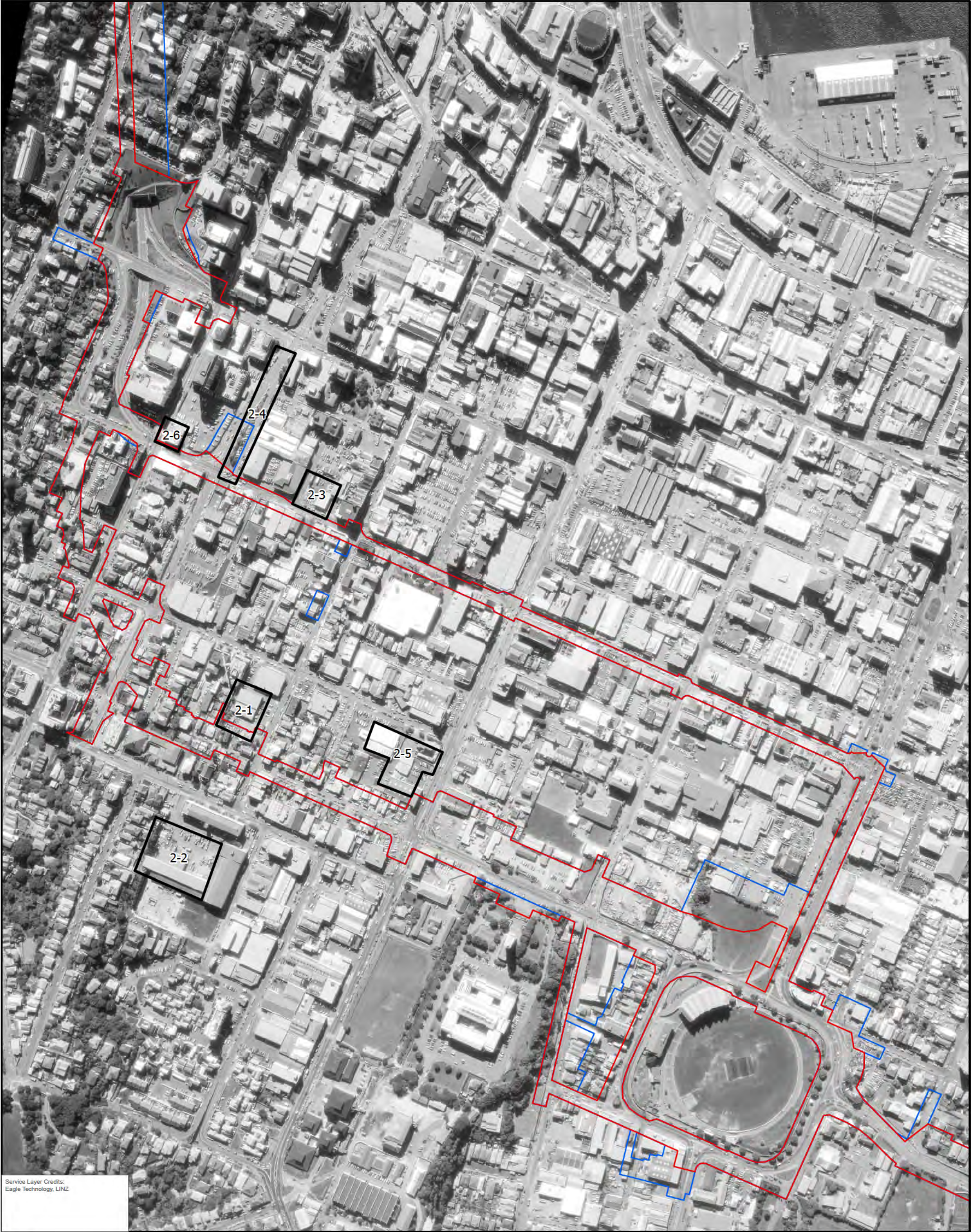




Service Layer Credits:
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Coordinate System:
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Scale:
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Project Number:
820/030609.00001

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19/06/2026

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FP

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- LEGEND
- Designation Boundaries
- NZTA_Designation_Existing

NZTA_Designation_Proposed

Feature

SH1 WELLINGTON IMPROVEMENTS

PROJECT SECTION 2
- TE ARO
- 1986



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Project Number: 820/030609.00001
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LEGEND
Designation Boundaries
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SH1 WELLINGTON IMPROVEMENTS

PROJECT SECTION 2
- TE ARO
- 1988

Attachment E - Figure 2-8

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Coordinate System:

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Scale:

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- Designation Boundaries**
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 - Feature

SH1 WELLINGTON IMPROVEMENTS

PROJECT SECTION 2
- TE ARO
- 1996



Service Layer Credits:

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km

Coordinate System:
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Project Number:
820/030609.00001

Date Drawn:
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FP

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LEGEND

Designation Boundaries

- NZTA_Designation_Existing
- NZTA_Designation_Proposed
- Feature

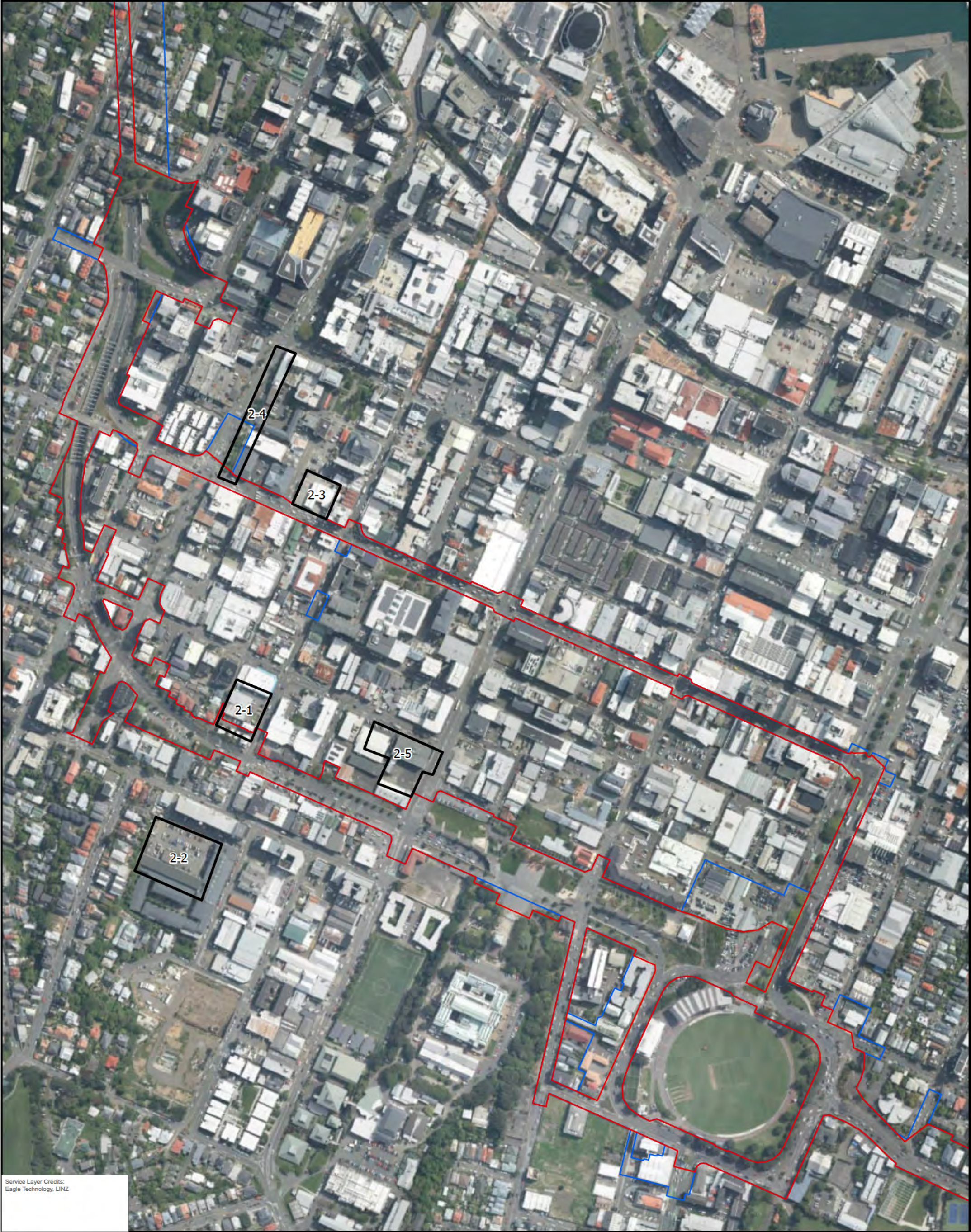
SH1 WELLINGTON IMPROVEMENTS

PROJECT SECTION 2
- TE ARO
- 2013

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Attachment E - Figure 2-10



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Coordinate System:
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Scale:
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Project Number:
820/030609.00001

