN - OVERALL  
1:1500@A1 / 1:3000 @A3



3 SITE LOCATION PLAN  
NTS @A3

Rev.	Date	Description	Iss.	Appr.	Keyplan
A	13.12.19	RC			

Do not scale this drawing. Verify all dimensions on site before commencing any work. Copyright © 2019 Buchan. This drawing remains the property of The Buchan Group New Zealand Pty Ltd. Reproduction in whole or in part without prior consent is forbidden.

File: M:\917004 Ruakaka\ARCHWORK\15K\Resource Consent\20191203\_Ruakaka\_RC.dwg

Project  
**RUAKAKA SERVICE CENTRE**  
2581 State Highway 1  
Ruakaka, Northland  
Project Number  
**917004**

Status  
**RESOURCE CONSENT**  
Date Plotted: 13.12.2019 at 16:11  
Date Issued: **DATE.13.12.20**  
Scale: **1:3000 @A3**

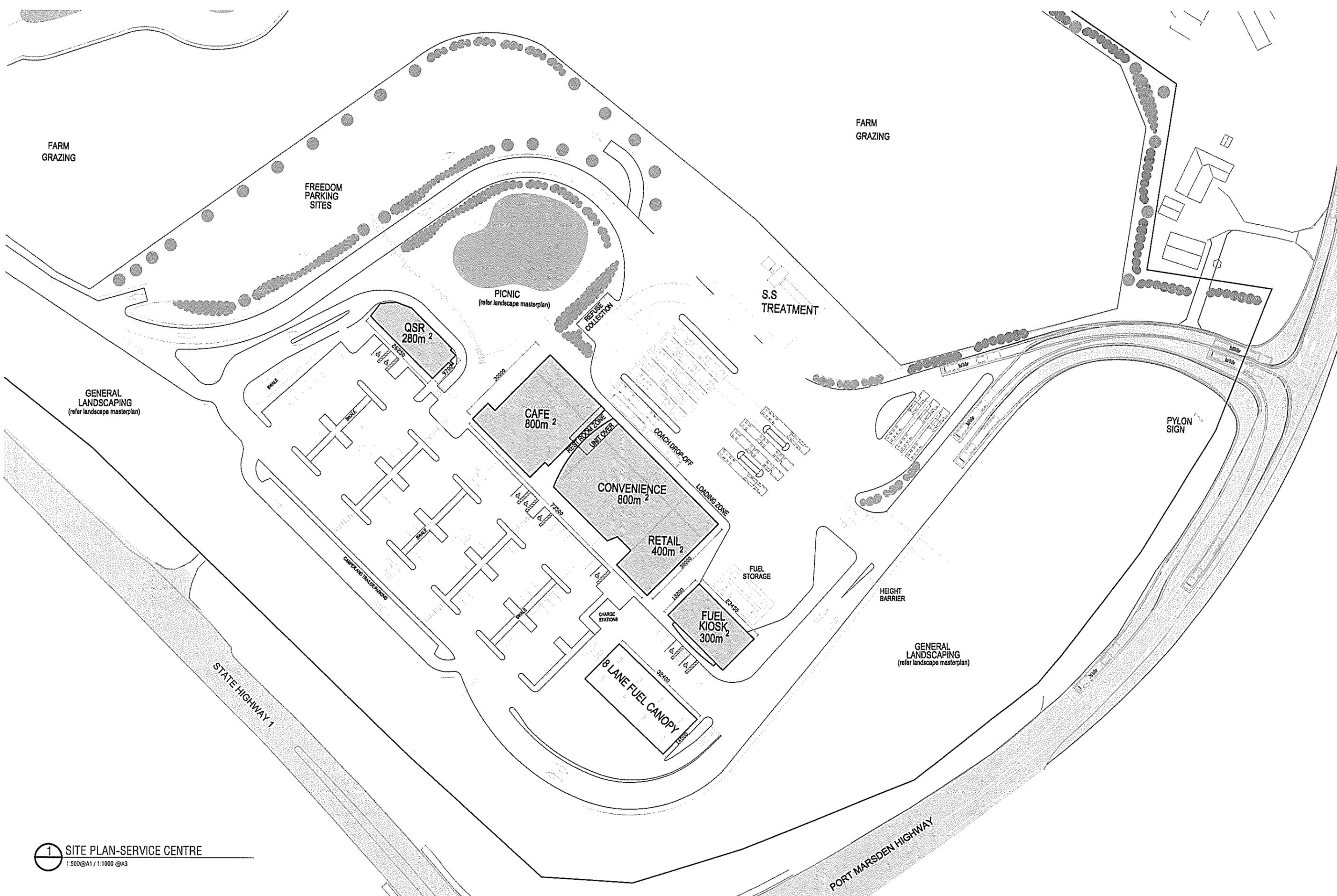


Drawing Title  
**PROPOSED SERVICE CENTRE  
SITE LAYOUT  
CONCEPT**  
Drawing Number  
**A-RC-170321-01**

Revision  
**A**

**BUCHAN**

Auckland Studio  
+64 9 303 1451 buchangroup.co.nz



**1 SITE PLAN-SERVICE CENTRE**  
1:500@A1 / 1:1000 @A3

Rev.	Date	Description	Iss.	Appr.	Keyplan
A	13.12.19	RC	-	-	-

Do not scale this drawing. Verify all dimensions on site before commencing any work. Copyright © 2018 Buchanan. This drawing remains the property of The Buchanan Group (New Zealand) Pty Ltd. Reproduction in whole or in part without prior consent is forbidden.

File: M:\9170321\004\_Ruakaka\ARC\HWDR\ISK\Resource Consent\20191203\_Ruakaka\_ISK.dwg

Project  
**RUAKAKA SERVICE CENTRE**  
2581 State Highway 1  
Ruakaka, Northland  
Project Number  
917004

Status  
**RESOURCE CONSENT**  
Date Plotted: 13.12.2019 at 16:28  
