www.beca.com

Report

Detailed Site Investigation (Contamination), MoE Drury Due Diligence, 281 Jesmond Road

Prepared for Ministry of Education (Client)

Prepared by Beca Limited (Beca)

5 September 2018

Revision History

Revision Nº	Prepared By	Description	Date
1	Renée Jens	Draft for Review	21/08/2018
2	Renée Jens	Report for Issue	05/09/2018

Document Acceptance

Action	Name	Signed	Date
Prepared by	Renée Jens		05/09/2018
Reviewed by	Curtis Blyth		05/09/2018
Approved by	Phillip Ware		05/09/2018
on behalf of	Beca Limited		

Executive Summary

The purpose of this assessment is to conduct a Detailed Site Investigation (contamination) on an area of land in the western part of a rural site at 281 Jesmond Road, Karaka Auckland.

The area investigated in this report is approximately 7,217 m^2 and is herein referred to as Area A. Review of the provided Preliminary Site Investigation (PSI, Focus Environmental) has shown that Area A has been used for agricultural activities since before 1960 with buildings present on the site before this time. Key land use activities have been identified that may have resulted in soil contamination including; potential treatment of livestock with organochlorines or organophosphates, unknown fill, and potential asbestos containing material in a deteriorated condition.

The following Hazardous Activities and Industries List (HAIL) activities have been identified for Area A at a more likely than not level of certainty based on the information provided in the PSI:

- A8: Livestock dip or spray race operations
- E1: Asbestos products, manufacture or disposal including sites with buildings containing asbestos products known to be in a deteriorated condition
- G5: Waste disposal to land (excluding where biosolids have been used as soil conditioners)
- I: Any other land that has been subject to the intentional or accidental release of a hazardous substance in sufficient quantity that it could be a risk to human health or the environment.

The soil investigation focused on the collection of soil samples based on potential areas of contamination associated with the localised HAILs as identified in the PSI. 12 test pits were hand dug or hand augered to a maximum depth of 0.5 m. A total of 17 soil samples were collected along with four building material samples.

Soil analytical results show the concentrations of heavy metal contaminants are below human health risk and environmental criteria, however there were two exceedances of copper and one exceedance of arsenic above background criteria. Concentrations of PAH, OCP and ONOP were below laboratory detection limits.

Four of the six samples tested for asbestos returned positive results, however only one sample was above the Tier 1 human health risk criteria threshold of 0.001% w/w. This sample was located adjacent the central stables area. Land disturbance activities associated with the proposed development will require resource consent under Regulation 10 of the NESCS as a restricted discretionary activity. A Site Management Plan will be required for the redevelopment of these areas. The spread of asbestos within soils has not been delineated, nor assessed in terms of its potential human health impact or overall impact of site development. Further testing and assessment is recommended.

Standard management controls will be required for the rest of the site. Soils are not classified as cleanfill based on concentrations of copper above background levels and the detection of asbestos. Off-site disposal will need to be to a facility licenced to accept the materials. Further sampling of the wider area may classify areas which meet the cleanfill criteria.

The exposure pathway assessment completed for the soil investigation identified three complete exposure pathways for the exposure to construction workers, the general public, and future site users, which could be mitigated and managed through the implementation of a Site Management Plan (SMP).

Receipt of analytical results and exposure pathway assessment within this DSI have resulted in the revised HAIL activities applicable to this site, being:

- E1: Asbestos products, manufacture or disposal including sites with buildings containing asbestos products known to be in a deteriorated condition

Contents

1 Introduction 1
- 1.1 Background 1
- 1.2 Purpose and Scope 1

2 Site Description 3
- 2.1 Site Location and Area 3
- 2.2 Proposed Works 3

3 Environmental Setting 4
- 3.1 Current Land Use 4
- 3.2 Surrounding Land Use 4
- 3.3 Geology 4
- 3.4 Topography 4
- 3.5 Sensitive Receptors/Hydrology 5

4 Information Search 7
- 4.1 Historical Aerial Photographs 7
- 4.2 Auckland Council Information 8
- 4.3 Site Walkover 8
- 4.4 Client Provided Information 9
- 4.5 Summary of Information Search 9

5 Site Investigation Scope and Rationale 10
- 5.1 Contaminants of Potential Concern and Investigation Rationale 10
- 5.2 Soil Sampling Methodology 10

6 Assessment Criteria 12
- 6.1 Assessment of Human Health Risk 12
- 6.2 Assessment of Environmental Risk 12

7 Results 13
- 7.1 Fieldwork Observations 13
- 7.2 Summary of Soil Analytical Results 13

8 Discussion and Risk Assessment 15
- 8.1 Exposure Pathway Assessment 15
- 8.2 Limitations of Site Characterisation 16

9 Development Implications 17
- 9.1 Consents 17

10 Summary of Conclusions 18

11 Limitations 19

Appendices

Appendix A

Preliminary Site Investigation – Focus Environmental Services Ltd

Appendix B

Summary of Soil Results

Appendix C

Hill Laboratories Report

Appendix D

Sampling Locations

1 Introduction

Beca Limited (Beca) has been commissioned by the Ministry of Education (MoE) to undertake a Detailed Site Investigation (DSI) for a site located at 281 Jesmond Road, Karaka, Auckland. MoE plan to construct a new secondary school at this site and this DSI forms part of the due diligence for the proposed school.

This report provides information on the history of the site and potential contaminants of concern, and details the soil sampling investigation undertaken, determines any risks to human health or environmental receptors, and confirms any consenting requirements under the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (NESCS) and Auckland Unitary Plan (AUP).

1.1 Background

A desktop study (Preliminary Site Investigation (PSI)) was undertaken by Focus Environmental Services Limited to understand the potential contamination of the site:

- Preliminary Site Investigation, Auranga Development, Stage B1 Sites, Auckland. Focus Environmental Services Limited, dated March 2017 (**Appendix A**).

No assessment of methodology, accuracy or validity has been undertaken by Beca for this PSI. No desk based review of potential contamination risk areas has been undertaken by Beca as part of the development of this report. All potential areas of contamination risk have been established using the Focus Environmental reports with MOE placing reliance on this PSI's findings.

The PSI findings formed the basis of this investigation and are referred to throughout this report.

1.2 Purpose and Scope

The purpose of this investigation was the following:

- Characterise potential contaminants in soils within the development area as a result of current and historical activities. Based on the contaminants of concern identified in the Focus PSI.
- Comment on the likely contaminated land consent requirements for the proposed works under the following legislation
  - Auckland Unitary Plan (AUP)
  - Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (NESCS).
- Identify areas of soil contamination which may require management with respect to risks to human health and to the environment based on the contaminants of concern identified in the Focus PSI.
- Provide advice regarding disposal of waste spoil.
- The scope of works included a review of the Focus Preliminary Site Investigation report which included:
  - Historical aerial photographs for the site
  - A contamination enquiry from Auckland Council including discharge and borehole consents.
  - The site property file for information relating to environmental events and activities.
  - A site walkover with observation notes and photographs

The review of this PSI informed the ground investigation, which comprised the following:

- Excavation of 12 hand augers to a maximum depth of 0.5 m below ground level (bgl).

- Collection of 17 soil samples and 4 building material samples.
- Screening analysis of 12 soil samples at shallow depth (0.1 – 0.2m) with 5 soil samples at deeper depth (0.4 -0.5m) held cold for analysis if required.
- Of the 12 soil samples:
  - 3 were analysed for heavy metals (arsenic, cadmium, chromium, copper, lead, nickel and zinc) and polycyclic aromatic hydrocarbons (PAH);
  - 3 analysed for organochlorine pesticides (OCP), organonitro and phosphorus pesticides (ONOP) and heavy metals (as per above); and
  - 6 analysed for a semi-quantitative assessment of asbestos.
- The 4 building material samples were analysed for the presence/absence of asbestos.

This assessment has been undertaken and reported in general accordance with the *Ministry for the Environment* (MfE) *Contaminated Land Management Guidelines No. 1 – Reporting on Contaminated Sites in New Zealand* (2011) and *MfE Contaminated Land Management Guidelines No. 5 – Site Investigation and Analysis* (2011).

2 Site Description

2.1 Site Location and Area

The site is located at 281 Jesmond Road in Drury, Auckland. The property has the legal description 'Lot 1 DP 89570' with an approximate area of 4.42 ha.

The location of the site is shown in **Figure 1** below.

Figure 1. Location of the site. Source: Auckland Council GeoMaps.

2.2 Proposed Works

The Ministry of Education (MoE) plan to develop a new secondary school in Drury West to provide for future population growth. The site has been identified as a potential site to be combined with another neighbouring site for the location of the secondary school.

3 Environmental Setting

3.1 Current Land Use

The site is a rural lifestyle block, predominantly used for rearing horses. There is one large residential dwelling on the western boundary of the property. Another smaller dwelling connected to an old shed is situated along the western boundary towards the north of the site. In the north-west corner of the site is a holding pen and loading bay for livestock. Near the centre of the site is an unused stable. The majority of the site is grassed and used for livestock grazing.

3.2 Surrounding Land Use

The majority of the land surrounding the sites are rural residential lifestyle blocks with a mixture of horticultural and agricultural activities. Jesmond Road is immediately adjacent to the site's western boundary. An unsealed, gravelled access-way is situated along the site's northern boundary.

The property directly north of the site is used for horticultural purposes. Further north are large residential property blocks. To the east, and north-west of the site are agricultural paddocks. To the west of the site are residential houses. South west of the site are three greenhouses. Land south of the site is predominantly paddocks for agricultural use with some residential dwellings present.

3.3 Geology

According to the New Zealand Institute of Geological and Nuclear Sciences[1], the underlying geology of the site is '*Pumiceous mud, sand and gravel with muddy peat and lignite: rhyolite pumice, including non-welded ignimbrite, tephra and alluvia'*. The main rock type is sand.

3.4 Topography

The site is undulating with the highest point of the site in the south west and the lowest point in the north east. The topography of the site and surrounding area is displayed in **Figure 2** below.

[1] Heron D. W. (custodian) 2014. Geological Map of New Zealand 1:250 000. Institute of Geological & Nuclear Sciences.

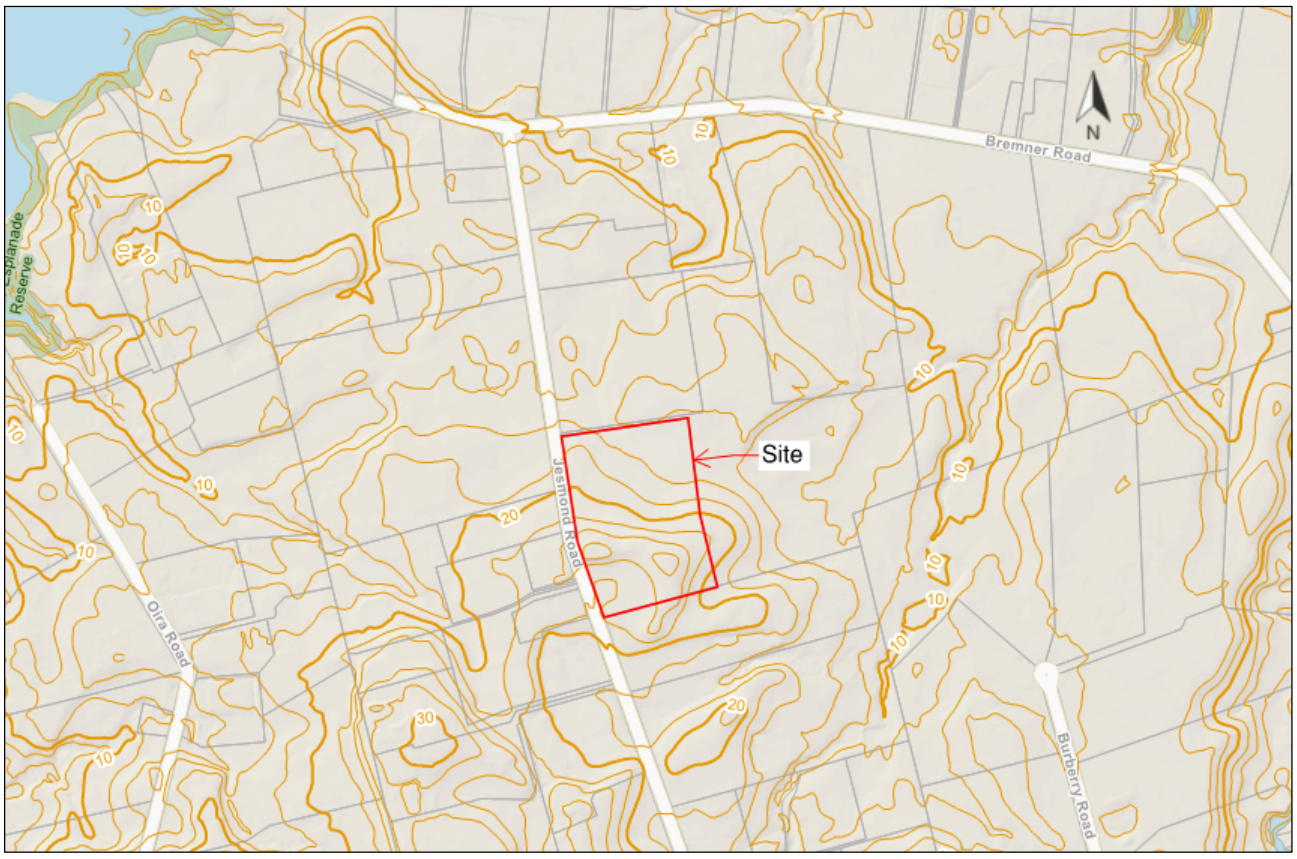


Figure 2. Topography of the site and surrounding area. Source: Auckland Council GeoMaps

3.5 Sensitive Receptors/Hydrology

Drury Creek is the nearest waterbody, located approximately 930 m north of the site. A tributary of Drury Creek is located approximately 150 m north of the site, within the north-west portion of property immediately north of the site (see **Figure 3** below). Another tributary of Drury Creek is located about 390 m east of the site. This feeds into what appears to be a man-made lake (see **Section 4.1**) which is located approximately 255 m south-east of the site.

Oira Creek is located approximately 880 m west of the site. Approximately 910 m to the east of the site is Ngakoroa Stream which connects to Drury Creek.

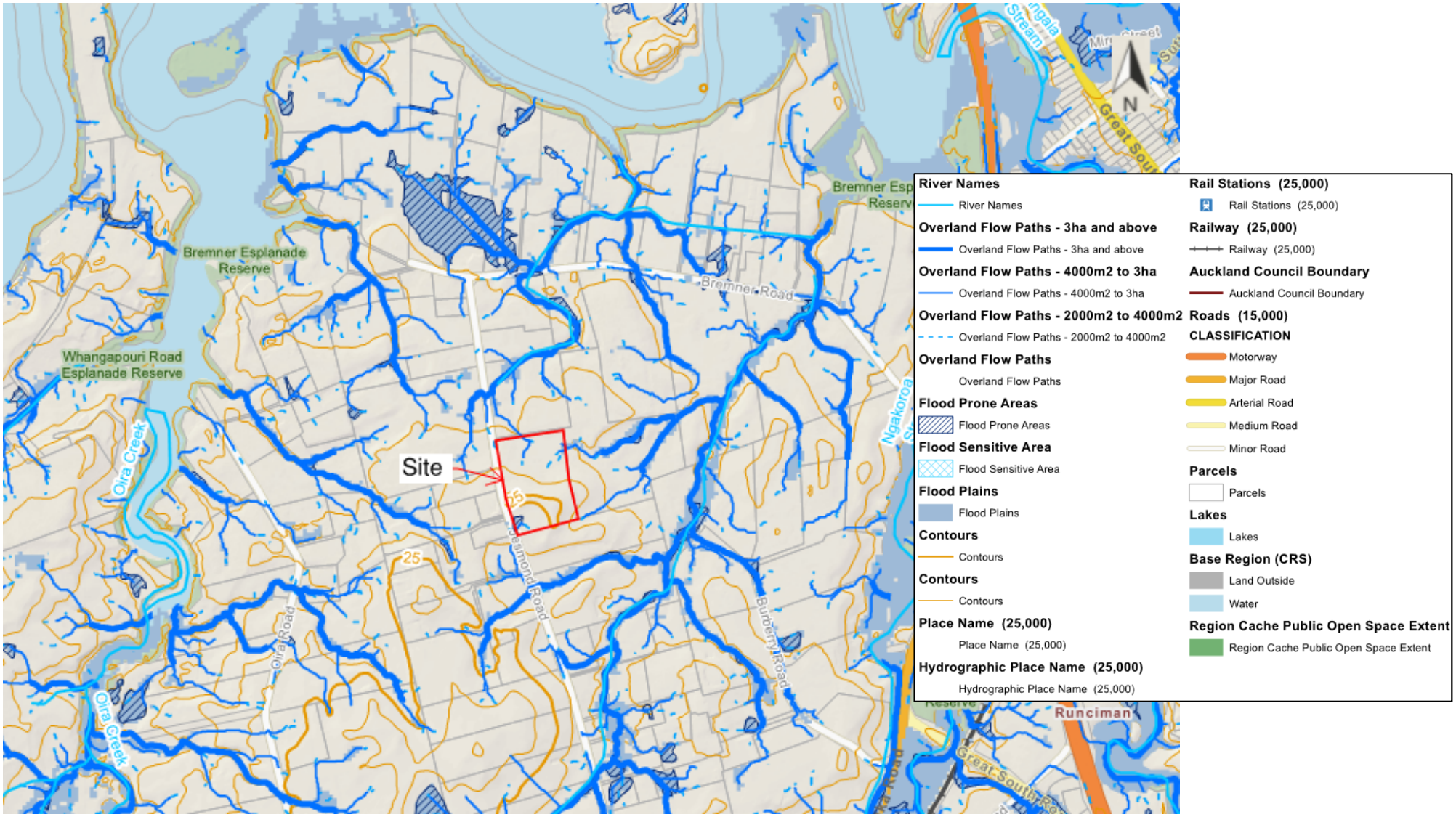


Figure 3. Sensitive receptors and hydrology of the site and surrounding areas. Source: Auckland Council GeoMaps

4 Information Search

4.1 Historical Aerial Photographs

Historical aerial photographs for the site were obtained and reviewed by Focus Environmental Services Ltd[2] and also by a Beca environmental scientist. The aerial photographs were reviewed to identify any changes in land use activities on the site and surrounding properties, with the following observations made:

Table 1. Observations of historic aerial photos obtained by Focus Environmental Services Ltd.

Year	Site	Observations
1960	The site	■ The site appears to be used for rural purposes. ■ Jesmond Road is adjacent to the western boundary of the site. ■ What appears to be a dwelling is located near the south-western boundary of the site. ■ Several site buildings are located in the centre and north-western portion of the site.
	Surrounding Properties	■ The surrounding properties are predominantly rural in use.
1980 & 1981	The site	■ The site appears relatively unchanged from the 1960 historical photograph. ■ The structure adjacent to the western boundary has been extended to form an elongated building.
	Surrounding Properties	■ There appear to be no appreciable changes to the surrounding properties.
1988	The site	■ There appears to be no appreciable changes to the site.
	Surrounding Properties	■ The surrounding land use is predominantly rural residential with the exception of the properties located to the further north-west and west of the site which appear to be utilised for horticultural purposes. ■ The property directly north of the site has been divided into thirds. ■ What appears to be a racing oval is present to the north-east of the site.
1996	The site	■ The site appears relatively unchanged, however a structure in the north-west corner of the site has been removed.
	Surrounding Properties	■ The surrounding land is predominantly rural residential in use. ■ It appears a small lake has been created to the south east of the site.
2003-2004, 2006	The site	■ Apart from a small addition to the rectangular building on the western boundary within the site, there appears to be no appreciable changes to the site or surrounding properties.
	Surrounding Properties	
2008	The site	■ A rectangular area in the north of the site appears to have been converted from grassland, however it is hard to decipher from the photo what the ground cover is.
	Surrounding Properties	■ There appear to be no changes to the surrounding properties.
2010-2011	The site	■ The rectangular section in the north of the site appears to be sand. ■ In the north-west corner of the site is a fenced off area of paddock with thinner fenced areas within this area. This may have been present since 2001 (but was hard to decipher due to the quality of the aerials). ■ The shed in the centre of the site has a fenced area of paddock extending from this building.

[2] "*Preliminary Site Investigation, Auranga Development, Stage B1 Sites, Auckland*" by Focus Environmental Services Ltd, March 2017

Year	Site	Observations
	Surrounding Properties	▪ Surrounding land appears to be used for a mixture or residential, horticultural and agricultural purposes.
2016	The site	▪ There appears to be no appreciable changes to the sites or surrounding properties.
	Surrounding Properties	

4.2 Auckland Council Information

4.2.1 Site Contamination Enquiry

The Auckland Council site contamination enquiry contained no records relating to the site. Borehole and discharge consents were included in the report but were not located on the site.

4.2.2 Property File

The electronic property file for the site was viewed by Focus Environmental Services as part of the PSI[3]. Information relevant to the site history and potential contamination sources has been retrieved and reviewed below. The relevant property file information from the PSI is as follows:

Table 2. Relevant property file information for the site (281 Jesmond Road)

Proposed Activity	Application Number	Date
Add to existing Dwelling	E73602	12/02/1973
Erect a Garage	N/A	25/07/1995
Dwelling	12359	01/11/1995
Dwelling alterations	003125	15/09/1998

4.3 Site Walkover

The site walkover was carried out by Focus Environmental Services Limited personnel on the 26th January 2017. The site walkover confirmed what was described in **Section 3.1**. In addition, the following was noted:

- A gravel driveway extended from Jesmond Road along the western boundary of the site to the two dwellings.
- The main, large residential dwelling had an attached garage, water storage tank, solar panels, concrete lined tool shed and raised vegetable beds.
- A 'ha-ha' wall was situated to the north of the dwelling to create a level platform for a domestic lawn. This was identified as a potential fill area.
- To the east of the dwelling is an incinerator used to burn refuse and timber.
- Silage bales were identified further east of the incinerator, and along the northern boundary.
- In the centre of the site is a livestock race which led to stables and a holding pen.
- The stables were used for storage. The inside was concrete lined, with suspected ACM board on the external structure which was in a deteriorated condition with extensive damage. Some suspected ACM fragments were seen on the soil surface.

[3] "*Preliminary Site Investigation, Auranga Development, Stage B1 Sites, Auckland*" by Focus Environmental Services Ltd, March 2017

- A pump house was identified slightly west of the northern boundary. This was suspected to be constructed of ACM. This was painted and appeared to be in relatively good condition.
- A possible former horse training arena with a sand base was in the north of the site which was no longer used.
- A stock holding pen and loading ramp was in the in north-west corner of the site, assumed to have been used for spray race operations.
- The second dwelling connected to the shed is on the western boundary near the north of the site. No access was gained to the shed. A rainwater tank was at the back of the shed, bordering the road. Suspected ACM fragments were located at the rear of the shed on the ground.

4.4 Client Provided Information

A preliminary site investigation (PSI) of the site (and others) titled "*Preliminary Site Investigation, Auranga Development, Stage B1 Sites, Auckland*" was undertaken by Focus Environmental Services in March 2017. The PSI noted that there were no previous environmental investigations relating to soil or groundwater contamination associated with the site.

4.5 Summary of Information Search

A review of the PSI has found that the site has been used for agricultural purposes since at least the 1960s.

The area of potential contamination identified in the PSI includes: the stock holding pen in the north-west of the site, the small residential dwelling connected to the shed on the site's western boundary toward the north of the site, the shed located near the centre of the site, the filled domestic lawn in front of the large residential dwelling, and the old incinerator to the east of the house. This area of concern (Area A) is displayed in **Figure 4** below.

Figure 4. Area within the site identified for possible contamination. Source: Auckland Council GeoMaps.

5 Site Investigation Scope and Rationale

5.1 Contaminants of Potential Concern and Investigation Rationale

Review of the site historical information has identified the following land use activities which may have resulted in the contamination of soil and/or groundwater in Area A. Contaminants of potential concern associated with these activities have also been identified in **Table 3** below. These land use activities are listed on the Ministry for the Environment's (MfE) Hazardous Activities and Industries List (HAIL).

Table 3. Contaminants of Potential Concern

Activity	HAIL Code	Contaminants of Potential Concern
■ Stock holding pen; potential for livestock dosing and treatment	■ A8: Livestock dip or spray race operations	■ Arsenic, organochlorines (eg, aldrin, dieldrin, DDT, lindane) and organophosphates, carbamates, and synthetic pyrethroids.
■ Asbestos containing materials in deteriorated condition	■ E1: Asbestos products, manufacture or disposal including sites with buildings containing asbestos products known to be in a deteriorated condition	■ Asbestos
■ Unknown fill	■ G5: Waste disposal to land (excluding where biosolids have been used as soil conditioners)	■ Metals, PAHs, semi-volatile organic compounds, and solvents
■ Incinerator and burning of waste	■ I: Any other land that has been subject to the intentional or accidental release of a hazardous substance in sufficient quantity that it could be a risk to human health or the environment.	■ Metals, PAHs

Sample locations were selected by targeting observed locations of possible contaminating activities. Soil samples were collected from each sampling location at regular intervals, with a shallow and deeper sample taken dependent on the localised geology and observations.

5.2 Soil Sampling Methodology

5.2.1 Summary of Field Work

The soil investigation was undertaken on the 27th July 2018. A total of 17 soil samples were collected from 12 hand auger/test pit locations. Test pits were first hand excavated by spade and then hand augered, with soil samples collected at a depth of 0.1 – 0.2m and at 0.4 – 0.5m at each location. This method allowed for the collection of in situ samples at the shallow depth. A soil sample location plan is provided in **Appendix D**.

Soil samples were collected directly by hand from the in-situ material at the shallow depth and directly from the hand auger at the deeper depths. A clean pair of nitrile gloves was worn for each sample to prevent cross-contamination. Samples were placed in laboratory supplied plastic or glass jars as appropriate and chilled prior to dispatch to R J Hill Laboratories Ltd (Hill Laboratories).

All sampling equipment was decontaminated between sampling locations using DECON 90 and distilled water.

All chemical laboratory analyses were undertaken by Hill Laboratories. A copy of the Hill Laboratories reports are included in **Appendix C**. All samples were accompanied with a Chain of Custody (COC) form which detail the required handling and testing instructions. Sample COC's can be provided on request.

Field sampling and relevant sampling management procedures were undertaken in general accordance with the MfE *Contaminated Land Management Guidelines No.5 – Site Investigation and Analysis (2011) and the New Zealand Guidelines for Assessing and Managing Asbestos in Soil (2017).*

A total of 17 soil samples were collected, with the 12 shallow samples analysed for the following:

- 3 samples analysed for heavy metals (arsenic, cadmium, chromium, copper, lead, nickel and zinc) and polycyclic aromatic hydrocarbons (PAH) in the vicinity of the incinerator and unknown fill;
- 3 analysed for organochlorine pesticides (OCP), organonitro and phosphorus pesticides (ONOP) and heavy metals (as per above) in the vicinity of the cattle yard; and
- 6 analysed for semi-quantitative asbestos in the vicinity of the potential ACM buildings in deteriorated condition.

Soil samples were selected for analysis based on spatial coverage and visual observations. Soil samples were analysed to provide an understanding of the potential extent of contamination. Soil samples not selected for analysis were held cold at the laboratory. A data summary sheet of the results is presented in **Appendix B**.

Four building material samples were also taken from the areas identified as being potentially contaminated with ACM in a deteriorated state, these locations are highlighted in **Appendix D**. These were analysed for the presence/absence of asbestos only, for the purpose of comparing nearby soil sample results.

6 Assessment Criteria

6.1 Assessment of Human Health Risk

The adopted assessment criteria for the investigation have been selected in accordance with the hierarchy defined by *Ministry for the Environment* (MfE) *Contaminated Land Management Guidelines No.*2 (MfE, 2002) and are summarised below. Assessment criteria for a rural/lifestyle block scenario have been adopted.

- *Resource Management (National Environment Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011. Soil Contaminant Standards for a rural/lifestyle block land use scenario was adopted.*
- *Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand (MfE, 1999). Values applicable to a commercial/industrial land use scenario was adopted.*
- *Regional Screening Levels, US Environmental Protection Agency (USEPA, 2012). Values applicable to a residential land use scenario was adopted.*
- *New Zealand Guidelines for Assessing and Managing Asbestos in Soil (2017) – Tier 1 and 2 assessment criteria*

6.2 Assessment of Environmental Risk

The risk posed by the discharge of contaminants in soil has been assessed against the following documents:

- Auckland Regional Council, 2002. Background Concentrations of Inorganic Elements in Soil from the Auckland Region. Background ranges for metals in volcanic range soils. Hereinafter referred to as the Auckland Background Concentrations.
- Auckland Council, 2016. Auckland Unitary Plan (Operative in part). Table E30.6.1.4.1 Permitted Activity Criteria.

7 Results

7.1 Fieldwork Observations

- Orange-brown clayey silt was observed in most of the soil samples.
- Soil samples taken in the vicinity of the retaining wall appeared to be fill.
- Broken fibre cement sheet fragments were observed around the stables in the centre of the site, and under the west side of the old shed connected to the residential dwelling near Jesmond Road.
- No samples were taken at TP12 due to a concrete foundation being present at the surface. Only one shallow sample was able to be collected at TP4 due to the inability to penetrate further.

Test pit locations and results are provided in **Appendix D**.

7.2 Summary of Soil Analytical Results

7.2.1 Metals

A total of 6 soil samples were analysed for metals. In summary:

- No samples exceeded the adopted human health risk assessment criteria.
- One of the six samples exceeded background levels for arsenic (TP5) and two of the six samples exceeded background levels for copper (TP1 and TP2).

7.2.2 Organochlorine Pesticides (OCP)

A total of 3 soil samples were analysed for OCP. In summary:

- All 3 samples were below laboratory detection limits for OCP.

7.2.3 Organonitro & phosphorus Pesticides (OCOP)

A total of 3 soil samples were analysed for ONOP. In summary:

- All 3 samples were below laboratory detection limits for ONOP.

7.2.4 Polyaromatic Hydrocarbons (PAH)

A total of 3 soil samples were analysed for PAH. In summary:

- All 3 samples were below laboratory detection limits for PAH.

7.2.5 Asbestos

A total of 6 soil samples and a total of 4 building material samples were analysed for the presence of asbestos:

- Four of the six soil samples had loose, white (chrysotile) asbestos fibres detected.
  - The shallow soil sample from TP9 taken from a depth of 0.1-0.2cm from soil nearby the central stables area returned a concentration of 0.00232% w/w which is greater than 0.001% w/w threshold for the Tier 1 risk assessment criteria for human health protection.

  - The shallow soil sample from TP7 and TP10 taken from a depth of 0.1-0.2cm from soil nearby the central stables area, and shallow samples TP11 and TP13 taken from a depth of 0.1-0.2cm from soil nearby the old shed connected to the residential dwelling near Jesmond Road, returned concentration results of <0.001% w/w.
  - Please see **Appendix C** for these laboratory results.
- Two of the four building material samples had white (chrysotile) and blue (crocidolite) asbestos detected. These samples are from the vicinity of the central stables area.
  - Please see **Appendix C** for these laboratory results.

8 Discussion and Risk Assessment

Concentrations of detected contaminants (except asbestos) were below the adopted criteria for the protection of human health and environmental discharge risk criteria.

One sample exceeded background criteria for arsenic, and two exceeded background criteria for copper. All three of these samples present a low risk to human health and environmental receptors.

Asbestos was identified as potentially present in the building materials within the PSI, samples were taken of broken cladding materials and asbestos detected in the cladding of the stables and nearby soil. The broken material observed by the old shed connected to the small dwelling did not have asbestos detected. One soil sample in the vicinity of this small dwelling showed a detectable concentration of white asbestos, however below human health risk guidelines. A building materials assessment was outside of the scope of this soil investigation. The spread of asbestos within soils has not been delineated, nor assessed in terms of its potential human health impact or overall impact of site development. Further testing and assessment of asbestos is recommended.

Removal of asbestos containing material and the soil nearby these buildings will be required for the redevelopment of these areas of the site. Asbestos containing material and soil will need to be disposed of to a licenced landfill. All removal will need to be undertaken by a licenced asbestos removal specialist.

Standard management controls would be required for redevelopment of the rest of the site. Soils from within Area A are not classified as cleanfill based on the exceedances of background concentrations and presence of asbestos in shallow soils in localised areas. Off-site disposal will need to be to a facility licenced to accept the materials, in particular, related to the asbestos concentrations identified.

8.1 Exposure Pathway Assessment

A Conceptual Site Model (CSM) (**Table 4**) was developed to inform the investigation and to describe the relationship between sources of contamination on site, the human and environmental receptors that may be exposed to those contaminants in the context of rural residential / lifestyle block use of the site, and the pathways by which those receptors may be exposed.

Overall, recorded soil contaminant concentrations will not prohibit the proposed development of the site.

Table 4. Conceptual Site Model

Source	Receptor	Pathway	Pathway Complete?
Asbestos present in localised areas of the site	Construction workers	Exposure of workers to contaminants in soils and groundwater during site redevelopment – dermal contact, ingestion or inhalation of dust/vapours.	Potentially Complete Pathway - The exposure pathway can be managed through an Asbestos Management Plan controls. Further delineation required.
	Future site users	Exposure of future site users to contaminants in soils – dermal contact, ingestion or inhalation of dust/vapours.	Potentially Complete Pathway Depends on the extent of contamination and the level of removal and

Source	Receptor	Pathway	Pathway Complete?
			type of mitigation put in place.
	General public	Exposure of general public to contaminants in soils– dermal contact, ingestion or inhalation of dust/vapours.	Potentially Complete Pathway - The exposure pathway can be managed through as Asbestos Management Plan controls. No public access to the site. Dust to be controlled during development.
	Groundwater resources for public consumption	Leaching and migration of soil contaminants into groundwater.	Incomplete Pathway – Asbestos localised and remains in surface soils. No potential pathway to nearest groundwater well.
	Surface water	Sediment and runoff directly into surface water.	Incomplete Pathway - The exposure pathway can be managed through implementation of standard sediment control practices.
		Migration of soil contaminants into surface water through shallow groundwater discharging into Drury Creek	Incomplete Pathway - Asbestos localised and remains in surface soils. No potential pathway through groundwater to nearest environmental receptor.

8.2 Limitations of Site Characterisation

Characterisation of subsurface conditions is dependent on the number of sample locations, methods of sampling and the uniformity of subsurface conditions. The accuracy of this characterisation is therefore limited by the Scope of works undertaken in accordance with the MfE Guidelines. There is the possibility that contamination present on the site has not been described. Whilst contaminant concentrations may be estimated at chosen sample locations, conditions at any location removed from the specific points of sampling can only be inferred on the basis of geological and hydrogeological conditions and the nature and the extent of identified contamination. Subsurface conditions can vary, resulting in uneven distribution of contaminants across a site which cannot be defined by these investigations. In addition, with time, the site conditions and environmental guidelines could change so that the reported assessments and conclusions are no longer valid. The conclusions of this report are made on the basis that the site conditions revealed by the investigation are representative of the actual conditions across the site at the time of sampling.

9 Development Implications

9.1 Consents

9.1.1 National Environmental Standard

The *Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011* (NESCS) applies to land as per clause 5(7):

"Land covered:
(7) The piece of land is a piece of land that is described by 1 of the following:
(a) an activity or industry described in the HAIL is being undertaken on it;
(b) an activity or industry described in the HAIL has been undertaken on it;
(c) it is more likely than not that an activity or industry described in the HAIL is being or has been undertaken on it."

On the basis of information provided in the PSI and the results of this DSI it can be concluded that on a more likely than not basis the following HAIL is applicable to this site:

- E1: Asbestos products, manufacture or disposal including sites with buildings containing asbestos products known to be in a deteriorated condition

The NESCS applies to certain activities taking place on HAIL land. The following activities are triggered for this site:

- Disturbing Soil

Soil Disturbance

Under Regulation 8(3) of the NESCS, soil disturbance of up to 25 m^3 per 500 m^2 and disposal of up to 5 m^3 per 500 m^2 is allowed as a Permitted Activity. For this site approximately 5,000 m^2 has been identified as potentially contaminated asbestos containing materials in a deteriorated condition as a conservative area. The total volume of soil disturbance is therefore 250 m^3, of which 50 m^3 can be disposed of offsite, as a Permitted Activity. The volume of soil to be disturbed is not yet known, however is anticipated to be above these thresholds. A Restricted Discretionary consent is therefore required under Regulation 10 of the NESCS to disturb and dispose of soil from Area A. A management plan should be prepared to outline the procedures in place to minimise any exposure risk during works.

9.1.1 Regional Plans

Under the Auckland Council Unitary Plan Operative in part, Area A is subject to 'Section E30 Contaminated land' which addresses the effects of the discharge of contaminants from contaminated land or land containing elevated levels of contaminants into air, or into water, or onto or into land pursuant to section 15 of the Resource Management Act 1991.

The proposed works comply with Standard E30.6.1.2 as soil testing has indicated that elements in the soil are within the permitted activity criteria range.