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- Designation Boundaries**
- NZTA_Designation_Existing
 - NZTA_Designation_Proposed
 - Feature

SH1 WELLINGTON IMPROVEMENTS

PROJECT SECTION 2
- TE ARO
- 2021

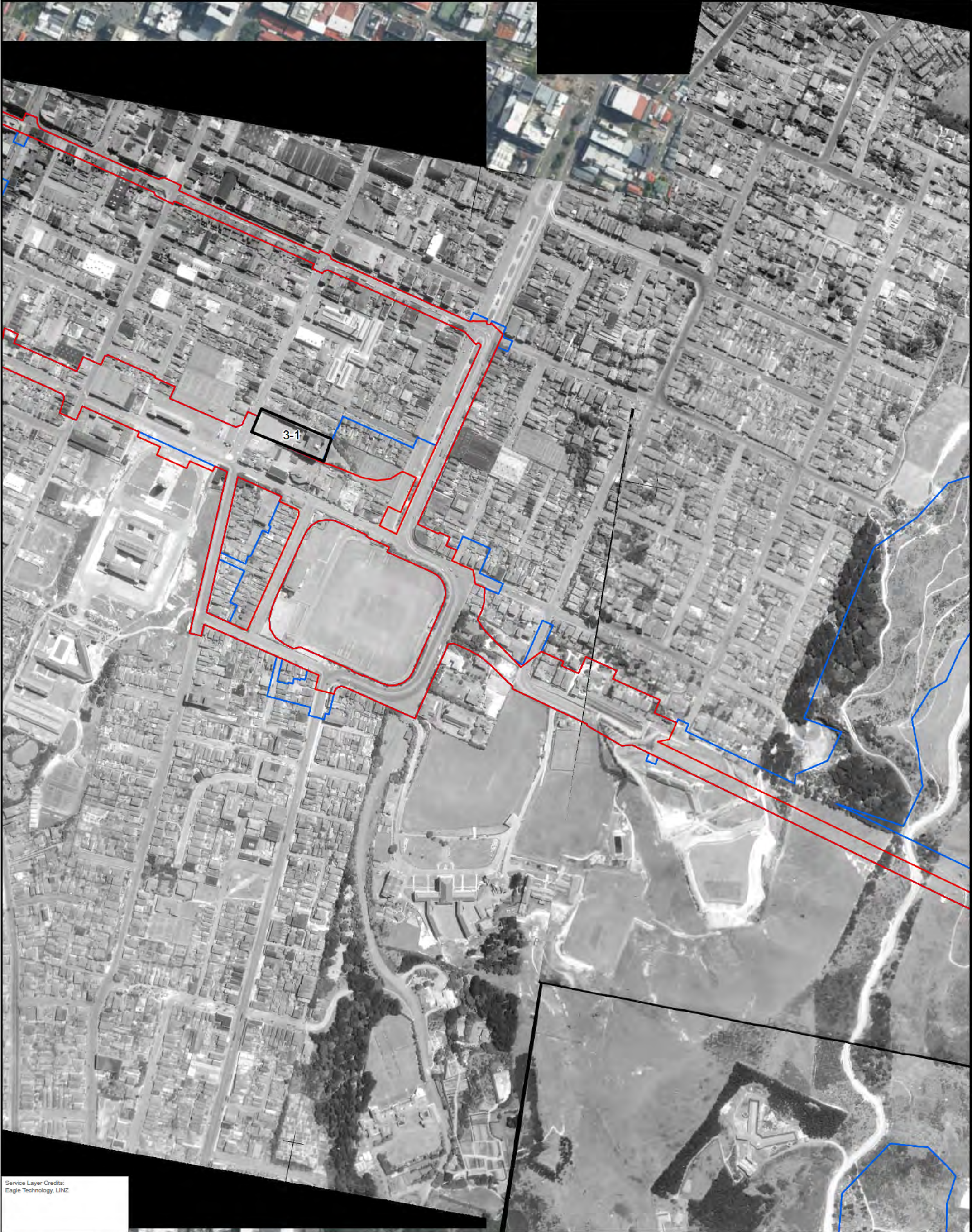
Project Section 3

Year	Reference	Observations
1938	Retrolens (black & white earliest available images)	Cambridge and Kent Terraces, the Basin Reserve and the Mount Victoria Tunnel are present in approximately their current alignments. Properties immediately adjacent to the Basin Reserve appear predominantly residential. Properties along Cambridge Terrace appear to be a mixture of commercial and residential. Warehouse type structures are visible at Feature 3-1, these are inferred to be part of the former WCC depot activity associated with SLUR file number SN/05/206/02 (169 Tory St, Wellington City).
1945	Retrolens (black & white)	Land cover appears broadly similar to the previous 1938 image in the immediate vicinity of the Project Section. Tennis courts and some structures have been cleared to form a park space (Feature 3-2).
1951-54	Retrolens (black & white)	Land cover appears broadly similar to the previous 1945 image in the immediate vicinity of the Project Section. The noted affected properties to the west of the Basin Reserve (Feature 3-3) and north of the Mount Victoria tunnel portal (Feature 3-4) appear to all be residential.
1960	Retrolens (black & white)	The buildings of Feature 3-5 have been replaced with a single commercial structure that is the consistent with the location of SLUR file number SN/05/225/02 (64 Cambridge Terrace, Wellington City). The land adjacent to Feature 3-3 has been cleared of residential buildings and commercial structure is under construction (Feature 3-6). Structures have been cleared from Feature 3-7, this Feature is consistent with the location of SLUR file number SN/05/881/02 (48 Buckle St). Other land cover appears broadly consistent with previous imagery.
1969	Retrolens (black & white)	Residential structures have been cleared and what appears to be Kirk Motors has been established (Feature 3-8), this is consistent with the Location of SLUR file number SN/05/230/02 (76 Cambridge Terrace, Wellington City). Commercial structures have been cleared from Feature 3-9. Buildings have been established on Feature 3-7 and it appears to have been incorporated in the land use of Feature 3-1. Several buildings have been cleared from the centre of Feature 3-3, and a new, present-day building has been established.
1971-74	Retrolens (black & white)	The Basin Reserve road layout is generally consistent with the present day (1974). Features 3-1 to 3-8 appear consistent, however aerial photo resolution is poor. A new commercial structure appears to have been established at Feature 3-9.
1986	Retrolens (black & white)	The circular embankment has been added to the Basin Reserve. The location of Features 3-1 and 3-7 as well as adjacent properties appear to be in shared land use, multiple materials are stockpiled and vehicles stored on open ground (Feature 3-10). Commercial structures have been established at Features 3-9 and 3-11, consistent with the SLUR file numbers SN/05/617/02 (20 Barker St, Wellington City) and SN/05/1435/02 (66 Cambridge Terrace, Wellington City).