Date Issued: DATE.04.12.20  
Scale: 1:1000@A3



Drawing Title  
**PROPOSED SERVICE CENTRE  
SITE LAYOUT  
CONCEPT**  
Drawing Number  
A-RC-170321-02

Revision  
A

**BUCHANAN**  
Auckland Studio  
+64 9 303 1451 buchangroup.co.nz

## **Appendix B - Hand Auger Logs and Photographs**

<b>PROJECT NUMBER</b> 1359.002	<b>DRILLING DATE</b> 02/06/2020	<b>COORDINATES</b> -
<b>PROJECT NAME</b> Detailed Site Investigation	<b>DRILLING COMPANY</b> -	<b>COORD SYS</b> NZTM
<b>CLIENT</b> Ruakaka Developments Limited	<b>DRILLER</b> -	<b>SURFACE ELEVATION</b> -
<b>ADDRESS</b> Ruakaka Service Centre, Ruakaka	<b>DRILLING METHOD</b> Hand Auger	<b>LOGGED BY</b> PS
	<b>TOTAL DEPTH</b> 0.6 m	<b>CHECKED BY</b> DO'R

**COMMENTS**

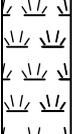
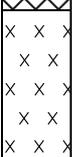
Depth (m)	Graphic Log	Moisture	Samples	Material Description	Additional Observations
				Topsoil	
				FILL clayey silt with trace sand and organics. Light grey with intermixed orange and brown streaks	
			HA01 0.2m		
0.5				Light grey silty CLAY - Natural Ground	
				Termination Depth at:0.6 m	

HA01



<b>PROJECT NUMBER</b> 1359.002	<b>DRILLING DATE</b> 02/06/2020	<b>COORDINATES</b> -
<b>PROJECT NAME</b> Detailed Site Investigation	<b>DRILLING COMPANY</b> -	<b>COORD SYS</b> NZTM
<b>CLIENT</b> Ruakaka Developments Limited	<b>DRILLER</b> -	<b>SURFACE ELEVATION</b> -
<b>ADDRESS</b> Ruakaka Service Centre, Ruakaka	<b>DRILLING METHOD</b> Hand Auger	<b>LOGGED BY</b> PS
	<b>TOTAL DEPTH</b> 0.6 m	<b>CHECKED BY</b> DO'R