10 Summary of Conclusions

- A review of the Preliminary Site Investigation (Focus Environmental) has shown that Area A has been used for agricultural purposes and has had buildings established on the site before 1960.
- The key land use activities that have been identified from the review of the PSI that may have resulted in contamination of the site was asbestos in a deteriorated condition, unknown fill, potential spray race operations and an area used for burning of waste.
- The soil investigation focused on the collection of soil samples based on areas of potential contamination. 12 test pits were hand excavated or hand augered to a maximum depth of 0.5 m. A total of 17 soil samples were taken along with four building material samples or suspected ACM.
- Soil analytical results show the concentrations of heavy metal contaminants are below human health risk and environmental criteria (except asbestos).
- Concentrations of PAH, OCP and ONOP were below laboratory detection limits in the samples analysed.
- Asbestos was detected in soil and building material samples taken from around the stables located in the middle of the site, and in soil samples from nearby the shed located on the western boundary. Only soil sample TP9 on the north side of the stables, taken from a depth of 0.1-0.2cm returned a concentration of asbestos fibres greater than the 0.001% threshold for the Tier 1 risk assessment criteria for human health protection as outlined in *New Zealand Guidelines for Assessing and Managing Asbestos in Soil (2017).*
- On the basis of information provided in the PSI and the subsequent soil analytical results provided in this DSI ii can be concluded on a more likely than not basis that only HAIL code E1; asbestos in a deteriorated condition, is applicable to this site.
- An Asbestos Management Control Plan will be required for the ongoing management of the stables area.
- Removal of this asbestos containing material from around the stables should be undertaken by a licensed asbestos removal company.
- Standard management controls will be required for the rest of the site. Soils are not classified as cleanfill based on the concentrations of heavy metals above background and detection of asbestos containing material. Off-site disposal will need to be to a facility licenced to accept the materials. Consented ‘cleanfills’ may accept such material dependent on their acceptance criteria. Further delineation sampling may classify areas of the site as cleanfill.
- The land disturbance activities associated with the proposed development will require resource consent under Regulation 10 of the NESCS as a restricted discretionary activity.
- The exposure pathway assessment completed for the soil investigation identified three complete exposure pathways which could be mitigated and managed through the implementation of a CSMP.

11 Limitations

This report has been prepared by Beca Ltd (Beca) solely for the Ministry of Education (Client). Beca has been requested by the Client to provide a Detailed Site Investigation (Contamination) at 281 Jesmond Road, Karaka, Auckland. This report is prepared solely for the purpose of assessing the potential soil contamination (Scope). The contents of this report may not be used by the Ministry of Education for any purpose other than in accordance with the stated Scope.

This report is confidential and is prepared solely for the Client. Beca accepts no liability to any other person for their use of or reliance on this report, and any such use or reliance will be solely at their own risk.

In preparing this report Beca has relied on key information from Focus Environmental Services Ltd which included historical aerial photographs, and property information held by Auckland Council.

This report contains information obtained by inspection, sampling, testing or other means of investigation. Unless specifically stated otherwise in this report, Beca has relied on the accuracy, completeness, currency and sufficiency of all information provided to it by, or on behalf of, the Client or any third party, including the information listed above, and has not independently verified the information provided. Beca accepts no responsibility for errors or omissions in, or the currency or sufficiency of, the information provided. Publicly available records are frequently inaccurate or incomplete.

The contents of this report are based upon our understanding and interpretation of current legislation and guidelines (“Standards”) as consulting professionals, and should not be construed as legal opinions or advice. Unless special arrangements are made, this report will not be updated to take account of subsequent changes to any such Standards.

This report should be read in full, having regard to all stated assumptions, limitations and disclaimers.

Appendix A

Preliminary Site Investigation – Focus Environmental Services Ltd

PRELIMINARY SITE INVESTIGATION
AURANGA DEVELOPMENT
STAGE B1 SITES
AUCKLAND

For the Attention of:

Karaka and Dury Limited

Reference: FES 0772.001 March 2017

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	Preliminary Site Investigation Auranga Development, Drury, Auckland.
Project Number	0772.001
File Reference	Z:\2017 Jobs\Auranga Development Stages B & C\01 Report\0772.001_PSI_SD
Date	March 2017

Author

Shane Dolan
Environmental Scientist

Reviewed

Sam Woolley
Senior Environmental Scientist

Authorised

David O'Reilly
Principal Environmental Consultant

Distribution List

Parties	Copies
Karaka and Drury 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
3.1	321 Bremner Road	5
3.2	325 Bremner Road	5
3.3	329 Bremner Road	5
3.4	333 Bremner Road	5
3.5	385 Bremner Road	5
3.6	389 Bremner Road	5
3.7	393 Bremner Road	5
3.8	403 Bremner Road	6
3.9	415 Bremner Road	6
3.10	420-417 Bremner Road	6
3.11	421 Bremner Road	6
3.12	Esplanade Reserve	6
3.13	221 Jesmond Road	6
3.14	235 Jesmond Road	6
3.15	281 Jesmond Road	6
3.16	341 Jesmond Road	7
3.17	401 Jesmond Road	7
3.18	451 Jesmond Road	7
3.19	30 Burberry Road	7
3.20	38 Burberry Road	7
3.21	41 Burberry Road	7
4.0	Geology and Hydrology	8
5.0	Regulatory Framework	9
5.1	The National Environmental Standard	9
5.2	Auckland Unitary Plan (Operative in Part)	9
6.0	Site History	10
6.1	Historical Aerial Photographs	10
6.2	Previous Investigations	22
6.3	Auckland Council Property File Search	23
6.4	Auckland Council Site Contamination Enquiry	28

6.5	Historical Certificate of Title Review	28
6.6	Onsite Interview	28
7.0	Site Walkover and Inspection	29
7.1	321 Bremner Road	29
7.2	325 Bremner Road	30
7.3	329 Bremner Road	30
7.4	333 Bremner Road	31
7.5	385 Bremner Road	32
7.6	389 Bremner Road	32
7.7	393 Bremner Road	33
7.8	403 Bremner Road	33
7.9	415 Bremner Road	34
7.10	420-417 Bremner Road	35
7.11	421 Bremner Road	36
7.12	Esplanade Reserve	36
7.13	221 Jesmond Road	37
7.14	235 Jesmond Road	38
7.15	281 Jesmond Road	38
7.16	341 Jesmond Road	39
7.17	401 Jesmond Road	40
7.18	451 Jesmond Road	40
7.19	30 Burberry Road	41
7.20	38 Burberry Road	41
7.21	41 Burberry Road	42
8.0	Asbestos Management	43
9.0	Potentially Contaminating Activities or Land Uses	44
9.1	321 Bremner Road	44
9.2	325 Bremner Road	46
9.3	329 Bremner Road	48
9.4	333 Bremner Road	50
9.5	385 Bremner Road	52
9.6	389 Bremner Road	54
9.7	393 Bremner Road	56
9.8	403 Bremner Road	58
9.9	415 Bremner Road	60

9.10	420-417 Bremner Road	62
9.11	421 Bremner Road	64
9.12	Esplanade Reserve	66
9.13	221 Jesmond Road	68
9.14	235 Jesmond Road	70
9.15	281 Jesmond Road	72
9.16	341 Jesmond Road	74
9.17	401 Jesmond Road	76
9.18	451 Jesmond Road	78
9.19	30 Burberry Road	80
9.20	38 Burberry Road	82
9.21	41 Burberry Road	84
10.0	Conclusions and Recommendations	86

Figures

Figure 1 – Site Location Plan
Figure 2-1 – Site Features Plan: 321 Bremner Road
Figure 2-1A – Site Features Plan: 321 Bremner Road
Figure 2-2 – Site Features Plan: 325 Bremner Road
Figure 2-3 – Site Features Plan: 329 Bremner Road
Figure 2-3A – Site Features Plan: 329 Bremner Road
Figure 2-4 – Site Features Plan: 333 Bremner Road
Figure 2-4A – Site Features Plan: 333 Bremner Road
Figure 2-5 – Site Features Plan: 385 Bremner Road
Figure 2-6 – Site Features Plan: 389 Bremner Road
Figure 2-6A – Site Features Plan: 389 Bremner Road
Figure 2-7 – Site Features Plan: 393 Bremner Road
Figure 2-8 – Site Features Plan: 403 Bremner Road
Figure 2-9 – Site Features Plan: 415 Bremner Road
Figure 2-9A – Site Features Plan: 415 Bremner Road
Figure 2-10 – Site Features Plan: 420-417 Bremner Road
Figure 2-11 – Site Features Plan: 421 Bremner Road
Figure 2-12 – Site Features Plan: Esplanade Reserve
Figure 2-12A – Site Features Plan: Esplanade Reserve
Figure 2-12B – Site Features Plan: Esplanade Reserve
Figure 2-12C – Site Features Plan: Esplanade Reserve
Figure 2-13 – Site Features Plan: 221 Jesmond Road
Figure 2-14 – Site Features Plan: 235 Jesmond Road
Figure 2-15 – Site Features Plan: 281 Jesmond Road
Figure 2-16 – Site Features Plan: 341 Jesmond Road
Figure 2-17 – Site Features Plan: 401 Jesmond Road
Figure 2-18 – Site Features Plan: 451 Jesmond Road
Figure 2-19 – Site Features Plan: 30 Burberry Road
Figure 2-20 – Site Feature Plan: 38 Burberry Road
Figure 2-21 – Site Feature Plan: 41 Burberry Road

Appendices

Appendix A – Site Contour Plans

Appendix B – Environment HAIL

Appendix C (1) – Historical Site Photographs

Appendix C (2) – Historical Site Photographs

Appendix D – Site Contamination Enquiry

Appendix E – Historic Certificate of Title

Appendix F – Site Inspection Photographs

Executive Summary

Focus Environmental Services Limited was contracted by Karaka & Drury Consultant Limited to carry out a Preliminary Site Investigation of the 21 properties located at Bremner Road, Jesmond Road and Burberry Road, Drury, Auckland forming the Auranga Development.

This investigation was completed to provide information on potential contamination at the sites as a result of historical and/or current land uses, and may be used to support an application to develop the site.

This Preliminary Site Investigation 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).

The history of the site was researched by Focus Environmental Services personnel, which involved a review of the available historical aerial photographs of the site, a review of the Auckland Council property file, a review of the historical certificate of title and a contaminated sites enquiry to Auckland Council. During the review of the available information any potentially contaminating activities or land uses were identified.

Following the desk top assessment, the sites were visited and a site inspection and walk over was carried out. The sites were inspected by Focus Environmental Services Limited personnel on dates between the 24th of January 2017 and the 3rd of February 2017. During the site inspection, any potentially contaminating activities or land uses were identified.

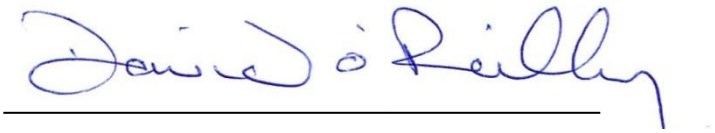
In summary, following the desk top assessment and site inspection and walkover, evidence of burning, potential spray race operations and storage of potentially treated timber were noted for 321 Bremner Road; evidence of hydrocarbon contamination, evidence of microbiological contamination and burning of potentially treat timber furniture were noted for 325 Bremner Road; evidence of burning, suspected uncertified fill material and a mechanical workshop were noted for 329 Bremner Road; potentially uncertified fill material, evidence of burning, storage of potentially treated timber, and evidence of fuel storage was noted for 333 Bremner Road; potential spray race operations and potential hydrocarbon contamination were noted for 389 Bremner Road; a single area of burning was noted for 403 Bremner Road; potential spray race operation were noted for 415 Bremner Road; storage of potentially treated timber was noted at 420-417 Bremner Road; evidence of horticultural activities were noted at 421 Bremner Road; evidence of microbiological contamination and evidence of potential ACM ground contamination were noted for the Esplanade Reserve; evidence of former horticultural activities, evidence of microbiological contamination, burning and potentially uncertified fill materials were noted for 221 Jesmond Road; evidence of rubber shaving on the base of the training arena were noted for 235 Jesmond Road; evidence of burning, evidence of potentially uncertified fill material, suspected spray race operations and potential ACM ground contamination were noted for 281 Jesmond Road; evidence of horticultural activities and potentially uncertified fill material were noted for 341 Jesmond Road; evidence of horticultural activities were noted for 401 Jesmond Road; evidence of horticultural activities and fuel storage were noted for 451 Jesmond Road. No potentially contaminating land uses and/or activities were identified at the site at 389 Bremner Road, 393 Bremner Road, 385 Bremner Road, 30 Burberry Road and 41 Burberry Road Drury.

The information obtained of the sites history and from the site inspection and walk over was assessed to determine if any potential hazardous activities listed on the Hazardous Activities and Industries List (HAIL) had occurred on site as a result of past or current land use.

Due to the potential sources of contamination identified at the above sites it is considered that there is evidence to suggest that an activity outlined in the HAIL list has been, or is currently being, carried out on the following sites; 321 Bremner Road, 325 Bremner Road, 329 Bremner Road, 333 Bremner Road, 403 Bremner Road, 415 Bremner Road, 420-417 Bremner Road, 421 Bremner Road, 221 Jesmond Road, 235 Jesmond Road, 281 Jesmond Road, 341 Jesmond Road, 401 Jesmond Road, 451 Jesmond Road and 38 Burberry Road.

Prior to the development of the areas of the site where potentially contaminating land uses and/or activities have taken place, a detailed site investigation is recommended. The detailed site investigation would confirm if the identified land uses and/or activities have affected the site soils and will confirm the consenting requirements for these areas of the site.

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 Karaka & Drury Consultant Limited ("the Client") in terms of the Focus Environmental Services Agreement ("Agreement").

1.2 The following report is based on:

- *Information provided by the client;*
- *A review of historical aerial photographs available for the site;*
- *A review of the historical Certificate of Title;*
- *A search of the Auckland Council Property File;*
- *A search of the Auckland Council Contaminated Sites Database; and*
- *A site walkover and inspection.*

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.

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.

2.0 Site Identification

The site consists of 21 properties located at Bremner Road, Jesmond Road and Burberry Road, Drury, Auckland as shown in Figure 1 attached. The site is located at national grid references 1771429mE & 5892088mN.

The site identification details are provided in Table 1 below.

Table 1: Site Identification Details: Auranga Development, Drury, Auckland.

Physical Address	Legal Description	Area (m^2)
321 Bremner Road, Drury	Lot 1 DP 333158	7,588
325 Bremner Road, Drury	Lot 8 DP 108332	20,207
329 Bremner Road, Drury	Lot 2 DP 110747	36,340
333 Bremner Road, Drury	Lot 1 DP 110747	45,500
385 Bremner Road, Drury	Lot 2 DP 123902	38,156
389 Bremner Road, Drury	Lot 2 DP 123093	26,114
393 Bremner Road, Drury	Lot 2 DP 123093	42,791
403 Bremner Road, Drury	Lot 1 DP 123093	20,245
415 Bremner Road, Drury	Lot 2 DP 103283	124,370
420-417 Bremner Road, Drury	Lot 2 DP 333158	93,154
421Bremner Road, Drury	Lot 1 DP 333158	6,911
Esplanade Reserve	Lot 3 DP 103283	-
	Lot 4 DP 106762	-
	Lot 9 DP 108332	-
221 Jesmond Road, Drury	Lot 2 DP 170365	61,050
235 Jesmond Road, Drury	Lot 1 DP 170365	41,030
281 Jesmond Road, Drury	Lot 1 DP 89570	44,185
341 Jesmond Road, Drury	Lot 2 DP 164625	85,860
401 Jesmond Road, Drury	Lot 1 DP 139636	41,000
451 Jesmond Road, Drury	Lot 2 DP 371107	15,070
30 Burberry Road, Drury	Lot 6 DP 193594	39,190
38 Burberry Road, Drury	Lot 15 DP 193594	59,840
41 Burberry Road, Drury	Lot 7 DP 166291	40,005

3.0 Site Topography

The properties of the Auranga Development contain undulating landscapes with numerous gullies and surface water bodies. Descriptions of the topographies of the individual sites are provided below.

The site contour plans are presented in Appendix A.

3.1 321 Bremner Road

The property at 321 Bremner Road is predominantly flat with a gentle slope towards a gully system which runs through the central portion of the site.

An unnamed tributary of the Drury Creek extends through the central portion of the site.

3.2 325 Bremner Road

The property at 325 Bremner Road is undulating with a gradual slope towards gully system running through the central portion of the site.

An unnamed tributary of the Drury Creek extends through the central portion of the site.

3.3 329 Bremner Road

The property at 329 Bremner Road is predominantly flat which the highest point of the site occurring where the residential area is located.

The Drury Creek which is located approximately 40m to the north of the site.

3.4 333 Bremner Road

The property at 333 Bremner Road is predominantly flat which the highest point of the site occurring where the residential area is located.

The Drury Creek which is located approximately 35m to the north of the site.

3.5 385 Bremner Road

The property at 385 Bremner Road is predominantly flat with a gradual slope northwards from the southern portion of the site.

The Drury Creek which is located approximately 190m to the north of the site.

3.6 389 Bremner Road

The property at 389 Bremner Road is predominantly flat with a gentle slope on the northern boundary towards the Esplanade Reserve.

The Drury Creek which is located approximately 35m to the north of the site.

3.7 393 Bremner Road

The property at 393 Bremner Road is predominantly flat with a gradual slope northwards from the south-western corner of the site.

The Drury Creek which is located approximately 160m to the north east of the site.

3.8 403 Bremner Road

The property at 389 Bremner Road is predominantly flat.

The Drury Creek which is located approximately 45m to the north east of the site.

3.9 415 Bremner Road

The property at 415 Bremner Road is predominantly flat with a gradual slope northwards from the south-eastern corner of the site. The northern section of the site slopes towards the Drury Creek.

The Drury Creek which is located approximately 30m to the north and east of the site.

3.10 420-417 Bremner Road

The property at 420-417 Bremner Road is predominantly flat, with a general slope towards the Esplanade Reserve on the southern boundary of the property.

The Drury Creek is situated approximately 27m from the north-western boundary of the site.

3.11 421 Bremner Road

The property at 421 Bremner Road is predominantly flat.

The Drury Creek is situated approximately 35m from the western boundary of the site.

3.12 Esplanade Reserve

Lot 3 DP 103283 is undulating with a sloping ridge towards the Drury Creek.

The Drury Creek extends along the boundary of the site.

3.13 221 Jesmond Road

The property at 221 Jesmond Road is undulating with the highest point occurring in the central portion of the site.

An unnamed tributary of the Drury Creek extends through the south-eastern portion of the site

3.14 235 Jesmond Road

The property at 235 Jesmond Road is undulating with the highest point of the site occurring where the residential area is located.

An unnamed tributary to the Drury Creek is located approximately 50m south east of the site.

3.15 281 Jesmond Road

The property at 281 Jesmond Road is undulating with a gradual slope running from the south west portion of the site to the north east.

An unnamed tributary to the Drury Creek is located approximately 150m north of the site.

3.16 341 Jesmond Road

The property at 341 Jesmond Road is undulating with the highest point of the site occurring where the residential area is located.

An unnamed tributary to the Drury Creek is located approximately 20m north of the site.

3.17 401 Jesmond Road

The property at 401 Jesmond Road is predominantly flat with a gradual slope towards the north-eastern corner of the site.

An unnamed tributary of the Drury Creek extends through the north-western portion of the site.

3.18 451 Jesmond Road

The property at 451 Jesmond Road is predominantly flat.

An unnamed tributary of the Drury Creek extends through the south-eastern portion of the site.

3.19 30 Burberry Road

The property at 30 Burberry Road is undulating with the highest point of the site occurring where the residential area is located.

An unnamed tributary of the Drury Creek extended through the north-western corner of the site.

3.20 38 Burberry Road

The property at 38 Burberry Road is undulating with a gradual slope towards a pond area in the central portion of the site.

An unnamed tributary of the Drury Creek extends through the central portion of the site

3.21 41 Burberry Road

The property at 41 Burberry Road is predominantly flat.

An unnamed tributary of the Drury Creek is located approximately 130m west of the site.

4.0 Geology and Hydrology

Published geological maps[1] indicate the sites of the Auranga Development are typically underlain by alluvial deposits of the Puketoka Formation. A description of the underlying geologies is presented in Table 2 below.

Table 2: Geology: Auranga Development, Drury.

Key name	Late Pliocene to Middle Pleistocene pumiceous river deposits
Simple name	Neogene sedimentary rocks
Main rock name	Sand
Description	Pumiceous mud, sand and gravel with muddy peat and lignite: rhyolite pumice, including non-welded ignimbrite, tephra and alluvia
Subsidiary rocks	Mud gravel peat lignite tephra pumice
Key group	Late Pliocene to Middle Pleistocene sediments
Stratigraphic lexicon name	Puketoka Formation
Absolute age (min)	0.071 million years
Absolute age (max)	3.6 million years
Rock group	Sandstone
Rock class	Clastic sediment
Key name	Late Pliocene to Middle Pleistocene pumiceous river deposits

No groundwater investigation has been undertaken as part of this investigation and the nearest surface water in each case is presented in Section 3 above.

[1] 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 1st 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 ($SCS_{(health)}$), for a variety of land use scenarios along with reference to best practice reporting documents.

The Ministry for the Environment HAIL is presented as Appendix B.

5.2 Auckland Unitary Plan (Operative in Part)

The contaminated land rules of the Auckland Unitary Plan (Operative in Part) (AUP Op in Part) have immediate legal effect following its notification. As the AUP Op in Part was notified on the 15th of November 2016 the contaminated land rules must be considered.

In brief, the objective of the AUP Op in Part 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 AUP Op in Part apply when the land contains contaminants above those levels specified in Table E30.6.1.4.1 of Chapter E30 of the AUP Op in Part.

6.0 Site History

The history of the site was researched by Focus Environmental Services personnel, which involved a review of the available historical aerial photographs of the site, a review of the Auckland Council Property file, a review of the historical Certificate of Title and a contaminated sites enquiry to Auckland Council.

6.1 Historical Aerial Photographs

Descriptions of the historical aerial photographs for the subject sites are presented in Tables 3-23 below. The historical site photographs are presented in Appendix C.

Table 3: Historical Photographs: 321 Bremner Road.

Date	Description
1960, 1980 & 1981	The 1960, 1980 & 1981 historical photograph show the subject site undeveloped and in use for rural purposes. No structure can be observed across the site. The Drury Creek can be seen to the north of the subject site while Bremner Road can be seen to the south of the site. The surrounding properties are predominantly rural in use.
1988	The 1988 historical photographs show the construction of a dwelling in the southern portion of the site. The remaining areas to the north are undeveloped and in use as grazing paddocks. The surrounding land is predominantly rural residential in use.
1996, 2006, 2008, 2012 & 2016	The 1996 – 2016 historical photographs show the subject site generally as it appeared during the site walk over and inspection. From the 1996 a second garage can be in the south-eastern corner of the residential area. The surrounding land is unchanged from rural residential in use.

See Appendix C (1)

Table 4: Historical Photographs: 325 Bremner Road.

Date	Description
1960	The 1960 historical photograph shows what appears to be two agricultural buildings in the south-eastern portion of the site. A milking parlour and cow shed are located on the northern boundary of the site. The surrounding properties are predominantly rural in use.
1980 & 1981	The 1980 & 1988 historical photographs show the subject site relatively unchanged from the 1960 historical photograph with the exception of the construction of a residential dwelling in the south-eastern portion of the site. The surrounding land uses are predominantly rural in use.
1988, 1996, 2001, 2006, 2008, 2012 & 2016	The 1988 - 2016 historical photographs are relatively unchanged from the 1981 historical photograph with the exception of lunging ring which was be seen from the 1988 historical photograph. The lunging ring is located on the western boundary of the north-eastern paddock. The surrounding properties are unchanged for rural residential in use.

See Appendix C (1)

Table 5: Historical Photographs: 329 Bremner Road.

Date	Description
1960, 1980, 1981 & 1988	The 1960 - 1988 historical photograph show the subject site undeveloped and in use for rural purposes. No structure can be observed across the site. The Drury Creek can be seen to the north of the subject site. The surrounding properties are predominantly rural in use.
1996 & 2001	The 1996 & 2001 historical photograph is of relatively poor resolution however it shows the residential dwelling located and associated buildings in the northern section of the site. The remaining areas to the south are predominantly in use for rural purposes. The surrounding land use are in use for rural residential purposes.
2006, 2008 & 2012	The 2006, 2008 & 2012 historical photographs show a large extension constructed on the eastern side of the dwelling. A large mechanic workshop has been constructed in the south-western corner of the site.
2016	The 2016 aerial photograph shows the subject site largely as it appeared during the site walk over and inspection. A swimming pool has been constructed to the rear of the dwelling. The surrounding land use is unchanged from rural residential.

See Appendix C (1)

Table 6: Historical Photographs: 333 Bremner Road.

Date	Description
1960, 1980 & 1981	The 1960 - 1981 historical photograph show the subject site undeveloped and in use for rural purposes. No structure can be observed across the site. The Drury Creek can be seen to the north of the subject site while Bremner Road is visible to the south. The surrounding properties are predominantly rural in use.
1988	The 1988 historical photograph shows the subject site relatively as it appeared in the 1981 historical photograph. However, what appears to be the construction of a new dwelling can be seen in the north-eastern portion of the site. The surrounding properties appear to be largely rural residential in use.
1996, 2001 & 2006	The 1996 - 2006 historical photograph shows the new site access road now on the western boundary of the sites. The dwelling appears to have undergone some alteration since 1988. A shed and adjoining livestock holding pen have also been constructed in the north-eastern section of the site.
2008	The 2008 historical photograph is relatively unchanged from the 2006 historical photograph. A number of mature trees have been removed adjacent to the dwelling to allow for landscape purposes. Areas of disturbed soil are visible in the north-eastern paddock of the site.
2012 & 2016	The 2012 & 2016 historical photographs are largely as the site appeared during the site walk over and inspection with the residential area on the western boundary and the storage yard, shed and adjoining livestock holding pen located along the eastern boundary. The surrounding land use is unchanged from rural residential.

See Appendix C (1)

Table 7: Historical Photographs: 385 Bremner Road.

Date	Description
1960, 1980 & 1981	The 1960 historical photograph shows a residential dwelling and associated building on the southern boundary of the site. The remaining area to the north appears to be in use for rural purposes. Bremner Road can be seen to the south of the site. The surrounding properties appear largely rural in use.
1988	The 1988 historical photographs show the subject site largely as it appeared in the 1981 historical photograph. The residential area on the southern boundary of the site appears to have had several alterations carried out to develop the property. The previous laneway to the paddocks in the northern section of the site has been closed off to allow for the construction of a new access way on the western boundary of the site. The surrounding properties appear largely rural in use.
1996	The 1996 historical photograph is of relatively poor resolution however its shows the construction of a swimming pool to the rear of the dwelling. A hay barn and adjoining stock holding yard has been erected in the north-western corner of the site.
2001, 2006, 2008, 2012 & 2016	The 2001 – 2016 historical photographs are generally as they appeared during the site walkover and inspection. The residential area in located in the south-eastern portion of the site while the remaining land to the north is predominantly utilised for grazing purposes. The surrounding land use is unchanged from rural residential.

See Appendix C (1)

Table 8: Historical Photographs: 389 Bremner Road.

Date	Description
1960	The 1960 historical photograph show the subject site undeveloped and in use for rural purposes. No structure can be observed across the site. The Drury Creek can be seen to the north of the property. The surrounding properties are predominantly rural in use.
1980, 1981 & 1988	The 1980 - 1988 historical photographs show the subject site relatively unchanged from the 1960 aerial photograph with the exception of the storage shed constructed on the western boundary of the site. The surrounding properties appear largely rural in use.
1996	The 1996 historical photograph is of relatively poor resolution however it appears to show the construction of a new dwelling in the north-eastern portion of the site. The surrounding properties appear largely rural residential in use.
2001	The 2001 historical photograph shows the subject site relatively unchanged from the 1996 historical photograph with the exception of a small utility shed on the eastern portion of the site and a stock holding yard in the central portion of the site. The surrounding land use is unchanged from rural residential in use.
2006, 2008, 2012 & 2016	The 2006 - 2016 historical photograph shows the site generally as it appeared during the site walk over and inspection. The utility shed on the eastern portion of the site has now been removed. The surrounding land use is unchanged from rural residential in use.

See Appendix C (1)

Table 9: Historical Photographs: 393 Bremner Road.

Date	Description
1960	The 1960 historical photograph show the subject site undeveloped and in use for rural purposes. No structure can be observed across the site. The surrounding properties are predominantly rural in use.
1980 & 1981	The 1980 & 1981 historical photographs show the subject site relatively unchanged from the 1960 aerial photograph with the exception of the cow shed which has been constructed in the central portion of the site. The surrounding properties are predominantly rural in use.
1988 & 1996	The 1988 historical photographs show the subject site relatively unchanged from the 1980 & 1981 historical photographs with the exception of a residential dwelling that has been constructed in the south-eastern portion of the site. The surrounding properties appear largely rural in use.
2001, 2006, 2008, 2012 & 2016	The 2001 – 2016 historical photographs are relatively unchanged from the 1996 historical photograph with the exception of the stock holding pen which has been constructed on the eastern boundary of the site adjacent to the lane way. The surrounding land use is unchanged from rural residential in use.

See Appendix C (1)

Table 10: Historical Photographs: 403 Bremner Road.

Date	Description
1960, 1980, 1981 & 1988	The 1960 - 1988 historical photograph show the subject site undeveloped and in use for rural purposes. No structure can be observed across the site. The surrounding properties are predominantly rural in use.
1996	The 1996 historical photograph is of relatively poor resolution however what appear to be the residential dwelling and shed have been constructed in the central portion of the site. The surrounding properties are predominantly rural residential in use.
2001	The 2001 historical photograph shows the subject site relatively unchanged from the 1996 historical photograph. A small utility shed has been erected on the western boundary of the of the site.
2006, 2008 & 2012	The 2006 – 2012 historical photograph shows the residential area extending north to the property boundary. A putting green has been constructed in the north-western corner of the property. A second access route to the dwelling has been created which extends around the north of the shed in the central portion of the site.
2016	The 2016 historical photograph shows the subject site generally as it appeared during the site walk over and inspection. A swimming pool has been constructed to the rear of the dwelling. The surrounding land use is unchanged from rural residential in use.

See Appendix C (1)

Table 11: Historical Photographs: 415 Bremner Road.

Date	Description
1960	The 1960 historical photograph shows a residential dwelling and associated buildings in the south-eastern portion of the site. The remaining areas to the north a rural in use. Bremner Road can be seen to the south of the site with the Drury Creek adjacent to the north-western boundary of the site. The surrounding properties are predominantly rural in use.
1980 & 1981	The 1980 (what about 1981) historical photograph shows the construction of shed in the central portion of the site and a stable in the south-western portion of the site. The surrounding properties are largely rural in use.
1988, 1996 & 2001	The 1988 - 2001 historical photograph shows the subject site relatively as it appeared during the 1981 historical photograph, however a sand arena can be observed adjacent to the stables. The surrounding properties appear largely rural residential in use.
2006, 2008, 2012 & 2016	The 2006 - 2016 historical photographs are relatively unchanged from the 2001 historical photograph and largely as the site appeared during the site walk over and investigation. The garage on the southern boundary of the site appears to have renovated with the construction of a new roof. The surrounding land use is unchanged from rural residential purposes.

See Appendix C (1)

Table 12: Historical Photographs: 420-417 Bremner Road.

Date	Description
1960, 1980, & 1981	The 1960 – 1981 (1981??) historical photographs show the subject site relatively undeveloped and in use for rural purposes. No structures can be observed across the site. The Drury Creek can be seen to the north west of the site. The surrounding properties are predominantly rural in use.
1988, 1996, 2001, 2006, 2008, 2012 & 2016	The 1988 - 2016 historical photograph shows the site generally as it appeared during the site walk over and inspection with the construction of a number of structures across the site. A new stable has been erected in the south-eastern corner of the site as well as a livestock shelter on the eastern boundary and a hay barn in the north-eastern corner of the property. The surrounding properties are predominantly rural residential in use.

See Appendix C (1)

Table 13: Historical Photographs: 421 Bremner Road.

Date	Description
1960, 1980 & 1981	The 1960 - 1981 historical photographs show the subject site undeveloped and in use for rural purposes. No structures can be observed across the site. The Drury Creek can be seen to the west of the site. The surrounding properties are predominantly rural in use.
1988 & 1996	The 1988 – 1996??? historical photographs shows the construction of the residential dwelling in the north-western portion of the site. The remaining areas of the site are predominantly in use for rural purposes. The surrounding land use is predominantly rural land use with the construction of residential dwellings to the east of the subject site.
2001	The 2001 historical photograph shows the site relatively unchanged from the 1996 historical photograph with the exception of what appears to be the erection of three greenhouses in the north-western corner of the site. The surrounding land use is unchanged from rural residential.
2006, 2008, 2012 & 2016	The 2006 – 2016 historical photograph shows the site generally as it appeared during the site walk over and inspection. with the addition of an attached garage to the dwelling and a workshop to the residential area. Two of the green houses appear to have been removed from the north-western corner of the site. The surrounding land use is unchanged from rural residential.

See Appendix C (1)

Table 14: Esplanade Reserve.

Date	Description
1960	The 1960 historical photograph show the subject site undeveloped and in use for rural purposes. No structures can be observed across the site. The Drury Creek is located adjacent to the northern boundary of the site. The surrounding land is predominantly rural in use.
1980, 1981 & 1988	The 1980 - 1988 historical photographs are relatively unchanged from the 1960 historical photograph with the exception two sheds which were located in close proximity on the western boundary of 420-417 Bremner Road. A further structure can be seen located adjacent to the northern boundary of 389 Bremner Road. The surrounding land is predominantly rural residential in use.
1996 & 2001	The 1996 & 2001 historical photographs show the site relatively unchanged from the 1988 historical photograph with the exception of the removal of the structure which was located adjacent to the northern boundary of 389 Bremner Road.
2006	The 2006 historical photograph shows a utility shed located adjacent to the north-eastern section of 421 Bremner Road. The two sheds located on the western boundary of 420-417 Bremner Road have been removed.
2008, 2012 & 2016	The 2008 - 2016 historical photograph shows the subject site relatively unchanged from the 2006 historical photograph and largely as it appeared during the site walk over and inspection. A storage shed has been constructed adjacent to the gravel driveway of 421 Bremner Road. The surrounding land is unchanged from rural residential in use.

See Appendix C (1)

Table 15: Historical Photographs: 221 Jesmond Road.

Date	Description
1960, 1980, 1981 & 1988	The 1960 - 1996 historical photographs show the subject site forming part of a larger plot of land. The site appears to be developed for rural purposes with several structures identified in the central and western portions of the site. A drainage gully can be seen running through the south-eastern corner of the site. The surrounding land use is predominantly for rural residential land use.
1996	The 1996 historical photograph is of relatively poor resolution however it appears is largely unchanged from the previous historical photographs, however, what appears to be are a large area of disturbed soil can be seen in the central portion of the site adjacent to the southern boundary. What appears to be a dam structure has been constructed to create a large pond on the neighbouring property to the north east.
2001	The 2001 historical photograph shows a large structure, most likely utilised for market garden purposes in the central portion of the site adjacent to the southern boundary. Only one of the previous structures identified from the earlier historical photographs remain on site. A line of mature trees on the northern boundary have been removed. A series of water pond and land bridges can now be seen to the north of the site. These water ponds appear to be a result of the dam structure present further upstream. It is suspected that the material used to construct the land bridges may potentially be uncertified fill. The surrounding properties have seen the development of more residential dwellings.
2006, 2008 & 2012	The 2006 - 2012 historical photographs are largely unchanged from the 2001 historical photograph. The market garden located in the central portion of the site adjacent to the southern boundary appears to be gradually down sized from the area depicted in the 2001 historical photograph.
2016	The 2016 historical photograph shows the subject site largely as it appeared during the site walk over and inspection. The market garden has now been fully decommissioned and the area has seen a regrowth of vegetation. The surrounding land use is unchanged from rural residential purposes.

See Appendix C (2)

Table 16: Historical Photographs: 235 Jesmond Road.

Date	Description
1960, 1980, 1981, 1988 & 1996	The 1960 - 1996 historical photographs show the subject site forming part of a larger plot of land. The site is undeveloped and in use for rural purposes. Jesmond Road can be seen running adjacent to the western boundary of the site. The surrounding properties are largely rural residential in use.
2001	The 2001 historical photograph shows the site developed for rural residential purposes. A dwelling and storage shed can be seen in the central portion of the site. The remainder of the site is in pasture.
2006, 2008, 2012 & 2016	The 2006 - 2016 show the subject site largely as it appeared during the site walk over and inspection. A large sand training arena and lunging ring can be along the southern boundary of the site. The surrounding properties are largely unchanged from rural residential in use.

See Appendix C (2)

Table 17: Historical Photographs: 281 Jesmond Road.