Year	Reference	Observations
		The land cover of Features 3-3, 3-4 and 3-6 appear consistent to the 1971-74 imagery.
1996	WCC (black and white)	Features 3-2 and 3-8 have been re-developed and the structures on the properties are consistent with the present-day Gazley Mitsubishi buildings. SLUR file number SN/05/230/02 (76 Cambridge Terrace, Wellington City) refers to a fuel service station, however the land use appears more consistent with a car sale yard which likely has an associated vehicle service and repair shop. Feature 3-10 has been cleared and redeveloped, the buildings are mostly consistent with the present day, including underground area, this is consistent with the Te Papa wet storage land use noted in the SLUR file note SN/05/206/02 (169 Tory St, Wellington City). Feature 3-7 has been cleared and appears to be in use as a car park. The land adjacent to Feature 3-7 has been cleared (Feature 3-12). The northern portion of Feature 3-3 has been cleared of residential structures. A building has been removed and replaced with what appears to be a fuel service station (Feature 3-13), consistent with SLUR file number SN/05/160/02 (28 Adelaide Rd, Wellington City).
2014	WCC (colour)	Significant earthworks are being undertaken as part of the Arras Tunnel alignment for SH1. A temporary road diversion is being constructed through Features 3-7 and 3-12. Feature 3-3 appears consistent with its present-day layout. Buildings visible from the earliest available imagery (1938) have been cleared from Feature 3-14.
2021	WCC (colour)	The Arras Tunnel is now present, significant earthworks have taken place creating public green space to the north of the national war memorial. All other Features appear in their present-day layout.





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Project Number: 820.030609.00001
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Drawn by: FP
Checked by: KT



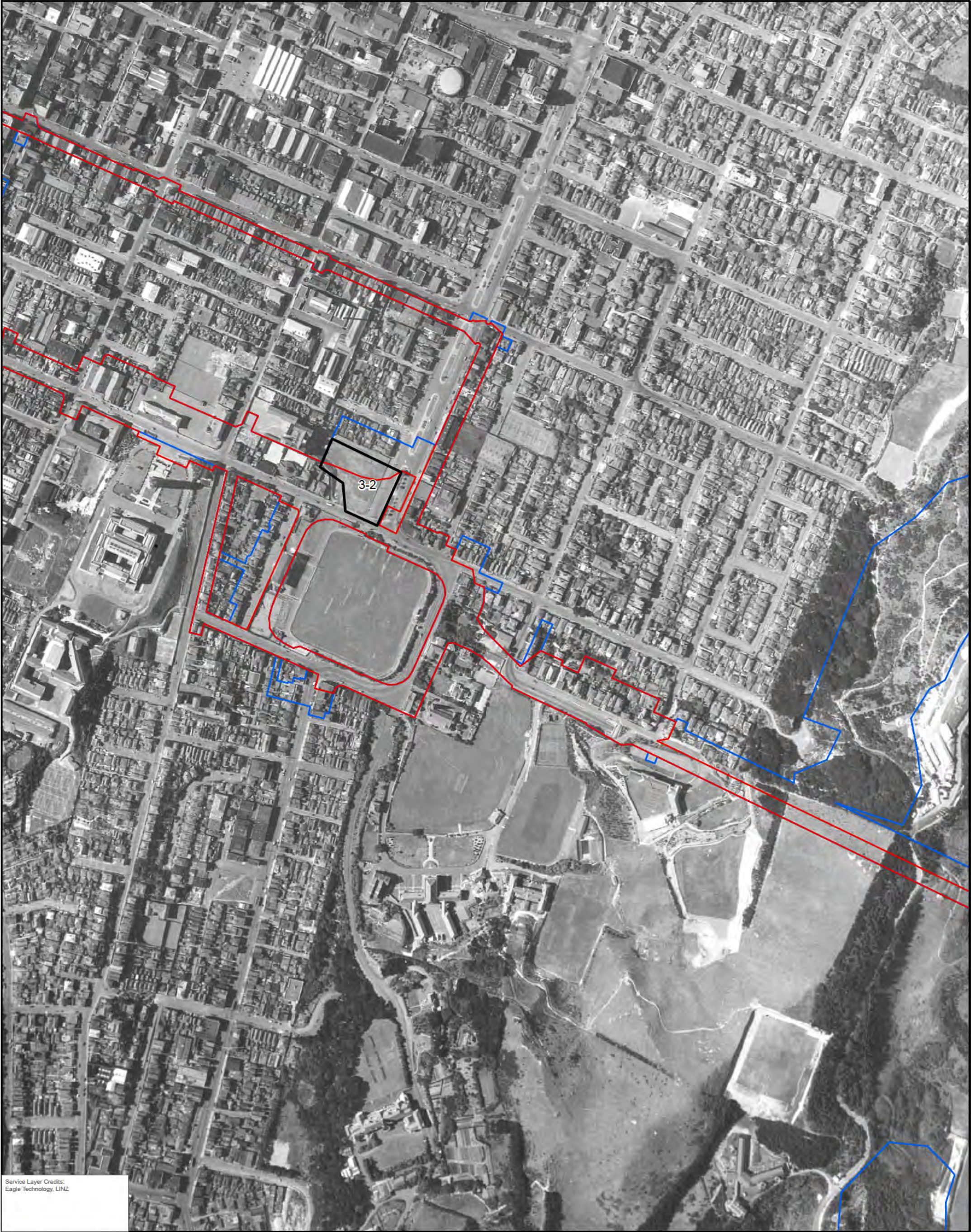
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— NZTA_Designation_Existing
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■ Feature

SH1 WELLINGTON IMPROVEMENTS

**PROJECT SECTION 3
- BASIN RESERVE
- 1938**

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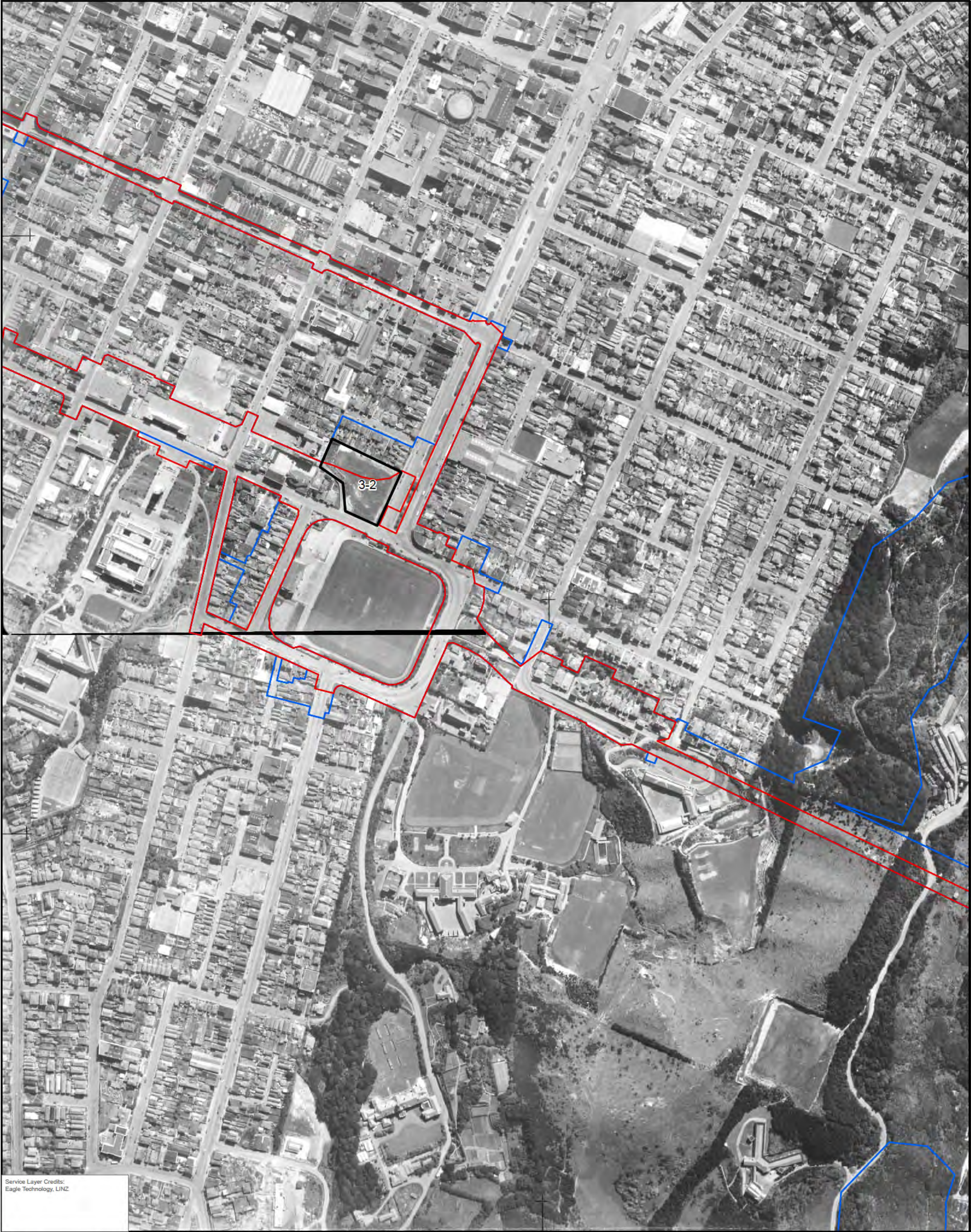
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SH1 WELLINGTON IMPROVEMENTS