**COMMENTS**

Depth (m)	Graphic Log	Moisture	Samples	Material Description	Additional Observations
				Topsoil	
				FILL clayey silt with trace organics. Light grey with intermixed orange and brown	
			HA02 0.2m		
0.5				Light grey clayey SILT - Natural Ground	
				Termination Depth at:0.6 m	

HA02



## **Appendix C - RPD Calculations**



### RPD Calculations: Ruakaka Service Centre, Ruakaka

Parameter	TP07 (SUR)	TP07 (DUP)	RPD (%)
Total Recoverable Arsenic	5	6	18.18
Total Recoverable Cadmium	0.78	0.77	1.29
Total Recoverable Chromium	12	15	22.22
Total Recoverable Copper	191	220	14.11
Total Recoverable Lead	310	220	33.96
Total Recoverable Nickel	4	5	22.22
Total Recoverable Zinc	181	169	6.86
Total DDT Isomers	< 0.09	< 0.09	-
Dieldrin	< 0.013	< 0.013	-
BaP eq.	<0.03	<0.04	-

**Note:** Results in *italics* exceed 30% RPD. Results in **red** exceed 50% RPD

## **Appendix D - Laboratory Transcripts**



## Certificate of Analysis

<b>Client:</b>	Focus Environmental Services Limited	<b>Lab No:</b>	2377232	SPV1
<b>Contact:</b>	Paula Stevenson C/- Focus Environmental Services Limited PO Box 11455 Ellerslie Auckland 1542	<b>Date Received:</b>	03-Jun-2020	
		<b>Date Reported:</b>	09-Jun-2020	
		<b>Quote No:</b>	80876	
		<b>Order No:</b>		
		<b>Client Reference:</b>	1359.002	
		<b>Submitted By:</b>	Paula Stevenson	

### Sample Type: Soil

Sample Name:	SP01 02-Jun-2020	HA01 0.2m 02-Jun-2020	HA01 0.2m DUP 02-Jun-2020	HA02 0.2m 02-Jun-2020	HB01 02-Jun-2020
Lab Number:	2377232.1	2377232.2	2377232.3	2377232.4	2377232.5

#### Individual Tests

Dry Matter	g/100g as rcvd	42	77	80	76	-
Total Recoverable Arsenic	mg/kg dry wt	22	-	-	-	-
Total Recoverable Copper	mg/kg dry wt	40	-	-	-	-
Total Recoverable Lead	mg/kg dry wt	31	-	-	-	2,000

#### Heavy Metals, Screen Level

Total Recoverable Arsenic	mg/kg dry wt	-	5	6	< 2	-
Total Recoverable Cadmium	mg/kg dry wt	-	0.78	0.77	0.17	-
Total Recoverable Chromium	mg/kg dry wt	-	12	15	5	-
Total Recoverable Copper	mg/kg dry wt	-	191	220	6	-
Total Recoverable Lead	mg/kg dry wt	-	310	220	9.1	-
Total Recoverable Nickel	mg/kg dry wt	-	4	5	< 2	-
Total Recoverable Zinc	mg/kg dry wt	-	181	169	16	-