Date	Description
1960	The 1960 historical photograph shows the subjects site in use for rural purposes. Jesmond Road can be seen adjacent to the western boundary of the site. A dwelling is located south-western boundary of the site. Several site buildings can be observed in the central and north western portion of the site. The surrounding properties are largely rural in use with the exception of the eastern portion of 401 Jesmond Road which is located adjacent to the north-eastern corner of the site.
1980, 1981, 1988 & 1996	The 1980- - 1996 historical photographs show the subject site relatively unchanged from the 1960 historical photograph. The structure adjacent to the western boundary has been extended to form an elongated building. The surrounding properties are largely rural residential in use with the exception of the eastern portion of 401 Jesmond Road which is located adjacent to the north-eastern corner of the site.
2001 & 2006	The 2001 & 2006 historical photographs show a stables and adjoining livestock holding pen located in the central portion of the site. A livestock holding pen and loading ramp can be seen in the north-western corner of the site. The remaining areas of the site consist of grazing paddocks.
2008 & 2012	The 2008 & 2012 historical photographs show the subject site relatively unchanged from the 2001 & 2006 historical photograph, however, what appears to be a large sand training arena is visible adjacent to the northern of the site.
2016	The 2016 historical photograph shows the subject site largely as it appeared during the site walk over and inspection. The large sand training arena located on the northern boundary of the site appears to no longer be in use and thin layer of vegetation now overlays the area. The surrounding properties are largely unchanged from rural residential in use with the exception of the eastern portion of 401 Jesmond Road which is located adjacent to the north-eastern corner of the site.

See Appendix C (2)

Table 18: Historical Photographs: 341 Jesmond Road.

Date	Description
1960, 1980 & 1981	The 1960 - 1981 historical photographs show the subject site in use for rural purposes. A single barn structure can be seen in the northern portion of the site adjacent to the property boundary. The surrounding properties are largely rural in use.
1988	The 1988 historical photograph shows the northern section of the site now being utilised for horticultural purposes. The remaining area to the south is undeveloped and in use for rural purposes. What appears to be a horse training ring is located adjacent to the north-eastern boundary of the site. The surrounding properties are largely rural residential in use with the exception 401 Jesmond Road which is adjacent to the north-western boundary of the site.
1996	The 1996 historical photograph is of relatively poor resolution however it shows the subject site generally unchanged from the 1988 historical photograph which the exception of the residential dwelling which is now located in the south-western portion of the site.
2001	The 2001 historical photograph shows the northern portion of the site no longer being utilised for horticultural purposes. A livestock holding pen can be seen in the central portion of the site adjacent to the driveway. A drainage pond is also visible in the central paddock of the site.
2006	The 2006 historical photograph shows the subject site relatively unchanged from the 2001 historical photograph with the exception of a large shed which is located adjacent to the north-western boundary of the site.
2008, 2012 & 2016	The 2008 - 2016 show the subject site largely as it appeared during the site walk over and inspection. A small orchard can be seen adjacent to the large shed on the north-western boundary of the site. The surrounding land uses are unchanged from rural residential with the exception of the eastern portion of 401 Jesmond Road which is being utilised for horticultural purposes.

See Appendix C (2)

Table 19: Historical Photographs: 401 Jesmond Road.

Date	Description
1960, 1980 & 1981	The 1960 - 1981 historical photographs show the subject site undeveloped and in use for rural purposes. Jesmond Road can be adjacent to the western boundary of the site. The surrounding properties are predominantly rural in use.
1988	The 1988 historical photograph shows the subject site being utilised for horticultural purposes. The site is can be seen divided into several sections which are bordered by shelter belts. A residential dwelling can be seen in the south-western corner of the site adjacent to Jesmond Road. The surrounding land use if predominantly rural residential with the exception of the properties located to the north west and south west which are utilised for horticultural purposes.
1996	The 1996 historical photograph shows the subject site relatively unchanged from the 1988 historical photograph. Some alterations have been made to the eastern portion of the site with the removal of some of the shelter belts in order to increase the paddocks size. The surrounding land is predominantly rural residential in use.
2001, 2006, 2008, 2012 & 2016	The 2001 - 2016 historical photographs shows the site largely as it appeared during the site walk over and inspection. The site can be seen divided into two sections. The western portions of the site in predominantly in pasture with what appears to be a market garden located in the central portion of the site. A storage shed can be seen located in the south-eastern corner of the site. The eastern section of the site is predominantly in use as an orchard. The surrounding land is unchanged from rural residential in use.

See Appendix C (2)

Table 20: Historical Photographs: 451 Jesmond Road.

Date	Description
1960, 1980 & 1981	The 1960 - 1981 historical photographs show the subject site forming part of a larger plot of land. The site is undeveloped and in use for rural purposes. Bremner Road is located to the north while Jesmond Road is located adjacent to the western boundary of the site. The surrounding properties are predominantly rural in use.
1988 & 1996	The 1988 & 1996 historical photographs are relatively unchanged from the 1980 & 1981 historical photographs. The properties to the south and west of the subject site are now in use for horticultural purposes. The remaining properties surrounding the site are in use for rural residential purposes.
2001, 2006 & 2008	The 2001 - 2008 historical photographs show the subject site relatively unchanged from the 1988 & 1966 historical photographs, however, what appears to be a market garden and small orchard are located on the eastern portion of the site. A large glass house can be seen on the property to the west of the site.
2012	The 2012 historical photograph shows a residential dwelling and garage located in the central portion of the site. The surrounding areas are predominantly rural residential in use with the exception of the properties to the south and west of the site which is utilised for horticultural purposes.
2016	The 2016 historical photograph shows the subject site largely as it appeared during the site walkover and inspection. The site curtilage has been landscaped to leave domestic gardens around the dwelling. A number of hedgerows can be seen on the eastern boundary of the site. The surrounding properties are unchanged from rural residential in use with the exception of the properties to the south and west of the site which is utilised for horticultural purposes.

See Appendix C (2)

Table 21: Historical Photographs: 30 Burberry Road.

Date	Description
1960, 1980, 1981, 1988 & 1996	The 1960 - 1996 historical photographs show the subject site forming part of a larger plot of land. The site appears to be developed for rural purposes with no structures identified throughout the site. The surrounding land use is predominantly for rural purposes.
2001	The 2001 historical photograph show a large dwelling and associated curtilage located in the central part of the southern section of the site. A swimming pool and large decking area is located to the north of the dwelling. Adjacent to the decking area which surrounded the pool a shed structure can be observed. Just north of the swimming pool and decking area a tennis court can be seen. A putting green and sand bunkers can be observed in the eastern curtilage of the site adjacent to Burberry Road. The remaining areas of the site to the west and north of the dwelling are utilised for grazing purposes. The surrounding land is predominantly for rural residential in use.
2006, 2008 & 2012	The 2006 - 2012 historical photographs show the site relatively unchanged from the 2001 historical photograph. The recreational golf area on the eastern curtilage has seen the addition of a driving range which extended across into the northern portion of the site. What appears to be a domestic orchard and vegetable garden can be seen to the west of the tennis court and decking area.
2016	The 2016 historical photograph shows the subject site relatively unchanged from the 2012 historical photograph and largely as the site appeared during the site walk over and inspection. The addition of a large garage A large garage can be seen along the southern boundary of the site. The surrounding land use is unchanged from rural residential.

See Appendix C (2)

Table 22: Historical Photographs: 38 Burberry Road.

Date	Description
1960, 1980, 1981 & 1988	The 1960 - 1988 historical photographs show the subject site forming part of a larger plot of land. The site appears to be developed for rural purposes with no structure identified throughout the site. A drainage gully passes through the north-western portion of the site. Burberry Road can be seen to the south east of the site. The surrounding land use is predominantly for rural purposes.
1996	The 1996 historical photograph shows the subject site undeveloped with no structures identified on site. The drainage gully running through the site has been dammed in the central portion of the site to create a pond. It is thought that potential fill material may have been imported on site to create the dam structure and subsequent land bridges.
2001 & 2006,	The 2001 & 2016 historical photographs show a dwelling and swimming pool located in the western portion of the site adjacent to the pond. What appears to be a domestic orchard can be seen to the west of the dwelling. A number of trees have been planted for landscape purposes in the area surrounding the pond. A stables and livestock holding pen can be seen in the central portion of the site. The surrounding land use is predominantly for rural residential purposes.
2008, 2012 & 2016	The 2008 - 2016 historical photographs show the site relatively unchanged from the 2001 & 2006 historical photograph. The domestic orchard to the west of the dwelling has been removed. The surrounding land in unchanged from rural residential in use.

See Appendix C (2)

Table 23: Historical Photographs: 41 Burberry Road.

Date	Description
1960, 1980, 1988 & 1996	The 1960 - 1996 historical photographs show the subject site forming part of a larger plot of land. The site appears to be developed for rural purposes with no structure identified throughout the site. Burberry Road can be seen to the south west of the site. The surrounding land use is predominantly for rural purposes.
2001	The 2001 historical photograph shows the subjects site developed for rural residential purposes. A dwelling and swimming pool has been constructed in the southern portion of the site. Further north of the dwelling a barn/stables can be seen. What appears to be a stockpile of soil can be observed in the north-western corner of the site. The neighbouring properties to the west and east of the site have both been developed for rural residential purposes with dwellings being constructed.
2006	The 2006 historical photograph shows the site relatively unchanged from the 2001 historical photograph. A pool house has been erected adjacent to the swimming pool and extensions to the barn/stables can be observed. The stockpile of soil in the north-western corner of the site has now been removed. What appears to be a market garden can be seen on the neighbouring property to the east adjacent to the site boundary.
2008, 2012 & 2016	The 2008 - 2016 historical photograph shows the subject site relatively unchanged from the 2006 historical photograph with the exception of further alterations being made to the barn/stables. The market garden on the eastern property has been removed to allow for the construction of a residential dwelling. The surrounding properties are unchanged from rural residential in use.

See Appendix C (2)

6.2 Previous Investigations

There are no previous environmental investigations relating to soil or groundwater contamination associated with any of the Auranga Development sites (as described in Table 1) on file with Auckland Council.

Two previous geotechnical investigations were available for the Auranga Development and have been summarised below:

The report titled 'Geotechnical Investigation for the feasibility of development at Van Den Brink Farms LTD property, Being Proposed Subdivision of Part Allotment 36, Parish Of Opaheke' dated January 1994 and prepared by Earthtec Consulting Limited evaluated the suitability of the site for the construction of houses at 41 Burberry Road, Drury. No fill materials were reported in any of the borehole logs and the site was considered suitable for development at the time of writing.

The geotechnical report titled 'Ashton Downs Lot 15 DP 166291' dated June 1996 and prepared by Babbage Consultants evaluated the suitability of the site for the construction of a dwelling located at 38 Burberry Road, Drury. Fill materials were reported in five out of the 13 borehole logs recorded across the site. The report concluded that the site was suitable to construct the proposed light timber framed dwelling, however ground water was to be considered with regards to deep foundations and other below ground structures.

With the exception of the above reports, at the time of writing the results, a geotechnical investigation for each of the sites within the Auranga Development were not available. Therefore, fill material, other than that identified during the site walkover and inspection,

may be present at the site. The identification of uncertified fill material will likely require further investigation and/or chemical analysis if detected.

6.3 Auckland Council Property File Search

The results of the council search showed several consents relating to the properties across the Auranga Development Project. The relevant details of the Property File search are presented in Tables 24-42 below.

Table 24: Relevant Property File Information: 321 Bremner Road, Drury

Proposed Activity	Application number	Date
Erect a Dwelling	J040070	17/09/1979
Drainage & Septic Tank Installation	6877	17/09/1979
Erect a Carport	F63948	03/03/1989
Erect a Garage	90/0428	10/09/1990

Table 25: Relevant Property File Information: 325 Bremner Road, Drury

Proposed Activity	Application number	Date
Erect Dwelling	I002989	11/09/1978
Addition of Carport	E360	28/08/1986

Table 26: Relevant Property File Information: 329 Bremner Road, Drury

Proposed Activity	Application number	Date
Subdivision (333 Bremner Road)	373/157	03/12/1985
Relocating dwelling / farm office/ studio house/ garage & Wastewater and storm water drainage	011238	22/11/1994
Alterations to Existing Dwelling	18403	18/12/2001
Dwelling Alterations	18746	04/06/2002
Storage Shed and Stables	18127	30/09/2004
Amendment to Pool Fencing	B/2013/8039/A	23/02/2015
New Swimming Pool & Earthworks	R/LUC/2014/574	19/05/2015
Erect Three Bay Shed	25473	CANCELLED

Table 27: Relevant Property File Information: 333 Bremner Road, Drury

Proposed Activity	Application number	Date
Construct Shed	1196	19/09/1955
Alterations to Dwelling	5124	12/02/1959
Construct Shed	B076904	18/08/1966
Alterations to Dwelling (carport)	A073193	14/02/1969
Install Septic Tank & Drainage System	1896-97	20/10/1986
Alterations to Dwelling – Garage/Workshop	E711	15/12/1986
Re-Site Dwelling	000E537	20/10/1986
Irrigation System for Market Gardens	AG/8492	07/09/1992

Table 28: Relevant Property File Information: 385 Bremner Road, Drury

Proposed Activity	Application number	Date
Erect Hay Barn	A073363	05/05/1969
Dwelling Alterations	G06253	10/09/1974
Re-Erect Shed	G60132	26/03/1975
2nd Dwelling Consent	N/A	1982
Alterations to Garage	B74222	28/11/1983
Erect a Dwelling	12703	10/06/1983
Re-site Dwelling	B12710	13/06/1983
Erect 'Skyline' Garage	033850	25/07/1985
Application for Subdivision	6/14/831	02/05/1985
Construct Spa Pool	E32919	09/09/1987
Swimming Pool	E26320	09/11/1987
Construct Garage/Utility Room/ Granny Flat	32429	24/03/1987
Application for Subdivision	6/15/303	April 1987
Erect Farm Building	10087	02/07/1993

Table 29: Relevant Property Information: 389 Bremner Road, Drury

Proposed Activity	Application number	Date
Construct Dwelling and Garage	011827	11/07/1997

Table 30: Relevant Property File Information: 403 Bremner Road, Drury

Proposed Activity	Application number	Date
Erect Dwelling	10506	27/10/1993
Erect Utility Shed	N/A	15/07/1993
Erect Utility Shed/Hay Barn	10363	18/05/1999
Sewage & Wastewater pumping Station	N/A	13/04/2005
Dwelling Additions	21225	26/09/2005
Additions Earthworks for Swimming Pool	R/LUC/2013/4152	23/10/2013
Construct Swimming Pool	R/LUC/2013/4620	28/11/2013

Table 31: Relevant Property File Information: 415 Bremner Road, Drury

Proposed Activity	Application number	Date
Alterations to dwelling	041218	18/09/1960
Plumbing & Drainage	6040/6041	06/12/1977
Erect Dwelling	H74355	06/12/1977
Erect 'pole type' Shed	H74354	06/12/1977
Add to Shed	K000046	22/07/1980
Hay Barn	B13063	10/11/1983
2nd Dwelling (Discretionary Consent)	LUC7394	30/03/2004
2nd Dwelling and Garage	20487	22/12/2004

Table 32: Relevant Property File Information: 420-417 Bremner Road, Drury.

Proposed Activity	Application number	Date
417 - Erect Dwelling	B108540	26/10/1984
420 – Erect Dwelling	116271	30/11/1989
420 – Dwelling Relocation from Dannevirke	N/A	24/04/1995
417 - Extension to Dwelling	16330	03/02/2000
420 – Erect Carport/Library/Alterations to Bathroom	17635	25/09/2001
Application for Subdivision	16/03/080	24/02/2004
Application for Subdivision	16/04/057	27/04/2005
420 – Erect Farm Shed	19204	10/10/2006
Application for Subdivision	16/10/109 – LU9992	23/12/2010

Table 33: Relevant Property File Information: 421 Bremner Road, Drury.

Proposed Activity	Reference	Date
Alterations to Dwelling & Boat Shed	21785/1	24/01/2007

Table 34: Relevant Property File Information: 221 Jesmond Road, Drury

Proposed Activity	Application number	Date
Subdivision (Horticulture Use)	309/27	07/03/1995
Erect Dwellings on Subdivided Sites	9354430	09/03/1995

Table 35: Relevant Property File Information: 235 Jesmond Road, Drury

Proposed Activity	Application number	Date
Dwelling	15045	20/05/1998
Erect Hay Barn/Storage Shed	15967	12/10/2000
Construct New Dwelling	15313	12/10/2000
Erect Floodlight Poles around Riding Arena (2)	20733	05/07/2004

Table 36: Relevant Property File Information: 281 Jesmond Road, Drury

Proposed Activity	Application number	Date
Add to existing Dwelling	E73602	12/02/1973
Erect a Garage	N/A	25/07/1995
Dwelling	12359	01/11/1995
Dwelling alterations	003125	15/09/1998

Table 37: Relevant Property File Information: 341 Jesmond Road, Drury

Proposed Activity	Application number	Date
Erect Dwelling & Garage	11565	27/11/1995
Erect New Barn & Stormwater Tank	19461	30/07/2004

Table 38: Relevant Property File Information: 401 Jesmond Road, Drury

Proposed Activity	Application number	Date
Re-site Dwelling	D18472	18/07/1986
Erect Double Garage	F63610	01/11/1988
Erect New Farm Building	15757	07/11/2000
Erect New Packhouse/Garage	19275	01/04/2008

Table 39: Relevant Property File Information: 451 Jesmond Road, Drury

Proposed Activity	Application number	Date
Erect a Dwelling	25130/1	11/05/2010
Installation of Wastewater Treatment System	25130/1	10/03/2011
Storage Shed	26006	05/12/2011

Table 40: Relevant Property File Information: 30 Burberry Road, Drury

Proposed Activity	Application number	Date
Application for Subdivision	1990/101064	26/04/1994
Erect Dwelling & Garage	15717/1	30/07/1999
Erect Swimming Pool	16459	03/04/2003
Erect Garage	2014/7534	10/06/2014
Erect Shed	2014/2273	06/08/2014

Table 41: Relevant Property File Information: 38 Burberry Road, Drury

Proposed Activity	Application number	Date
Building Consent for Dam	11351	18/07/1995
Application for Subdivision	N/A	04/11/1995
Geotechnical Report	N/A	June 1996
Construct New Dwelling, 3 Bridges, Stables & Swimming Pool	12830	07/10/1996

Table 42: Relevant Property File Information: 41 Burberry Road, Drury

Proposed Activity	Application number	Date
Geotech Investigation for Subdivision	1990/101064	27/01/1994
Erect Dwelling	1999/105574	30/07/1999
Construct Swimming Pool	2000/106067	20/03/2000
Erect Barns & Stables	2000/106536	24/10/2000
Alterations to Barn	2002/107858	16/07/2002
Erect Pool Shed	2005/111069	25/10/2005
Extension to Barn	2007/112298	14/06/2007

6.4 Auckland Council Site Contamination Enquiry

The Auckland Council site contamination enquiry contained no records relating to the Auranga Development Sites.

The report did however contain information on properties in the vicinity of the Auranga Development catchment; contaminated site discharge located at 269 Bremner Road (consent number 47184) and 31 Burberry Road (consent number 46096). An overview of pollution incidents was also recorded for properties located at 12 Pitt Road; where large volumes of hydrocarbon fuel was discharged to land and 90 Karaka Road; where open burning of refuse was recorded.

A number of borehole consents were noted in the general area, however, none of these were located on the properties within the study area.

The Auckland Council Site Contamination Enquiry is presented in Appendix D.

6.5 Historical Certificate of Title Review

The historical certificate of title review was completed for the properties within the Auranga Development.

Following the review of the historical certificate of title two companies were listed which related to 235 Jesmond Road and 221 Jesmond Road. Both companies, Copplestone Limited and Rejen Trading Limited have since gone into liquidation and no information could be obtained relating to their operations.

The historical certificate of title is presented in full as Appendix E.

6.6 Onsite Interview

During the site walkover and inspection of the Auranga Development, it was not possible to interview the landowners/tenants of each site. This was due to properties being vacant at the time of the site walkover and inspection. This is likely due to landowners/tenants being at work considering the site walk over and inspections were carried out between 9am and 3pm Monday – Friday.

Furthermore, a copy of the Hazardous Activities and Industries List was issued to each land owner with the intention of receiving some background information of any potential contaminating land use or activities being currently or historically taken place on site before commencing site walk overs and inspections. No response or information was received relating to this matter.

The only property where an onsite interview was possible was 325 Bremner Road, Drury. The interview with the current owner of the property was conducted by Focus Environmental Services personnel. During the interview the following items were noted:

- The interviewee made reference to an offal pit onsite which was located to the north of the garage.
- The interviewee stated that areas of disturbed soil identified throughout the site were a result of excavated test pits which were carried out on site prior to the site walk over and inspection. It was noted that soil cores were also taken during the at the time of the test pit excavations. This is likely associated with a geotechnical investigation but was not confirmed. We have requested that if fill was identified that the geotechnical report be provided to us for review.

7.0 Site Walkover and Inspection

7.1 321 Bremner Road

The site inspection and walk over was carried out by Focus Environmental Services Limited personnel on the 25th January 2017. The site inspection was carried out during a period of fine weather.

The site was accessed from Bremner Road via concrete driveway which lead to the residential area. The residential area consisted of a single storey dwelling, garages, water storage tank and associated curtilage.

Potentially treated timber was stacked to the rear and side of the garage on the eastern boundary.

Septic tank ventilation pipes were identified along the eastern boundary of the site adjacent to the rain water storage tank. On the northern curtilage of the site was a utility shed which was erected on a concrete base. This was being utilised for storage of garden equipment and utensils at the time of the site walk over and inspection. Adjacent to the garden shed was some raised composting containers constructed from timber.

A burn pile mixed with vegetation and refuse was located north of the residential area. The surrounding area consisted of a burn barrel potentially used to burn refuse, two small galvanise huts utilised for firewood storage, a metal boat and transport trailer, a utility shed (2) with timber base used for storage, a stockpile of concrete rubble and a tree house. A stock holding pen and loading ramp was also identified in the vicinity, due to the estimated age of the holding pen it is considered that potential spray race operations were carried out in this area of the site.

A drainage gully was identified in the central portion of the site. The remaining land north of the drainage gully consisted of overgrown paddocks.

The site inspection photographs are presented in Appendix F.

7.2 325 Bremner Road

The site inspection and walk over was carried out by Focus Environmental Services Limited personnel on the 25th January 2017. The site inspection was carried out during a period of fine weather.

The site was accessed from Bremner Road via a concrete driveway which lead to the residential area. The residential area consisted of a single storey dwelling, a concrete pavement parking area and associated curtilage.

To the rear of the dwelling was an outdoor entertaining area which over looked the southern curtilage. This area extended north to a concrete lined garage which was being utilised for storage of gardening equipment, firewood and other miscellaneous items. To the rear of the garage an offal pit was identified on the northern boundary of the residential area. It is not considered that an offal is a potential source of chemical ground contamination, however, it would be considered a bacteriological source of contamination and therefore a potential human health risk.

Beyond the residential area were a number of paddocks which were being utilised for sheep grazing at the time of the site walk over and inspection. Furthermore, there was no evidence of a sheep dip present on site. A burn pile was located adjacent to the eastern boundary of the site. The burn pile consisted of timber, wooden furniture and vegetation. Due to the risk of potentially treated furniture it would be considered that this would constitute a HAIL activity. No other evidence of refuse was identified with the burn pile.

A drainage gully extended through the central portion of the site. On the northern side of the gully was a small lunging ring which was overgrown and no longer in use. Further north of the lunging ring was a pump house. The pump house was partially lined with concrete with dark staining observed at the base. The staining appeared to be result of an oil spillage, most likely associated with the oil can identified inside the pump house. Due to the small area of staining and quantity of spillage significant ground contamination is not expected.

On the northern boundary of the site was an old milking parlour and attached livestock holding shed. PACM boards were identified on the internal walls of the parlour. The ACM appeared to be in relatively good condition and would be considered unlikely to pose potential for ground contamination in its current state. Adjacent to the milking parlour was a cow shed.

The remaining areas of the site were predominantly paddocks utilised for sheep grazing. During the site walk over and inspection several areas of disturbed soil were identified throughout the paddocks. The current landowner stated that this was a result of a previous site investigation that involved test pits and soil cores carried out on site.

The site inspection photographs are presented in Appendix F.

7.3 329 Bremner Road

The site inspection and walk over was carried out by Focus Environmental Services Limited personnel on the 25th January 2017. The site inspection was carried out during a period of fine weather.

The site was accessed from Bremner Road via a tarmac driveway which led to the residential area. The residential area of the site consisted of a large residential dwelling, attached garage, swimming pool, outdoor entertaining area and associated curtilage.

A timber frame cabin (1) constructed on a raised platform was identified adjacent to the dwelling. The cabin was being utilised to store firewood at the time of the site walk over and inspection.

A galvanised utility shed was located on the southern boundary of the residential area. The shed contained a compressed gas system which was connected to several 47kg gas cylinders. The use of the compressed gas system was not evident at the time of the site walk over and inspection. A water storage tank and associated pump house was located adjacent to the galvanised utility shed.

Slightly west was a timber frame cabin (2) which was constructed on a raised platform. The cabin was being utilised for storage of a wide range of miscellaneous items. PACM boards were identified on the base of the cabin. It should be noted that PACM board appeared in relatively good condition, and would be considered unlikely to present potential for ground contamination in their current state.

South of the residential area was a paddock which was being utilised as an All-Terrain Vehicles (ATV) race track. The race track contained a stockpile of soil which was utilised as a jump. A second stockpile of soil overlain with vegetation and refuse was located in the central portion of the paddock. On inspection, evidence of burning was observed.

On the south-western portion of the site was a large concrete lined mechanic workshop. The forecourt of the workshop was concrete lined and utilised to store ATV's and associated mechanical parts. A rainwater storage tank, oil barrels and battery storage container were also located in the area.

The site inspection photographs are presented in Appendix F.

7.4 333 Bremner Road

The site inspection and walk over was carried out by Focus Environmental Services Limited personnel on the 25th January 2017. The site inspection was carried out during a period of fine weather.

The site was accessed from Bremner Road via a gravel driveway which led to the residential area. The residential area of the site consisted of a large dwelling, attached garage, concrete parking area and associated curtilage.

A raised vegetable patch and outdoor entertaining area was identified at the rear of the dwelling adjacent to the western boundary. Serval constructed bee hives were identified on the northern portion of the site adjacent to the site boundary. A firewood shelter was observed in front of the dwelling on the eastern boundary of the residential area.

Waste vegetation bags were identified at the access point to the grazing paddock on the eastern boundary of the site. A drainage gully was observed running through the central portion of the paddock. An electrical transformer hut was located adjacent to the drainage gully. A burn pile overlain with vegetation was identified north of the electrical transformer in the north-western portion of the paddock. A potential fill area in the north-western corner of the paddock was identified. The potential fill area was identified due to the irregular contours of the land in the area. A raised fuel storage tank was observed adjacent to the western boundary of the paddock, however no evidence of staining was identified at the time of the site walk over and inspection.

On the eastern portion of the site was a storage yard that contained stockpiles of soil, firewood and potentially treated timber fencing posts. Two bags labelled toxic waste "CISPLATIN CYPOTOXIC" were identified on the eastern boundary on the yard. This

material appeared correctly bagged and sealed using cable ties and therefore would not be considered a potential source of ground contamination. A stock holding pen and loading ramp was identified in the south-eastern corner of the gravel yard.

A large storage shed was identified on the southern portion of the gravel yard. The shed was being utilised for storage and contained a boat, quad bike, farm machinery and other miscellaneous items. From visual inspection, it is not considered that any maintenance/workshop activities were being carried out. Adjacent to the shed was a concrete water trough which was fixed to a raised structure. It is thought that this area may have potentially been used as a wash down area for horses. Two shipping containers were located within the confines of the storage yard. These containers were locked and no indication of the contents was evident, however, there were no visual or olfactory evidence of contamination around the perimeter of the containers.

A pond was identified south of the residential dwelling on the western boundary.

The remaining areas of the site to the south were utilised as grazing pastures for horses at the time of the site walk over and inspection.

The site inspection photographs are presented in Appendix F.

7.5 385 Bremner Road

The site inspection and walk over was carried out by Focus Environmental Services Limited personnel on the 24nd of January 2017. The site inspection was carried out during a period of fine weather.

The site was accessed from Bremner Road via a tarmac driveway which led to the residential area. The residential area of the site consisted of a large two storey dwelling, attached garages, tarmac parking area and associated curtilage.

There was restricted access on site and as a result it was not possible to access the rear of the property at the time of the site walk over and inspection.

The northern section of the site was divided into paddocks which were utilised for grazing. A concrete lined hay shed was identified in the north-western corner of the site. Adjacent to the shed was a stock holding pen and loading ramp. It is considered unlikely that the stock holding pen has been utilised for spray race operations due to its relatively recent construction.

The site inspection photographs are presented in Appendix F.

7.6 389 Bremner Road

The site inspection and walk over was carried out by Focus Environmental Services Limited personnel on the 24nd of January 2017. The site inspection was carried out during a period of fine weather.

The site was accessed from Bremner Road via a shared gravel driveway which led to the residential area. The residential area of the site consisted of a dwelling, attached garage, concrete pavement parking area and associated curtilage.

To the south of the dwelling were three small utility sheds that were constructed on a raised timber base. Only two of the garden sheds were being utilised at the time of the site walk over and inspection. Shed 2 contained fuel cans, garden tools and other miscellaneous items while shed 3 contained firewood. Light staining was observed on

the base of shed 2, however, due to the small area of staining significant ground contamination is not expected.

Adjacent to the garage was water tank system and associated water pump which was stored in a locked timber cabinet.

To the rear of the dwelling was an outdoor entertaining area which over looked a timber composter, fruit trees and landscaped garden. Two water storage tanks were identified in the north-western corner of the property.

An overgrown paddock was observed on the western portion of the site. A large shed utilised for storage and maintenance of agricultural machinery was located on the western boundary of the paddock. The shed was built from galvanised steel and constructed on a concrete base. No visual or olfactory evidence of contamination was observed in the area surrounding the shed.

To the south east of the residential area was a livestock holding pen and loading ramp. Due to the age of the holding pen it is likely that spray race operations have occurred. Silage bales were located adjacent to the stockholding pen.

The remainder of the site on the eastern section of the site consisted of overgrown paddocks.

The site inspection photographs are presented in Appendix F.

7.7 393 Bremner Road

The site inspection and walk over was carried out by Focus Environmental Services Limited personnel on the 24th of January 2017. The site inspection was carried out during a period of fine weather.

The site was accessed from Bremner Road via a shared gravel driveway which led to the residential area. The residential area of the site consisted of a dwelling, two garages, concrete parking area and associated curtilage.

A disused Avery was identified on the western boundary of the residential area. An outdoor entertaining area was situated to the front of the dwelling overlooking the paddocks to the north.

The northern areas of the site were predominately paddock. A large cow shed was identified in the central portion of the site. The shed was constructed from galvanize steel, however, no concrete base was identified. No visual or olfactory evidence of contamination was identified it the area surrounding the shed.

The site inspection photographs are presented in Appendix F.

7.8 403 Bremner Road

The site inspection and walk over was carried out by Focus Environmental Services Limited personnel on the 24nd of January 2017. The site inspection was carried out during a period of fine weather.

The site was accessed from Bremner Road via a shared gravel driveway which led to the residential area. The residential area of the site consisted of a dwelling and attached garage, gravel parking area and associated curtilage.

To the east of the dwelling was a utility shed, however, it was inaccessible at the site of the site walk over and inspection. Adjacent to the garden shed was a swimming pool and outdoor entertaining area. In the north-western corner of the site was a golf recreational area consisting of a putting green, sand bunker and garden pond. Due to the size and fact that the green forms part of the domestic garden it is unlikely that the application of chemical has occurred and therefore it would not be considered to be a potential source of contamination.

Adjacent to the residential area along the western boundary was timber framed outhouse used to store firewood. A burn pile was identified slightly south of the outhouse. Tree cuttings, timber and refuse was observed within the burn pile. Two concrete water tanks and a stockpile of vegetation were identified in close proximity to the burn pile and outhouse on the western portion of the site.

In the central portion of the site a large barn was identified. The barn was being utilised for storage off agricultural machinery and equipment and other miscellaneous items. A small chemical store used for storing sprays, paints and solvents was identified inside the shed.

To the south of the shed was a livestock holding pen and loading ramp. Due to the age the stock loading area it is considered unlikely that spray race operations have occurred in this area of the site.

The remaining areas of the site consisted of grazing paddocks.

The site inspection photographs are presented in Appendix F.

7.9 415 Bremner Road

The site inspection and walk over was carried out by Focus Environmental Services Limited personnel on the 24nd of January 2017. The site inspection was carried out during a period of fine weather.

The site was accessed from Bremner Road via a gravel driveway which extended through the southern portion of the site and led to the residential area of the site. The residential area of the site consisted of a dwelling, concrete pavement parking area, secondary dwelling with attached garage and associated curtilage.

A livestock run and loading ramp were identified adjacent to the driveway in the south-eastern corner of the site. Adjacent to the race was a livestock holding shed which was utilised for storage at the time of the site walk over and inspection. The shed was concrete lined with wooden pallets overlain. The cladding of this building was identified as potential asbestos containing material (PACM).

A small chemical storage room was identified adjacent to the livestock holding shed. A storage cabinet containing veterinary medicine was fixed to the wall.

Slightly east of this shed there was a stock holding pen identified. Due to the estimated age of this holding pen it is considered that it potentially has been utilised for spray race operations.

A large sand arena used for horse training was identified north of the stock holding shed and spray race. As the bedding material was made up of sand it would not be considered a potential source of contamination. Adjacent to the sand arena there was a large shed utilised as a storage facility and stables. The stable to the rear of the shed was inaccessible as a vet was present at the time of the site walkover and investigation. The storage facility to the front of the shed contained a sand floor which extended from the arena floor. A

horse transport truck, tractor, quad bike and other miscellaneous items were stored in this area.

To the north of the sand arena there were silage bales observed. Slightly west of the silage bale several beehives were identified. A raceway extended north with paddocks present on either side. The paddocks were utilised for grazing for horses and sheep. On inspection no evidence of a sheep dip was identified. The northern portion of the site had a dried gully system which appeared to flow towards the Drury Creek.

The site inspection photographs are presented in Appendix F.

7.10 420-417 Bremner Road

The site inspection and walk over was carried out by Focus Environmental Services Limited personnel on the 24nd of January 2017. The site inspection was carried out during a period of fine weather.

The site was accessed from Bremner Road via a shared gravel driveway. On entering the site stables were observed adjacent to the driveway.

The stables were built from galvanized steel sheets and constructed on a concrete base. The stables were being utilised for storage of timber and agricultural machinery at the time of the site walk over and inspection. A small chemical store was observed inside the stables. To the rear of the stables was a stockholding pen and race. Due to the age of the stockholding pen it is considered unlikely that spray race operation have occurred in this area of the site. A stockpile of tree branches and potentially treated fencing post were observed to the west of the stables.

A livestock shelter constructed from timber and galvanized steel was located in the north-eastern corner of the central paddock.

A hay barn was located in the north-eastern corner of the property. The barn was built from galvanized steel and constructed on a hardstand base which was overlain by hay.

An area of scorched ground thought to previously be a burn pile was observed in the northern portion of the site. It appeared as though vegetation was the primary item of burning and no evidence of refuse was identified. The vegetation appeared to be generated from hedge trimming activities taken place on the western boundary adjacent to the burn pile.

A raceway was observed running through the central portion of the site. The race extended from the western boundary to the stables which was located in the south-eastern corner of the site.

The remaining areas of the site were predominantly grazing paddocks.

The site inspection photographs are presented as Appendix F.

7.11 421 Bremner Road

The site inspection and walk over was carried out by Focus Environmental Services Limited personnel on the 24nd of January 2017. The site inspection was carried out during a period of fine weather.

The site was accessed from Bremner Road via a shared gravel driveway. The driveway led to the residential area which consisted of a single storey dwelling and attached garage, concrete parking area, carpentry workshop and associated curtilage.

A concrete path extended from the concrete parking area through to the rear of the dwelling where an outdoor entertaining area and garden pond were identified.

A green house was identified in the north-western portion of the site, however, it appeared to be no longer in use and in a state of deterioration. Adjacent to the green house, fruit was observed growing in raised beds.

A domestic garden was observed to the rear of the property, including a second outdoor entertaining area. A rainwater storage tank was identified adjacent to the attached garage.

To the east of the property was a paddock which was being utilised for grazing at the time of the site walkover and inspection. A small concrete outhouse was identified on the northern boundary of the paddock, however, the purpose of this structure was unknown.

On the south-western portion of the property was a domestic garden which overlooked the Esplanade Reserve. The garden contained a restored phone box in the south-western portion.

The site inspection photographs are presented as Appendix F.

7.12 Esplanade Reserve

The site inspection and walk over was carried out by Focus Environmental Services Limited personnel on the 3rd February 2017. The site inspection was carried out during a period of relatively fine weather.

The site was accessed from Bremner Road via a gravel driveway which provided access to 421 Bremner Road.

The area of the site facing 421 Bremner Road largely consisted of mixed vegetation and domestic gardens. The Drury Creek was observed along the western boundary of the site. A timber framed outhouse utilised for firewood storage was located adjacent to the gravel driveway.

A vegetable patch was located adjacent to the residential area along with a stockpile of vegetation.

A utility shed with a timber base was being utilised for the storage of garden equipment and utensils. A storage area containing oil barrels, paving stones and a burn barrel was identified on the western boundary of the site overlooking the Drury Creek.