**PROJECT SECTION 3
- BASIN RESERVE
- 1941**



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- Designation Boundaries**
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 - NZTA_Designation_Proposed
 - Feature

SH1 WELLINGTON IMPROVEMENTS

**PROJECT SECTION 3
- BASIN RESERVE
- 1945**



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SH1 WELLINGTON IMPROVEMENTS

**PROJECT SECTION 3
- BASIN RESERVE
- 1951**



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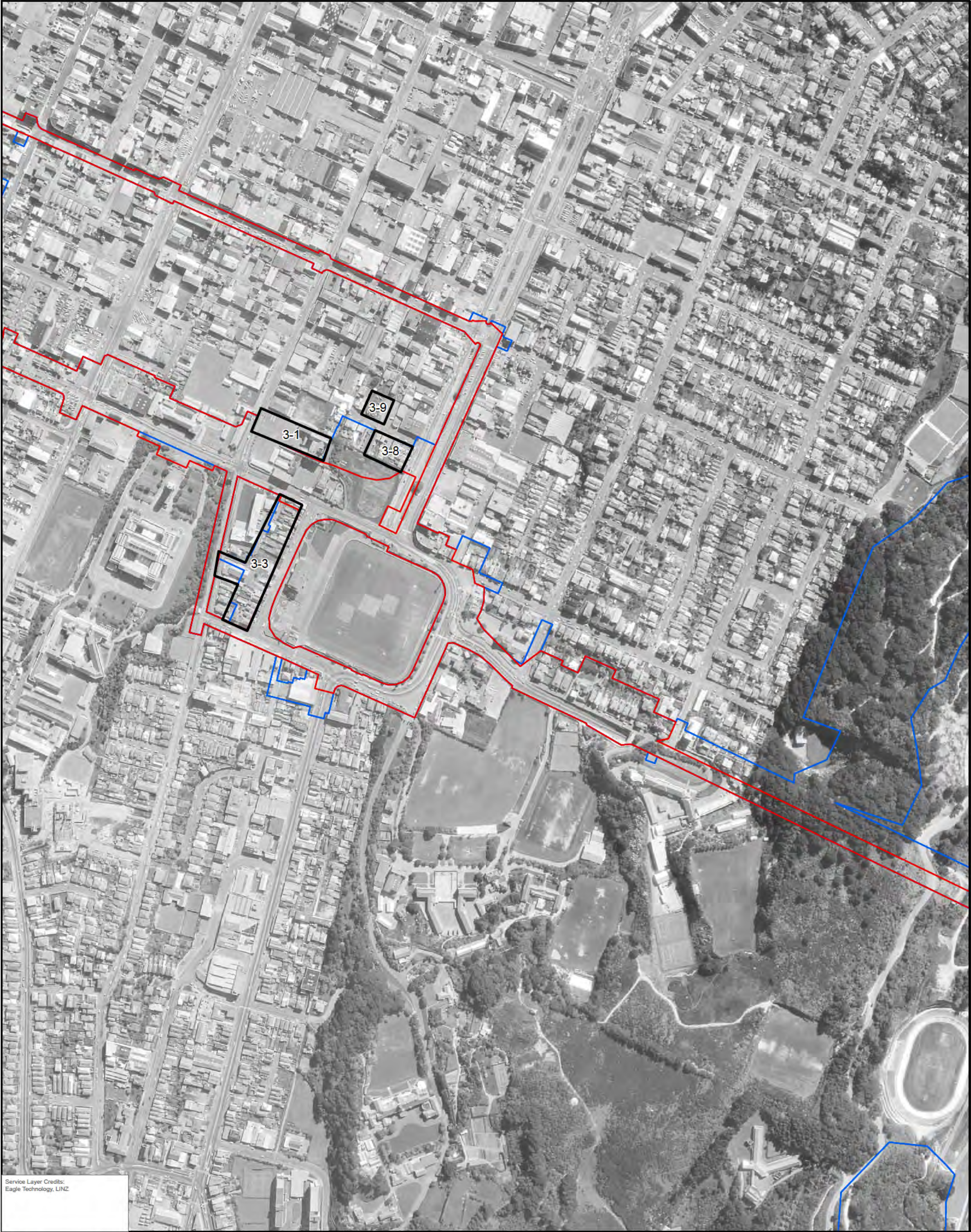
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**PROJECT SECTION 3
- BASIN RESERVE
- 1960**