#### Organochlorine Pesticides Screening in Soil

Aldrin	mg/kg dry wt	< 0.05	< 0.013	< 0.013	< 0.013	-
alpha-BHC	mg/kg dry wt	< 0.05	< 0.013	< 0.013	< 0.013	-
beta-BHC	mg/kg dry wt	< 0.05	< 0.013	< 0.013	< 0.013	-
delta-BHC	mg/kg dry wt	< 0.05	< 0.013	< 0.013	< 0.013	-
gamma-BHC (Lindane)	mg/kg dry wt	< 0.05	< 0.013	< 0.013	< 0.013	-
cis-Chlordane	mg/kg dry wt	< 0.05	< 0.013	< 0.013	< 0.013	-
trans-Chlordane	mg/kg dry wt	< 0.05	< 0.013	< 0.013	< 0.013	-
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	< 0.09	< 0.04	< 0.04	< 0.04	-
2,4'-DDD	mg/kg dry wt	< 0.05	< 0.013	< 0.013	< 0.013	-
4,4'-DDD	mg/kg dry wt	< 0.05	< 0.013	< 0.013	< 0.013	-
2,4'-DDE	mg/kg dry wt	< 0.05	< 0.013	< 0.013	< 0.013	-
4,4'-DDE	mg/kg dry wt	< 0.05	< 0.013	< 0.013	< 0.013	-
2,4'-DDT	mg/kg dry wt	< 0.05	< 0.013	< 0.013	< 0.013	-
4,4'-DDT	mg/kg dry wt	< 0.09	< 0.03	< 0.03	< 0.03	-
Total DDT Isomers	mg/kg dry wt	< 0.4	< 0.09	< 0.09	< 0.09	-
Dieldrin	mg/kg dry wt	< 0.05	< 0.013	< 0.013	< 0.013	-
Endosulfan I	mg/kg dry wt	< 0.05	< 0.013	< 0.013	< 0.013	-
Endosulfan II	mg/kg dry wt	< 0.05	< 0.013	< 0.013	< 0.013	-
Endosulfan sulphate	mg/kg dry wt	< 0.09	< 0.03	< 0.03	< 0.03	-
Endrin	mg/kg dry wt	< 0.05	< 0.013	< 0.013	< 0.013	-
Endrin aldehyde	mg/kg dry wt	< 0.05	< 0.013	< 0.013	< 0.013	-
Endrin ketone	mg/kg dry wt	< 0.05	< 0.013	< 0.013	< 0.013	-
Heptachlor	mg/kg dry wt	< 0.05	< 0.013	< 0.013	< 0.013	-
Heptachlor epoxide	mg/kg dry wt	< 0.05	< 0.013	< 0.013	< 0.013	-