The area of the site facing 415 Bremner Road largely consisted of mixed vegetation and pasture land. The Drury Creek was observed on the western and northern boundaries of the site. What appeared to be an offal pit was identified in the north-eastern portion of the site. It is not considered that an offal is a potential source of chemical ground contamination, however, it would be considered a bacteriological source of contamination and therefore a potential human health risk.

The area of the site facing 389 Bremner Road largely consisted of mixed vegetation, production grass and managed grass areas. A settlement pond was identified

The area of the site overlooking 333 Bremner Road was mixed vegetation, domestic gardens and pasture land. Two access laneways leading to the Drury Creek were identified in the western and central portion of the site. What appeared to be an offal pit was identified on the northern boundary of the grazing paddock. Again, this would be considered a bacteriological source of contamination and therefore a potential human health risk.

The area overlooking 329 Bremner Road largely consisted of mixed vegetation and domestic gardens. An area of concrete, brick, roof slate and PACM fragments were identified at the edge of the domestic garden. It would appear that demolition material from nearby structures have been deposited at this location.

The site inspection photographs are presented in Appendix F.

7.13 221 Jesmond Road

The site inspection and walk over was carried out by Focus Environmental Services Limited personnel on the 26th of January 2017. The site inspection was carried out during a period of relatively fine weather.

The site was accessed from Jesmond Road via a gate directly into the western portion of the site. This area of the site was grassed with small trees scattered throughout. An old livestock holding yard was identified in the south-western corner of the site. Due to the estimated age of this structure and its appearance it is possible that spray race operations were conducted in this area of the site.

The central eastern portion of the site contained a storage shed which was comprised of corrugated iron. Access to the storage shed was restricted. Outside the storage shed there was a number of miscellaneous agricultural plant items observed. Located adjacent the southern aspect of the storage shed there was an offal pit identified, it was covered with meshed box iron material. It is not considered that an offal is a potential source of chemical ground contamination, however, it would be considered a bacteriological source of contamination and therefore a potential human health risk.

Slightly east of the storage shed there was several stockpiles of soil materials identified. The source of these materials was unknown.

Slightly south of these stockpiles there was an area of exposed clay observed. This was within the area of the former horticultural activity identified in the historical review. There was no clear evidence of the former glasshouses or horticultural activity observed in this area of the site.

Along the northern boundary of the site there was a network of pond structures observed, these ponds were separated by land bridges. The land bridges appeared to be constructed with soils materials; potentially uncertified fill materials. Running along the southern aspect of the ponds there was evidence of scorched ground and semi-burned trees, it would appear that the stand of trees in this area of the site identified in the historical review have been dropped and burned in this area of the site. There was no evidence of refuse burning observed.

The reminder of the site was in paddocks for grazing sheep at the time of the site walkover and inspection.

The site inspection photographs are presented as Appendix F.

7.14 235 Jesmond Road

The site inspection and walk over was carried out by Focus Environmental Services Limited personnel on the 26th of January 2017. The site inspection was carried out during a period of relatively fine weather.

The site was accessed from Jesmond Road via a gravel driveway, which extended through the central portion of the site to the residential area. There were paddocks observed on either side of the driveway. The residential area of the site consisted of a large single storey dwelling with attached carpark, a water tank, old domestic vegetable patch and associated curtilage.

Slightly south of the residential area there was large horse training arena (1) identified. Rubber shavings were observed as the bedding for this arena, which may constitute a potential source of contamination.

A burn pile was identified adjacent the south boundary of horse training arena 1. There was no evidence of any refuse or deleterious material within this burn pile and it appeared as though it was for burning vegetation & possibly stable bedding (hay/straw) only. There was also a stockpile of waste stable bedding observed in this area of the site.

Slightly west of this area there was another horse training arena (2) observed. This arena was much smaller and the bedding was sand and therefore is not considered a potential source of contamination. A portion of this arena was used to store a number of bales of haylage (horse feed).

Slightly west of this area there was a small shed and a child's play house. The small shed had a wooden floor and was used for hay storage, there was no evidence of any potential sources of contamination. In this area of the site there was a large shed utilised as stables and a tack room. At the rear of the stables there was a wash down area, most likely used for washing horses after training sessions. The stables themselves were concrete lined and appeared to be in good condition. The tack room was used for storage of saddles, bridles and other horse riding equipment. There was a farm bike and some shelves with old paint cans present, however there was evidence of staining observed.

The reminder of the site was in paddocks for grazing.

The site inspection photographs are presented as Appendix F.

7.15 281 Jesmond Road

The site inspection and walk over was carried out by Focus Environmental Services Limited personnel on the 26th January 2017. The site inspection was carried out during a period of fine weather.

The site was accessed from Jesmond Road via a gravel driveway which extended along the western boundary of the site to the residential area. The residential area consisted of a dwelling and attached garage, water storage tank, solar panels, concrete lined tool shed and raised vegetable beds. A potential fill area to the north of the dwelling was identified to create a level platform for a domestic lawn.

An incinerator used to burn refuse and timber was identified to the east of the dwelling. Further east of the incinerator silage bales were identified.

In the central portion of the site was a livestock race which led to stables and a stock holding pen. A small outhouse structure was attached to the stables. The stables were concrete lined and utilised for storage at the time of the site walk over and inspection.

PACM cement board was identified on the external facing of the attached outhouse structure. It should be noted that the ACM board had extensive damage and ACM board fragments were identified on the soil surface surrounding the structure.

Silages bales were identified adjacent to the northern boundary of the site. Slightly west of the silage bales was a pump house. The pump house was constructed from ACM Cement Board. It should be noted that PACM board was painted and appeared in relatively good condition, and would be considered unlikely to present ground contamination in its current state.

What appeared to be a former horse training arena was located in the north-western portion of the site. As the base consisted of sand it would not be considered to be a potential source of contamination. The section of the surrounding landscaped had been cut and removed to provide a flat terrain. The arena appeared to no longer be in use during the site walk over and inspection.

In the north-western corner of the site was a stock holding pen and loading ramp. Due to the age of the stockholding pen it is considered that this area may have been utilised for spray race operations.

A secondary dwelling and adjoining shed was located in the north-western paddock of the site. The shed was locked at the time of the site walk over and inspection, therefore, no access was gained to inspect for potential sources of contamination. A rain water storage tank was located to the rear of the shed. PACM board fragments were also identified to the rear of the shed on the ground surface.

The site inspection photographs are presented in Appendix F.

7.16 341 Jesmond Road

The site inspection and walk over was carried out by Focus Environmental Services Limited personnel on the 26th January 2017. The site inspection was carried out during a period of fine weather.

The site was accessed from Jesmond Road via a gravel driveway, which extended through the western portion the site to the residential area. The residential area consisted of a dwelling, attached garage, rain water storage tank, concrete parking area and associated curtilage.

In the northern section of the site adjacent to the driveway was a stock holding pen and loading ramp. It is considered unlikely that the stock holding pen has been utilised for spray race operations due to its relatively recent construction. Adjacent to the stock holding pen was a laneway which extended east across the site. Slightly north was a large shed and rain water storage tank and associated water pump. The shed was locked at the time of the site walk over and inspection and no access was gained to inspect for potential sources of contamination. A lean-to shelter was attached to the shed and was being utilised to store firewood.

Immediately west of the shed was a small orchard. A decaying sheep carcase was identified adjacent to the orchard.

To the east of the shed was a hay barn and stock holding shed. A rain water storage tank was located adjacent to the hay barn. Both structures were empty and no concrete base were identified at the time of the site walk over and inspection.

The remaining area of the site was predominantly paddocks utilised for grazing.

The site inspection photographs are presented in Appendix F.

7.17 401 Jesmond Road

The site inspection and walk over was carried out by Focus Environmental Services Limited personnel on the 26th January 2017. The site inspection was carried out during a period of fine weather.

The site was accessed from Jesmond Road via a concrete driveway which led to the residential dwelling, attached garage and concrete paving area.

To the rear of the dwelling was a domestic garden that contained a rainwater storage tank, vegetable patches, garden pond and some fruit trees. A garden shed utilised as a pump house was located on the northern boundary of the residential area.

Adjacent to the residential area was an overgrown paddock. A machinery storage shed was located in the south-eastern corner of the paddock. In the central portion of the paddock was an overgrown market garden which was fenced off from the surrounding paddock.

On the eastern portion of the site was an orchard which was encased by a shelter belt. On the southern boundary of the orchard was a small galvanize hut which contained a seating bench and carboard packaging. The use of the hut was unclear at the time of the site walkover and inspection.

In the south-eastern corner of the orchard was rolls of plastic orchards covers.

The site inspection photographs are presented in Appendix F.

7.18 451 Jesmond Road

The site inspection and walk over was carried out by Focus Environmental Services Limited personnel on the 25th January 2017. The site inspection was carried out during a period of fine weather.

The site was accessed from Jesmond Road via a gravel driveway which extended through the central portion of the site to the residential area. A garden lawn was observed on either side of the driveway.

A turning point area was located in the central portion of the driveway. Adjacent to the driveway were two pergolas which were located on either side of the driveway.

A utility shed utilised as a pump house was located on the northern boundary of the site.

In the central portion of the site was the residential dwelling and attached garage. A sheltered deck extended from the dwelling to form an outdoor entertaining area.

A concrete lined garage was located in close proximity to the dwelling. The garage was being utilised for storage at the time of the site walk over and inspection.

To the rear of the dwelling was a water storage tank, fuel storage tank and associated boiler and sewage treatment system.

In the western portion of the site was a number of wire trellis utilised for growing ornamental flowers. The managed grass area extended out to the western boundary where a number of planted hedge rows were identified.

In the south-eastern corner of the site was a stockpile of soil with vegetation cover. A drainage trench ran along the southern boundary of the site. A small stockpile of firewood underlain by plastic sheeting was located adjacent to the drainage trench.

The site inspection photographs are presented in Appendix F.

7.19 30 Burberry Road

The site inspection and walk over was carried out by Focus Environmental Services Limited personnel on the 26th of January 2017. The site inspection was carried out during a period of relatively fine weather.

The site was accessed from Burberry Road via a tarmac driveway which led to the residential area. Garden lawns were observed on either side of the driveway.

A golf recreational area consisting of a driving range, putting green and sand bunkers were located in the north-eastern corner of the domestic lawn. Due to the size and fact that the green forms part of the domestic garden it is unlikely that the application of chemical has occurred and therefore it would not be considered to be a potential source of contamination.

The residential dwelling was located in the central portion of the site. A swimming pool, spa bath, outdoor entertaining area and tennis court were identified to the north of the dwelling.

A vegetable patch and small area of fruit trees were identified to the rear of the tennis court. A small metal frame garden shed was also located in this area however it was surrounded by dense vegetation, therefore close inspection of the shed was not possible at the time of the site walk over and inspection.

To the rear of the dwelling were two water storage tanks which were partially submerged in the ground. A septic tank and associated ventilation outlets were observed to the east of the water storage tanks. It appeared that the percolation area was located in the paddock to the rear of the dwelling.

A large concrete lined shed was located along the southern boundary of the site. The shed was utilised for car parking and storage of garden equipment and utensils.

The western portion of the site consisted of an area of vegetation stockpiling which was located to the rear of the shed and a drainage gully system which drained to the man-made pond on the neighbouring property to the east. The gully extended along the western boundary of the site and was dry at the time of the site walk over and inspection.

The northern portion of the site consisted of overgrown paddocks. An overgrown gully extended across the paddock to the north-eastern corner of the site. A culvert was observed in the north-eastern corner adjacent to the accent point to the paddock.

The site inspection photographs are presented in Appendix F.

7.20 38 Burberry Road

Access to the site was not granted, therefore no site walk over and inspection could be carried out. Any information relating to potential contaminating activities or land uses carried out on site could only be identified using historical photographs or previous site investigations.

7.21 41 Burberry Road

Access to the site was not granted, therefore no site walk over and inspection could be carried out. Any information relating to potential contaminating activities or land uses carried out on site could only be identified using historical photographs or previous site investigations.

8.0 Asbestos Management

Due to the estimated age of some of the dwellings/building structures identified across the investigated sites (pre-2000) it is likely that some of the materials used to construct the dwelling may include asbestos containing materials (ACM). External ACM products are likely restricted to the soffits of the dwellings with the exception of base boards and external cladding materials which were located at 329 Bremner Road, 415 Bremner Road and 281 Jesmond Road.

Based on the visual inspection undertaken during the site walkover and inspection of the 21 sites within the Auranga Development, external ACM products are likely restricted to the soffits of the dwellings.

Following the site inspection and walkover further ACM products identified included internal cement board which was noted at 415, 325 Bremner Road; ACM based board which was noted at 329 Bremner Road; ACM cement board and broken fragments were noted at 281 Jesmond Road.

These potential ACM's appeared in relatively good condition, and are considered unlikely to present ground contamination in their current state.

However, broken ACM fragments were identified at two separate locations at 281 Jesmond Road and the Esplanade Reserve. These areas will require sampling to identify if any ACM ground contamination has occurred.

It should be noted that ACM, other than that described above, may also be present at the investigated sites and a thorough inspection should be carried out by a suitably qualified and competent asbestos surveyor prior to any demolition activities at the sites.

Any removal of asbestos materials from the site will need to 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) by a Class A licensed asbestos removals specialist under an approved asbestos removal control plan.

All asbestos contaminated materials removed from the above sites will require disposal at a suitably licensed disposal facility.

9.0 Potentially Contaminating Activities or Land Uses

9.1 321 Bremner Road

During the site walkover and inspection evidence of burning, potential spray race operation and storage of potentially treated timber was noted.

Furthermore, following the review of the available historical photographs, the southern area of the site appears to have been utilised for horticultural purposes.

Therefore, following the desktop assessment and site inspection and walk over of the site at 321 Bremner Road, Drury the following potential contaminating land uses and/or activities have been identified:

- Evidence of burning;
- Potential spray race operations; and
- Storage of potentially treated timber.

The assessment provided in Table 43 below expands on the potential sources of contamination (as identified above) and exposure pathways and was based on the potential effects of the potential change of land use, subdivision and soil disturbance activities on human health and the environment.

Table 43: Conceptual Site Model: 321 Bremner Road, Drury

Potential Source	Potential Pathways	Potential Receptors	Assessment
Contaminated Soil	Dermal Contact with Contaminated Soils	Human Health – Residential Land Use	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.
		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 – Residential Land Use	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.
		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 – Residential Land Use	Incomplete: No evidence of potential vapours or fibres identified at the site.
		Human Health – Commercial/Industrial Outdoor Worker	Incomplete: No evidence of potential vapours or fibres identified at the site.
	Surface Water Run-off	Ecological Receptors - Drury Creek	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.
	Migration of Groundwater	Ecological Receptors - Drury Creek	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.

9.2 325 Bremner Road

During the site walkover and inspection burning of potentially treated timber furniture, evidence of hydrocarbon contamination and evidence of microbiological contamination were noted.

Furthermore, following the review of the available historical photographs, the southern area of the site appears to have been utilised for horticultural purposes.

Therefore, following the desktop assessment and site inspection and walk over of the site at 325 Bremner Road, Drury the following potential contaminating land uses and/or activities have been identified:

- Burning of potentially treated timer furniture;
- Evidence of hydrocarbon contamination; and
- Evidence of microbiological contamination.

The assessment provided in Table 44 below expands on the potential sources of contamination (as identified above) and exposure pathways and was based on the potential effects of the potential change of land use, subdivision and soil disturbance activities on human health and the environment.

Table 44: Conceptual Site Model: 325 Bremner Road, Drury

Potential Source	Potential Pathways	Potential Receptors	Assessment
Contaminated Soil	Dermal Contact with Contaminated Soils	Human Health – Residential Land Use	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.
		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 – Residential Land Use	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.
		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 – Residential Land Use	Incomplete: No evidence of potential vapours or fibres identified at the site.
		Human Health – Commercial/Industrial Outdoor Worker	Incomplete: No evidence of potential vapours or fibres identified at the site.
	Surface Water Run-off	Ecological Receptors - Drury Creek	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.
	Migration of Groundwater	Ecological Receptors - Drury Creek	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.

9.3 329 Bremner Road

During the site walkover and inspection evidence uncertified fill material, burning and a mechanic workshop were noted.

Therefore, following the desktop assessment and site inspection and walk over of the site at 329 Bremner Road, Drury the following potential contaminating land uses and/or activities have been identified:

- Suspected uncertified fill material;
- Evidence of burning; and
- Mechanical Workshop.

The assessment provided in Table 45 below expands on the potential sources of contamination (as identified above) and exposure pathways and was based on the potential effects of the potential change of land use, subdivision and soil disturbance activities on human health and the environment.

Table 45: Conceptual Site Model: 329 Bremner Road, Drury

Potential Source	Potential Pathways	Potential Receptors	Assessment
Contaminated Soil	Dermal Contact with Contaminated Soils	Human Health – Residential Land Use	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.
		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 – Residential Land Use	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.
		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 – Residential Land Use	Incomplete: No evidence of potential vapours or fibres identified at the site.
		Human Health – Commercial/Industrial Outdoor Worker	Incomplete: No evidence of potential vapours or fibres identified at the site.
	Surface Water Run-off	Ecological Receptors - Drury Creek	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.
	Migration of Groundwater	Ecological Receptors - Drury Creek	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.

9.4 333 Bremner Road

During the site walkover and inspection evidence of burning, uncertified fill material, storage of potentially treated timber and potential spray race operations was noted.

Furthermore, following the review of the available historical photographs, the southern area of the site appears to have been utilised for horticultural purposes.

Therefore, following the desktop assessment and site inspection and walk over of the site at 333 Bremner Road, Drury the following potential contaminating land uses and/or activities have been identified:

- Evidence of burning;
- Suspected uncertified fill material;
- Evidence of above ground fuel storage;
- Stockpiling of potentially treated timber; and
- Potential spray race operations

The assessment provided in Table 46 below expands on the potential sources of contamination (as identified above) and exposure pathways and was based on the potential effects of the potential change of land use, subdivision and soil disturbance activities on human health and the environment.

Table 46: Conceptual Site Model: 333 Bremner Road, Drury

Potential Source	Potential Pathways	Potential Receptors	Assessment
Contaminated Soil	Dermal Contact with Contaminated Soils	Human Health – Residential Land Use	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.
		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 – Residential Land Use	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.
		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 – Residential Land Use	Incomplete: No evidence of potential vapours or fibres identified at the site.
		Human Health – Commercial/Industrial Outdoor Worker	Incomplete: No evidence of potential vapours or fibres identified at the site.
	Surface Water Run-off	Ecological Receptors - Drury Creek	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.
	Migration of Groundwater	Ecological Receptors - Drury Creek	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.

9.5 385 Bremner Road

Following the review of the available information relating to the subject site and the site walkover and inspection no potentially contaminating land uses and/or activities were identified at the site at 385 Bremner Road, Drury.

The assessment provided in Table 47 below expands on the potential sources of contamination (as identified above) and exposure pathways and was based on the potential effects of the potential change of land use, subdivision and soil disturbance activities on human health and the environment.

Table 47: Conceptual Site Model: 385 Bremner Road, Drury

Potential Source	Potential Pathways	Potential Receptors	Assessment
Contaminated Soil	Dermal Contact with Contaminated Soils	Human Health – Residential Land Use	Incomplete: Sampling and analysis is not recommended on site as no potentially contaminating activities or land uses were identified.
		Human Health – Commercial/Industrial Outdoor Worker	Incomplete: Sampling and analysis is not recommended on site as no potentially contaminating activities or land uses were identified.
	Ingestion of Contaminated Soils	Human Health – Residential Land Use	Incomplete: Sampling and analysis is not recommended on site as no potentially contaminating activities or land uses were identified.
		Human Health – Commercial/Industrial Outdoor Worker	Incomplete: Sampling and analysis is not recommended on site as no potentially contaminating activities or land uses were identified.
	Inhalation of Vapours/Fibres	Human Health – Residential Land Use	Incomplete: No evidence of potential vapours or fibres identified at the site.
		Human Health – Commercial/Industrial Outdoor Worker	Incomplete: No evidence of potential vapours or fibres identified at the site.
	Surface Water Run-off	Ecological Receptors - Drury Creek	Incomplete: Sampling and analysis is not recommended on site as no potentially contaminating activities or land uses were identified.
	Migration of Groundwater	Ecological Receptors - Drury Creek	Incomplete: Sampling and analysis is not recommended on site as no potentially contaminating activities or land uses were identified.

9.6 389 Bremner Road

During the site walkover and inspection evidence of potential hydrocarbon contamination and potential spray race operations was noted.

Therefore, following the desktop assessment and site inspection and walk over of the site at 389 Bremner Road, Drury the following potential contaminating land uses and/or activities have been identified:

- Potential hydrocarbon contamination; and
- Potential spray race operations

The assessment provided in Table 48 below expands on the potential sources of contamination (as identified above) and exposure pathways and was based on the potential effects of the potential change of land use, subdivision and soil disturbance activities on human health and the environment.

Table 48: Conceptual Site Model: 389 Bremner Road, Drury

Potential Source	Potential Pathways	Potential Receptors	Assessment
Contaminated Soil	Dermal Contact with Contaminated Soils	Human Health – Residential Land Use	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.
		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 – Residential Land Use	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.
		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 – Residential Land Use	Incomplete: No evidence of potential vapours or fibres identified at the site.
		Human Health – Commercial/Industrial Outdoor Worker	Incomplete: No evidence of potential vapours or fibres identified at the site.
	Surface Water Run-off	Ecological Receptors - Drury Creek	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.
	Migration of Groundwater	Ecological Receptors - Drury Creek	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.

9.7 393 Bremner Road

Following the review of the available information relating to the subject site and the site walkover and inspection no potentially contaminating land uses and/or activities were identified at the site at 393 Bremner Road, Drury.

The assessment provided in Table 49 below expands on the potential sources of contamination (as identified above) and exposure pathways and was based on the potential effects of the potential change of land use, subdivision and soil disturbance activities on human health and the environment.

Table 49: Conceptual Site Model: 393 Bremner Road, Drury

Potential Source	Potential Pathways	Potential Receptors	Assessment
Contaminated Soil	Dermal Contact with Contaminated Soils	Human Health – Residential Land Use	Incomplete: Sampling and analysis is not recommended on site as no potentially contaminating activities or land uses were identified.
		Human Health – Commercial/Industrial Outdoor Worker	Incomplete: Sampling and analysis is not recommended on site as no potentially contaminating activities or land uses were identified.
	Ingestion of Contaminated Soils	Human Health – Residential Land Use	Incomplete: Sampling and analysis is not recommended on site as no potentially contaminating activities or land uses were identified.
		Human Health – Commercial/Industrial Outdoor Worker	Incomplete: Sampling and analysis is not recommended on site as no potentially contaminating activities or land uses were identified.
	Inhalation of Vapours/Fibres	Human Health – Residential Land Use	Incomplete: No evidence of potential vapours or fibres identified at the site.
		Human Health – Commercial/Industrial Outdoor Worker	Incomplete: No evidence of potential vapours or fibres identified at the site.
	Surface Water Run-off	Ecological Receptors - Drury Creek	Incomplete: Sampling and analysis is not recommended on site as no potentially contaminating activities or land uses were identified.
	Migration of Groundwater	Ecological Receptors - Drury Creek	Incomplete: Sampling and analysis is not recommended on site as no potentially contaminating activities or land uses were identified.

9.8 403 Bremner Road

During the site walkover and inspection evidence burning was noted.

Therefore, following the desktop assessment and site inspection and walk over of the site at 403 Bremner Road, Drury the following potential contaminating land uses and/or activities have been identified:

- Evidence of burning.

The assessment provided in Table 50 below expands on the potential sources of contamination (as identified above) and exposure pathways and was based on the potential effects of the potential change of land use, subdivision and soil disturbance activities on human health and the environment.

Table 50: Conceptual Site Model: 403 Bremner Road, Drury

Potential Source	Potential Pathways	Potential Receptors	Assessment
Contaminated Soil	Dermal Contact with Contaminated Soils	Human Health – Residential Land Use	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.
		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 – Residential Land Use	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.
		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 – Residential Land Use	Incomplete: No evidence of potential vapours or fibres identified at the site.
		Human Health – Commercial/Industrial Outdoor Worker	Incomplete: No evidence of potential vapours or fibres identified at the site.
	Surface Water Run-off	Ecological Receptors - Drury Creek	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.
	Migration of Groundwater	Ecological Receptors - Drury Creek	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.

9.9 415 Bremner Road

During the site walkover and inspection evidence of potential spray race operations were noted.

Therefore, following the desktop assessment and site inspection and walk over of the site at 415 Bremner Road, Drury the following potential contaminating land uses and/or activities have been identified:

- Potential spray race operations.

The assessment provided in Table 51 below expands on the potential sources of contamination (as identified above) and exposure pathways and was based on the potential effects of the potential change of land use, subdivision and soil disturbance activities on human health and the environment.

Table 51: Conceptual Site Model: 415 Bremner Road, Drury

Potential Source	Potential Pathways	Potential Receptors	Assessment
Contaminated Soil	Dermal Contact with Contaminated Soils	Human Health – Residential Land Use	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.
		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 – Residential Land Use	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.
		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 – Residential Land Use	Incomplete: No evidence of potential vapours or fibres identified at the site.
		Human Health – Commercial/Industrial Outdoor Worker	Incomplete: No evidence of potential vapours or fibres identified at the site.
	Surface Water Run-off	Ecological Receptors - Drury Creek	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.
	Migration of Groundwater	Ecological Receptors - Drury Creek	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.

9.10 420-417 Bremner Road

During the site walkover and inspection evidence of evidence stockpiling of potentially treated timber was noted.

Therefore, following the desktop assessment and site inspection and walk over of the site at 420-417 Bremner Road, Drury the following potential contaminating land uses and/or activities have been identified:

- Stockpiling of potentially treated timber.

The assessment provided in Table 52 below expands on the potential sources of contamination (as identified above) and exposure pathways and was based on the potential effects of the potential change of land use, subdivision and soil disturbance activities on human health and the environment.

Table 52: Conceptual Site Model: 420-417 Bremner Road, Drury

Potential Source	Potential Pathways	Potential Receptors	Assessment
Contaminated Soil	Dermal Contact with Contaminated Soils	Human Health – Residential Land Use	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.
		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 – Residential Land Use	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.
		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 – Residential Land Use	Incomplete: No evidence of potential vapours or fibres identified at the site.
		Human Health – Commercial/Industrial Outdoor Worker	Incomplete: No evidence of potential vapours or fibres identified at the site.
	Surface Water Run-off	Ecological Receptors – Drury Creek	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.
	Migration of Groundwater	Ecological Receptors - Drury Creek	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.

9.11 421 Bremner Road

During the site walkover and inspection evidence of horticultural activities were noted.

Therefore, following the desktop assessment and site inspection and walk over of the site at 421 Bremner Road, Drury the following potential contaminating land uses and/or activities have been identified:

- Evidence of horticultural activities.

The assessment provided in Table 53 below expands on the potential sources of contamination (as identified above) and exposure pathways and was based on the potential effects of the potential change of land use, subdivision and soil disturbance activities on human health and the environment.

Table 53: Conceptual Site Model: 421 Bremner Road, Drury.

Potential Source	Potential Pathways	Potential Receptors	Assessment
Contaminated Soil	Dermal Contact with Contaminated Soils	Human Health – Residential Land Use	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.
		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 – Residential Land Use	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.
		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 – Residential Land Use	Incomplete: No evidence of potential vapours or fibres identified at the site.
		Human Health – Commercial/Industrial Outdoor Worker	Incomplete: No evidence of potential vapours or fibres identified at the site.
	Surface Water Run-off	Ecological Receptors - Drury Creek	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.
	Migration of Groundwater	Ecological Receptors - Drury Creek	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.

9.12 Esplanade Reserve

During the site walkover and inspection evidence of burning, evidence of microbial contamination and evidence of PACM ground contamination was noted.

Therefore, following the desktop assessment and site inspection and walk over of the site at Esplanade Reserve the following potential contaminating land uses and/or activities have been identified:

- Evidence of burning;
- Evidence of microbiological contamination; and
- Evidence of PACM Ground Contamination.

The assessment provided in Table 54 below expands on the potential sources of contamination (as identified above) and exposure pathways and was based on the potential effects of the potential change of land use, subdivision and soil disturbance activities on human health and the environment.

Table 54: Conceptual Site Model: Esplanade Reserve, Drury

Potential Source	Potential Pathways	Potential Receptors	Assessment
Contaminated Soil	Dermal Contact with Contaminated Soils	Human Health – Residential Land Use	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.
		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 – Residential Land Use	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.
		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 – Residential Land Use	Potentially complete: Potential fibres associated with ACM identified at the site.
		Human Health – Commercial/Industrial Outdoor Worker	Potentially complete: Potential fibres associated with ACM identified at the site.
	Surface Water Run-off	Ecological Receptors - Drury Creek	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.
	Migration of Groundwater	Ecological Receptors - Drury Creek	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.

9.13 221 Jesmond Road

During the site walkover and inspection evidence of suspected uncertified fill material and evidence of burning were noted.

Furthermore, following the review of the available historical photographs, the central area of the site adjacent to the southern boundary appears to have been utilised for horticultural purposes.

Therefore, following the desktop assessment and site inspection and walk over of the site at 221 Bremner Road, Drury the following potential contaminating land uses and/or activities have been identified:

- Suspected uncertified fill material;
- Evidence of burning; and
- Former horticultural activities.

The assessment provided in Table 55 below expands on the potential sources of contamination (as identified above) and exposure pathways and was based on the potential effects of the potential change of land use, subdivision and soil disturbance activities on human health and the environment.

Table 55: Conceptual Site Model: 221 Jesmond Road, Drury

Potential Source	Potential Pathways	Potential Receptors	Assessment
Contaminated Soil	Dermal Contact with Contaminated Soils	Human Health – Residential Land Use	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.
		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 – Residential Land Use	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.
		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 – Residential Land Use	Incomplete: No evidence of potential vapours or fibres identified at the site.
		Human Health – Commercial/Industrial Outdoor Worker	Incomplete: No evidence of potential vapours or fibres identified at the site.
	Surface Water Run-off	Ecological Receptors - Ngakoroa Stream	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.
	Migration of Groundwater	Ecological Receptors - Ngakoroa Stream	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.

9.14 235 Jesmond Road

During the site walkover and inspection evidence of rubber shavings were noted on the base of the horse training arena.

Therefore, following the desktop assessment and site inspection and walk over of the site at 235 Jesmond Road, Drury the following potential contaminating land uses and/or activities have been identified:

- Potential for Leaching of Heavy Metal from Training Arena.

The assessment provided in Table 56 below expands on the potential sources of contamination (as identified above) and exposure pathways and was based on the potential effects of the potential change of land use, subdivision and soil disturbance activities on human health and the environment.

Table 56: Conceptual Site Model: 235 Jesmond Road, Drury

Potential Source	Potential Pathways	Potential Receptors	Assessment
Contaminated Soil	Dermal Contact with Contaminated Soils	Human Health – Residential Land Use	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.
		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 – Residential Land Use	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.
		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 – Residential Land Use	Incomplete: No evidence of potential vapours or fibres identified at the site.
		Human Health – Commercial/Industrial Outdoor Worker	Incomplete: No evidence of potential vapours or fibres identified at the site.
	Surface Water Run-off	Ecological Receptors - Ngakoroa Stream	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.
	Migration of Groundwater	Ecological Receptors - Ngakoroa Stream	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.

9.15 281 Jesmond Road

During the site walkover and inspection evidence of burning, uncertified fill material, potential spray race operations and asbestos contamination was noted.

Therefore, following the desktop assessment and site inspection and walk over of the site at 281 Jesmond Road, Drury the following potential contaminating land uses and/or activities have been identified:

- Evidence of burning;
- Potential spray race operations;
- Suspected uncertified fill material; and
- Evidence of PACM ground contamination.

The assessment provided in Table 57 below expands on the potential sources of contamination (as identified above) and exposure pathways and was based on the potential effects of the potential change of land use, subdivision and soil disturbance activities on human health and the environment.

Table 57: Conceptual Site Model: 281 Jesmond Road, Drury

Potential Source	Potential Pathways	Potential Receptors	Assessment
Contaminated Soil	Dermal Contact with Contaminated Soils	Human Health – Residential Land Use	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.
		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 – Residential Land Use	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.
		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 – Residential Land Use	Potentially complete: Potential fibres associated with ACM identified at the site.
		Human Health – Commercial/Industrial Outdoor Worker	Potentially complete: Potential fibres associated with ACM identified at the site.
	Surface Water Run-off	Ecological Receptors - Drury Creek	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.
	Migration of Groundwater	Ecological Receptors - Drury Creek	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.

9.16 341 Jesmond Road

During the site walkover and inspection evidence of horticultural activities were noted.

However, following the review of the available historical photographs, the northern area of the site also appears to have been utilised for horticultural purposes.

In addition, following the review of the available historical photographs, a wet land feature can be seen in the central portion of the site. As this was no evident during the site walk over and inspection it is considered that the low-lying area has potentially been subject to reclamation and may contain uncertified filling materials.

Therefore, following the desktop assessment and site inspection and walk over of the site at 341 Jesmond Road, Drury the following potential contaminating land uses and/or activities have been identified:

- Evidence of horticultural activities; and
- Suspected uncertified fill material.

The assessment provided in Table 58 below expands on the potential sources of contamination (as identified above) and exposure pathways and was based on the potential effects of the potential change of land use, subdivision and soil disturbance activities on human health and the environment.

Table 58: Conceptual Site Model: 341 Jesmond Road, Drury

Potential Source	Potential Pathways	Potential Receptors	Assessment
Contaminated Soil	Dermal Contact with Contaminated Soils	Human Health – Residential Land Use	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.
		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 – Residential Land Use	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.
		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 – Residential Land Use	Incomplete: No evidence of potential vapours or fibres identified at the site.
		Human Health – Commercial/Industrial Outdoor Worker	Incomplete: No evidence of potential vapours or fibres identified at the site.
	Surface Water Run-off	Ecological Receptors - Ngakoroa Stream	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.
	Migration of Groundwater	Ecological Receptors - Ngakoroa Stream	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.

9.17 401 Jesmond Road

During the site walkover and inspection evidence of horticultural activities was noted.

Furthermore, following the review of the available historical photographs, the western area of the site appears to have been utilised for horticultural purposes.

Therefore, following the desktop assessment and site inspection and walk over of the site at 401 Jesmond Road, Drury the following potential contaminating land uses and/or activities have been identified:

- Evidence of horticultural activities.

The assessment provided in Table 59 below expands on the potential sources of contamination (as identified above) and exposure pathways and was based on the potential effects of the potential change of land use, subdivision and soil disturbance activities on human health and the environment.

Table 59: Conceptual Site Model: 401 Jesmond Road, Drury

Potential Source	Potential Pathways	Potential Receptors	Assessment
Contaminated Soil	Dermal Contact with Contaminated Soils	Human Health – Residential Land Use	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.
		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 – Residential Land Use	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.
		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 – Residential Land Use	Incomplete: No evidence of potential vapours or fibres identified at the site.
		Human Health – Commercial/Industrial Outdoor Worker	Incomplete: No evidence of potential vapours or fibres identified at the site.
	Surface Water Run-off	Ecological Receptors - Drury Creek	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.
	Migration of Groundwater	Ecological Receptors - Drury Creek	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.

9.18 451 Jesmond Road

During the site walkover and inspection evidence of horticultural activities and above ground fuel storage were noted.

Furthermore, following the review of the available historical photographs, the central and eastern portion of the site appears to have been utilised for horticultural purposes.

Therefore, following the desktop assessment and site inspection and walk over of the site at 451 Jesmond Road, Drury the following potential contaminating land uses and/or activities have been identified:

- Evidence of horticultural activities; and
- Evidence of above ground fuel storage.

The assessment provided in Table 60 below expands on the potential sources of contamination (as identified above) and exposure pathways and was based on the potential effects of the potential change of land use, subdivision and soil disturbance activities on human health and the environment.

Table 60: Conceptual Site Model: 451 Jesmond Road, Drury

Potential Source	Potential Pathways	Potential Receptors	Assessment
Contaminated Soil	Dermal Contact with Contaminated Soils	Human Health – Residential Land Use	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.
		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 – Residential Land Use	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.
		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 – Residential Land Use	Incomplete: No evidence of potential vapours or fibres identified at the site.
		Human Health – Commercial/Industrial Outdoor Worker	Incomplete: No evidence of potential vapours or fibres identified at the site.
	Surface Water Run-off	Ecological Receptors - Drury Creek	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.
	Migration of Groundwater	Ecological Receptors - Drury Creek	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.

9.19 30 Burberry Road

Following the review of the available information relating to the subject and the site walkover and inspection no potentially contaminating land uses and/or activities were identified at the site at 30 Burberry Road, Drury.

The assessment provided in Table 61 below expands on the potential sources of contamination (as identified above) and exposure pathways and was based on the potential effects of the potential change of land use, subdivision and soil disturbance activities on human health and the environment.