Attachment E - Figure 3-5

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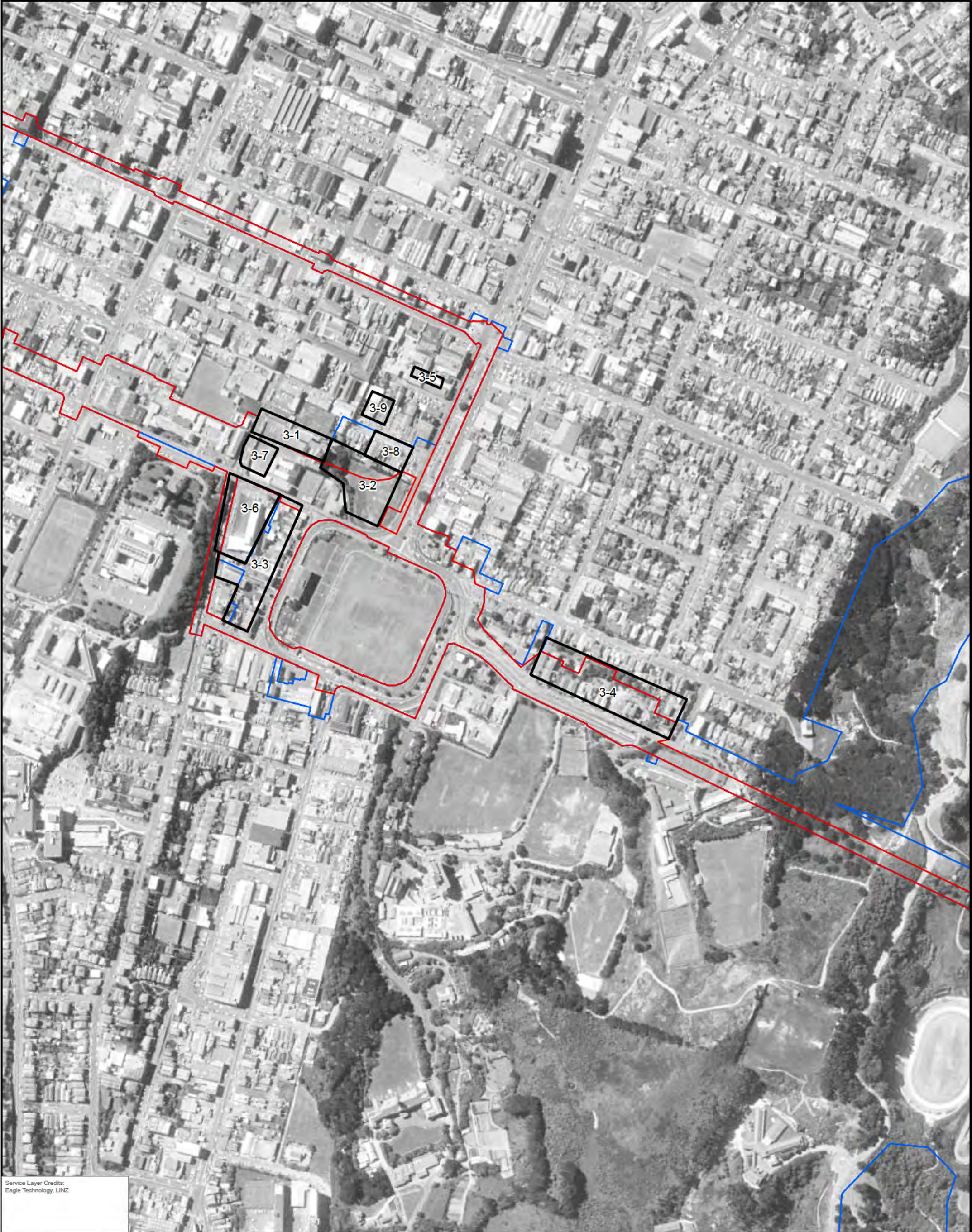
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SH1 WELLINGTON IMPROVEMENTS

**PROJECT SECTION 3
- BASIN RESERVE
- 1969**



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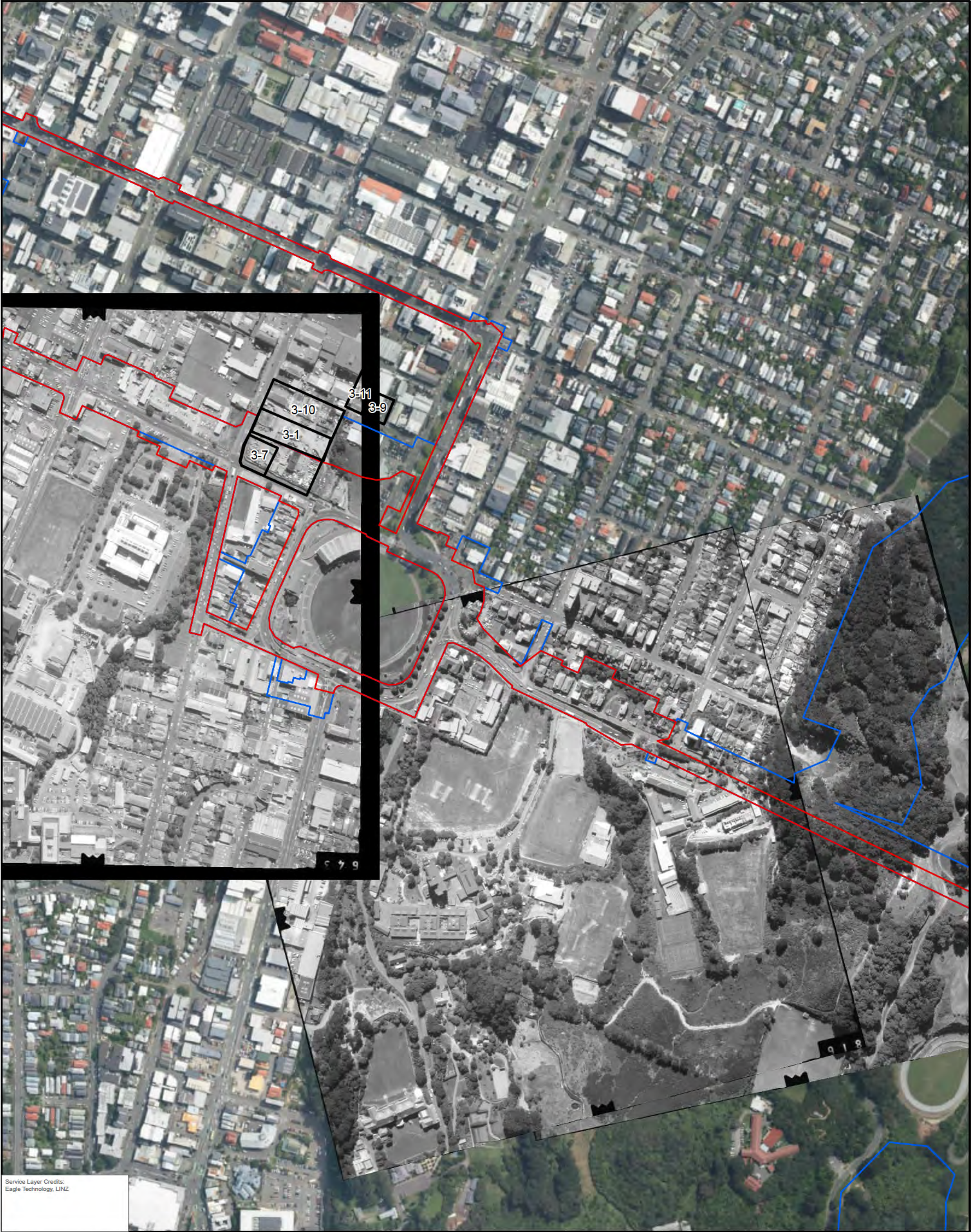
SH1 WELLINGTON IMPROVEMENTS

**PROJECT SECTION 3
- BASIN RESERVE
- 1974**

Attachment E - Figure 3-7

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PROJECT SECTION 3
- BASIN RESERVE
- 1985