Sample Type: Soil						
<b>Sample Name:</b>		SP01 02-Jun-2020	HA01 0.2m 02-Jun-2020	HA01 0.2m DUP 02-Jun-2020	HA02 0.2m 02-Jun-2020	HB01 02-Jun-2020
<b>Lab Number:</b>		2377232.1	2377232.2	2377232.3	2377232.4	2377232.5
Organochlorine Pesticides Screening in Soil						
Hexachlorobenzene	mg/kg dry wt	< 0.05	< 0.013	< 0.013	< 0.013	-
Methoxychlor	mg/kg dry wt	< 0.09	< 0.03	< 0.03	< 0.03	-
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	< 0.013	< 0.013	-
2-Methylnaphthalene	mg/kg dry wt	-	< 0.013	< 0.013	< 0.013	-
Acenaphthylene	mg/kg dry wt	-	< 0.013	< 0.013	< 0.013	-
Acenaphthene	mg/kg dry wt	-	< 0.013	< 0.013	< 0.013	-
Anthracene	mg/kg dry wt	-	< 0.013	< 0.013	< 0.013	-
Benzo[a]anthracene	mg/kg dry wt	-	0.015	0.013	< 0.013	-
Benzo[a]pyrene (BAP)	mg/kg dry wt	-	0.021	0.020	< 0.013	-
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	mg/kg dry wt	-	< 0.04	< 0.03	< 0.04	-
Benzo[a]pyrene Toxic Equivalence (TEF)	mg/kg dry wt	-	< 0.04	< 0.03	< 0.04	-
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	-	0.019	0.019	< 0.013	-
Benzo[e]pyrene	mg/kg dry wt	-	< 0.013	< 0.013	< 0.013	-
Benzo[g,h,i]perylene	mg/kg dry wt	-	0.014	< 0.013	< 0.013	-
Benzo[k]fluoranthene	mg/kg dry wt	-	< 0.013	< 0.013	< 0.013	-
Chrysene	mg/kg dry wt	-	< 0.013	< 0.013	< 0.013	-
Dibenzo[a,h]anthracene	mg/kg dry wt	-	< 0.013	< 0.013	< 0.013	-
Fluoranthene	mg/kg dry wt	-	0.022	0.025	< 0.013	-
Fluorene	mg/kg dry wt	-	< 0.013	< 0.013	< 0.013	-
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	-	< 0.013	< 0.013	< 0.013	-
Naphthalene	mg/kg dry wt	-	< 0.07	< 0.07	< 0.07	-
Perylene	mg/kg dry wt	-	< 0.013	< 0.013	< 0.013	-
Phenanthrene	mg/kg dry wt	-	< 0.013	< 0.013	< 0.013	-
Pyrene	mg/kg dry wt	-	0.022	0.022	< 0.013	-
<b>Sample Name:</b>		HB02 02-Jun-2020	HB03 02-Jun-2020	HB04 02-Jun-2020	HB05 02-Jun-2020	HB06 02-Jun-2020
<b>Lab Number:</b>		2377232.6	2377232.7	2377232.8	2377232.9	2377232.10
Individual Tests						
Total Recoverable Lead	mg/kg dry wt	16.2	12.0	33	19.2	35
<b>Sample Name:</b>		PB01 02-Jun-2020	PB02 02-Jun-2020	PB03 02-Jun-2020	Composite of Comp01 A, Comp01 B, Comp01 C & Comp01 D	Composite of Comp02 A, Comp02 B, Comp02 C & Comp02 D
<b>Lab Number:</b>		2377232.11	2377232.12	2377232.13	2377232.22	2377232.23
Individual Tests						
Dry Matter	g/100g as rcvd	-	-	-	63	61
Total Recoverable Arsenic	mg/kg dry wt	-	-	-	< 2	< 2
Total Recoverable Copper	mg/kg dry wt	-	-	-	13	11
Total Recoverable Lead	mg/kg dry wt	250	182	660	18.2	13.6
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	-	-	-	< 0.016	< 0.016
alpha-BHC	mg/kg dry wt	-	-	-	< 0.016	< 0.016
beta-BHC	mg/kg dry wt	-	-	-	< 0.016	< 0.016
delta-BHC	mg/kg dry wt	-	-	-	< 0.016	< 0.016
gamma-BHC (Lindane)	mg/kg dry wt	-	-	-	< 0.016	< 0.016
cis-Chlordane	mg/kg dry wt	-	-	-	< 0.016	< 0.016
trans-Chlordane	mg/kg dry wt	-	-	-	< 0.016	< 0.016
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	-	-	-	< 0.04	< 0.04
2,4'-DDD	mg/kg dry wt	-	-	-	< 0.016	< 0.016
4,4'-DDD	mg/kg dry wt	-	-	-	< 0.016	< 0.016

Sample Type: Soil						
Sample Name:	PB01 02-Jun-2020	PB02 02-Jun-2020	PB03 02-Jun-2020	Composite of Comp01 A, Comp01 B, Comp01 C & Comp01 D	Composite of Comp02 A, Comp02 B, Comp02 C & Comp02 D	
Lab Number:	2377232.11	2377232.12	2377232.13	2377232.22	2377232.23	
Organochlorine Pesticides Screening in Soil						
2,4'-DDE	mg/kg dry wt	-	-	-	< 0.016	< 0.016
4,4'-DDE	mg/kg dry wt	-	-	-	< 0.016	< 0.016
2,4'-DDT	mg/kg dry wt	-	-	-	< 0.016	< 0.016
4,4'-DDT	mg/kg dry wt	-	-	-	< 0.04	< 0.04
Total DDT Isomers	mg/kg dry wt	-	-	-	< 0.11	< 0.11
Dieldrin	mg/kg dry wt	-	-	-	< 0.016	< 0.016
Endosulfan I	mg/kg dry wt	-	-	-	< 0.016	< 0.016
Endosulfan II	mg/kg dry wt	-	-	-	< 0.016	< 0.016
Endosulfan sulphate	mg/kg dry wt	-	-	-	< 0.04	< 0.04
Endrin	mg/kg dry wt	-	-	-	< 0.016	< 0.016
Endrin aldehyde	mg/kg dry wt	-	-	-	< 0.016	< 0.016
Endrin ketone	mg/kg dry wt	-	-	-	< 0.016	< 0.016
Heptachlor	mg/kg dry wt	-	-	-	< 0.016	< 0.016
Heptachlor epoxide	mg/kg dry wt	-	-	-	< 0.016	< 0.016
Hexachlorobenzene	mg/kg dry wt	-	-	-	< 0.016	< 0.016
Methoxychlor	mg/kg dry wt	-	-	-	< 0.04	< 0.04