Table 61: Conceptual Site Model: 30 Burberry Road, Drury

Potential Source	Potential Pathways	Potential Receptors	Assessment
Contaminated Soil	Dermal Contact with Contaminated Soils	Human Health – Residential Land Use	Incomplete: Sampling and analysis is not recommended on site as no potentially contaminating activities or land uses were identified.
		Human Health – Commercial/Industrial Outdoor Worker	Incomplete: Sampling and analysis is not recommended on site as no potentially contaminating activities or land uses were identified.
	Ingestion of Contaminated Soils	Human Health – Residential Land Use	Incomplete: Sampling and analysis is not recommended on site as no potentially contaminating activities or land uses were identified.
		Human Health – Commercial/Industrial Outdoor Worker	Incomplete: Sampling and analysis is not recommended on site as no potentially contaminating activities or land uses were identified.
	Inhalation of Vapours/Fibres	Human Health – Residential Land Use	Incomplete: No evidence of potential vapours or fibres identified at the site.
		Human Health – Commercial/Industrial Outdoor Worker	Incomplete: No evidence of potential vapours or fibres identified at the site.
	Surface Water Run-off	Ecological Receptors - Drury Creek	Incomplete: Sampling and analysis is not recommended on site as no potentially contaminating activities or land uses were identified.
	Migration of Groundwater	Ecological Receptors - Drury Creek	Incomplete: Sampling and analysis is not recommended on site as no potentially contaminating activities or land uses were identified.

9.20 38 Burberry Road

A site walkover and inspection of 38 Burberry Road was not possible due to access restrictions, therefore it was not possible to inspect the site for any potential contaminating activities.

However, following the review of the available historical photographs, suspected uncertified fill material may have been imported on site in order to construct the dam structure and evidence of former horticultural activities were noted.

Therefore, following the desktop assessment of the site at 38 Bremner Road, Drury the following potential contaminating land uses and/or activities have been identified:

- Potential horticultural activities; and
- Suspected uncertified fill material.

The assessment provided in Table 62 below expands on the potential sources of contamination (as identified above) and exposure pathways and was based on the potential effects of the potential change of land use, subdivision and soil disturbance activities on human health and the environment.

Table 62: Conceptual Site Model: 38 Burberry Road, Drury

Potential Source	Potential Pathways	Potential Receptors	Assessment
Contaminated Soil	Dermal Contact with Contaminated Soils	Human Health – Residential Land Use	Potentially complete: A site inspection is recommended to identify any potentially contaminating activities or land uses.
		Human Health – Commercial/Industrial Outdoor Worker	Potentially complete: A site inspection is recommended to identify any potentially contaminating activities or land uses.
	Ingestion of Contaminated Soils	Human Health – Residential Land Use	Potentially complete: A site inspection is recommended to identify any potentially contaminating activities or land uses.
		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 – Residential Land Use	Potentially complete: A site inspection is recommended to identify any potentially contaminating activities or land uses.
		Human Health – Commercial/Industrial Outdoor Worker	Potentially complete: A site inspection is recommended to identify any potentially contaminating activities or land uses.
	Surface Water Run-off	Ecological Receptors - Ngakoroa Stream	Potentially complete: A site inspection is recommended to identify any potentially contaminating activities or land uses.
	Migration of Groundwater	Ecological Receptors - Ngakoroa Stream	Potentially complete: A site inspection is recommended to identify any potentially contaminating activities or land uses..

9.21 41 Burberry Road

A site walkover and inspection of 41 Burberry Road was not possible due to access restrictions, therefore it was not possible to inspect the site for any potential contaminating activities.

Following the review of the available information relating to the subject site no potentially contaminating land uses and/or activities were identified at the site at 41 Burberry Road, Drury.

The assessment provided in Table 63 below expands on the potential sources of contamination (as identified above) and exposure pathways and was based on the potential effects of the potential change of land use, subdivision and soil disturbance activities on human health and the environment.

Table 63: Conceptual Site Model: 41 Burberry Road, Drury

Potential Source	Potential Pathways	Potential Receptors	Assessment
Contaminated Soil	Dermal Contact with Contaminated Soils	Human Health – Residential Land Use	Potentially complete: A site inspection is recommended to identify any potentially contaminating activities or land uses.
		Human Health – Commercial/Industrial Outdoor Worker	Potentially complete: A site inspection is recommended to identify any potentially contaminating activities or land uses.
	Ingestion of Contaminated Soils	Human Health – Residential Land Use	Potentially complete: A site inspection is recommended to identify any potentially contaminating activities or land uses.
		Human Health – Commercial/Industrial Outdoor Worker	Potentially complete: A site inspection is recommended to identify any potentially contaminating activities or land uses.
	Inhalation of Vapours/Fibres	Human Health – Residential Land Use	Potentially complete: A site inspection is recommended to identify any potentially contaminating activities or land uses.
		Human Health – Commercial/Industrial Outdoor Worker	Potentially complete: A site inspection is recommended to identify any potentially contaminating activities or land uses.
	Surface Water Run-off	Ecological Receptors - Ngakoroa Stream	Potentially complete: A site inspection is recommended to identify any potentially contaminating activities or land uses.
	Migration of Groundwater	Ecological Receptors - Ngakoroa Stream	Potentially complete: A site inspection is recommended to identify any potentially contaminating activities or land uses.

10.0 Conclusions and Recommendations

The Preliminary Site Investigation for the Auranga Development 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).

The history of the site was researched by Focus Environmental Services personnel, which involved a review of the available historical aerial photographs of the site, a review of the historical certificate of title, a review of the Auckland Council property file and a contaminated sites enquiry to Auckland Council. During the review of the available information any potentially contaminating activities or land uses were identified.

Following the desk top assessment, the site was visited and a site inspection and walk over was carried out. The site was inspected by Focus Environmental Services Limited personnel on dates between the 24th of January 2017 and the 3rd of February 2017. During the site inspection, any potentially contaminating activities or land uses were identified.

In summary, following the desk top assessment and site inspection and walkover, evidence of burning, potential spray race operations and storage of potentially treated timber were noted for 321 Bremner Road; evidence of hydrocarbon contamination, evidence of microbiological contamination and burning of potentially treat timber furniture were noted for 325 Bremner Road; evidence of burning, suspected uncertified fill material and a mechanical workshop were noted for 329 Bremner Road; potentially uncertified fill material, evidence of burning, storage of potentially treated timber, and evidence of fuel storage was noted for 333 Bremner Road; potential spray race operations and potential hydrocarbon contamination were noted for 389 Bremner Road; a single area of burning was noted for 403 Bremner Road; potential spray race operation were noted for 415 Bremner Road; storage of potentially treated timber was noted at 420-417 Bremner Road; evidence of horticultural activities were noted at 421 Bremner Road; evidence of microbiological contamination and evidence of potential ACM ground contamination were noted for the Esplanade Reserve; evidence of former horticultural activities, evidence of microbiological contamination, burning and potentially uncertified fill materials were noted for 221 Jesmond Road; evidence of rubber shaving on the base of the training arena were noted for 235 Jesmond Road; evidence of burning, evidence of potentially uncertified fill material, suspected spray race operations and potential ACM ground contamination were noted for 281 Jesmond Road; evidence of horticultural activities and potentially uncertified fill material were noted for 341 Jesmond Road; evidence of horticultural activities were noted for 401 Jesmond Road; evidence of horticultural activities and fuel storage were noted for 451 Jesmond Road. No potentially contaminating land uses and/or activities were identified at the site at 389 Bremner Road, 393 Bremner Road, 385 Bremner Road, 30 Burberry Road and 41 Burberry Road Drury.

The information obtained of the sites history and from the site inspection and walk over was assessed to determine if any potential hazardous activities listed on the Hazardous Activities and Industries List (HAIL) had occurred on site as a result of past or current land use.

Due to the potential source of contamination identified at the above sites it is considered that there is evidence to suggest that an activity outlined in the HAIL list has been, or is currently being, carried out on the pieces of land.

Prior to the development of the areas of the site where potentially contaminating land uses and/or activities have taken place, a detailed site investigation is recommended.

The detailed site investigation would confirm if the identified land uses and/or activities have affected the site soils and will confirm the consenting requirements for this area of the site.

Figures

Figure 1 – Site Location Plan
Figure 2-1 – Site Features Plan: 321 Bremner Road
Figure 2-1A – Site Features Plan: 321 Bremner Road
Figure 2-2 – Site Features Plan: 325 Bremner Road
Figure 2-3 – Site Features Plan: 329 Bremner Road
Figure 2-3A – Site Features Plan: 329 Bremner Road
Figure 2-4 – Site Features Plan: 333 Bremner Road
Figure 2-4A – Site Features Plan: 333 Bremner Road
Figure 2-5 – Site Features Plan: 385 Bremner Road
Figure 2-6 – Site Features Plan: 389 Bremner Road
Figure 2-6A – Site Features Plan: 389 Bremner Road
Figure 2-7 – Site Features Plan: 393 Bremner Road
Figure 2-8 – Site Features Plan: 403 Bremner Road
Figure 2-9 – Site Features Plan: 415 Bremner Road
Figure 2-9A – Site Features Plan: 415 Bremner Road
Figure 2-10 – Site Features Plan: 420-417 Bremner Road
Figure 2-11 – Site Features Plan: 421 Bremner Road
Figure 2-12 – Site Features Plan: Esplanade Reserve
Figure 2-12A – Site Features Plan: Esplanade Reserve
Figure 2-12B – Site Features Plan: Esplanade Reserve
Figure 2-12C – Site Features Plan: Esplanade Reserve
Figure 2-13 – Site Features Plan: 221 Jesmond Road
Figure 2-14 – Site Features Plan: 235 Jesmond Road
Figure 2-15 – Site Features Plan: 281 Jesmond Road
Figure 2-16 – Site Features Plan: 341 Jesmond Road
Figure 2-17 – Site Features Plan: 401 Jesmond Road
Figure 2-18 – Site Features Plan: 451 Jesmond Road
Figure 2-19 – Site Features Plan: 30 Burberry Road
Figure 2-20 – Site Feature Plan: 38 Burberry Road
Figure 2-21 – Site Feature Plan: 41 Burberry Road

Appendices

Appendix A – Site Contour Plans

Appendix B – Environment HAIL

Appendix C (1) – Historical Site Photographs

Appendix C (2) – Historical Site Photographs

Appendix D – Site Contamination Enquiry

Appendix E – Historic Certificate of Title

Appendix F – Site Inspection Photographs

Appendix B

Summary of Soil Results

SOIL ANALYSIS SUMMARY TABLE: 281 Jesmond Road													Assessment Criteria		
Sample Name	TP1 S1	TP2 S1	TP3 S1	TP4 S1	TP5 S1	TP6 S1	TP7 S1	TP9 S1	TP10 S1	TP11 S1	TP13 S1	TP14 S1			
Sample Depth	0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2	**Background Criteria [1]**	**Human Health Risk (rural/lifestyle block) [2]**	**Environmental Discharge [5]**
Sample Date	27-Jul-18	27-Jul-18	27-Jul-18	27-Jul-18	27-Jul-18	27-Jul-18	27-Jul-18	27-Jul-18	27-Jul-18	27-Jul-18	27-Jul-18	27-Jul-18			
Lab Number	2024183.1	2024183.3	2024183.5	2024183.7	2024183.8	2024183.1	2024183.12	2024183.13	2024183.14	2024183.15	2024183.16	2024183.17			
Heavy Metals (mg/kg dry wt)															
Total Recoverable Arsenic	11	11	10	7	14	5	-	-	-	-	-	-	12	17	100
Total Recoverable Cadmium	0.58	0.53	0.34	0.11	0.1	< 0.10	-	-	-	-	-	-	0.65	0.8	7.5
Total Recoverable Chromium	64	65	19	14	16	13	-	-	-	-	-	-	125	290	400
Total Recoverable Copper	107	113	17	17	12	9	-	-	-	-	-	-	90	10,000	325
Total Recoverable Lead	52	41	32	38	25	17.2	-	-	-	-	-	-	65	160	250
Total Recoverable Nickel	13	12	5	4	3	3	-	-	-	-	-	-	320	1,500 [3]	105
Total Recoverable Zinc	97	89	41	60	46	23	-	-	-	-	-	-	1,160	23,000 [3]	400
Semi Quantitative Asbestos (g ashed wt)															
Asbestos Presence / Absence	-	-	-	-	-	-	Chrysotile (White Asbestos) detected.	Chrysotile (White Asbestos) detected.	Chrysotile (White Asbestos) detected.	Asbestos NOT detected.	Chrysotile (White Asbestos) detected.	Asbestos NOT detected.	-	-	-
Description of Asbestos Form	-	-	-	-	-	-	Loose Fibres	Loose Fibres	Loose Fibres	-	Loose Fibres	-	-	-	-
Weight of Asbestos in >10mm Sample Fraction	-	-	-	-	-	-	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	-	-	-
Weight of Asbestos in <10mm to >2mm Sample Fraction	-	-	-	-	-	-	< 0.00001	0.0076	0.00057	< 0.00001	0.00003	< 0.00001	-	-	-
Weight of Asbestos in <2mm Sample Fraction	-	-	-	-	-	-	0.00023	0.00021	0.00048	< 0.00001	< 0.00001	< 0.00001	-	-	-
Total Fibres	-	-	-	-	-	-	0.00023	0.00781	0.00105	-	0.00003	-	-	-	-
%w/w	-	-	-	-	-	-	0.00007	0.00232	0.0003	-	0.00001	-	-	0.0010% [6]	-
Organochlorine Pesticides (mg/kg dry wt)															
All 26 Compounds	-	-	-	BD	BD	BD	-	-	-	-	-	-	-	-	-
Organonitro&phosphorus Pesticides (mg/kg)															
All 89 Compounds	-	-	-	BD	BD	BD	-	-	-	-	-	-	-	-	-
Polycyclic Aromatic Hydrocarbons (mg/kg dry wt)															
All 22 Compounds	BD	BD	BD	-	-	-	-	-	-	-	-	-	-	-	-
Total of Reported PAHs in Soil (mg/kg)	< 0.4	< 0.4	< 0.4	-	-	-	-	-	-	-	-	-	-	-	-

Annotations

1. Background Concentrations of Inorganic Elements in Soil from the Auckland Region. Auckland Regional Council, 2002. Background ranges for metals in volcanic range soils
2. Resource Management (National Environmental Standard for Assessing and managing Contaminants in Soil to Protect Human Health) Regulation 2012 - Values applicable to 'commercial/industrial outdoor worker, unpaved' have been selecte
3. US EPA Regional Screening Levels. Values applicable to 'residential' Landuse have been selected where appropriate.

4. Ministry for the Environment Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand - Module 4, Table 4.11 (MAH/PAH), Table 4.14 (TPH). Values applicable to 'Commercial/Industrial landuse - All Pathways' for Silty Clay Soil Type at applicable depths ("<1m" and "1m - 4m") have been selected.
5. Environmental Discharge Criteria have been selected from the Auckland Unitary Plan Operative in part - Table E30.6.1.4.1 Permitted Activity Criteria
6. New Zealand Guidelines for Assessing and Managing Asbestos in Soil (2017) – Tier 1 assessment criteria for human health protection

BD - Below laboratory detection limits

Results below detectable concentrations are grey
Results exceeding background levels are underlined
Results exceeding environmental risk criteria are bold
Results exceeding human health risk criteria are shaded grey

Appendix C

Hill Laboratories Report

Hill Laboratories
TRIED, TESTED AND TRUSTED

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

T 0508 HILL LAB (44 555 22)
T +64 7 858 2000
E mail@hill-labs.co.nz
W www.hill-laboratories.com

Certificate of Analysis

Client:	Beca Limited	**Lab No:**	2024183	SPv1
Contact:	C Blyth	**Date Received:**	01-Aug-2018	
	C/- Beca Limited	**Date Reported:**	10-Aug-2018	
	PO Box 6345	**Quote No:**	72192	
	Wellesley Street	**Order No:**	18:128	
	Auckland 1141	**Client Reference:**	4216997/200/DA	
		Submitted By:	Renee Jens	

Sample Type: Soil

Sample Name:		TP1 S1 0.1-0.2 27-Jul-2018 10:30 am	TP2 S1 0.1-0.2 27-Jul-2018 11:00 am	TP3 S1 0.1-0.2 27-Jul-2018 11:20 am	TP4 S1 0.1-0.2 27-Jul-2018 12:15 pm	TP5 S1 0.1-0.2 27-Jul-2018 12:30 pm
Lab Number:		2024183.1	2024183.3	2024183.5	2024183.7	2024183.8
Individual Tests						
Dry Matter	g/100g as rcvd	69	70	71	75	74
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	11	11	10	7	14
Total Recoverable Cadmium	mg/kg dry wt	0.58	0.53	0.34	0.11	0.10
Total Recoverable Chromium	mg/kg dry wt	64	65	19	14	16
Total Recoverable Copper	mg/kg dry wt	107	113	17	17	12
Total Recoverable Lead	mg/kg dry wt	52	41	32	38	25
Total Recoverable Nickel	mg/kg dry wt	13	12	5	4	3
Total Recoverable Zinc	mg/kg dry wt	97	89	41	60	46
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	-	-	-	< 0.013	< 0.014
alpha-BHC	mg/kg dry wt	-	-	-	< 0.013	< 0.014
beta-BHC	mg/kg dry wt	-	-	-	< 0.013	< 0.014
delta-BHC	mg/kg dry wt	-	-	-	< 0.013	< 0.014
gamma-BHC (Lindane)	mg/kg dry wt	-	-	-	< 0.013	< 0.014
cis-Chlordane	mg/kg dry wt	-	-	-	< 0.013	< 0.014
trans-Chlordane	mg/kg dry wt	-	-	-	< 0.013	< 0.014
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	-	-	-	< 0.04	< 0.04
2,4'-DDD	mg/kg dry wt	-	-	-	< 0.013	< 0.014
4,4'-DDD	mg/kg dry wt	-	-	-	< 0.013	< 0.014
2,4'-DDE	mg/kg dry wt	-	-	-	< 0.013	< 0.014
4,4'-DDE	mg/kg dry wt	-	-	-	< 0.013	< 0.014
2,4'-DDT	mg/kg dry wt	-	-	-	< 0.013	< 0.014
4,4'-DDT	mg/kg dry wt	-	-	-	< 0.013	< 0.014
Total DDT Isomers	mg/kg dry wt	-	-	-	< 0.08	< 0.08
Dieldrin	mg/kg dry wt	-	-	-	< 0.013	< 0.014
Endosulfan I	mg/kg dry wt	-	-	-	< 0.013	< 0.014
Endosulfan II	mg/kg dry wt	-	-	-	< 0.013	< 0.014
Endosulfan sulphate	mg/kg dry wt	-	-	-	< 0.013	< 0.014
Endrin	mg/kg dry wt	-	-	-	< 0.013	< 0.014
Endrin aldehyde	mg/kg dry wt	-	-	-	< 0.013	< 0.014
Endrin ketone	mg/kg dry wt	-	-	-	< 0.013	< 0.014
Heptachlor	mg/kg dry wt	-	-	-	< 0.013	< 0.014
Heptachlor epoxide	mg/kg dry wt	-	-	-	< 0.013	< 0.014
Hexachlorobenzene	mg/kg dry wt	-	-	-	< 0.013	< 0.014
Methoxychlor	mg/kg dry wt	-	-	-	< 0.013	< 0.014

Sample Type: Soil						
Sample Name:		TP1 S1 0.1-0.2 27-Jul-2018 10:30 am	TP2 S1 0.1-0.2 27-Jul-2018 11:00 am	TP3 S1 0.1-0.2 27-Jul-2018 11:20 am	TP4 S1 0.1-0.2 27-Jul-2018 12:15 pm	TP5 S1 0.1-0.2 27-Jul-2018 12:30 pm
Lab Number:		2024183.1	2024183.3	2024183.5	2024183.7	2024183.8
Organonitro&phosphorus Pesticides Screen in Soil by GCMS						
Acetochlor	mg/kg	-	-	-	< 0.07	< 0.07
Alachlor	mg/kg	-	-	-	< 0.05	< 0.05
Atrazine	mg/kg	-	-	-	< 0.07	< 0.07
Atrazine-desethyl	mg/kg	-	-	-	< 0.07	< 0.07
Atrazine-desisopropyl	mg/kg	-	-	-	< 0.13	< 0.13
Azaconazole	mg/kg	-	-	-	< 0.04	< 0.04
Azinphos-methyl	mg/kg	-	-	-	< 0.13	< 0.13
Benalaxyl	mg/kg	-	-	-	< 0.04	< 0.04
Bitertanol	mg/kg	-	-	-	< 0.13	< 0.13
Bromacil	mg/kg	-	-	-	< 0.07	< 0.07
Bromopropylate	mg/kg	-	-	-	< 0.07	< 0.07
Butachlor	mg/kg	-	-	-	< 0.07	< 0.07
Captan	mg/kg	-	-	-	< 0.13	< 0.13
Carbaryl	mg/kg	-	-	-	< 0.07	< 0.07
Carbofuran	mg/kg	-	-	-	< 0.07	< 0.07
Chlorfluazuron	mg/kg	-	-	-	< 0.07	< 0.07
Chlorothalonil	mg/kg	-	-	-	< 0.07	< 0.07
Chlorpyrifos	mg/kg	-	-	-	< 0.07	< 0.07
Chlorpyrifos-methyl	mg/kg	-	-	-	< 0.07	< 0.07
Chlortoluron	mg/kg	-	-	-	< 0.13	< 0.13
Cyanazine	mg/kg	-	-	-	< 0.07	< 0.07
Cyfluthrin	mg/kg	-	-	-	< 0.08	< 0.08
Cyhalothrin	mg/kg	-	-	-	< 0.07	< 0.07
Cypermethrin	mg/kg	-	-	-	< 0.15	< 0.16
Deltamethrin (including Tralomethrin)	mg/kg	-	-	-	< 0.07	< 0.07
Diazinon	mg/kg	-	-	-	< 0.04	< 0.04
Dichlofluanid	mg/kg	-	-	-	< 0.07	< 0.07
Dichloran	mg/kg	-	-	-	< 0.2	< 0.2
Dichlorvos	mg/kg	-	-	-	< 0.09	< 0.09
Difenoconazole	mg/kg	-	-	-	< 0.09	< 0.09
Dimethoate	mg/kg	-	-	-	< 0.13	< 0.13
Diphenylamine	mg/kg	-	-	-	< 0.13	< 0.13
Diuron	mg/kg	-	-	-	< 0.07	< 0.07
Fenpropimorph	mg/kg	-	-	-	< 0.07	< 0.07
Fluazifop-butyl	mg/kg	-	-	-	< 0.07	< 0.07
Fluometuron	mg/kg	-	-	-	< 0.07	< 0.07
Flusilazole	mg/kg	-	-	-	< 0.07	< 0.07
Fluvalinate	mg/kg	-	-	-	< 0.05	< 0.05
Furalaxyl	mg/kg	-	-	-	< 0.04	< 0.04
Haloxyfop-methyl	mg/kg	-	-	-	< 0.07	< 0.07
Hexaconazole	mg/kg	-	-	-	< 0.07	< 0.07
Hexazinone	mg/kg	-	-	-	< 0.04	< 0.04
IPBC (3-Iodo-2-propynyl-n-butylcarbamate)	mg/kg dry wt	-	-	-	< 0.4	< 0.4
Kresoxim-methyl	mg/kg	-	-	-	< 0.04	< 0.04
Linuron	mg/kg	-	-	-	< 0.07	< 0.07
Malathion	mg/kg	-	-	-	< 0.07	< 0.07
Metalaxyl (Mefenoxam)	mg/kg	-	-	-	< 0.07	< 0.07
Methamidophos	mg/kg	-	-	-	< 0.4	< 0.4
Metolachlor	mg/kg	-	-	-	< 0.05	< 0.05
Metribuzin	mg/kg	-	-	-	< 0.07	< 0.07
Molinate	mg/kg	-	-	-	< 0.13	< 0.13
Myclobutanil	mg/kg	-	-	-	< 0.07	< 0.07
Naled	mg/kg	-	-	-	< 0.4	< 0.4
Norflurazon	mg/kg	-	-	-	< 0.13	< 0.13

Sample Type: Soil						
Sample Name:		TP1 S1 0.1-0.2 27-Jul-2018 10:30 am	TP2 S1 0.1-0.2 27-Jul-2018 11:00 am	TP3 S1 0.1-0.2 27-Jul-2018 11:20 am	TP4 S1 0.1-0.2 27-Jul-2018 12:15 pm	TP5 S1 0.1-0.2 27-Jul-2018 12:30 pm
Lab Number:		2024183.1	2024183.3	2024183.5	2024183.7	2024183.8
Organonitro&phosphorus Pesticides Screen in Soil by GCMS						
Oxadiazon	mg/kg	-	-	-	< 0.07	< 0.07
Oxyfluorfen	mg/kg	-	-	-	< 0.04	< 0.04
Paclobutrazol	mg/kg	-	-	-	< 0.07	< 0.07
Parathion-ethyl	mg/kg	-	-	-	< 0.07	< 0.07
Parathion-methyl	mg/kg	-	-	-	< 0.07	< 0.07
Pendimethalin	mg/kg	-	-	-	< 0.07	< 0.07
Permethrin	mg/kg	-	-	-	< 0.03	< 0.03
Pirimicarb	mg/kg	-	-	-	< 0.07	< 0.07
Pirimiphos-methyl	mg/kg	-	-	-	< 0.07	< 0.07
Prochloraz	mg/kg	-	-	-	< 0.4	< 0.4
Procymidone	mg/kg	-	-	-	< 0.07	< 0.07
Prometryn	mg/kg	-	-	-	< 0.04	< 0.04
Propachlor	mg/kg	-	-	-	< 0.07	< 0.07
Propanil	mg/kg	-	-	-	< 0.2	< 0.2
Propazine	mg/kg	-	-	-	< 0.04	< 0.04
Propiconazole	mg/kg	-	-	-	< 0.05	< 0.05
Pyriproxyfen	mg/kg	-	-	-	< 0.07	< 0.07
Quizalofop-ethyl	mg/kg	-	-	-	< 0.07	< 0.07
Simazine	mg/kg	-	-	-	< 0.07	< 0.07
Simetryn	mg/kg	-	-	-	< 0.07	< 0.07
Sulfentrazone	mg/kg	-	-	-	< 0.4	< 0.4
TCMTB [2-(thiocyanomethylthio) benzothiazole,Busan]	mg/kg dry wt	-	-	-	< 0.13	< 0.13
Tebuconazole	mg/kg	-	-	-	< 0.07	< 0.07
Terbacil	mg/kg	-	-	-	< 0.07	< 0.07
Terbufos	mg/kg	-	-	-	< 0.07	< 0.07
Terbumeton	mg/kg	-	-	-	< 0.07	< 0.07
Terbuthylazine	mg/kg	-	-	-	< 0.04	< 0.04
Terbuthylazine-desethyl	mg/kg	-	-	-	< 0.07	< 0.07
Terbutryn	mg/kg	-	-	-	< 0.07	< 0.07
Thiabendazole	mg/kg	-	-	-	< 0.4	< 0.4
Thiobencarb	mg/kg	-	-	-	< 0.07	< 0.07
Tolylfluanid	mg/kg	-	-	-	< 0.04	< 0.04
Triazophos	mg/kg	-	-	-	< 0.07	< 0.07
Trifluralin	mg/kg	-	-	-	< 0.07	< 0.07
Vinclozolin	mg/kg	-	-	-	< 0.07	< 0.07
Polycyclic Aromatic Hydrocarbons Screening in Soil						
1-Methylnaphthalene	mg/kg dry wt	< 0.015	< 0.015	< 0.014	-	-
2-Methylnaphthalene	mg/kg dry wt	< 0.015	< 0.015	< 0.014	-	-
Perylene	mg/kg dry wt	< 0.015	< 0.015	< 0.014	-	-
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	mg/kg dry wt	< 0.04	< 0.04	< 0.04	-	-
Benzo[a]pyrene Toxic Equivalence (TEF)	mg/kg dry wt	< 0.04	< 0.04	< 0.04	-	-
Acenaphthylene	mg/kg dry wt	< 0.015	< 0.015	< 0.014	-	-
Acenaphthene	mg/kg dry wt	< 0.015	< 0.015	< 0.014	-	-
Anthracene	mg/kg dry wt	< 0.015	< 0.015	< 0.014	-	-
Benzo[a]anthracene	mg/kg dry wt	< 0.015	< 0.015	< 0.014	-	-
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.015	< 0.015	< 0.014	-	-
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.015	< 0.015	< 0.014	-	-
Benzo[e]pyrene	mg/kg dry wt	< 0.015	< 0.015	< 0.014	-	-
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.015	< 0.015	< 0.014	-	-
Benzo[k]fluoranthene	mg/kg dry wt	< 0.015	< 0.015	< 0.014	-	-
Chrysene	mg/kg dry wt	< 0.015	< 0.015	< 0.014	-	-

Sample Type: Soil						
Sample Name:		TP1 S1 0.1-0.2 27-Jul-2018 10:30 am	TP2 S1 0.1-0.2 27-Jul-2018 11:00 am	TP3 S1 0.1-0.2 27-Jul-2018 11:20 am	TP4 S1 0.1-0.2 27-Jul-2018 12:15 pm	TP5 S1 0.1-0.2 27-Jul-2018 12:30 pm
Lab Number:		2024183.1	2024183.3	2024183.5	2024183.7	2024183.8
Polycyclic Aromatic Hydrocarbons Screening in Soil						
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.015	< 0.015	< 0.014	-	-
Fluoranthene	mg/kg dry wt	< 0.015	< 0.015	< 0.014	-	-
Fluorene	mg/kg dry wt	< 0.015	< 0.015	< 0.014	-	-
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.015	< 0.015	< 0.014	-	-
Naphthalene	mg/kg dry wt	< 0.08	< 0.08	< 0.07	-	-
Phenanthrene	mg/kg dry wt	< 0.015	< 0.015	< 0.014	-	-
Pyrene	mg/kg dry wt	< 0.015	< 0.015	< 0.014	-	-
Total of Reported PAHs in Soil*	mg/kg	< 0.4	< 0.4	< 0.4	-	-

Sample Name:		TP6 S1 0.1-0.2 27-Jul-2018 12:00 pm	TP7 S1 0.1-0.2 27-Jul-2018 2:00 pm	TP9 S1 0.1-0.2 27-Jul-2018 2:30 pm	TP10 S1 0.1-0.2 27-Jul-2018 2:15 pm	TP11 S1 0.1-0.2 27-Jul-2018 3:00 pm
Lab Number:		2024183.10	2024183.12	2024183.13	2024183.14	2024183.15
Individual Tests						
Dry Matter	g/100g as rcvd	75	-	-	-	-
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	5	-	-	-	-
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	-	-	-	-
Total Recoverable Chromium	mg/kg dry wt	13	-	-	-	-
Total Recoverable Copper	mg/kg dry wt	9	-	-	-	-
Total Recoverable Lead	mg/kg dry wt	17.2	-	-	-	-
Total Recoverable Nickel	mg/kg dry wt	3	-	-	-	-
Total Recoverable Zinc	mg/kg dry wt	23	-	-	-	-
Semi Quantitative Asbestos in Soil						
As Received Weight	g	-	440.5	471.4	479.2	531.7
Dry Weight	g	-	325.4	336.1	354.0	413.4
Dry Sample Fraction >10mm	g ashed wt	-	< 0.1	8.4	6.8	57.7
Sample Fraction <10mm to >2mm	g ashed wt	-	79.1	161.1	141.0	128.2
Sample Fraction <2mm	g ashed wt	-	220.1	141.9	181.1	204.6
<2mm Subsample Weight	g ashed wt	-	53.2	52.4	56.5	55.7
Asbestos Presence / Absence		-	Chrysotile (White Asbestos) detected.	Chrysotile (White Asbestos) detected.	Chrysotile (White Asbestos) detected.	Asbestos NOT detected.
Description of Asbestos Form		-	Loose Fibres	Loose Fibres	Loose Fibres	-
Weight of Asbestos in >10mm Sample Fraction	g ashed wt	-	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Weight of Asbestos in <10mm to > 2mm Sample Fraction	g ashed wt	-	< 0.00001	0.00760	0.00057	< 0.00001
Weight of Asbestos in <2mm Sample Fraction	g ashed wt	-	0.00023	0.00021	0.00048	< 0.00001
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	< 0.013	-	-	-	-
alpha-BHC	mg/kg dry wt	< 0.013	-	-	-	-
beta-BHC	mg/kg dry wt	< 0.013	-	-	-	-
delta-BHC	mg/kg dry wt	< 0.013	-	-	-	-
gamma-BHC (Lindane)	mg/kg dry wt	< 0.013	-	-	-	-
cis-Chlordane	mg/kg dry wt	< 0.013	-	-	-	-
trans-Chlordane	mg/kg dry wt	< 0.013	-	-	-	-
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	< 0.04	-	-	-	-
2,4'-DDD	mg/kg dry wt	< 0.013	-	-	-	-
4,4'-DDD	mg/kg dry wt	< 0.013	-	-	-	-
2,4'-DDE	mg/kg dry wt	< 0.013	-	-	-	-
4,4'-DDE	mg/kg dry wt	< 0.013	-	-	-	-
2,4'-DDT	mg/kg dry wt	< 0.013	-	-	-	-
4,4'-DDT	mg/kg dry wt	< 0.013	-	-	-	-
Total DDT Isomers	mg/kg dry wt	< 0.08	-	-	-	-

Sample Type: Soil						
Sample Name:		TP6 S1 0.1-0.2 27-Jul-2018 12:00 pm	TP7 S1 0.1-0.2 27-Jul-2018 2:00 pm	TP9 S1 0.1-0.2 27-Jul-2018 2:30 pm	TP10 S1 0.1-0.2 27-Jul-2018 2:15 pm	TP11 S1 0.1-0.2 27-Jul-2018 3:00 pm
Lab Number:		2024183.10	2024183.12	2024183.13	2024183.14	2024183.15
Organochlorine Pesticides Screening in Soil						
Dieldrin	mg/kg dry wt	< 0.013	-	-	-	-
Endosulfan I	mg/kg dry wt	< 0.013	-	-	-	-
Endosulfan II	mg/kg dry wt	< 0.013	-	-	-	-
Endosulfan sulphate	mg/kg dry wt	< 0.013	-	-	-	-
Endrin	mg/kg dry wt	< 0.013	-	-	-	-
Endrin aldehyde	mg/kg dry wt	< 0.013	-	-	-	-
Endrin ketone	mg/kg dry wt	< 0.013	-	-	-	-
Heptachlor	mg/kg dry wt	< 0.013	-	-	-	-
Heptachlor epoxide	mg/kg dry wt	< 0.013	-	-	-	-
Hexachlorobenzene	mg/kg dry wt	< 0.013	-	-	-	-
Methoxychlor	mg/kg dry wt	< 0.013	-	-	-	-
Organonitro&phosphorus Pesticides Screen in Soil by GCMS						
Acetochlor	mg/kg	< 0.07	-	-	-	-
Alachlor	mg/kg	< 0.05	-	-	-	-
Atrazine	mg/kg	< 0.07	-	-	-	-
Atrazine-desethyl	mg/kg	< 0.07	-	-	-	-
Atrazine-desisopropyl	mg/kg	< 0.13	-	-	-	-
Azaconazole	mg/kg	< 0.04	-	-	-	-
Azinphos-methyl	mg/kg	< 0.13	-	-	-	-
Benalaxyl	mg/kg	< 0.04	-	-	-	-
Bitertanol	mg/kg	< 0.13	-	-	-	-
Bromacil	mg/kg	< 0.07	-	-	-	-
Bromopropylate	mg/kg	< 0.07	-	-	-	-
Butachlor	mg/kg	< 0.07	-	-	-	-
Captan	mg/kg	< 0.13	-	-	-	-
Carbaryl	mg/kg	< 0.07	-	-	-	-
Carbofuran	mg/kg	< 0.07	-	-	-	-
Chlorfluazuron	mg/kg	< 0.07	-	-	-	-
Chlorothalonil	mg/kg	< 0.07	-	-	-	-
Chlorpyrifos	mg/kg	< 0.07	-	-	-	-
Chlorpyrifos-methyl	mg/kg	< 0.07	-	-	-	-
Chlortoluron	mg/kg	< 0.13	-	-	-	-
Cyanazine	mg/kg	< 0.07	-	-	-	-
Cyfluthrin	mg/kg	< 0.08	-	-	-	-
Cyhalothrin	mg/kg	< 0.07	-	-	-	-
Cypermethrin	mg/kg	< 0.16	-	-	-	-
Deltamethrin (including Tralomethrin)	mg/kg	< 0.07	-	-	-	-
Diazinon	mg/kg	< 0.04	-	-	-	-
Dichlofluanid	mg/kg	< 0.07	-	-	-	-
Dichloran	mg/kg	< 0.2	-	-	-	-
Dichlorvos	mg/kg	< 0.09	-	-	-	-
Difenoconazole	mg/kg	< 0.09	-	-	-	-
Dimethoate	mg/kg	< 0.13	-	-	-	-
Diphenylamine	mg/kg	< 0.13	-	-	-	-
Diuron	mg/kg	< 0.07	-	-	-	-
Fenpropimorph	mg/kg	< 0.07	-	-	-	-
Fluazifop-butyl	mg/kg	< 0.07	-	-	-	-
Fluometuron	mg/kg	< 0.07	-	-	-	-
Flusilazole	mg/kg	< 0.07	-	-	-	-
Fluvalinate	mg/kg	< 0.05	-	-	-	-
Furalaxyl	mg/kg	< 0.04	-	-	-	-
Haloxyfop-methyl	mg/kg	< 0.07	-	-	-	-
Hexaconazole	mg/kg	< 0.07	-	-	-	-
Hexazinone	mg/kg	< 0.04	-	-	-	-