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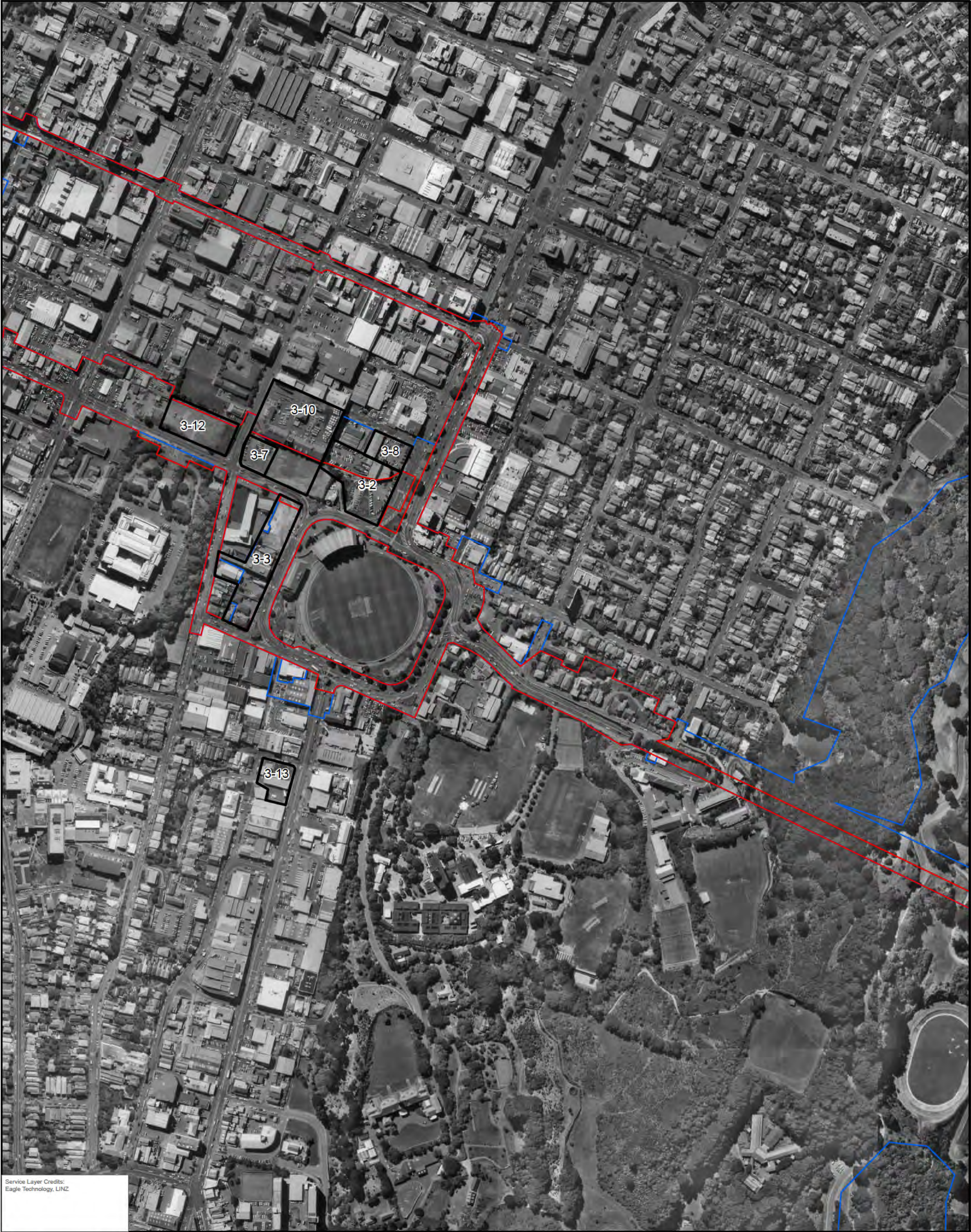
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**PROJECT SECTION 3
- BASIN RESERVE
- 1988**

Attachment E - Figure 3-9

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**PROJECT SECTION 3
- BASIN RESERVE
- 1996**



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- Designation Boundaries**
- NZTA_Designation_Existing
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 - Feature

SH1 WELLINGTON IMPROVEMENTS

PROJECT SECTION 3
- BASIN RESERVE
- 2013



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SH1 WELLINGTON IMPROVEMENTS

**PROJECT SECTION 3
- BASIN RESERVE
- 2021**

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Project Sections 4 and 5

Year	Reference	Observations
1938	Retrolens (black & white earliest available images)	The land cover within Project Sections 4 and 5 is broadly consistent with the suburbs of Hataitai and Kilbirnie. Specific features are discussed below. Feature 5-1 incorporates a mixture of residential dwellings and commercial buildings. Feature 5-2 appears to be two residential dwellings. Feature 5-3 appears to be in use as a market garden, online records support this Heritage Help - Church of the Latter Day Saints. Feature 5-4 incorporates residential dwellings. Feature 5-5 is Kilbirnie Park, which is in a state of partial land reclamation. The northern most portion of the Feature includes sports fields and what appear to be residential dwellings. Feature 5-6 appears to be five residential dwellings.
1945	Retrolens (black & white)	The sports fields of Hataitai Park have been expanded. Ruahine Street is now present. The northern portion of Feature 5-1 appears to be in use as a fuel service station. What appears to be military barracks type buildings are present at Feature 5-7, online records (Heritage Help - Hataitai Camp) indicate these buildings were established by the Public Works Department to house construction workers. The reclamation of Feature 5-5 is completed. Outside storage of processed timber is visible at Feature 5-8, this is consistent with the Evans Bay Timber Company Ltd noted on SLUR file number SN/05/044/02 (40 Kilbirnie Cres, Wellington City). Features 5-2 to 5-4 and 5-6 appear broadly consistent with previous image.
1951-54	Retrolens (black & white)	No significant land cover changes within the main identified features from the previous aerial imagery.
1957	Retrolens (black & white)	The 1957 aerial shows the airport runway extension underway and the associated land reclamation to the east of Kilbirnie.
1960-61	Retrolens (black & white)	Features 5-1 and 5-2 appear broadly consistent. Feature 5-3 is being redeveloped, and the new structure on the property appears consistent with the present-day Church of the Latter Day Saints. Features 5-4 to 5-8 also appear broadly consistent with the previous imagery. The section of the current day SH1 alignment adjacent to Kilbirnie is being expanded, this is in conjunction with the construction of the Cobham Drive section of SH1, this has involved the removal of the residential dwellings in the northeast corner of Feature 5-5. A building consistent with the present-day Wellington Badminton Centre has been established at Feature 5-9. Feature 5-10 outlines part of the present-day marina, land reclamation associated with this feature is observable in the southern portion of the feature.
1969	Retrolens (black & white)	Features 5-1 to 5-4, 5-6, and 5-9 are broadly consistent with the previous imagery. The residential dwellings from the northeast of Feature 5-5 have been completely removed. The buildings from Feature 5-7 have been cleared. No processed timber appears to be stored on Feature 5-8 in this image. The land reclamation for Feature 5-10 has been completed and the land cover is broadly consistent with the present day land use.



Year	Reference	Observations
1971-74	Retrolens (black & white)	All identified features appear consistent with the previous imagery, however aerial photo resolution is poor.
1986	Retrolens (black & white)	Land cover is broadly consistent with the previous imagery. St Patricks College has been established to the east of Feature 5-5. The building coverage of Feature 5-10 is now consistent with the present day.
1996	WCC (black and white)	Features 5-1 to 5-7, 5-9 and 5-10 appear broadly consistent with the previous imagery. Processed timber is visible stored outside at Feature 5-8, it is noted that this property was operated as a Placemakers.
2014	WCC (colour)	Feature 5-7 has been redeveloped into medium density residential units. All other noted features appear broadly consistent. It is noted that in Feature 5-1, the property associated with SLUR file number SN/05/205/02 (22 Moxham Avenue, Wellington City) had an underground storage tank removed in 2006.