## 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 Laboratories, 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%.	-	1-13, 22-23
Environmental Solids Sample Preparation	Air dried at 35°C and sieved, <2mm fraction. Used for sample preparation. May contain a residual moisture content of 2-5%.	-	1, 5-13, 22-23
Total of Reported PAHs in Soil	Sonication extraction, SPE cleanup, GC-MS SIM analysis.	0.3 mg/kg dry wt	2-4
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	2-4
Organochlorine Pesticides Screening in Soil	Sonication extraction, SPE cleanup, dual column GC-ECD analysis (modified US EPA 8082). Tested on as received sample.	0.010 - 0.06 mg/kg dry wt	1-4, 22-23
Polycyclic Aromatic Hydrocarbons Screening in Soil	Sonication extraction, Dilution or SPE cleanup (if required), GC-MS SIM analysis (modified US EPA 8270). Tested on as received sample. [KBIs:5786,2805,2695].	0.002 - 0.3 mg/kg dry wt	2-4
Dry Matter (Env)	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	1-4, 22-23
Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	1, 5-13, 22-23
Composite Environmental Solid Samples*	Individual sample fractions mixed together to form a composite fraction.	-	14-21
Total Recoverable Arsenic	Dried sample, sieved as specified (if required). Nitric/Hydrochloric acid digestion, ICP-MS, screen level. US EPA 200.2.	2 mg/kg dry wt	1, 22-23
Total Recoverable Copper	Dried sample, sieved as specified (if required). Nitric/Hydrochloric acid digestion, ICP-MS, screen level. US EPA 200.2.	2 mg/kg dry wt	1, 22-23
Total Recoverable Lead	Dried sample, sieved as specified (if required). Nitric/Hydrochloric acid digestion, ICP-MS, screen level. US EPA 200.2.	0.4 mg/kg dry wt	1, 5-13, 22-23

Sample Type: Soil			
Test	Method Description	Default Detection Limit	Sample No
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.	0.002 mg/kg dry wt	2-4
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).	0.002 mg/kg dry wt	2-4

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

Dates of testing are available on request. Please contact the laboratory for more information.

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.

Ara Heron BSc (Tech)  
Client Services Manager - Environmental



## Certificate of Analysis

<b>Client:</b>	Focus Environmental Services Limited	<b>Lab No:</b>	2377768	A2Pv1
<b>Contact:</b>	Paula Stevenson C/- Focus Environmental Services Limited PO Box 11455 Ellerslie Auckland 1542	<b>Date Received:</b>	03-Jun-2020	
		<b>Date Reported:</b>	03-Jun-2020	
		<b>Quote No:</b>	80876	
		<b>Order No:</b>		
		<b>Client Reference:</b>	1359.002	
		<b>Submitted By:</b>	Paula Stevenson	

### Sample Type: Building Material

Sample Name	Lab Number	Sample Category	Sample Weight on receipt	Asbestos Presence / Absence	Description of Asbestos in Non Homogeneous Samples
PACM01	2377768.1	Fibre Board	6.94	Asbestos NOT detected. Organic fibres detected.	-
PACM02	2377768.2	Fibre Cement	9.02	Amosite (Brown Asbestos) detected. Chrysotile (White Asbestos) 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 Laboratories, 28 Duke Street, Frankton, Hamilton 3204.