Sample Type: Soil						
Sample Name:		TP6 S1 0.1-0.2 27-Jul-2018 12:00 pm	TP7 S1 0.1-0.2 27-Jul-2018 2:00 pm	TP9 S1 0.1-0.2 27-Jul-2018 2:30 pm	TP10 S1 0.1-0.2 27-Jul-2018 2:15 pm	TP11 S1 0.1-0.2 27-Jul-2018 3:00 pm
Lab Number:		2024183.10	2024183.12	2024183.13	2024183.14	2024183.15
Organonitro&phosphorus Pesticides Screen in Soil by GCMS						
IPBC (3-Iodo-2-propynyl-n-butylcarbamate)	mg/kg dry wt	< 0.4	-	-	-	-
Kresoxim-methyl	mg/kg	< 0.04	-	-	-	-
Linuron	mg/kg	< 0.07	-	-	-	-
Malathion	mg/kg	< 0.07	-	-	-	-
Metalaxyl (Mefenoxam)	mg/kg	< 0.07	-	-	-	-
Methamidophos	mg/kg	< 0.4	-	-	-	-
Metolachlor	mg/kg	< 0.05	-	-	-	-
Metribuzin	mg/kg	< 0.07	-	-	-	-
Molinate	mg/kg	< 0.13	-	-	-	-
Myclobutanil	mg/kg	< 0.07	-	-	-	-
Naled	mg/kg	< 0.4	-	-	-	-
Norflurazon	mg/kg	< 0.13	-	-	-	-
Oxadiazon	mg/kg	< 0.07	-	-	-	-
Oxyfluorfen	mg/kg	< 0.04	-	-	-	-
Paclobutrazol	mg/kg	< 0.07	-	-	-	-
Parathion-ethyl	mg/kg	< 0.07	-	-	-	-
Parathion-methyl	mg/kg	< 0.07	-	-	-	-
Pendimethalin	mg/kg	< 0.07	-	-	-	-
Permethrin	mg/kg	< 0.03	-	-	-	-
Pirimicarb	mg/kg	< 0.07	-	-	-	-
Pirimiphos-methyl	mg/kg	< 0.07	-	-	-	-
Prochloraz	mg/kg	< 0.4	-	-	-	-
Procymidone	mg/kg	< 0.07	-	-	-	-
Prometryn	mg/kg	< 0.04	-	-	-	-
Propachlor	mg/kg	< 0.07	-	-	-	-
Propanil	mg/kg	< 0.2	-	-	-	-
Propazine	mg/kg	< 0.04	-	-	-	-
Propiconazole	mg/kg	< 0.05	-	-	-	-
Pyriproxyfen	mg/kg	< 0.07	-	-	-	-
Quizalofop-ethyl	mg/kg	< 0.07	-	-	-	-
Simazine	mg/kg	< 0.07	-	-	-	-
Simetryn	mg/kg	< 0.07	-	-	-	-
Sulfentrazone	mg/kg	< 0.4	-	-	-	-
TCMTB [2-(thiocyanomethylthio) benzothiazole,Busan]	mg/kg dry wt	< 0.13	-	-	-	-
Tebuconazole	mg/kg	< 0.07	-	-	-	-
Terbacil	mg/kg	< 0.07	-	-	-	-
Terbufos	mg/kg	< 0.07	-	-	-	-
Terbumeton	mg/kg	< 0.07	-	-	-	-
Terbuthylazine	mg/kg	< 0.04	-	-	-	-
Terbuthylazine-desethyl	mg/kg	< 0.07	-	-	-	-
Terbutryn	mg/kg	< 0.07	-	-	-	-
Thiabendazole	mg/kg	< 0.4	-	-	-	-
Thiobencarb	mg/kg	< 0.07	-	-	-	-
Tolylfluanid	mg/kg	< 0.04	-	-	-	-
Triazophos	mg/kg	< 0.07	-	-	-	-
Trifluralin	mg/kg	< 0.07	-	-	-	-
Vinclozolin	mg/kg	< 0.07	-	-	-	-

Sample Name:		TP13 S1 0.1-0.2 27-Jul-2018 3:30 pm	TP14 S1 0.1-0.2 27-Jul-2018 4:00 pm			
Lab Number:		2024183.16	2024183.17			

Sample Type: Soil						
Sample Name:		TP13 S1 0.1-0.2 27-Jul-2018 3:30 pm	TP14 S1 0.1-0.2 27-Jul-2018 4:00 pm			
Lab Number:		2024183.16	2024183.17			
Semi Quantitative Asbestos in Soil						
As Received Weight	g	416.1	540.7	-	-	-
Dry Weight	g	261.6	383.2	-	-	-
Dry Sample Fraction >10mm	g ashed wt	< 0.1	< 0.1	-	-	-
Sample Fraction <10mm to >2mm	g ashed wt	40.6	100.6	-	-	-
Sample Fraction <2mm	g ashed wt	181.8	253.3	-	-	-
<2mm Subsample Weight	g ashed wt	55.2	56.9	-	-	-
Asbestos Presence / Absence		Chrysotile (White Asbestos) detected.	Asbestos NOT detected.	-	-	-
Description of Asbestos Form		Loose Fibres	-	-	-	-
Weight of Asbestos in >10mm Sample Fraction	g ashed wt	< 0.00001	< 0.00001	-	-	-
Weight of Asbestos in <10mm to > 2mm Sample Fraction	g ashed wt	0.00003	< 0.00001	-	-	-
Weight of Asbestos in <2mm Sample Fraction	g ashed wt	< 0.00001	< 0.00001	-	-	-

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 clean 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.

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Individual Tests			
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, 3, 5, 7-8, 10
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	BaP Potency Equivalence calculated from Benz(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 + Chrysene x 0.01 + Dibenz(a,h)anthracene x 1 + 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	1, 3, 5
Benzo[a]pyrene Toxic Equivalence (TEF)	BaP Toxic Equivalence calculated from Benzo(a)anthracene x 0.1 + BaP x 1 + Benzo(b)fluoranthene x 0.1 + Benzo(k) fluoranthene x 0.1 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.1 + 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	1, 3, 5
Total of Reported PAHs in Soil*	Sonication extraction, SPE cleanup, GC-MS SIM analysis.	0.3 mg/kg	1, 3, 5
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	1, 3, 5, 7-8, 10
Semi Quantitative Asbestos in Soil	Based on approximately 100g of sample provided.	-	12-17
Organochlorine/nitro&phosphorus Pest.s Screen in Soils, GCMS	Sonication extraction, Dilution cleanup, GC-MS analysis. Tested on as received sample	-	7-8, 10
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]	-	1, 3, 5
Semi Quantitative Asbestos in Soil			
As Received Weight	Measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	12-17
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	12-17
Sample Fraction >10mm	Sample ashed at 400°C, 10mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g ashed wt	12-17

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Sample Fraction <10mm and >2mm	Sample ashed at 400°C, 10mm and 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g ashed wt	12-17
Sample Fraction <2mm	Sample ashed at 400°C, 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g ashed wt	12-17
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.	-	12-17
Description of Asbestos Form	Description of asbestos form and/or shape if present.	-	12-17
Weight of Asbestos in >10mm Sample Fraction	Measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.00001 g ashed wt	12-17
Weight of Asbestos in <10mm to >2mm Sample Fraction	Measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.00001 g ashed wt	12-17
Weight of Asbestos in <2mm Sample Fraction	Measurement on analytical balance. Asbestos weight in <2mm subsample, if <2mm subsample weight is not "Entire Fraction". Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.00001 g ashed wt	12-17

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

Samples are held at the laboratory after reporting for a length of time depending on the preservation used and the stability of the analytes being tested. Once the storage period is completed the samples are discarded unless otherwise advised by the client.

Kim Harrison MSc
Client Services Manager - Environmental

Hill Laboratories
TRIED, TESTED AND TRUSTED

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

T 0508 HILL LAB (44 555 22)
T +64 7 858 2000
E mail@hill-labs.co.nz
W www.hill-laboratories.com

Certificate of Analysis

Client:	Beca Limited	**Lab No:**	2024778	A2Pv1
Contact:	C Blyth	**Date Received:**	01-Aug-2018	
	C/- Beca Limited	**Date Reported:**	06-Aug-2018	
	PO Box 6345	**Quote No:**	72192	
	Wellesley Street	**Order No:**	18:128	
	Auckland 1141	**Client Reference:**	4216997/200/DA	
		Add. Client Ref:	Sampled on: 27.7.18	
		Submitted By:	Renee Jens	

Sample Type: Building Material

Sample Name	Lab Number	Sample Category	Sample Weight on receipt (g)	Asbestos Presence / Absence
TP8 - Sample on top of soil	2024778.1	Fibre Cement	220.48	Chrysotile (White Asbestos) and Crocidolite (Blue Asbestos) detected.
TP10 - Sample from hole in shed	2024778.2	Fibre Cement	102.29	Chrysotile (White Asbestos) and Crocidolite (Blue Asbestos) detected.
TP14 - Sample from top of ground	2024778.3	Fibre Cement	143.31	Asbestos NOT detected.
TP8 - Sample from soil in bucket	2024778.4	Fibre Cement	40.32	Asbestos NOT detected.

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 clean 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.

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; 72 Grafton Road, Auckland.	-	1-4
Sample Weight on receipt	Sample weight. Analysed at Hill Laboratories - Asbestos; 72 Grafton Road, Auckland.	0.01 g	1-4
Asbestos Presence / Absence	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; 72 Grafton Road, Auckland. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	-	1-4

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

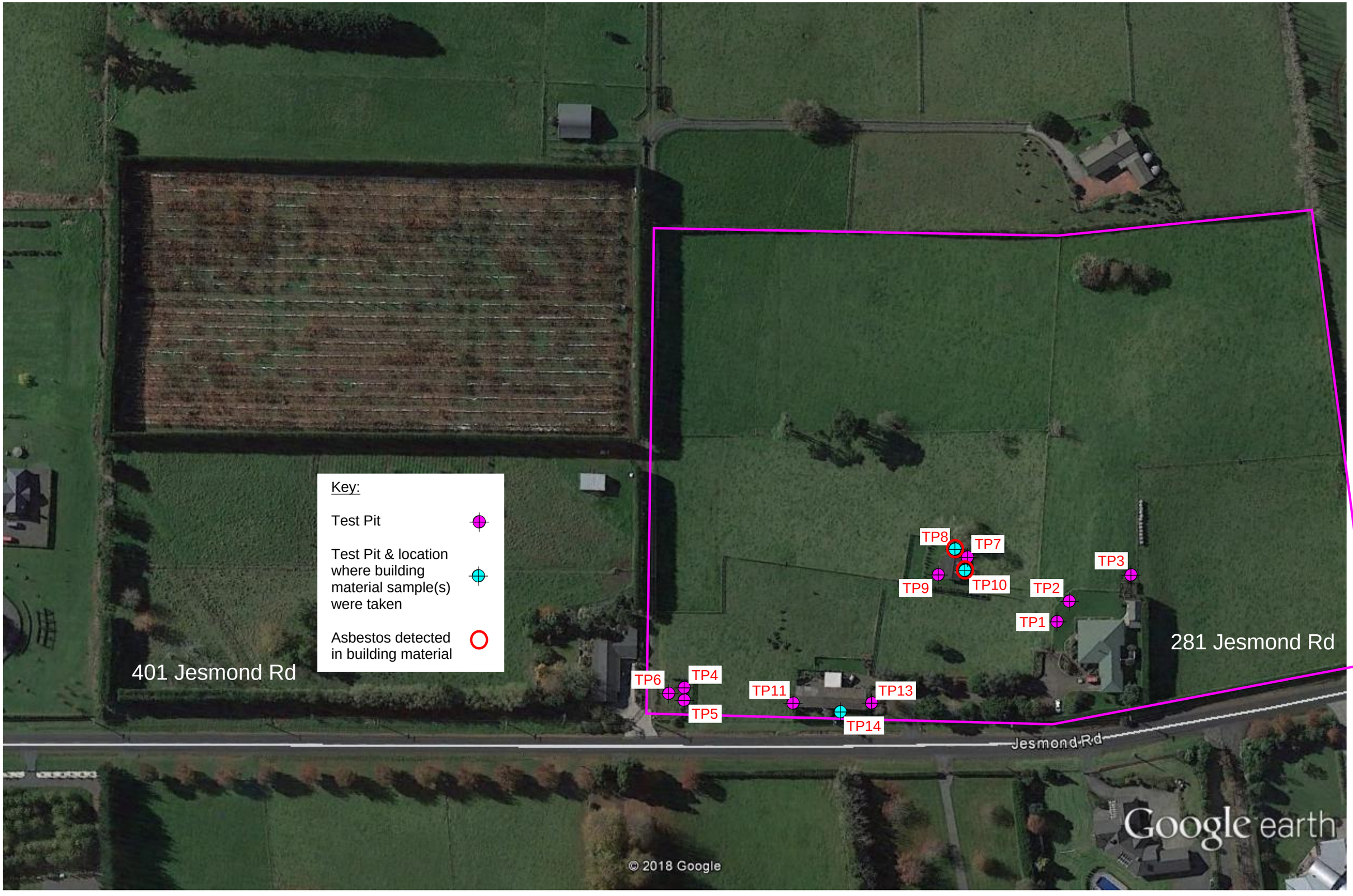
Samples are held at the laboratory after reporting for a length of time depending on the preservation used and the stability of the analytes being tested. Once the storage period is completed the samples are discarded unless otherwise advised by the client.

Keith Benson

Keith Benson HNC Chem
Laboratory Technician - Asbestos

Appendix D

Sampling Locations



Soil Sample Location Plan - Contamination Assessment (27th July 2018)

www.beca.com

Report

Detailed Site Investigation (Contamination), MoE Drury Due Diligence, 401 Jesmond Road

Prepared for Ministry of Education (Client)

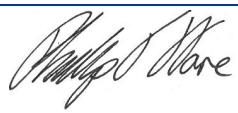
Prepared by Beca Limited (Beca)

31 August 2018

Revision History

Revision Nº	Prepared By	Description	Date
1	Renée Jens	Draft for Review	31/08/2018
2			
3			
4			
5			

Document Acceptance

Action	Name	Signed	Date
Prepared by	Renée Jens		31/08/2018
Reviewed by	Curtis Blyth		31/08/2018
Approved by	Phillip Ware		31/08/2018
on behalf of	Beca Ltd		

Executive Summary

The purpose of this assessment is to conduct a Detailed Site Investigation (contamination) on an area of land in the eastern part of a rural site located at 401 Jesmond Road, Karaka, Auckland.

The land investigated in this report has an approximate area of 22,237 m^2 and is herein referred to as Area A. A site information search has shown that Area A has been used for horticultural activities since 1988, with the development of an orchard and market garden. Area A has never been built upon based on the information reviewed as part of this investigation.

The following Hazardous Activities and Industries List (HAIL) activities have been identified for Area A following the information search:

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

The soil investigation focused on the collection of soil samples across the observed horticultural activities. 32 hand augers were excavated to a maximum depth of 0.5 m bgl. A total of 64 soil samples were collected from all hand auger locations at two regular intervals; 0.1-0.2 m and 0.4-0.5 m. Samples were composited based on depth to form 8 shallow composite samples and 8 deep composite samples.

Soil analytical results of the 8 shallow samples show concentrations of contaminants are below the adopted human health risk and environmental discharge risk criteria. Detectable concentrations of DDE and DDT contamination presents a low risk to construction worker health and future site users for a rural residential / lifestyle block use, which has been chosen conservatively to account for a rural school exposure profile. Due to the typical depth distribution of pesticides being most concentrated in the upper 0.2m of soils, the deeper soil samples were not tested.

Standard management controls would be required comparable with a site with low levels of DDE and DDT. Erosion and sediment controls are considered an effective method in mitigating any environmental risk from the site based on the lack of nearby environmental receptors, low concentrations of pesticides present and immobility of pesticides in the soil column.

Soils are not classified as cleanfill. Off-site disposal will need to be to a facility licenced to accept the materials. Consented ‘cleanfills’ may accept the low concentrations of pesticides present. Any material that is excavated and remains onsite may require consent to remain, it is recommended that such decisions should be made once detailed design is complete and construction works defined.

Based on the results of this investigation, the land disturbance activities and change in land use associated with the proposed development will require resource consent under Regulation 9 of the NESCS as a controlled activity.

Contents

1 Introduction 1
- 1.1 Background 1
- 1.2 Purpose and Scope 1

2 Site Description 3
- 2.1 Site Location and Area 3
- 2.2 Proposed Works 3

3 Environmental Setting 4
- 3.1 Current Land Use 4
- 3.2 Surrounding Land Use 4
- 3.3 Geology 4
- 3.4 Topography 4
- 3.5 Sensitive Receptors/Hydrology 5

4 Information Search 6
- 4.1 Historical Aerial Photographs 6
- 4.2 Auckland Council Information 7
- 4.3 Site Walkover 7
- 4.4 Client Provided Information 8
- 4.5 Summary of Information Search 8

5 Site Investigation Scope and Rationale 9
- 5.1 Contaminants of Potential Concern and Investigation Rationale 9
- 5.2 Soil Sampling Methodology 9

6 Assessment Criteria 11
- 6.1 Assessment of Human Health Risk 11
- 6.2 Assessment of Environmental Risk 11

7 Results 12
- 7.1 Fieldwork Observations 12
- 7.2 Summary of Soil Analytical Results 12

8 Discussion and Risk Assessment 13
- 8.1 Exposure Pathway Assessment 13
- 8.2 Limitations of Site Characterisation 14

9 Development Implications 15
- 9.1 Consents 15

10 Conclusions 17

11 Limitations 18

Appendices

Appendix A

Preliminary Site Investigation – Focus Environmental Services Ltd

Appendix B

Summary of Soil Results

Appendix C

Hill Laboratories Lab Report

Appendix D

Hand Auger Locations

1 Introduction

Beca Limited (Beca) has been commissioned by the Ministry of Education (MoE) to undertake a Detailed Site Investigation (DSI) for part of a site located at 401 Jesmond Road, Karaka, Auckland. MoE plan to construct a new secondary school at this site and this DSI forms part of the due diligence for the proposed school.

1.1 Background

A desktop study (Preliminary Site Investigation (PSI)) was undertaken by Focus Environmental Services Limited (Focus) to understand the potential contamination of the site:

- Preliminary Site Investigation, Auranga Development, Stage B1 Sites, Auckland. Focus Environmental Services Limited, March 2017 (**Appendix A**).

No assessment of methodology, accuracy or validity has been undertaken by Beca for this PSI. No desk based review of potential contamination risk areas has been undertaken by Beca as part of the development of this report. All potential areas of contamination risk have been established from the Focus PSI with MoE placing reliance on this PSI and its findings.

The PSI findings formed the basis of this investigation and are referred to throughout this report.

1.2 Purpose and Scope

The purpose of this investigation was the following:

- Characterise potential contaminants in soils within the development area as a result of current and historical activities, based on the contaminants of concern identified in the Focus PSI.
- Comment on the likely contaminated land consent requirements for the proposed works under the following legislation
  - Auckland Unitary Plan (AUP)
  - Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (NESCS).
- Identify areas of soil contamination which may require management with respect to risks to human health and to the environment based on the contaminants of concern identified in the Focus PSI.
- Provide advice regarding disposal of waste spoil.

The scope of works included a review of the Focus Preliminary Site Investigation report, which included:

- Historical aerial photographs for the site
- A contamination enquiry from Auckland Council including discharge and borehole consents.
- The site property file for information relating to environmental events and activities.
- A site walkover with observation notes and photographs

The review of this PSI informed the ground investigation, which comprised the following:

- Hand excavation of 32 hand augers to a maximum depth of 0.5 m below ground level (bgl).
- Collection of 64 soil samples to make up 16 composite samples; of which 8 composites are for shallow depth (0.1 - 0.2m), and 8 composites for deeper depth (0.4 – 0.5m).
- Screening analysis of 8 composite soil samples at shallow depth (0.1 – 0.2m) with the 8 deeper composites (0.4 – 0.5m) held cold for further analysis if required.

- The 8 composite soil samples were analysed for heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc), organochlorine pesticides (OCP) and organonitro and organophosphorus pesticides (ONOP).
- No potential 'hot spot' areas of potential contamination were identified within the PSI and therefore no targeted sampling was indertaken.

This assessment has been undertaken and reported in general accordance with the *Ministry for the Environment* (MfE) *Contaminated Land Management Guidelines No. 1 – Reporting on Contaminated Sites in New Zealand* (2011) and *MfE Contaminated Land Management Guidelines No. 5 – Site Investigation and Analysis* (2011).

2 Site Description

2.1 Site Location and Area

The site is located at 401 Jesmond Road in Drury, Auckland. The property has the legal description 'Lot 1 DP 139263' with an approximate area of 4.1 ha.

The location of the site is shown in **Figure 1** below.

Figure 1. Location of the site. Source: Auckland Council GeoMaps.

2.2 Proposed Works

The Ministry of Education (MoE) plan to build a new secondary school in Drury West to provide for future population growth. This site has been identified as a potential site to be combined with another neighbouring site for the location of the secondary school.

3 Environmental Setting

3.1 Current Land Use

The site is predominantly used for horticulture. There is a residential dwelling in the south-west corner of the site. A storage shed is situated near the middle of the site towards the southern boundary. The eastern section of the site is an old kiwifruit orchard. The western section of the site is mainly grassland, with what seems to be an old market garden in the centre of the site with mounded earth rows.

3.2 Surrounding Land Use

The majority of the land surrounding the sites are rural residential lifestyle blocks with a mixture of horticultural and agricultural activities. Jesmond Road is immediately adjacent to the site's western boundary. An unsealed, gravelled access-way is situated along the site's southern boundary.

The property directly south of the site has paddocks for livestock. Directly north of the site are large residential property blocks. To the north, east and west of the site are agricultural paddocks. Land north-west of the site consists of residential houses, a possible orchard, and a greenhouse. South west of the site are residential houses.

3.3 Geology

According to the New Zealand Institute of Geological and Nuclear Sciences[1], the underlying geology of the site is '*Pumiceous mud, sand and gravel with muddy peat and lignite: rhyolite pumice, including non-welded ignimbrite, tephra and alluvia'*. The main rock type is sand.

3.4 Topography

The site is relatively flat with a slight slope towards the north east corner of the site. The topography of the site and surrounding area is displayed in **Figure 2** below.

[1] Heron D. W. (custodian) 2014. Geological Map of New Zealand 1:250 000. Institute of Geological & Nuclear Sciences.

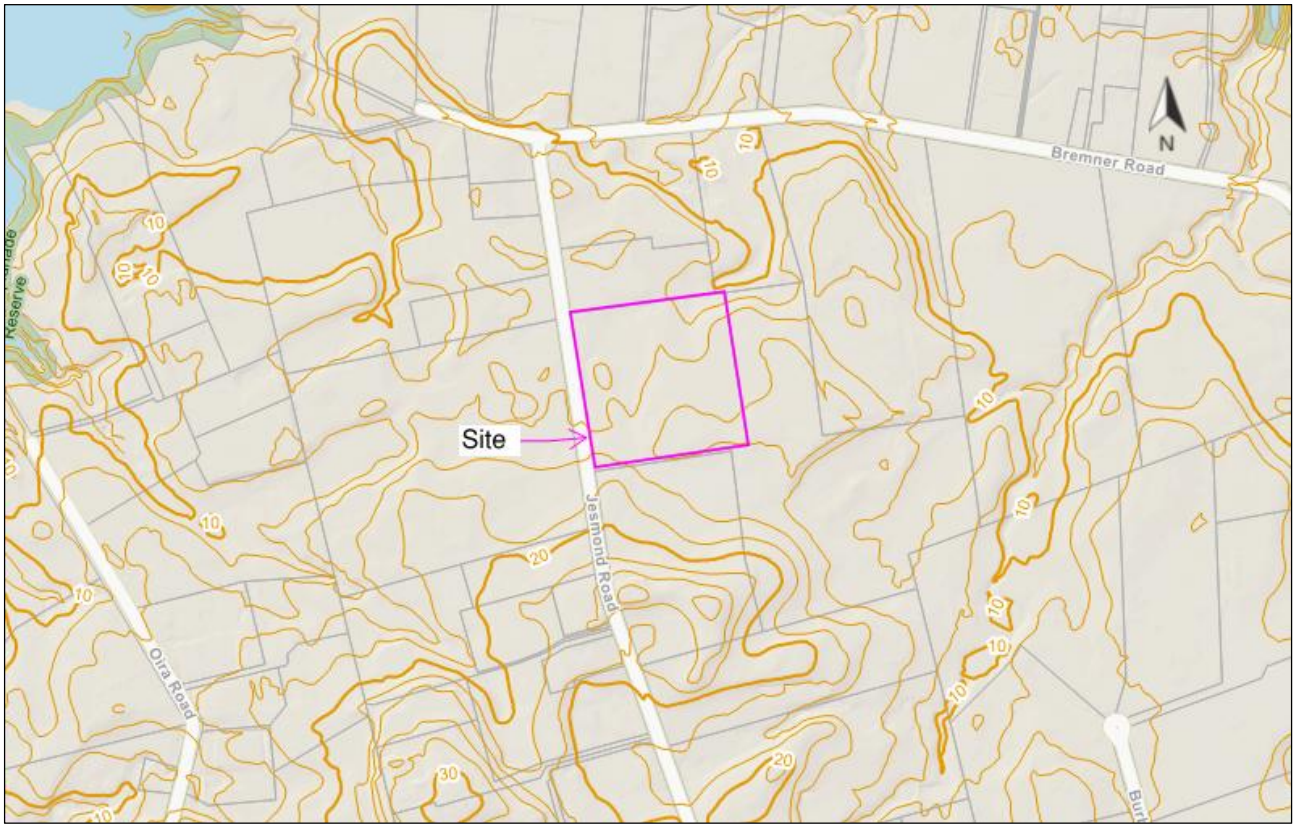


Figure 2. Topography of the site and surrounding area. Source: Auckland Council GeoMaps

3.5 Sensitive Receptors/Hydrology

Drury Creek is the nearest waterbody, located approximately 735 m north of the site. A tributary of Drury Creek is located within the north-west portion of the site. Another tributary of Drury Creek is located about 390 m east of the site. This feeds into what appeared to be a man-made lake (see **Section 4.1**) which is located approximately 400 m south-east of the site.

Oira Creek is located approximately 880 m west of the site. Approximately 910 m east of the site is Ngakoroa Stream which connects to Drury Creek.

4 Information Search

4.1 Historical Aerial Photographs

Historical aerial photographs for the site were obtained and reviewed by Focus Environmental Services Ltd[2] and also by a Beca environmental scientist. The aerial photographs were reviewed to identify any changes in land use activities on the site and surrounding properties, with the following observations made:

Table 1. Observations of historic aerial photos obtained by Focus Environmental Services Ltd.

Year	Site	Observations
1960	The site	■ The site appears to be undeveloped and used for rural purposes. ■ Jesmond Road is seen adjacent to the western boundary of the site.
	Surrounding Properties	■ The surrounding properties are predominantly rural in use.
1980 & 1981	The site	■ The site appears to be relatively unchanged from the 1960 historical photograph, however, there appears to be a structure present towards the south-western corner of the site.
	Surrounding Properties	■ There appear to be no appreciable changes to the surrounding properties.
1988	The site	■ The site appears to be utilised for horticultural purposes. ■ The site is divided into four vertical sections which appear to be bordered by shelter belts. The three eastern sections are split into even thirds. ■ A residential dwelling can be seen in the south-western corner of the site, adjacent to Jesmond Road. The previous structure has been removed.
	Surrounding Properties	■ The surrounding land use is predominantly rural residential with the exception of the properties located to the north-west and south-west which appear to be utilised for horticultural purposes. ■ What appears to be a racing oval is present to the east of the site
1996	The site	■ The site appears relatively unchanged from the 1988 historical photograph. ■ Some alterations have been made to the eastern portion of the site for what appears to be the removal of some of the shelter belts which separated the thirds.
	Surrounding Properties	■ The surrounding land is predominantly rural residential in use. ■ It appears a small lake has been created to the south east of the site
2003-2004, 2006	The site	■ There appears to be no appreciable changes to the site or surrounding properties.
	Surrounding Properties	
2008	The site	■ There appear to be no changes to the site.
	Surrounding Properties	■ A rectangular area in the north of the property directly south of the site appears to have been converted from grassland, however it is hard to decipher from the photo what the ground cover is. ■ There appear to be no appreciable changes to the surrounding properties.
2010-2011	The site	■ There are no appreciable changes to the site. ■ The area of land in the middle of the site has horizontal lines (similar to plough lines) throughout the area.

[2] "*Preliminary Site Investigation, Auranga Development, Stage B1 Sites, Auckland*" by Focus Environmental Services Ltd, March 2017

Year	Site	Observations
		■ In the eastern area of the site, within the middle of the horticulture area there appears to be a small shed by the site's southern boundary.
	Surrounding Properties	■ Surrounding land appears to be used for a mixture or residential, horticultural and agricultural purposes.
2016	The site	■ There appears to be no appreciable changes to the sites or surrounding properties.
	Surrounding Properties	

4.2 Auckland Council Information

4.2.1 Site Contamination Enquiry

The Auckland Council site contamination enquiry contained no records relating to the site. Borehole and discharge consents were included in the report but were not located on the site.

4.2.2 Property File

The electronic property file for the site was viewed by Focus Environmental Services as part of the PSI[3]. Information relevant to the site history and potential contamination sources has been retrieved and reviewed below. The relevant property file information from the PSI is as follows:

Table 2. Relevant property file information for the site (401 Jesmond Road)

Proposed Activity	Application Number	Date
Re-site Dwelling	D18472	18/07/1986
Erect Double Garage	F63610	01/11/1988
Erect New Farm Building	15757	07/11/2000
Erect New Packhouse/Garage	19275	01/04/2008

4.3 Site Walkover

The site walkover was carried out by Focus Environmental Services Limited personnel on the 26th January 2017. The site walkover confirmed what was described in **Section 3.1**. In addition, the following was noted:

- A concrete driveway extended from Jesmond Road to the dwelling in the south-west corner of the site, where there was also an attached garage and concrete paving area.
- At the rear of the dwelling was a domestic garden that contained a rainwater storage tank, vegetable patches, garden pond and some fruit trees. To the north of the domestic area is a garden shed with a pump house.
- An overgrown paddock is situated directly to the north and east of the house.
- To the east of the house is a machinery storage shed in the south-east corner of the paddock.
- In the centre of the paddock, towards the paddocks east boundary was a fenced off, overgrown market garden.
- Adjacent to the paddock, further east of the house is an orchard bordered by a shelter belt.

[3] "*Preliminary Site Investigation, Auranga Development, Stage B1 Sites, Auckland*" by Focus Environmental Services Ltd, March 2017

- Towards the southern boundary, in the middle of the orchard was a small, galvanised hut which contained a seating bench and old cardboard box packaging. This shed appeared to be a rain shelter area only for orchard workers with no indication of storage of chemicals, mixing apparatus or a water source. This area was ruled out as being a potential chemical storage area and was not assessed further.
- Rolls of plastic orchard covers were situated in the south-east corner of the site.

4.4 Client Provided Information

A preliminary site investigation (PSI) of the site (and others) titled "*Preliminary Site Investigation, Auranga Development, Stage B1 Sites, Auckland*" was undertaken by Focus Environmental Services in March 2017. The PSI noted that there were no previous environmental investigations relating to soil or groundwater contamination associated with the site.

4.5 Summary of Information Search

A review of the PSI has found that a portion of the site has been used for horticultural purposes since 1988.

The area of concern is the possible kiwifruit orchard in the east of the site and a potential market garden (present since 1996) near the centre of the site. These two activities may have led to the possible contamination of soils within the site. This area of further investigation (Area A) is displayed in **Figure 3** below.

Figure 3. Area within the site identified for possible contamination. Source: Auckland Council GeoMaps.

5 Site Investigation Scope and Rationale

5.1 Contaminants of Potential Concern and Investigation Rationale

Review of the site historical information has identified the following land use activities which may have resulted in the contamination of soil and/or groundwater in Area A. Contaminants of potential concern associated with these activities have also been identified in **Table 3** below. These land use activities are listed on the Ministry for the Environment's (MfE) Hazardous Activities and Industries List (HAIL).

Table 3. Contaminants of Potential Concern

Activity	HAIL Code	Contaminants of Potential Concern
■ Horticulture – orchard and market garden; use of pesticides.	■ A10: Persistent pesticide bulk storage or use including sport turfs, market gardens, orchards, glass houses or spray sheds.	■ Metals including arsenic, lead, mercury, and copper. ■ Organic agrichemicals including organochlorine pesticides, organophosphate pesticides, herbicides, fungicides, carbamates, acidic herbicides, and synthetic pyrethroids.

A systematic sampling approach was chosen to obtain an evenly spaced coverage of the market garden and orchard. Soil samples were collected from each sampling location at regular intervals, with a shallow (0.1 – 0.2 mbgl) and deeper (0.4 – 0.5 mbgl) sample taken. Samples were then composited with adjacent sample sites in a uniform manner.

5.2 Soil Sampling Methodology

5.2.1 Summary of Field Work

The soil investigation was undertaken on the 1st and 2nd August 2018. A total of 64 soil samples were collected from 32 hand auger locations. Soil samples were collected at a depth of 0.1 – 0.2 m and at 0.4 – 0.5 m at each hand auger location.

Soil samples were collected directly by hand from the hand auger. A clean pair of nitrile gloves was worn for each sample to prevent cross-contamination. Samples were placed in laboratory supplied plastic and glass jars as appropriate and chilled prior to dispatch to R J Hill Laboratories Ltd (Hill Laboratories).

All sampling equipment was decontaminated between sampling locations using DECON 90 and distilled water.

All chemical laboratory analyses were undertaken by Hill Laboratories. A copy of the Hill Laboratories reports are included in **Appendix C**. All samples were accompanied with a Chain of Custody (COC) form which detail the required handling and testing instructions. Sample COC's can be provided on request.

Field sampling and relevant sampling management procedures were undertaken in general accordance with the MfE *Contaminated Land Management Guidelines No.5 – Site Investigation and Analysis (2011).*

A total of 16 composite samples were taken, with all 8 shallow composites analysed for the following:

- Organochlorine pesticides (OCP);
- Organonitro & phosphate pesticides (ONOP); and

- Heavy metals; arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc.

Soil samples were selected for analysis based on spatial coverage and visual observations. Soil samples were analysed to provide an understanding of the potential extent of contamination. Soil samples not selected for analysis were held cold at the laboratory. A data summary sheet of the results is presented in **Appendix B**.

6 Assessment Criteria

6.1 Assessment of Human Health Risk

The adopted assessment criteria for the investigation have been selected in accordance with the hierarchy defined by *Ministry for the Environment* (MfE) *Contaminated Land Management Guidelines No.*2 (MfE, 2002) and are summarised below. Assessment criteria for a rural/lifestyle block scenario have been adopted as a conservative approach to address the future secondary school exposure profile.

- *Resource Management (National Environment Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011. Soil Contaminant Standards for a rural/lifestyle block land use scenario was adopted.*
- *Regional Screening Levels, US Environmental Protection Agency (USEPA, 2012). Values applicable to a residential land use scenario was adopted.*

6.2 Assessment of Environmental Risk

The risk posed by the discharge of contaminants in soil has been assessed against the following documents:

- Auckland Regional Council, 2002. Background Concentrations of Inorganic Elements in Soil from the Auckland Region. Background ranges for metals in volcanic range soils. Hereinafter referred to as the Auckland Background Concentrations.
- Auckland Council, 2016. Auckland Unitary Plan (Operative in part). Table E30.6.1.4.1 Permitted Activity Criteria.

7 Results

7.1 Fieldwork Observations

- Orange brown silt with some clay was observed in the majority of soil samples.
- Various locations within the orchard had very moist soil samples.
- The market garden soil samples were dry.
- The market garden was overgrown with broken fencing. The orchard also appeared unused with broken wires, with a lay out similar to a kiwifruit orchard.

Hand auger locations **Appendix D** and a summary of the soil sample results are provided in **Appendix B**.

7.2 Summary of Soil Analytical Results

7.2.1 Metals

A total of 8 composite soil samples were analysed for metals. In summary:

- No samples exceeded the adopted human health risk assessment criteria.
- No samples exceeded the adopted environmental risk assessment criteria.
- One out of the 8 composite samples exceeded background levels for volcanic soils in the Auckland Region for cadmium. This exceedance was in the market garden, composite MGC1.

7.2.2 Organochlorine Pesticides (OCP)

A total of 8 composite soil samples were analysed for OCP. In summary:

- No samples exceeded the adopted human health risk assessment criteria.
- No samples exceeded the adopted environmental risk assessment criteria.
- Five samples detected DDE above laboratory detection limits.
- Two samples detected DDT above laboratory detection limits.

7.2.3 Organonitro & phosphorus Pesticides (OCOP)

A total of 8 composite soil samples were analysed for ONOP. In summary:

- All samples were below laboratory detection limits for ONOP.