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Project Number: 820.030609.00001
Date Drawn: 19/06/2026
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SH1 WELLINGTON IMPROVEMENTS

PROJECT SECTION 4
- MOUNT VICTORIA TUNNEL &
PROJECT SECTION 5
- EASTERN CONNECTIONS
- 1938

Attachment E - Figure 4-1



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Project Number: 820.030609.00001
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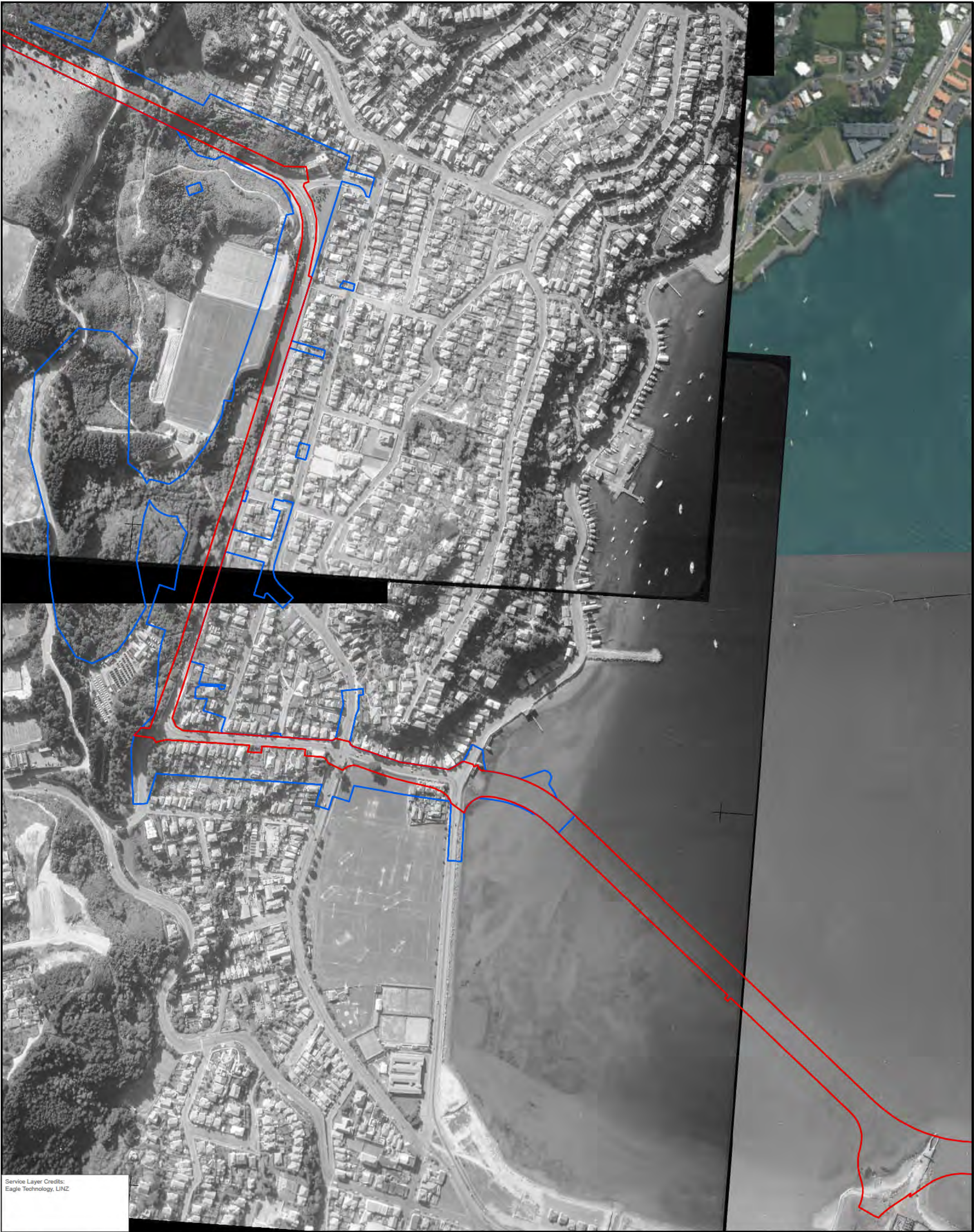


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SH1 WELLINGTON IMPROVEMENTS

PROJECT SECTION 4
- MOUNT VICTORIA TUNNEL &
PROJECT SECTION 5
- EASTERN CONNECTIONS
- 1945

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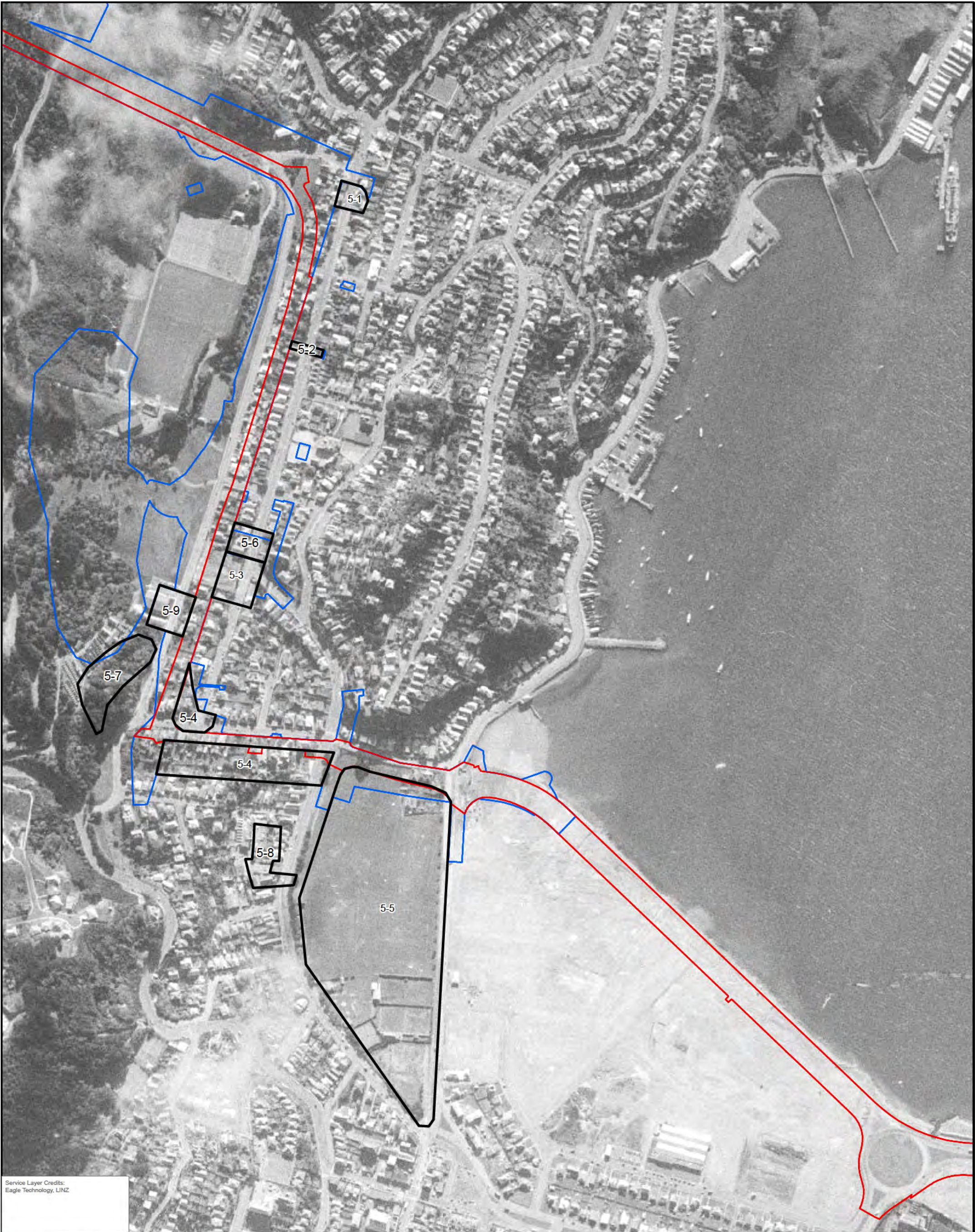
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SH1 WELLINGTON IMPROVEMENTS

PROJECT SECTION 4
- MOUNT VICTORIA TUNNEL &
PROJECT SECTION 5
- EASTERN CONNECTIONS
- 1954



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SH1 WELLINGTON IMPROVEMENTS

PROJECT SECTION 4
- MOUNT VICTORIA TUNNEL &
PROJECT SECTION 5
- EASTERN CONNECTIONS
- 1957



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SH1 WELLINGTON IMPROVEMENTS

PROJECT SECTION 4
- MOUNT VICTORIA TUNNEL &
PROJECT SECTION 5
- EASTERN CONNECTIONS
- 1938



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PROJECT SECTION 4
- MOUNT VICTORIA TUNNEL &
PROJECT SECTION 5
- EASTERN CONNECTIONS
- 1969