### Sample Type: Building Material

Test	Method Description	Default Detection Limit	Sample No
Asbestos in Bulk Material			
Sample Category	Assessment of sample type. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	-	1-2
Sample Weight on receipt	Sample weight. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.01 g	1-2
<b>Asbestos Presence / Absence</b>	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0.01%	1-2
Description of Asbestos in Non Homogenous Samples	Form, dimensions and/or weight of asbestos fibres present. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	-	1-2



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

Dates of testing are available on request. Please contact the laboratory for more information.

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.



Rhodri Williams BSc (Hons)  
Technical Manager - Asbestos



## Certificate of Analysis

<b>Client:</b>	Focus Environmental Services Limited	<b>Lab No:</b>	2377563	A2Pv1
<b>Contact:</b>	Paula Stevenson C/- Focus Environmental Services Limited PO Box 11455 Ellerslie Auckland 1542	<b>Date Received:</b>	03-Jun-2020	
		<b>Date Reported:</b>	05-Jun-2020	
		<b>Quote No:</b>	80876	
		<b>Order No:</b>		
		<b>Client Reference:</b>	1359.002	
		<b>Submitted By:</b>	Paula Stevenson	

### Sample Type: Soil

Sample Name:	ASB01 02-Jun-2020	ASB02 02-Jun-2020	HB01 02-Jun-2020	HB02 02-Jun-2020	HB03 02-Jun-2020
Lab Number:	2377563.3	2377563.4	2377563.5	2377563.6	2377563.7
Asbestos Presence / Absence	Amosite (Brown Asbestos) and Chrysotile (White Asbestos) detected.	Amosite (Brown Asbestos) and Chrysotile (White Asbestos) detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.
Description of Asbestos Form	ACM Debris	ACM Debris	-	-	-
Asbestos in ACM as % of Total Sample*	% w/w < 0.001	% w/w < 0.001	< 0.001	< 0.001	< 0.001
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	% w/w 0.004	% w/w 0.031	< 0.001	< 0.001	< 0.001
Asbestos as Fibrous Asbestos as % of Total Sample*	% w/w < 0.001	% w/w < 0.001	< 0.001	< 0.001	< 0.001
Asbestos as Asbestos Fines as % of Total Sample*	% w/w 0.004	% w/w 0.031	< 0.001	< 0.001	< 0.001
As Received Weight	g 708.2	g 862.4	g 711.5	g 877.4	g 709.7
Dry Weight	g 521.9	g 586.4	g 472.1	g 670.0	g 457.2
Moisture	% 26	% 32	% 34	% 24	% 36
Sample Fraction >10mm	g dry wt 45.7	g dry wt 48.5	g dry wt 12.2	g dry wt 62.2	g dry wt < 0.1
Sample Fraction <10mm to >2mm	g dry wt 132.5	g dry wt 174.0	g dry wt 106.2	g dry wt 241.3	g dry wt 115.7
Sample Fraction <2mm	g dry wt 343.0	g dry wt 362.2	g dry wt 352.8	g dry wt 365.3	g dry wt 340.3
<2mm Subsample Weight	g dry wt 54.6	g dry wt 55.8	g dry wt 59.9	g dry wt 51.5	g dry wt 54.7
Weight of Asbestos in ACM (Non-Friable)	g dry wt < 0.00001	g dry wt < 0.00001	g dry wt < 0.00001	g dry wt < 0.00001	g dry wt < 0.00001
Weight of Asbestos as Fibrous Asbestos (Friable)	g dry wt < 0.00001	g dry wt < 0.00001	g dry wt < 0.00001	g dry wt < 0.00001	g dry wt < 0.00001
Weight of Asbestos as Asbestos Fines (Friable)*	g dry wt 0.02162	g dry wt 0.18112	g dry wt < 0.00001	g dry wt < 0.00001	g dry wt < 0.00001