8 Discussion and Risk Assessment

Concentrations of all detected contaminants were below the adopted criteria for the protection of human health and environmental criteria.

One sample exceeded background criteria for cadmium, but presents a low risk to human health and environmental receptors.

Five out of the eight composite samples had low concentrations of DDE detected (0.018 - 0.063mg/kg) compared to the respective assessment criteria for DDE of 2.0mg/kg. Two of these samples also had low concentrations of DDT detected (0.015 - 0.017mg/kg) compared to the respective assessment criteria for DDT of 45mg/kg. The presence of low level DDE and DDT contamination does not present a risk to construction worker health, nor to the health of future site users for a rural/lifestyle block and residential use which has been chosen as a conservative exposure assessment for the future secondary school land use.

Standard management controls would be required to commensurate with a site with low levels of DDE and DDT. The controls will apply to the whole of Area A.

Soils are not classified as cleanfill. Disposal of soil offsite will need to be to a facility licenced to accept the materials. Consented 'cleanfills' may accept the low concentrations of pesticides present.

8.1 Exposure Pathway Assessment

A Conceptual Site Model (CSM) (see **Table 4** below) was developed to inform the investigation and to describe the relationship between sources of contamination on site, the human and environmental receptors that may be exposed to those contaminants in the context of rural residential / lifestyle block use of the site, and the pathways by which those receptors may be exposed.

Overall, recorded soil contaminant concentrations will not prohibit the proposed development of the site.

Table 4. Conceptual Site Model

Source	Receptor	Pathway	Pathway Complete?
Low levels of DDE and DDT contaminants from pesticide application	Construction workers	Exposure of workers to contaminants in soils and groundwater during site redevelopment – dermal contact, ingestion or inhalation of dust/vapours.	Incomplete Pathway – concentrations of contaminants below human health risk criteria. Management Plan will be in place.
	Future site users	Exposure of future site users to contaminants in soils – dermal contact, ingestion or inhalation of dust/vapours.	Incomplete Pathway – concentrations of contaminants below rural residential / lifestyle block criteria.
	General public	Exposure of general public to contaminants in soils– dermal contact, ingestion or inhalation of dust/vapours.	Incomplete Pathway - Concentrations of contaminants are below rural residential / lifestyle

Source	Receptor	Pathway	Pathway Complete?
			block criteria. No public access to the site. Dust to be controlled during development.
	Groundwater resources for public consumption	Leaching and migration of soil contaminants into groundwater.	Incomplete Pathway – concentrations of contaminants below human health risk criteria and no nearby groundwater wells for consumption reported.
	Surface water	Sediment and runoff directly into surface water.	Incomplete Pathway – No nearby surface water receptors and contaminants identified immobile. Erosion and sediment control will suffice.
		Migration of soil contaminants into surface water through shallow groundwater discharging into Drury Creek	Incomplete Pathway – Contaminants identified immobile in soil column, leachability considered low.

8.2 Limitations of Site Characterisation

Characterisation of subsurface conditions is dependent on the number of sample locations, methods of sampling and the uniformity of subsurface conditions. The accuracy of this characterisation is therefore limited by the Scope of works undertaken in accordance with the MfE Guidelines. There is the possibility that contamination present on the site has not been described. Whilst contaminant concentrations may be estimated at chosen sample locations, conditions at any location removed from the specific points of sampling can only be inferred on the basis of geological and hydrogeological conditions and the nature and the extent of identified contamination. Subsurface conditions can vary, resulting in uneven distribution of contaminants across a site which cannot be defined by these investigations. In addition, with time, the site conditions and environmental guidelines could change so that the reported assessments and conclusions are no longer valid. The conclusions of this report are made on the basis that the site conditions revealed by the investigation are representative of the actual conditions across the site at the time of sampling.

9 Development Implications

9.1 Consents

9.1.1 National Environmental Standard

The *Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011* (NESCS) applies to land as per clause 5(7):

"Land covered:
(7) The piece of land is a piece of land that is described by 1 of the following:
(a) an activity or industry described in the HAIL is being undertaken on it;
(b) an activity or industry described in the HAIL has been undertaken on it;
(c) it is more likely than not that an activity or industry described in the HAIL is being or has been undertaken on it."

The following HAIL activities have been identified for this site:

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

The NESCS applies to certain activities taking place on HAIL land. The following activities are triggered for this site:

- Disturbing Soil
- Change in Land Use

Soil Disturbance

Under Regulation 8(3) of the NESCS, soil disturbance of up to 25 m^3 per 500 m^2 and disposal of up to 5 m^3 per 500 m^2 is allowed as a Permitted Activity. For this site approximately 22,237 m^2 has been identified as potentially contaminated from horticulture activities. The total volume of soil disturbance is therefore 1,112 m^3, of which 223 m^3 can be disposed of offsite, as a Permitted Activity. The volume of soil to be disturbed is not yet known, however is anticipated to be above these thresholds. A Controlled Activity consent is therefore required under Regulation 9 of the NESCS to disturb and dispose of soil from Area A.

Change in Land Use

The current land use will be changing from what is deemed productive land (horticulture) to a school (conservatively classified as 'rural residential'). Soil contamination onsite has been determined to not exceed any applicable standard of Regulation 7 of the NESCS and this DSI is considered thorough and appropriate in assessing any potential risk present with the aforementioned change in land use. A Controlled Activity consent is therefore required under Regulation 9 of the NESCS for this change in land use.

9.1.1 Regional Plans

Under the Auckland Council Unitary Plan Operative in part, Area A is subject to 'Section E30 Contaminated land' which addresses the effects of the discharge of contaminants from contaminated land or land containing elevated levels of contaminants into air, or into water, or onto or into land pursuant to section 15 of the Resource Management Act 1991.

The proposed works comply with Standard E30.6.1.2 as soil testing has indicated that elements in the soil are within the permitted activity criteria range.

10 Conclusions

- Review of the PSI has shown that an area of the site ('Area A') has been used for horticultural purposes since 1988, with the establishment of an orchard and later an area of land used as a market garden.
- The key land use activity that has been identified that may have resulted in contamination was horticultural activities and the potential broad application of pesticides to crops (HAIL A10).
- The soil investigation focused on the collection of soil samples evenly throughout Area A. 32 hand auger locations were extended to a maximum depth of 0.5 m. A total of 64 soil samples were collected to create 16 composite samples.
- Soil analytical results show the concentrations of contaminants are below the adopted human health risk and environmental discharge risk criteria.
- The presence of low level DDE and DDT contamination presents a low risk to construction worker health, nor to the health of future site users for a rural residential / lifestyle block use.
- Standard management controls (erosion and sediment control) would be required commensurate with a site with low levels of DDE and DDT. The controls will apply to the whole of Area A.
- Soils are not classified as cleanfill. Any off-site disposal required will need to be to a facility licenced to accept the materials. Consented 'cleanfills' may accept the low concentrations of pesticides present.
- Due to the inability of pesticides to migrate through the soil column it is considered that appropriate erosion and sediment control measures will adequately prevent the loss of sediment from the site and effectively mitigate any potential risk that may be present to environmental receptors during the soil disturbance works.
- The soil disturbance activities and change in land use associated with the proposed development will require resource consent under Regulation 9 of the NESCS as a controlled activity.

11 Limitations

This report has been prepared by Beca Ltd (Beca) solely for the Ministry of Education (Client). Beca has been requested by the Client to provide a Detailed Site Investigation (Contamination) at 401 Jesmond Road, Karaka, Auckland. This report is prepared solely for the purpose of assessing the potential soil contamination (Scope). The contents of this report may not be used by the Ministry of Education for any purpose other than in accordance with the stated Scope.

This report is confidential and is prepared solely for the Client. Beca accepts no liability to any other person for their use of or reliance on this report, and any such use or reliance will be solely at their own risk.

In preparing this report Beca has relied on key information from Focus Environmental Services Ltd which included historical aerial photographs, and property information held by Auckland Council.

This report contains information obtained by inspection, sampling, testing or other means of investigation. Unless specifically stated otherwise in this report, Beca has relied on the accuracy, completeness, currency and sufficiency of all information provided to it by, or on behalf of, the Client or any third party, including the information listed above, and has not independently verified the information provided. Beca accepts no responsibility for errors or omissions in, or the currency or sufficiency of, the information provided. Publicly available records are frequently inaccurate or incomplete.

The contents of this report are based upon our understanding and interpretation of current legislation and guidelines (“Standards”) as consulting professionals, and should not be construed as legal opinions or advice. Unless special arrangements are made, this report will not be updated to take account of subsequent changes to any such Standards.

This report should be read in full, having regard to all stated assumptions, limitations and disclaimers.

Appendix A

Preliminary Site Investigation – Focus Environmental Services Ltd

Note: Material relevant to this site DSI have been cut from the original PSI due to the size of the original report. The original PSI can be provided on request.

PRELIMINARY SITE INVESTIGATION
AURANGA DEVELOPMENT
STAGE B1 SITES
AUCKLAND

For the Attention of:

Karaka and Dury Limited

Reference: FES 0772.001 March 2017

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	Preliminary Site Investigation Auranga Development, Drury, Auckland.
Project Number	0772.001
File Reference	Z:\2017 Jobs\Auranga Development Stages B & C\01 Report\0772.001_PSI_SD
Date	March 2017

Author

Shane Dolan
Environmental Scientist

Reviewed

Sam Woolley
Senior Environmental Scientist

Authorised

David O'Reilly
Principal Environmental Consultant

Distribution List

Parties	Copies
Karaka and Drury 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
3.1	321 Bremner Road	5
3.2	325 Bremner Road	5
3.3	329 Bremner Road	5
3.4	333 Bremner Road	5
3.5	385 Bremner Road	5
3.6	389 Bremner Road	5
3.7	393 Bremner Road	5
3.8	403 Bremner Road	6
3.9	415 Bremner Road	6
3.10	420-417 Bremner Road	6
3.11	421 Bremner Road	6
3.12	Esplanade Reserve	6
3.13	221 Jesmond Road	6
3.14	235 Jesmond Road	6
3.15	281 Jesmond Road	6
3.16	341 Jesmond Road	7
3.17	401 Jesmond Road	7
3.18	451 Jesmond Road	7
3.19	30 Burberry Road	7
3.20	38 Burberry Road	7
3.21	41 Burberry Road	7
4.0	Geology and Hydrology	8
5.0	Regulatory Framework	9
5.1	The National Environmental Standard	9
5.2	Auckland Unitary Plan (Operative in Part)	9
6.0	Site History	10
6.1	Historical Aerial Photographs	10
6.2	Previous Investigations	22
6.3	Auckland Council Property File Search	23
6.4	Auckland Council Site Contamination Enquiry	28

6.5	Historical Certificate of Title Review	28
6.6	Onsite Interview	28
7.0	Site Walkover and Inspection	29
7.1	321 Bremner Road	29
7.2	325 Bremner Road	30
7.3	329 Bremner Road	30
7.4	333 Bremner Road	31
7.5	385 Bremner Road	32
7.6	389 Bremner Road	32
7.7	393 Bremner Road	33
7.8	403 Bremner Road	33
7.9	415 Bremner Road	34
7.10	420-417 Bremner Road	35
7.11	421 Bremner Road	36
7.12	Esplanade Reserve	36
7.13	221 Jesmond Road	37
7.14	235 Jesmond Road	38
7.15	281 Jesmond Road	38
7.16	341 Jesmond Road	39
7.17	401 Jesmond Road	40
7.18	451 Jesmond Road	40
7.19	30 Burberry Road	41
7.20	38 Burberry Road	41
7.21	41 Burberry Road	42
8.0	Asbestos Management	43
9.0	Potentially Contaminating Activities or Land Uses	44
9.1	321 Bremner Road	44
9.2	325 Bremner Road	46
9.3	329 Bremner Road	48
9.4	333 Bremner Road	50
9.5	385 Bremner Road	52
9.6	389 Bremner Road	54
9.7	393 Bremner Road	56
9.8	403 Bremner Road	58
9.9	415 Bremner Road	60

9.10	420-417 Bremner Road	62
9.11	421 Bremner Road	64
9.12	Esplanade Reserve	66
9.13	221 Jesmond Road	68
9.14	235 Jesmond Road	70
9.15	281 Jesmond Road	72
9.16	341 Jesmond Road	74
9.17	401 Jesmond Road	76
9.18	451 Jesmond Road	78
9.19	30 Burberry Road	80
9.20	38 Burberry Road	82
9.21	41 Burberry Road	84
10.0	Conclusions and Recommendations	86

Figures

Figure 1 – Site Location Plan
Figure 2-1 – Site Features Plan: 321 Bremner Road
Figure 2-1A – Site Features Plan: 321 Bremner Road
Figure 2-2 – Site Features Plan: 325 Bremner Road
Figure 2-3 – Site Features Plan: 329 Bremner Road
Figure 2-3A – Site Features Plan: 329 Bremner Road
Figure 2-4 – Site Features Plan: 333 Bremner Road
Figure 2-4A – Site Features Plan: 333 Bremner Road
Figure 2-5 – Site Features Plan: 385 Bremner Road
Figure 2-6 – Site Features Plan: 389 Bremner Road
Figure 2-6A – Site Features Plan: 389 Bremner Road
Figure 2-7 – Site Features Plan: 393 Bremner Road
Figure 2-8 – Site Features Plan: 403 Bremner Road
Figure 2-9 – Site Features Plan: 415 Bremner Road
Figure 2-9A – Site Features Plan: 415 Bremner Road
Figure 2-10 – Site Features Plan: 420-417 Bremner Road
Figure 2-11 – Site Features Plan: 421 Bremner Road
Figure 2-12 – Site Features Plan: Esplanade Reserve
Figure 2-12A – Site Features Plan: Esplanade Reserve
Figure 2-12B – Site Features Plan: Esplanade Reserve
Figure 2-12C – Site Features Plan: Esplanade Reserve
Figure 2-13 – Site Features Plan: 221 Jesmond Road
Figure 2-14 – Site Features Plan: 235 Jesmond Road
Figure 2-15 – Site Features Plan: 281 Jesmond Road
Figure 2-16 – Site Features Plan: 341 Jesmond Road
Figure 2-17 – Site Features Plan: 401 Jesmond Road
Figure 2-18 – Site Features Plan: 451 Jesmond Road
Figure 2-19 – Site Features Plan: 30 Burberry Road
Figure 2-20 – Site Feature Plan: 38 Burberry Road
Figure 2-21 – Site Feature Plan: 41 Burberry Road

Appendices

Appendix A – Site Contour Plans

Appendix B – Environment HAIL

Appendix C (1) – Historical Site Photographs

Appendix C (2) – Historical Site Photographs

Appendix D – Site Contamination Enquiry

Appendix E – Historic Certificate of Title

Appendix F – Site Inspection Photographs

Executive Summary

Focus Environmental Services Limited was contracted by Karaka & Drury Consultant Limited to carry out a Preliminary Site Investigation of the 21 properties located at Bremner Road, Jesmond Road and Burberry Road, Drury, Auckland forming the Auranga Development.

This investigation was completed to provide information on potential contamination at the sites as a result of historical and/or current land uses, and may be used to support an application to develop the site.

This Preliminary Site Investigation 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).

The history of the site was researched by Focus Environmental Services personnel, which involved a review of the available historical aerial photographs of the site, a review of the Auckland Council property file, a review of the historical certificate of title and a contaminated sites enquiry to Auckland Council. During the review of the available information any potentially contaminating activities or land uses were identified.

Following the desk top assessment, the sites were visited and a site inspection and walk over was carried out. The sites were inspected by Focus Environmental Services Limited personnel on dates between the 24th of January 2017 and the 3rd of February 2017. During the site inspection, any potentially contaminating activities or land uses were identified.

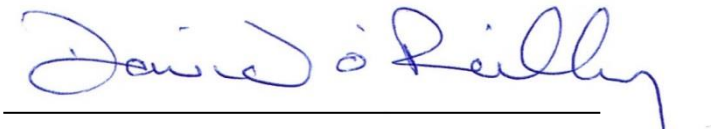
In summary, following the desk top assessment and site inspection and walkover, evidence of burning, potential spray race operations and storage of potentially treated timber were noted for 321 Bremner Road; evidence of hydrocarbon contamination, evidence of microbiological contamination and burning of potentially treat timber furniture were noted for 325 Bremner Road; evidence of burning, suspected uncertified fill material and a mechanical workshop were noted for 329 Bremner Road; potentially uncertified fill material, evidence of burning, storage of potentially treated timber, and evidence of fuel storage was noted for 333 Bremner Road; potential spray race operations and potential hydrocarbon contamination were noted for 389 Bremner Road; a single area of burning was noted for 403 Bremner Road; potential spray race operation were noted for 415 Bremner Road; storage of potentially treated timber was noted at 420-417 Bremner Road; evidence of horticultural activities were noted at 421 Bremner Road; evidence of microbiological contamination and evidence of potential ACM ground contamination were noted for the Esplanade Reserve; evidence of former horticultural activities, evidence of microbiological contamination, burning and potentially uncertified fill materials were noted for 221 Jesmond Road; evidence of rubber shaving on the base of the training arena were noted for 235 Jesmond Road; evidence of burning, evidence of potentially uncertified fill material, suspected spray race operations and potential ACM ground contamination were noted for 281 Jesmond Road; evidence of horticultural activities and potentially uncertified fill material were noted for 341 Jesmond Road; evidence of horticultural activities were noted for 401 Jesmond Road; evidence of horticultural activities and fuel storage were noted for 451 Jesmond Road. No potentially contaminating land uses and/or activities were identified at the site at 389 Bremner Road, 393 Bremner Road, 385 Bremner Road, 30 Burberry Road and 41 Burberry Road Drury.

The information obtained of the sites history and from the site inspection and walk over was assessed to determine if any potential hazardous activities listed on the Hazardous Activities and Industries List (HAIL) had occurred on site as a result of past or current land use.

Due to the potential sources of contamination identified at the above sites it is considered that there is evidence to suggest that an activity outlined in the HAIL list has been, or is currently being, carried out on the following sites; 321 Bremner Road, 325 Bremner Road, 329 Bremner Road, 333 Bremner Road, 403 Bremner Road, 415 Bremner Road, 420-417 Bremner Road, 421 Bremner Road, 221 Jesmond Road, 235 Jesmond Road, 281 Jesmond Road, 341 Jesmond Road, 401 Jesmond Road, 451 Jesmond Road and 38 Burberry Road.

Prior to the development of the areas of the site where potentially contaminating land uses and/or activities have taken place, a detailed site investigation is recommended. The detailed site investigation would confirm if the identified land uses and/or activities have affected the site soils and will confirm the consenting requirements for these areas of the site.

Submitted by,



David O'Reilly
Principal Environmental Consultant
Focus Environmental Services Limited

3.16 341 Jesmond Road

The property at 341 Jesmond Road is undulating with the highest point of the site occurring where the residential area is located.

An unnamed tributary to the Drury Creek is located approximately 20m north of the site.

3.17 401 Jesmond Road

The property at 401 Jesmond Road is predominantly flat with a gradual slope towards the north-eastern corner of the site.

An unnamed tributary of the Drury Creek extends through the north-western portion of the site.

3.18 451 Jesmond Road

The property at 451 Jesmond Road is predominantly flat.

An unnamed tributary of the Drury Creek extends through the south-eastern portion of the site.

3.19 30 Burberry Road

The property at 30 Burberry Road is undulating with the highest point of the site occurring where the residential area is located.

An unnamed tributary of the Drury Creek extended through the north-western corner of the site.

3.20 38 Burberry Road

The property at 38 Burberry Road is undulating with a gradual slope towards a pond area in the central portion of the site.

An unnamed tributary of the Drury Creek extends through the central portion of the site

3.21 41 Burberry Road

The property at 41 Burberry Road is predominantly flat.

An unnamed tributary of the Drury Creek is located approximately 130m west of the site.

4.0 Geology and Hydrology

Published geological maps[1] indicate the sites of the Auranga Development are typically underlain by alluvial deposits of the Puketoka Formation. A description of the underlying geologies is presented in Table 2 below.

Table 2: Geology: Auranga Development, Drury.

Key name	Late Pliocene to Middle Pleistocene pumiceous river deposits
Simple name	Neogene sedimentary rocks
Main rock name	Sand
Description	Pumiceous mud, sand and gravel with muddy peat and lignite: rhyolite pumice, including non-welded ignimbrite, tephra and alluvia
Subsidiary rocks	Mud gravel peat lignite tephra pumice
Key group	Late Pliocene to Middle Pleistocene sediments
Stratigraphic lexicon name	Puketoka Formation
Absolute age (min)	0.071 million years
Absolute age (max)	3.6 million years
Rock group	Sandstone
Rock class	Clastic sediment
Key name	Late Pliocene to Middle Pleistocene pumiceous river deposits

No groundwater investigation has been undertaken as part of this investigation and the nearest surface water in each case is presented in Section 3 above.

[1] 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 1st 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 ($SCS_{(health)}$), for a variety of land use scenarios along with reference to best practice reporting documents.

The Ministry for the Environment HAIL is presented as Appendix B.

5.2 Auckland Unitary Plan (Operative in Part)

The contaminated land rules of the Auckland Unitary Plan (Operative in Part) (AUP Op in Part) have immediate legal effect following its notification. As the AUP Op in Part was notified on the 15th of November 2016 the contaminated land rules must be considered.

In brief, the objective of the AUP Op in Part 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 AUP Op in Part apply when the land contains contaminants above those levels specified in Table E30.6.1.4.1 of Chapter E30 of the AUP Op in Part.

6.0 Site History

The history of the site was researched by Focus Environmental Services personnel, which involved a review of the available historical aerial photographs of the site, a review of the Auckland Council Property file, a review of the historical Certificate of Title and a contaminated sites enquiry to Auckland Council.

6.1 Historical Aerial Photographs

Descriptions of the historical aerial photographs for the subject sites are presented in Tables 3-23 below. The historical site photographs are presented in Appendix C.

Table 3: Historical Photographs: 321 Bremner Road.

Date	Description
1960, 1980 & 1981	The 1960, 1980 & 1981 historical photograph show the subject site undeveloped and in use for rural purposes. No structure can be observed across the site. The Drury Creek can be seen to the north of the subject site while Bremner Road can be seen to the south of the site. The surrounding properties are predominantly rural in use.
1988	The 1988 historical photographs show the construction of a dwelling in the southern portion of the site. The remaining areas to the north are undeveloped and in use as grazing paddocks. The surrounding land is predominantly rural residential in use.
1996, 2006, 2008, 2012 & 2016	The 1996 – 2016 historical photographs show the subject site generally as it appeared during the site walk over and inspection. From the 1996 a second garage can be in the south-eastern corner of the residential area. The surrounding land is unchanged from rural residential in use.

See Appendix C (1)

Table 4: Historical Photographs: 325 Bremner Road.

Date	Description
1960	The 1960 historical photograph shows what appears to be two agricultural buildings in the south-eastern portion of the site. A milking parlour and cow shed are located on the northern boundary of the site. The surrounding properties are predominantly rural in use.
1980 & 1981	The 1980 & 1988 historical photographs show the subject site relatively unchanged from the 1960 historical photograph with the exception of the construction of a residential dwelling in the south-eastern portion of the site. The surrounding land uses are predominantly rural in use.
1988, 1996, 2001, 2006, 2008, 2012 & 2016	The 1988 - 2016 historical photographs are relatively unchanged from the 1981 historical photograph with the exception of lunging ring which was be seen from the 1988 historical photograph. The lunging ring is located on the western boundary of the north-eastern paddock. The surrounding properties are unchanged for rural residential in use.

See Appendix C (1)

Table 18: Historical Photographs: 341 Jesmond Road.

Date	Description
1960, 1980 & 1981	The 1960 - 1981 historical photographs show the subject site in use for rural purposes. A single barn structure can be seen in the northern portion of the site adjacent to the property boundary. The surrounding properties are largely rural in use.
1988	The 1988 historical photograph shows the northern section of the site now being utilised for horticultural purposes. The remaining area to the south is undeveloped and in use for rural purposes. What appears to be a horse training ring is located adjacent to the north-eastern boundary of the site. The surrounding properties are largely rural residential in use with the exception 401 Jesmond Road which is adjacent to the north-western boundary of the site.
1996	The 1996 historical photograph is of relatively poor resolution however it shows the subject site generally unchanged from the 1988 historical photograph which the exception of the residential dwelling which is now located in the south-western portion of the site.
2001	The 2001 historical photograph shows the northern portion of the site no longer being utilised for horticultural purposes. A livestock holding pen can be seen in the central portion of the site adjacent to the driveway. A drainage pond is also visible in the central paddock of the site.
2006	The 2006 historical photograph shows the subject site relatively unchanged from the 2001 historical photograph with the exception of a large shed which is located adjacent to the north-western boundary of the site.
2008, 2012 & 2016	The 2008 - 2016 show the subject site largely as it appeared during the site walk over and inspection. A small orchard can be seen adjacent to the large shed on the north-western boundary of the site. The surrounding land uses are unchanged from rural residential with the exception of the eastern portion of 401 Jesmond Road which is being utilised for horticultural purposes.

See Appendix C (2)

Table 19: Historical Photographs: 401 Jesmond Road.

Date	Description
1960, 1980 & 1981	The 1960 - 1981 historical photographs show the subject site undeveloped and in use for rural purposes. Jesmond Road can be adjacent to the western boundary of the site. The surrounding properties are predominantly rural in use.
1988	The 1988 historical photograph shows the subject site being utilised for horticultural purposes. The site is can be seen divided into several sections which are bordered by shelter belts. A residential dwelling can be seen in the south-western corner of the site adjacent to Jesmond Road. The surrounding land use if predominantly rural residential with the exception of the properties located to the north west and south west which are utilised for horticultural purposes.
1996	The 1996 historical photograph shows the subject site relatively unchanged from the 1988 historical photograph. Some alterations have been made to the eastern portion of the site with the removal of some of the shelter belts in order to increase the paddocks size. The surrounding land is predominantly rural residential in use.
2001, 2006, 2008, 2012 & 2016	The 2001 - 2016 historical photographs shows the site largely as it appeared during the site walk over and inspection. The site can be seen divided into two sections. The western portions of the site in predominantly in pasture with what appears to be a market garden located in the central portion of the site. A storage shed can be seen located in the south-eastern corner of the site. The eastern section of the site is predominantly in use as an orchard. The surrounding land is unchanged from rural residential in use.

See Appendix C (2)

may be present at the site. The identification of uncertified fill material will likely require further investigation and/or chemical analysis if detected.

6.3 Auckland Council Property File Search

The results of the council search showed several consents relating to the properties across the Auranga Development Project. The relevant details of the Property File search are presented in Tables 24-42 below.

Table 24: Relevant Property File Information: 321 Bremner Road, Drury

Proposed Activity	Application number	Date
Erect a Dwelling	J040070	17/09/1979
Drainage & Septic Tank Installation	6877	17/09/1979
Erect a Carport	F63948	03/03/1989
Erect a Garage	90/0428	10/09/1990

Table 25: Relevant Property File Information: 325 Bremner Road, Drury

Proposed Activity	Application number	Date
Erect Dwelling	I002989	11/09/1978
Addition of Carport	E360	28/08/1986

Table 26: Relevant Property File Information: 329 Bremner Road, Drury

Proposed Activity	Application number	Date
Subdivision (333 Bremner Road)	373/157	03/12/1985
Relocating dwelling / farm office/ studio house/ garage & Wastewater and storm water drainage	011238	22/11/1994
Alterations to Existing Dwelling	18403	18/12/2001
Dwelling Alterations	18746	04/06/2002
Storage Shed and Stables	18127	30/09/2004
Amendment to Pool Fencing	B/2013/8039/A	23/02/2015
New Swimming Pool & Earthworks	R/LUC/2014/574	19/05/2015
Erect Three Bay Shed	25473	CANCELLED

Table 38: Relevant Property File Information: 401 Jesmond Road, Drury

Proposed Activity	Application number	Date
Re-site Dwelling	D18472	18/07/1986
Erect Double Garage	F63610	01/11/1988
Erect New Farm Building	15757	07/11/2000
Erect New Packhouse/Garage	19275	01/04/2008

Table 39: Relevant Property File Information: 451 Jesmond Road, Drury

Proposed Activity	Application number	Date
Erect a Dwelling	25130/1	11/05/2010
Installation of Wastewater Treatment System	25130/1	10/03/2011
Storage Shed	26006	05/12/2011

Table 40: Relevant Property File Information: 30 Burberry Road, Drury

Proposed Activity	Application number	Date
Application for Subdivision	1990/101064	26/04/1994
Erect Dwelling & Garage	15717/1	30/07/1999
Erect Swimming Pool	16459	03/04/2003
Erect Garage	2014/7534	10/06/2014
Erect Shed	2014/2273	06/08/2014

Table 41: Relevant Property File Information: 38 Burberry Road, Drury

Proposed Activity	Application number	Date
Building Consent for Dam	11351	18/07/1995
Application for Subdivision	N/A	04/11/1995
Geotechnical Report	N/A	June 1996
Construct New Dwelling, 3 Bridges, Stables & Swimming Pool	12830	07/10/1996

Table 42: Relevant Property File Information: 41 Burberry Road, Drury

Proposed Activity	Application number	Date
Geotech Investigation for Subdivision	1990/101064	27/01/1994
Erect Dwelling	1999/105574	30/07/1999
Construct Swimming Pool	2000/106067	20/03/2000
Erect Barns & Stables	2000/106536	24/10/2000
Alterations to Barn	2002/107858	16/07/2002
Erect Pool Shed	2005/111069	25/10/2005
Extension to Barn	2007/112298	14/06/2007

6.4 Auckland Council Site Contamination Enquiry

The Auckland Council site contamination enquiry contained no records relating to the Auranga Development Sites.

The report did however contain information on properties in the vicinity of the Auranga Development catchment; contaminated site discharge located at 269 Bremner Road (consent number 47184) and 31 Burberry Road (consent number 46096). An overview of pollution incidents was also recorded for properties located at 12 Pitt Road; where large volumes of hydrocarbon fuel was discharged to land and 90 Karaka Road; where open burning of refuse was recorded.

A number of borehole consents were noted in the general area, however, none of these were located on the properties within the study area.

The Auckland Council Site Contamination Enquiry is presented in Appendix D.

6.5 Historical Certificate of Title Review

The historical certificate of title review was completed for the properties within the Auranga Development.

Following the review of the historical certificate of title two companies were listed which related to 235 Jesmond Road and 221 Jesmond Road. Both companies, Copplestone Limited and Rejen Trading Limited have since gone into liquidation and no information could be obtained relating to their operations.

The historical certificate of title is presented in full as Appendix E.

6.6 Onsite Interview

During the site walkover and inspection of the Auranga Development, it was not possible to interview the landowners/tenants of each site. This was due to properties being vacant at the time of the site walkover and inspection. This is likely due to landowners/tenants being at work considering the site walk over and inspections were carried out between 9am and 3pm Monday – Friday.

Furthermore, a copy of the Hazardous Activities and Industries List was issued to each land owner with the intention of receiving some background information of any potential contaminating land use or activities being currently or historically taken place on site before commencing site walk overs and inspections. No response or information was received relating to this matter.

The only property where an onsite interview was possible was 325 Bremner Road, Drury. The interview with the current owner of the property was conducted by Focus Environmental Services personnel. During the interview the following items were noted:

- The interviewee made reference to an offal pit onsite which was located to the north of the garage.
- The interviewee stated that areas of disturbed soil identified throughout the site were a result of excavated test pits which were carried out on site prior to the site walk over and inspection. It was noted that soil cores were also taken during the at the time of the test pit excavations. This is likely associated with a geotechnical investigation but was not confirmed. We have requested that if fill was identified that the geotechnical report be provided to us for review.

7.0 Site Walkover and Inspection

7.1 321 Bremner Road

The site inspection and walk over was carried out by Focus Environmental Services Limited personnel on the 25th January 2017. The site inspection was carried out during a period of fine weather.

The site was accessed from Bremner Road via concrete driveway which lead to the residential area. The residential area consisted of a single storey dwelling, garages, water storage tank and associated curtilage.

Potentially treated timber was stacked to the rear and side of the garage on the eastern boundary.

Septic tank ventilation pipes were identified along the eastern boundary of the site adjacent to the rain water storage tank. On the northern curtilage of the site was a utility shed which was erected on a concrete base. This was being utilised for storage of garden equipment and utensils at the time of the site walk over and inspection. Adjacent to the garden shed was some raised composting containers constructed from timber.

A burn pile mixed with vegetation and refuse was located north of the residential area. The surrounding area consisted of a burn barrel potentially used to burn refuse, two small galvanise huts utilised for firewood storage, a metal boat and transport trailer, a utility shed (2) with timber base used for storage, a stockpile of concrete rubble and a tree house. A stock holding pen and loading ramp was also identified in the vicinity, due to the estimated age of the holding pen it is considered that potential spray race operations were carried out in this area of the site.

A drainage gully was identified in the central portion of the site. The remaining land north of the drainage gully consisted of overgrown paddocks.

The site inspection photographs are presented in Appendix F.

The site inspection photographs are presented in Appendix F.

7.17 401 Jesmond Road

The site inspection and walk over was carried out by Focus Environmental Services Limited personnel on the 26th January 2017. The site inspection was carried out during a period of fine weather.

The site was accessed from Jesmond Road via a concrete driveway which led to the residential dwelling, attached garage and concrete paving area.

To the rear of the dwelling was a domestic garden that contained a rainwater storage tank, vegetable patches, garden pond and some fruit trees. A garden shed utilised as a pump house was located on the northern boundary of the residential area.

Adjacent to the residential area was an overgrown paddock. A machinery storage shed was located in the south-eastern corner of the paddock. In the central portion of the paddock was an overgrown market garden which was fenced off from the surrounding paddock.

On the eastern portion of the site was an orchard which was encased by a shelter belt. On the southern boundary of the orchard was a small galvanize hut which contained a seating bench and carboard packaging. The use of the hut was unclear at the time of the site walkover and inspection.

In the south-eastern corner of the orchard was rolls of plastic orchards covers.

The site inspection photographs are presented in Appendix F.

7.18 451 Jesmond Road

The site inspection and walk over was carried out by Focus Environmental Services Limited personnel on the 25th January 2017. The site inspection was carried out during a period of fine weather.

The site was accessed from Jesmond Road via a gravel driveway which extended through the central portion of the site to the residential area. A garden lawn was observed on either side of the driveway.

A turning point area was located in the central portion of the driveway. Adjacent to the driveway were two pergolas which were located on either side of the driveway.

A utility shed utilised as a pump house was located on the northern boundary of the site.

In the central portion of the site was the residential dwelling and attached garage. A sheltered deck extended from the dwelling to form an outdoor entertaining area.

A concrete lined garage was located in close proximity to the dwelling. The garage was being utilised for storage at the time of the site walk over and inspection.

To the rear of the dwelling was a water storage tank, fuel storage tank and associated boiler and sewage treatment system.

In the western portion of the site was a number of wire trellis utilised for growing ornamental flowers. The managed grass area extended out to the western boundary where a number of planted hedge rows were identified.

9.17 401 Jesmond Road

During the site walkover and inspection evidence of horticultural activities was noted.

Furthermore, following the review of the available historical photographs, the western area of the site appears to have been utilised for horticultural purposes.

Therefore, following the desktop assessment and site inspection and walk over of the site at 401 Jesmond Road, Drury the following potential contaminating land uses and/or activities have been identified:

- Evidence of horticultural activities.

The assessment provided in Table 59 below expands on the potential sources of contamination (as identified above) and exposure pathways and was based on the potential effects of the potential change of land use, subdivision and soil disturbance activities on human health and the environment.

Table 59: Conceptual Site Model: 401 Jesmond Road, Drury

Potential Source	Potential Pathways	Potential Receptors	Assessment
Contaminated Soil	Dermal Contact with Contaminated Soils	Human Health – Residential Land Use	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.
		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 – Residential Land Use	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.
		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 – Residential Land Use	Incomplete: No evidence of potential vapours or fibres identified at the site.
		Human Health – Commercial/Industrial Outdoor Worker	Incomplete: No evidence of potential vapours or fibres identified at the site.
	Surface Water Run-off	Ecological Receptors - Drury Creek	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.
	Migration of Groundwater	Ecological Receptors - Drury Creek	Potentially Complete: Sampling and analysis is recommended to confirm the concentrations of contaminants in soil.

10.0 Conclusions and Recommendations

The Preliminary Site Investigation for the Auranga Development 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).

The history of the site was researched by Focus Environmental Services personnel, which involved a review of the available historical aerial photographs of the site, a review of the historical certificate of title, a review of the Auckland Council property file and a contaminated sites enquiry to Auckland Council. During the review of the available information any potentially contaminating activities or land uses were identified.

Following the desk top assessment, the site was visited and a site inspection and walk over was carried out. The site was inspected by Focus Environmental Services Limited personnel on dates between the 24th of January 2017 and the 3rd of February 2017. During the site inspection, any potentially contaminating activities or land uses were identified.