Sample Name:	HB04 02-Jun-2020	HB05 02-Jun-2020	HB06 02-Jun-2020		
Lab Number:	2377563.8	2377563.9	2377563.10		
Asbestos Presence / Absence	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	-	-
Description of Asbestos Form	-	-	-	-	-
Asbestos in ACM as % of Total Sample*	% w/w < 0.001	% w/w < 0.001	% w/w < 0.001	-	-
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	% w/w < 0.001	% w/w < 0.001	% w/w < 0.001	-	-
Asbestos as Fibrous Asbestos as % of Total Sample*	% w/w < 0.001	% w/w < 0.001	% w/w < 0.001	-	-
Asbestos as Asbestos Fines as % of Total Sample*	% w/w < 0.001	% w/w < 0.001	% w/w < 0.001	-	-
As Received Weight	g 698.3	g 698.1	g 683.3	-	-
Dry Weight	g 420.2	g 408.0	g 464.9	-	-



Sample Type: Soil						
Sample Name:		HB04	HB05	HB06		
		02-Jun-2020	02-Jun-2020	02-Jun-2020		
Lab Number:		2377563.8	2377563.9	2377563.10		
Moisture	%	40	42	32	-	-
Sample Fraction >10mm	g dry wt	5.6	14.3	25.8	-	-
Sample Fraction <10mm to >2mm	g dry wt	134.4	81.2	121.9	-	-
Sample Fraction <2mm	g dry wt	279.3	312.5	316.6	-	-
<2mm Subsample Weight	g dry wt	53.2	52.4	57.7	-	-
Weight of Asbestos in ACM (Non-Friable)	g dry wt	< 0.00001	< 0.00001	< 0.00001	-	-
Weight of Asbestos as Fibrous Asbestos (Friable)	g dry wt	< 0.00001	< 0.00001	< 0.00001	-	-
Weight of Asbestos as Asbestos Fines (Friable)*	g dry wt	< 0.00001	< 0.00001	< 0.00001	-	-

#### 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.

Please refer to the **BRANZ New Zealand Guidelines for Assessing and Managing Asbestos in Soil.**

<https://www.branz.co.nz/asbestos>

The following assumptions have been made:

1. Asbestos Fines in the <2mm fraction, after homogenisation, is evenly distributed throughout the fraction
2. The weight of asbestos in the sample is unaffected by the ashing process.

Results are representative of the sample provided to Hill Laboratories only.

## 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 Laboratories, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Soil			
Test	Method Description	Default Detection Limit	Sample No
Individual Tests			
Wgt of Asbestos as Asbestos Fines in <10mm >2mm Fraction*	Measurement on analytical balance, from the <10mm >2mm Fraction. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.00001 g dry wt	3-10
New Zealand Guidelines Semi Quantitative Asbestos in Soil			
As Received Weight	Measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	3-10
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	3-10
Moisture	Sample dried at 100 to 105°C. Calculation = (As received weight - Dry weight) / as received weight x 100.	1 %	3-10
Sample Fraction >10mm	Sample dried at 100 to 105°C, 10mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g dry wt	3-10
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; 101c Waterloo Road, Christchurch.	0.1 g dry wt	3-10
Sample Fraction <2mm	Sample dried at 100 to 105°C, 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g dry wt	3-10
Asbestos Presence / Absence	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0.01%	3-10
Description of Asbestos Form	Description of asbestos form and/or shape if present.	-	3-10

Sample Type: Soil			
Test	Method Description	Default Detection Limit	Sample No
Weight of Asbestos in ACM (Non-Friable)	Measurement on analytical balance, from the >10mm Fraction. Weight of asbestos based on assessment of ACM form. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	3-10
Asbestos in ACM as % of Total Sample*	Calculated from weight of asbestos in ACM and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	3-10
Weight of Asbestos as Fibrous Asbestos (Friable)	Measurement on analytical balance, from the >10mm Fraction. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	3-10
Asbestos as Fibrous Asbestos as % of Total Sample*	Calculated from weight of fibrous asbestos and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	3-10
Weight of Asbestos as Asbestos Fines (Friable)*	Measurement on analytical balance, from the <10mm Fractions. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	3-10
Asbestos as Asbestos Fines as % of Total Sample*	Calculated from weight of asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	3-10
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	Calculated from weight of fibrous asbestos plus asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	3-10

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

Dates of testing are available on request. Please contact the laboratory for more information.

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.

Rhodri Williams BSc (Hons)  
Technical Manager - Asbestos