In summary, following the desk top assessment and site inspection and walkover, evidence of burning, potential spray race operations and storage of potentially treated timber were noted for 321 Bremner Road; evidence of hydrocarbon contamination, evidence of microbiological contamination and burning of potentially treat timber furniture were noted for 325 Bremner Road; evidence of burning, suspected uncertified fill material and a mechanical workshop were noted for 329 Bremner Road; potentially uncertified fill material, evidence of burning, storage of potentially treated timber, and evidence of fuel storage was noted for 333 Bremner Road; potential spray race operations and potential hydrocarbon contamination were noted for 389 Bremner Road; a single area of burning was noted for 403 Bremner Road; potential spray race operation were noted for 415 Bremner Road; storage of potentially treated timber was noted at 420-417 Bremner Road; evidence of horticultural activities were noted at 421 Bremner Road; evidence of microbiological contamination and evidence of potential ACM ground contamination were noted for the Esplanade Reserve; evidence of former horticultural activities, evidence of microbiological contamination, burning and potentially uncertified fill materials were noted for 221 Jesmond Road; evidence of rubber shaving on the base of the training arena were noted for 235 Jesmond Road; evidence of burning, evidence of potentially uncertified fill material, suspected spray race operations and potential ACM ground contamination were noted for 281 Jesmond Road; evidence of horticultural activities and potentially uncertified fill material were noted for 341 Jesmond Road; evidence of horticultural activities were noted for 401 Jesmond Road; evidence of horticultural activities and fuel storage were noted for 451 Jesmond Road. No potentially contaminating land uses and/or activities were identified at the site at 389 Bremner Road, 393 Bremner Road, 385 Bremner Road, 30 Burberry Road and 41 Burberry Road Drury.

The information obtained of the sites history and from the site inspection and walk over was assessed to determine if any potential hazardous activities listed on the Hazardous Activities and Industries List (HAIL) had occurred on site as a result of past or current land use.

Due to the potential source of contamination identified at the above sites it is considered that there is evidence to suggest that an activity outlined in the HAIL list has been, or is currently being, carried out on the pieces of land.

Prior to the development of the areas of the site where potentially contaminating land uses and/or activities have taken place, a detailed site investigation is recommended.

The detailed site investigation would confirm if the identified land uses and/or activities have affected the site soils and will confirm the consenting requirements for this area of the site.

Appendix B

Summary of Soil Results

SOIL ANALYSIS SUMMARY TABLE: 401 Jesmond Road									Assessment Criteria		
Sample Name	Composite of MGC 1.1 S, MGC 1.2 S, MGC 1.3 S & MGC 1.4 S	Composite of MGC 2.1 S, MGC 2.2 S, MGC 2.3 S & MGC 2.4 S	Composite of OC 1.1 S, OC 1.2 S, OC 1.3 S & OC 1.4 S	Composite of OC 2.1 S, OC 2.2 S, OC 2.3 S & OC 2.4 S	Composite of OC 3.1 S, OC 3.2 S, OC 3.3 S & OC 3.4 S	Composite of OC 4.1 S, OC 4.2 S, OC 4.3 S & OC 4.4 S	Composite of OC 5.1 S, OC 5.2 S, OC 5.3 S & OC 5.4 S	Composite of OC 6.1 S, OC 6.2 S, OC 6.3 S & OC 6.4 S	**Background Criteria [1]**	**Human Health Risk (rural/lifestyle block) [2]**	**Environmental Discharge [4]**
Sample Depth (m)	0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2			
Sample Date	2-Aug-18	2-Aug-18	1-Aug-18	1-Aug-18	1-Aug-18	2-Aug-18	2-Aug-18	2-Aug-18			
Lab Number	2025734.69	2025734.7	2025734.71	2025734.72	2025734.73	2025734.74	2025734.75	2025734.76			
Heavy Metals (mg/kg dry wt)											
Total Recoverable Arsenic	7	7	7	10	8	6	7	7	12	17	100
Total Recoverable Cadmium	0.78	0.38	0.54	0.63	0.48	0.64	0.49	0.45	0.65	0.8	7.5
Total Recoverable Chromium	16	17	18	23	20	16	19	16	125	290	400
Total Recoverable Copper	17	15	18	19	13	18	15	15	90	10,000	325
Total Recoverable Lead	27	30	29	43	25	25	26	26	65	160	250
Total Recoverable Mercury	0.22	0.2	0.2	0.34	0.31	0.26	0.23	0.22	0.45	200	0.75
Total Recoverable Nickel	7	6	7	6	6	6	6	6	320	1,500 [3]	105
Total Recoverable Zinc	42	49	37	46	33	36	35	28	1,160	23,000 [3]	400
Organochlorine Pesticides (mg/kg dry wt)											
Aldrin	< 0.017	< 0.015	< 0.014	< 0.014	< 0.015	< 0.016	< 0.015	< 0.015	-	-	-
alpha-BHC	< 0.017	< 0.015	< 0.014	< 0.014	< 0.015	< 0.016	< 0.015	< 0.015	-	-	-
beta-BHC	< 0.017	< 0.015	< 0.014	< 0.014	< 0.015	< 0.016	< 0.015	< 0.015	-	-	-
delta-BHC	< 0.017	< 0.015	< 0.014	< 0.014	< 0.015	< 0.016	< 0.015	< 0.015	-	-	-
gamma-BHC (Lindane)	< 0.017	< 0.015	< 0.014	< 0.014	< 0.015	< 0.016	< 0.015	< 0.015	-	-	-
cis-Chlordane	< 0.017	< 0.015	< 0.014	< 0.014	< 0.015	< 0.016	< 0.015	< 0.015	-	-	-
trans-Chlordane	< 0.017	< 0.015	< 0.014	< 0.014	< 0.015	< 0.016	< 0.015	< 0.015	-	-	-
Total Chlordane [(cis+trans)*100/42]	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	-	-	-
2,4'-DDD	< 0.017	< 0.015	< 0.014	< 0.014	< 0.015	< 0.016	< 0.015	< 0.015	-	-	-
4,4'-DDD	< 0.017	< 0.015	< 0.014	< 0.014	< 0.015	< 0.016	< 0.015	< 0.015	-	-	-
2,4'-DDE	< 0.017	< 0.015	< 0.014	< 0.014	< 0.015	< 0.016	< 0.015	< 0.015	-	-	-
4,4'-DDE	0.026	< 0.015	0.018	< 0.014	0.04	0.063	< 0.015	0.025	-	2.0 [3]	-
2,4'-DDT	< 0.017	< 0.015	< 0.014	< 0.014	< 0.015	< 0.016	< 0.015	< 0.015	-	-	-
4,4'-DDT	< 0.017	< 0.015	< 0.014	< 0.014	0.017	0.015	< 0.015	< 0.015	-	-	-
Total DDT Isomers	0.026	< 0.09	0.018	< 0.09	0.021	0.078	< 0.09	0.025	-	45	12
Dieldrin	< 0.017	< 0.015	< 0.014	< 0.014	< 0.015	< 0.016	< 0.015	< 0.015	-	-	-
Endosulfan I	< 0.017	< 0.015	< 0.014	< 0.014	< 0.015	< 0.016	< 0.015	< 0.015	-	-	-
Endosulfan II	< 0.017	< 0.015	< 0.014	< 0.014	< 0.015	< 0.016	< 0.015	< 0.015	-	-	-
Endosulfan sulphate	< 0.017	< 0.015	< 0.014	< 0.014	< 0.015	< 0.016	< 0.015	< 0.015	-	-	-
Endrin	< 0.017	< 0.015	< 0.014	< 0.014	< 0.015	< 0.016	< 0.015	< 0.015	-	-	-
Endrin aldehyde	< 0.017	< 0.015	< 0.014	< 0.014	< 0.015	< 0.016	< 0.015	< 0.015	-	-	-
Endrin ketone	< 0.017	< 0.015	< 0.014	< 0.014	< 0.015	< 0.016	< 0.015	< 0.015	-	-	-
Heptachlor	< 0.017	< 0.015	< 0.014	< 0.014	< 0.015	< 0.016	< 0.015	< 0.015	-	-	-
Heptachlor epoxide	< 0.017	< 0.015	< 0.014	< 0.014	< 0.015	< 0.016	< 0.015	< 0.015	-	-	-
Hexachlorobenzene	< 0.017	< 0.015	< 0.014	< 0.014	< 0.015	< 0.016	< 0.015	< 0.015	-	-	-
Methoxychlor	< 0.017	< 0.015	< 0.014	< 0.014	< 0.015	< 0.016	< 0.015	< 0.015	-	-	-
Organonitro&phosphorus Pesticides (mg/kg)											
All 89 Compounds	BD	BD	BD	BD	BD	BD	BD	BD	-	-	-

Annotations

1. Background Concentrations of Inorganic Elements in Soil from the Auckland Region. Auckland Regional Council, 2002. Background ranges for metals in volcanic range soils.
2. Resource Management (National Environmental Standard for Assessing and managing Contaminants in Soil to Protect Human Health) Regulation 2012 - Values applicable to 'rural/lifestyle block' have been selected
3. US EPA Regional Screening Levels. Values applicable to 'residential' Landuse have been selected where appropriate.
4. Environmental Discharge Criteria have been selected from the Auckland Unitary Plan Operative in part - Table E30.6.1.4.1 Permitted Activity Criteria

BD - Below laboratory detection limits

Results below detectable concentrations are grey
Exceeding background levels
Exceeding environmental risk criteria
Exceeding human health risk criteria

Appendix C

Hill Laboratories Lab Report

Hill Laboratories
TRIED, TESTED AND TRUSTED

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

T 0508 HILL LAB (44 555 22)
T +64 7 858 2000
E mail@hill-labs.co.nz
W www.hill-laboratories.com

Certificate of Analysis

Client:	Beca Limited	**Lab No:**	2025734	SPv1
Contact:	C Blyth	**Date Received:**	03-Aug-2018	
	C/- Beca Limited	**Date Reported:**	13-Aug-2018	
	PO Box 6345	**Quote No:**	72192	
	Wellesley Street	**Order No:**	18:130	
	Auckland 1141	**Client Reference:**	4216997/200	
		Submitted By:	Renee Jens	

Sample Type: Soil

Sample Name:		Composite of MGC 1.1 S, MGC 1.2 S, MGC 1.3 S & MGC 1.4 S	Composite of MGC 2.1 S, MGC 2.2 S, MGC 2.3 S & MGC 2.4 S	Composite of OC 1.1 S, OC 1.2 S, OC 1.3 S & OC 1.4 S	Composite of OC 2.1 S, OC 2.2 S, OC 2.3 S & OC 2.4 S	Composite of OC 3.1 S, OC 3.2 S, OC 3.3 S & OC 3.4 S
Lab Number:		2025734.69	2025734.70	2025734.71	2025734.72	2025734.73
Individual Tests						
Dry Matter	g/100g as rcvd	60	68	70	70	70
Heavy Metals with Mercury, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	7	7	7	10	8
Total Recoverable Cadmium	mg/kg dry wt	0.78	0.38	0.54	0.63	0.48
Total Recoverable Chromium	mg/kg dry wt	16	17	18	23	20
Total Recoverable Copper	mg/kg dry wt	17	15	18	19	13
Total Recoverable Lead	mg/kg dry wt	27	30	29	43	25
Total Recoverable Mercury	mg/kg dry wt	0.22	0.20	0.20	0.34	0.31
Total Recoverable Nickel	mg/kg dry wt	7	6	7	6	6
Total Recoverable Zinc	mg/kg dry wt	42	49	37	46	33
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	< 0.017	< 0.015	< 0.014	< 0.014	< 0.015
alpha-BHC	mg/kg dry wt	< 0.017	< 0.015	< 0.014	< 0.014	< 0.015
beta-BHC	mg/kg dry wt	< 0.017	< 0.015	< 0.014	< 0.014	< 0.015
delta-BHC	mg/kg dry wt	< 0.017	< 0.015	< 0.014	< 0.014	< 0.015
gamma-BHC (Lindane)	mg/kg dry wt	< 0.017	< 0.015	< 0.014	< 0.014	< 0.015
cis-Chlordane	mg/kg dry wt	< 0.017	< 0.015	< 0.014	< 0.014	< 0.015
trans-Chlordane	mg/kg dry wt	< 0.017	< 0.015	< 0.014	< 0.014	< 0.015
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
2,4'-DDD	mg/kg dry wt	< 0.017	< 0.015	< 0.014	< 0.014	< 0.015
4,4'-DDD	mg/kg dry wt	< 0.017	< 0.015	< 0.014	< 0.014	< 0.015
2,4'-DDE	mg/kg dry wt	< 0.017	< 0.015	< 0.014	< 0.014	< 0.015
4,4'-DDE	mg/kg dry wt	0.026	< 0.015	0.018	< 0.014	0.040
2,4'-DDT	mg/kg dry wt	< 0.017	< 0.015	< 0.014	< 0.014	< 0.015
4,4'-DDT	mg/kg dry wt	< 0.017	< 0.015	< 0.014	< 0.014	0.017
Total DDT Isomers	mg/kg dry wt	< 0.10	< 0.09	< 0.09	< 0.09	< 0.09
Dieldrin	mg/kg dry wt	< 0.017	< 0.015	< 0.014	< 0.014	< 0.015
Endosulfan I	mg/kg dry wt	< 0.017	< 0.015	< 0.014	< 0.014	< 0.015
Endosulfan II	mg/kg dry wt	< 0.017	< 0.015	< 0.014	< 0.014	< 0.015
Endosulfan sulphate	mg/kg dry wt	< 0.017	< 0.015	< 0.014	< 0.014	< 0.015
Endrin	mg/kg dry wt	< 0.017	< 0.015	< 0.014	< 0.014	< 0.015
Endrin aldehyde	mg/kg dry wt	< 0.017	< 0.015	< 0.014	< 0.014	< 0.015
Endrin ketone	mg/kg dry wt	< 0.017	< 0.015	< 0.014	< 0.014	< 0.015
Heptachlor	mg/kg dry wt	< 0.017	< 0.015	< 0.014	< 0.014	< 0.015
Heptachlor epoxide	mg/kg dry wt	< 0.017	< 0.015	< 0.014	< 0.014	< 0.015

Sample Type: Soil						
Sample Name:		Composite of MGC 1.1 S, MGC 1.2 S, MGC 1.3 S & MGC 1.4 S	Composite of MGC 2.1 S, MGC 2.2 S, MGC 2.3 S & MGC 2.4 S	Composite of OC 1.1 S, OC 1.2 S, OC 1.3 S & OC 1.4 S	Composite of OC 2.1 S, OC 2.2 S, OC 2.3 S & OC 2.4 S	Composite of OC 3.1 S, OC 3.2 S, OC 3.3 S & OC 3.4 S
Lab Number:		2025734.69	2025734.70	2025734.71	2025734.72	2025734.73
Organochlorine Pesticides Screening in Soil						
Hexachlorobenzene	mg/kg dry wt	< 0.017	< 0.015	< 0.014	< 0.014	< 0.015
Methoxychlor	mg/kg dry wt	< 0.017	< 0.015	< 0.014	< 0.014	< 0.015
Organonitro&phosphorus Pesticides Screen in Soil by GCMS						
Acetochlor	mg/kg	< 0.08	< 0.07	< 0.07	< 0.07	< 0.07
Alachlor	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Atrazine	mg/kg	< 0.08	< 0.07	< 0.07	< 0.07	< 0.07
Atrazine-desethyl	mg/kg	< 0.08	< 0.07	< 0.07	< 0.07	< 0.07
Atrazine-desisopropyl	mg/kg	< 0.16	< 0.14	< 0.14	< 0.14	< 0.14
Azaconazole	mg/kg	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
Azinphos-methyl	mg/kg	< 0.16	< 0.14	< 0.14	< 0.14	< 0.14
Benalaxyl	mg/kg	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
Bitertanol	mg/kg	< 0.16	< 0.14	< 0.14	< 0.14	< 0.14
Bromacil	mg/kg	< 0.08	< 0.07	< 0.07	< 0.07	< 0.07
Bromopropylate	mg/kg	< 0.08	< 0.07	< 0.07	< 0.07	< 0.07
Butachlor	mg/kg	< 0.08	< 0.07	< 0.07	< 0.07	< 0.07
Captan	mg/kg	< 0.16	< 0.14	< 0.14	< 0.14	< 0.14
Carbaryl	mg/kg	< 0.08	< 0.07	< 0.07	< 0.07	< 0.07
Carbofuran	mg/kg	< 0.08	< 0.07	< 0.07	< 0.07	< 0.07
Chlorfluazuron	mg/kg	< 0.08	< 0.07	< 0.07	< 0.07	< 0.07
Chlorothalonil	mg/kg	< 0.08	< 0.07	< 0.07	< 0.07	< 0.07
Chlorpyrifos	mg/kg	< 0.08	< 0.07	< 0.07	< 0.07	< 0.07
Chlorpyrifos-methyl	mg/kg	< 0.08	< 0.07	< 0.07	< 0.07	< 0.07
Chlortoluron	mg/kg	< 0.16	< 0.14	< 0.14	< 0.14	< 0.14
Cyanazine	mg/kg	< 0.08	< 0.07	< 0.07	< 0.07	< 0.07
Cyfluthrin	mg/kg	< 0.10	< 0.09	< 0.09	< 0.09	< 0.09
Cyhalothrin	mg/kg	< 0.08	< 0.07	< 0.07	< 0.07	< 0.07
Cypermethrin	mg/kg	< 0.2	< 0.17	< 0.17	< 0.17	< 0.17
Deltamethrin (including Tralomethrin)	mg/kg	< 0.08	< 0.07	< 0.07	< 0.07	< 0.07
Diazinon	mg/kg	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
Dichlofluanid	mg/kg	< 0.08	< 0.07	< 0.07	< 0.07	< 0.07
Dichloran	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Dichlorvos	mg/kg	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09
Difenoconazole	mg/kg	< 0.12	< 0.10	< 0.10	< 0.10	< 0.10
Dimethoate	mg/kg	< 0.16	< 0.14	< 0.14	< 0.14	< 0.14
Diphenylamine	mg/kg	< 0.16	< 0.14	< 0.14	< 0.14	< 0.14
Diuron	mg/kg	< 0.08	< 0.07	< 0.07	< 0.07	< 0.07
Fenpropimorph	mg/kg	< 0.08	< 0.07	< 0.07	< 0.07	< 0.07
Fluazifop-butyl	mg/kg	< 0.08	< 0.07	< 0.07	< 0.07	< 0.07
Fluometuron	mg/kg	< 0.08	< 0.07	< 0.07	< 0.07	< 0.07
Flusilazole	mg/kg	< 0.08	< 0.07	< 0.07	< 0.07	< 0.07
Fluvalinate	mg/kg	< 0.06	< 0.05	< 0.05	< 0.05	< 0.05
Furalaxyl	mg/kg	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
Haloxyfop-methyl	mg/kg	< 0.08	< 0.07	< 0.07	< 0.07	< 0.07
Hexaconazole	mg/kg	< 0.08	< 0.07	< 0.07	< 0.07	< 0.07
Hexazinone	mg/kg	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
IPBC (3-Iodo-2-propynyl-n-butylcarbamate)	mg/kg dry wt	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
Kresoxim-methyl	mg/kg	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
Linuron	mg/kg	< 0.08	< 0.07	< 0.07	< 0.07	< 0.07
Malathion	mg/kg	< 0.08	< 0.07	< 0.07	< 0.07	< 0.07
Metalaxyl (Mefenoxam)	mg/kg	< 0.08	< 0.07	< 0.07	< 0.07	< 0.07
Methamidophos	mg/kg	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
Metolachlor	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Metribuzin	mg/kg	< 0.08	< 0.07	< 0.07	< 0.07	< 0.07

Sample Type: Soil						
Sample Name:		Composite of MGC 1.1 S, MGC 1.2 S, MGC 1.3 S & MGC 1.4 S	Composite of MGC 2.1 S, MGC 2.2 S, MGC 2.3 S & MGC 2.4 S	Composite of OC 1.1 S, OC 1.2 S, OC 1.3 S & OC 1.4 S	Composite of OC 2.1 S, OC 2.2 S, OC 2.3 S & OC 2.4 S	Composite of OC 3.1 S, OC 3.2 S, OC 3.3 S & OC 3.4 S
Lab Number:		2025734.69	2025734.70	2025734.71	2025734.72	2025734.73
Organonitro&phosphorus Pesticides Screen in Soil by GCMS						
Molinate	mg/kg	< 0.16	< 0.14	< 0.14	< 0.14	< 0.14
Myclobutanil	mg/kg	< 0.08	< 0.07	< 0.07	< 0.07	< 0.07
Naled	mg/kg	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
Norflurazon	mg/kg	< 0.16	< 0.14	< 0.14	< 0.14	< 0.14
Oxadiazon	mg/kg	< 0.08	< 0.07	< 0.07	< 0.07	< 0.07
Oxyfluorfen	mg/kg	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
Paclobutrazol	mg/kg	< 0.08	< 0.07	< 0.07	< 0.07	< 0.07
Parathion-ethyl	mg/kg	< 0.08	< 0.07	< 0.07	< 0.07	< 0.07
Parathion-methyl	mg/kg	< 0.08	< 0.07	< 0.07	< 0.07	< 0.07
Pendimethalin	mg/kg	< 0.08	< 0.07	< 0.07	< 0.07	< 0.07
Permethrin	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Pirimicarb	mg/kg	< 0.08	< 0.07	< 0.07	< 0.07	< 0.07
Pirimiphos-methyl	mg/kg	< 0.08	< 0.07	< 0.07	< 0.07	< 0.07
Prochloraz	mg/kg	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
Procymidone	mg/kg	< 0.08	< 0.07	< 0.07	< 0.07	< 0.07
Prometryn	mg/kg	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
Propachlor	mg/kg	< 0.08	< 0.07	< 0.07	< 0.07	< 0.07
Propanil	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Propazine	mg/kg	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
Propiconazole	mg/kg	< 0.06	< 0.05	< 0.05	< 0.05	< 0.05
Pyriproxyfen	mg/kg	< 0.08	< 0.07	< 0.07	< 0.07	< 0.07
Quizalofop-ethyl	mg/kg	< 0.08	< 0.07	< 0.07	< 0.07	< 0.07
Simazine	mg/kg	< 0.08	< 0.07	< 0.07	< 0.07	< 0.07
Simetryn	mg/kg	< 0.08	< 0.07	< 0.07	< 0.07	< 0.07
Sulfentrazone	mg/kg	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
TCMTB [2-(thiocyanomethylthio) benzothiazole,Busan]	mg/kg dry wt	< 0.16	< 0.14	< 0.14	< 0.14	< 0.14
Tebuconazole	mg/kg	< 0.08	< 0.07	< 0.07	< 0.07	< 0.07
Terbacil	mg/kg	< 0.08	< 0.07	< 0.07	< 0.07	< 0.07
Terbufos	mg/kg	< 0.08	< 0.07	< 0.07	< 0.07	< 0.07
Terbumeton	mg/kg	< 0.08	< 0.07	< 0.07	< 0.07	< 0.07
Terbuthylazine	mg/kg	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
Terbuthylazine-desethyl	mg/kg	< 0.08	< 0.07	< 0.07	< 0.07	< 0.07
Terbutryn	mg/kg	< 0.08	< 0.07	< 0.07	< 0.07	< 0.07
Thiabendazole	mg/kg	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
Thiobencarb	mg/kg	< 0.08	< 0.07	< 0.07	< 0.07	< 0.07
Tolylfluanid	mg/kg	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
Triazophos	mg/kg	< 0.08	< 0.07	< 0.07	< 0.07	< 0.07
Trifluralin	mg/kg	< 0.08	< 0.07	< 0.07	< 0.07	< 0.07
Vinclozolin	mg/kg	< 0.08	< 0.07	< 0.07	< 0.07	< 0.07

Sample Name:		Composite of OC 4.1 S, OC 4.2 S, OC 4.3 S & OC 4.4 S	Composite of OC 5.1 S, OC 5.2 S, OC 5.3 S & OC 5.4 S	Composite of OC 6.1 S, OC 6.2 S, OC 6.3 S & OC 6.4 S		
Lab Number:		2025734.74	2025734.75	2025734.76		
Individual Tests						
Dry Matter	g/100g as rcvd	65	70	70	-	-
Heavy Metals with Mercury, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	6	7	7	-	-
Total Recoverable Cadmium	mg/kg dry wt	0.64	0.49	0.45	-	-
Total Recoverable Chromium	mg/kg dry wt	16	19	16	-	-
Total Recoverable Copper	mg/kg dry wt	18	15	15	-	-
Total Recoverable Lead	mg/kg dry wt	25	26	26	-	-
Total Recoverable Mercury	mg/kg dry wt	0.26	0.23	0.22	-	-

Sample Type: Soil						
Sample Name:		Composite of OC 4.1 S, OC 4.2 S, OC 4.3 S & OC 4.4 S	Composite of OC 5.1 S, OC 5.2 S, OC 5.3 S & OC 5.4 S	Composite of OC 6.1 S, OC 6.2 S, OC 6.3 S & OC 6.4 S		
Lab Number:		2025734.74	2025734.75	2025734.76		
Heavy Metals with Mercury, Screen Level						
Total Recoverable Nickel	mg/kg dry wt	6	6	6	-	-
Total Recoverable Zinc	mg/kg dry wt	36	35	28	-	-
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	< 0.016	< 0.015	< 0.015	-	-
alpha-BHC	mg/kg dry wt	< 0.016	< 0.015	< 0.015	-	-
beta-BHC	mg/kg dry wt	< 0.016	< 0.015	< 0.015	-	-
delta-BHC	mg/kg dry wt	< 0.016	< 0.015	< 0.015	-	-
gamma-BHC (Lindane)	mg/kg dry wt	< 0.016	< 0.015	< 0.015	-	-
cis-Chlordane	mg/kg dry wt	< 0.016	< 0.015	< 0.015	-	-
trans-Chlordane	mg/kg dry wt	< 0.016	< 0.015	< 0.015	-	-
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	< 0.04	< 0.04	< 0.04	-	-
2,4'-DDD	mg/kg dry wt	< 0.016	< 0.015	< 0.015	-	-
4,4'-DDD	mg/kg dry wt	< 0.016	< 0.015	< 0.015	-	-
2,4'-DDE	mg/kg dry wt	< 0.016	< 0.015	< 0.015	-	-
4,4'-DDE	mg/kg dry wt	0.063	< 0.015	0.025	-	-
2,4'-DDT	mg/kg dry wt	< 0.016	< 0.015	< 0.015	-	-
4,4'-DDT	mg/kg dry wt	0.015	< 0.015	< 0.015	-	-
Total DDT Isomers	mg/kg dry wt	< 0.10	< 0.09	< 0.09	-	-
Dieldrin	mg/kg dry wt	< 0.016	< 0.015	< 0.015	-	-
Endosulfan I	mg/kg dry wt	< 0.016	< 0.015	< 0.015	-	-
Endosulfan II	mg/kg dry wt	< 0.016	< 0.015	< 0.015	-	-
Endosulfan sulphate	mg/kg dry wt	< 0.016	< 0.015	< 0.015	-	-
Endrin	mg/kg dry wt	< 0.016	< 0.015	< 0.015	-	-
Endrin aldehyde	mg/kg dry wt	< 0.016	< 0.015	< 0.015	-	-
Endrin ketone	mg/kg dry wt	< 0.016	< 0.015	< 0.015	-	-
Heptachlor	mg/kg dry wt	< 0.016	< 0.015	< 0.015	-	-
Heptachlor epoxide	mg/kg dry wt	< 0.016	< 0.015	< 0.015	-	-
Hexachlorobenzene	mg/kg dry wt	< 0.016	< 0.015	< 0.015	-	-
Methoxychlor	mg/kg dry wt	< 0.016	< 0.015	< 0.015	-	-
Organonitro&phosphorus Pesticides Screen in Soil by GCMS						
Acetochlor	mg/kg	< 0.08	< 0.07	< 0.07	-	-
Alachlor	mg/kg	< 0.05	< 0.05	< 0.05	-	-
Atrazine	mg/kg	< 0.08	< 0.07	< 0.07	-	-
Atrazine-desethyl	mg/kg	< 0.08	< 0.07	< 0.07	-	-
Atrazine-desisopropyl	mg/kg	< 0.15	< 0.14	< 0.14	-	-
Azaconazole	mg/kg	< 0.04	< 0.04	< 0.04	-	-
Azinphos-methyl	mg/kg	< 0.15	< 0.14	< 0.14	-	-
Benalaxyl	mg/kg	< 0.04	< 0.04	< 0.04	-	-
Bitertanol	mg/kg	< 0.15	< 0.14	< 0.14	-	-
Bromacil	mg/kg	< 0.08	< 0.07	< 0.07	-	-
Bromopropylate	mg/kg	< 0.08	< 0.07	< 0.07	-	-
Butachlor	mg/kg	< 0.08	< 0.07	< 0.07	-	-
Captan	mg/kg	< 0.15	< 0.14	< 0.14	-	-
Carbaryl	mg/kg	< 0.08	< 0.07	< 0.07	-	-
Carbofuran	mg/kg	< 0.08	< 0.07	< 0.07	-	-
Chlorfluazuron	mg/kg	< 0.08	< 0.07	< 0.07	-	-
Chlorothalonil	mg/kg	< 0.08	< 0.07	< 0.07	-	-
Chlorpyrifos	mg/kg	< 0.08	< 0.07	< 0.07	-	-
Chlorpyrifos-methyl	mg/kg	< 0.08	< 0.07	< 0.07	-	-
Chlortoluron	mg/kg	< 0.15	< 0.14	< 0.14	-	-
Cyanazine	mg/kg	< 0.08	< 0.07	< 0.07	-	-
Cyfluthrin	mg/kg	< 0.09	< 0.09	< 0.09	-	-

Sample Type: Soil						
Sample Name:		Composite of OC 4.1 S, OC 4.2 S, OC 4.3 S & OC 4.4 S	Composite of OC 5.1 S, OC 5.2 S, OC 5.3 S & OC 5.4 S	Composite of OC 6.1 S, OC 6.2 S, OC 6.3 S & OC 6.4 S		
Lab Number:		2025734.74	2025734.75	2025734.76		
Organonitro&phosphorus Pesticides Screen in Soil by GCMS						
Cyhalothrin	mg/kg	< 0.08	< 0.07	< 0.07	-	-
Cypermethrin	mg/kg	< 0.18	< 0.17	< 0.17	-	-
Deltamethrin (including Tralomethrin)	mg/kg	< 0.08	< 0.07	< 0.07	-	-
Diazinon	mg/kg	< 0.04	< 0.04	< 0.04	-	-
Dichlofluanid	mg/kg	< 0.08	< 0.07	< 0.07	-	-
Dichloran	mg/kg	< 0.2	< 0.2	< 0.2	-	-
Dichlorvos	mg/kg	< 0.09	< 0.09	< 0.09	-	-
Difenoconazole	mg/kg	< 0.11	< 0.10	< 0.10	-	-
Dimethoate	mg/kg	< 0.15	< 0.14	< 0.14	-	-
Diphenylamine	mg/kg	< 0.15	< 0.14	< 0.14	-	-
Diuron	mg/kg	< 0.08	< 0.07	< 0.07	-	-
Fenpropimorph	mg/kg	< 0.08	< 0.07	< 0.07	-	-
Fluazifop-butyl	mg/kg	< 0.08	< 0.07	< 0.07	-	-
Fluometuron	mg/kg	< 0.08	< 0.07	< 0.07	-	-
Flusilazole	mg/kg	< 0.08	< 0.07	< 0.07	-	-
Fluvalinate	mg/kg	< 0.06	< 0.05	< 0.05	-	-
Furalaxyl	mg/kg	< 0.04	< 0.04	< 0.04	-	-
Haloxyfop-methyl	mg/kg	< 0.08	< 0.07	< 0.07	-	-
Hexaconazole	mg/kg	< 0.08	< 0.07	< 0.07	-	-
Hexazinone	mg/kg	< 0.04	< 0.04	< 0.04	-	-
IPBC (3-Iodo-2-propynyl-n-butylcarbamate)	mg/kg dry wt	< 0.4	< 0.4	< 0.4	-	-
Kresoxim-methyl	mg/kg	< 0.04	< 0.04	< 0.04	-	-
Linuron	mg/kg	< 0.08	< 0.07	< 0.07	-	-
Malathion	mg/kg	< 0.08	< 0.07	< 0.07	-	-
Metalaxyl (Mefenoxam)	mg/kg	< 0.08	< 0.07	< 0.07	-	-
Methamidophos	mg/kg	< 0.4	< 0.4	< 0.4	-	-
Metolachlor	mg/kg	< 0.05	< 0.05	< 0.05	-	-
Metribuzin	mg/kg	< 0.08	< 0.07	< 0.07	-	-
Molinate	mg/kg	< 0.15	< 0.14	< 0.14	-	-
Myclobutanil	mg/kg	< 0.08	< 0.07	< 0.07	-	-
Naled	mg/kg	< 0.4	< 0.4	< 0.4	-	-
Norflurazon	mg/kg	< 0.15	< 0.14	< 0.14	-	-
Oxadiazon	mg/kg	< 0.08	< 0.07	< 0.07	-	-
Oxyfluorfen	mg/kg	< 0.04	< 0.04	< 0.04	-	-
Paclobutrazol	mg/kg	< 0.08	< 0.07	< 0.07	-	-
Parathion-ethyl	mg/kg	< 0.08	< 0.07	< 0.07	-	-
Parathion-methyl	mg/kg	< 0.08	< 0.07	< 0.07	-	-
Pendimethalin	mg/kg	< 0.08	< 0.07	< 0.07	-	-
Permethrin	mg/kg	< 0.03	< 0.03	< 0.03	-	-
Pirimicarb	mg/kg	< 0.08	< 0.07	< 0.07	-	-
Pirimiphos-methyl	mg/kg	< 0.08	< 0.07	< 0.07	-	-
Prochloraz	mg/kg	< 0.4	< 0.4	< 0.4	-	-
Procymidone	mg/kg	< 0.08	< 0.07	< 0.07	-	-
Prometryn	mg/kg	< 0.04	< 0.04	< 0.04	-	-
Propachlor	mg/kg	< 0.08	< 0.07	< 0.07	-	-
Propanil	mg/kg	< 0.2	< 0.2	< 0.2	-	-
Propazine	mg/kg	< 0.04	< 0.04	< 0.04	-	-
Propiconazole	mg/kg	< 0.06	< 0.05	< 0.05	-	-
Pyriproxyfen	mg/kg	< 0.08	< 0.07	< 0.07	-	-
Quizalofop-ethyl	mg/kg	< 0.08	< 0.07	< 0.07	-	-
Simazine	mg/kg	< 0.08	< 0.07	< 0.07	-	-
Simetryn	mg/kg	< 0.08	< 0.07	< 0.07	-	-
Sulfentrazone	mg/kg	< 0.4	< 0.4	< 0.4	-	-

Sample Type: Soil						
Sample Name:		Composite of OC 4.1 S, OC 4.2 S, OC 4.3 S & OC 4.4 S	Composite of OC 5.1 S, OC 5.2 S, OC 5.3 S & OC 5.4 S	Composite of OC 6.1 S, OC 6.2 S, OC 6.3 S & OC 6.4 S		
Lab Number:		2025734.74	2025734.75	2025734.76		
Organonitro&phosphorus Pesticides Screen in Soil by GCMS						
TCMTB [2-(thiocyanomethylthio) benzothiazole,Busan]	mg/kg dry wt	< 0.15	< 0.14	< 0.14	-	-
Tebuconazole	mg/kg	< 0.08	< 0.07	< 0.07	-	-
Terbacil	mg/kg	< 0.08	< 0.07	< 0.07	-	-
Terbufos	mg/kg	< 0.08	< 0.07	< 0.07	-	-
Terbumeton	mg/kg	< 0.08	< 0.07	< 0.07	-	-
Terbuthylazine	mg/kg	< 0.04	< 0.04	< 0.04	-	-
Terbuthylazine-desethyl	mg/kg	< 0.08	< 0.07	< 0.07	-	-
Terbutryn	mg/kg	< 0.08	< 0.07	< 0.07	-	-
Thiabendazole	mg/kg	< 0.4	< 0.4	< 0.4	-	-
Thiobencarb	mg/kg	< 0.08	< 0.07	< 0.07	-	-
Tolylfluanid	mg/kg	< 0.04	< 0.04	< 0.04	-	-
Triazophos	mg/kg	< 0.08	< 0.07	< 0.07	-	-
Trifluralin	mg/kg	< 0.08	< 0.07	< 0.07	-	-
Vinclozolin	mg/kg	< 0.08	< 0.07	< 0.07	-	-

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 clean 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.

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	69-76
Organochlorine/nitro&phosphorus Pest.s Screen in Soils, GCMS	Sonication extraction, Dilution cleanup, GC-MS analysis. Tested on as received sample	-	69-76
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	69-76
Composite Environmental Solid Samples*	Individual sample fractions mixed together to form a composite fraction.	-	1-4, 9-12, 17-20, 25-28, 33-36, 41-44, 49-52, 57-60

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

Samples are held at the laboratory after reporting for a length of time depending on the preservation used and the stability of the analytes being tested. Once the storage period is completed the samples are discarded unless otherwise advised by the client.

Carole Rodgers-Carroll BA, NZCS
Client Services Manager - Environmental

Appendix D

Hand Auger Locations

Soil Sample Location Plan - Contamination Assessment , 401 Jesmond Road (1st and 2nd August 2018)