Attachment E - Figure 4-6



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Coordinate System:
NZGD 2000 New Zealand Transverse Mercator
Scale: 1:5,000 at A3
Project Number: 820.030609.00001
Date Drawn: 19/06/2026
Drawn by: FP



LEGEND
Designation Boundaries
— NZTA_Designation_Existing
— NZTA_Designation_Proposed

SH1 WELLINGTON IMPROVEMENTS

PROJECT SECTION 4
- MOUNT VICTORIA TUNNEL &
PROJECT SECTION 5
- EASTERN CONNECTIONS
- 1974

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- EASTERN CONNECTIONS
- 1980



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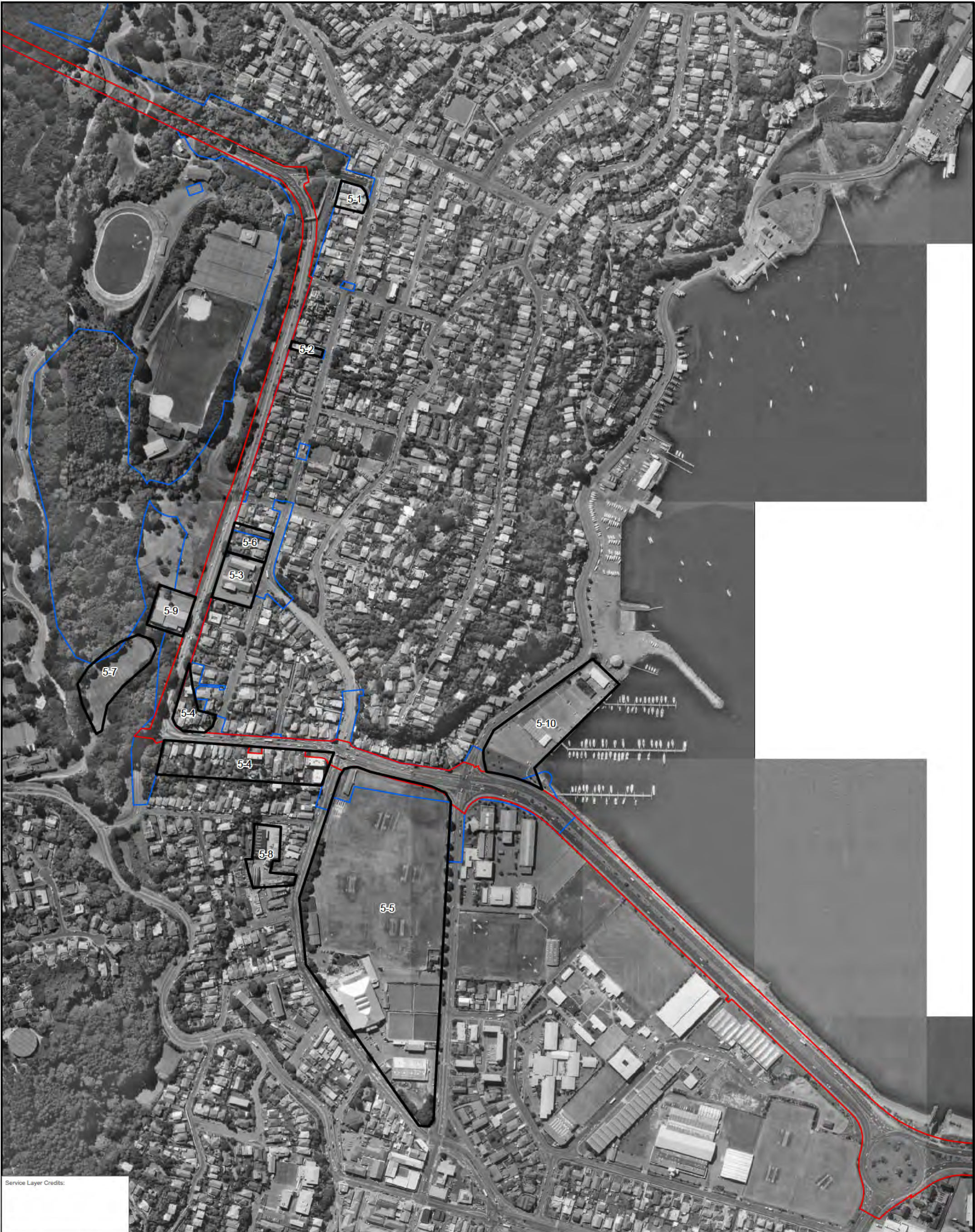
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- 1996



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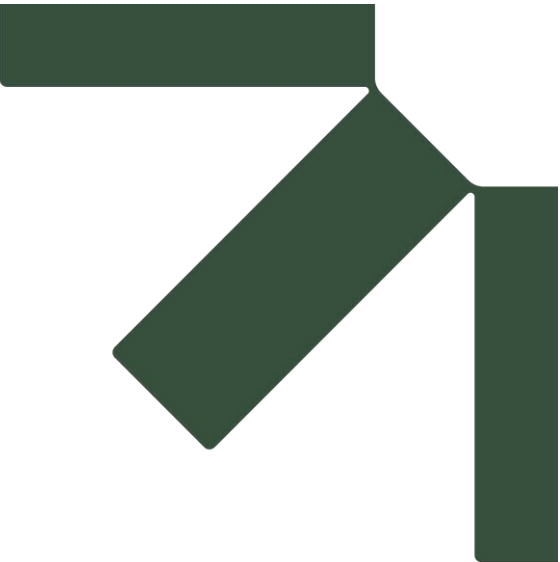
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Scale: 1:5,000 at A3
Project Number: 820.030609.00001
Date Drawn: 19/06/2026
Drawn by: FP



LEGEND
Designation Boundaries
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— NZTA_Designation_Proposed

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- EASTERN CONNECTIONS
- 2021



Attachment F Additional Council Information

Preliminary Site Investigation

State Highway 1 (SH1) Wellington Improvements Project

New Zealand Transport Agency Waka Kotahi

SLR Project No.: 820.030609.00001

3 June 2026

Landfills in the Wellington Region

**Prepared by:
Chris Purchas
Resource Investigations Department
October 1998**

Publication No. WRC/RINV-T-98/47

10.43 Kelburn Park

10.43.1 Location Information

Location:	Kelburn Park	Last Used:	1935
Access:	Salmanca Road	Map Reference:	2658217 5989822
Nearby Town:	Kelburn	Survey Date:	
Fill Contents:	General refuse	File Number:	K/9/5/21

10.43.2 General Description

Kelburn Park is located on Salamanca Road, Kelburn. Current land use is playing fields and a bowling green. Surrounding land uses are recreational, residential and Victoria University of Wellington. The site is owned and maintained by the Wellington City Council.

The landfill operated from 1929 to 1935, receiving general refuse.

Surrounding topography is steep and the nearest identified surface water body is the Wellington Harbour. The most likely discharge pathway is through stormwater to the Wellington Harbour. There is no groundwater use in the immediate area. Prior to construction of the motorway from Te Aro to Thorndon, there was a valley with a stream flowing through it which probably received leachate from this site.

The site is considered relatively low priority with respect to the discharge of leachate.

On the basis of the age, size and type of refuse disposed of at the site, potential gas generation has been estimated as low. There are buildings that have the potential to act as gas collection points. Based predominantly on the age of the site, it is considered relatively low priority with respect the discharge of landfill gas.

10.43.3 Kelburn Park: Risk Ranking

Waste Type	Cleanfill	General Refuse	Hazardous/ Industrial
Confirmed	x	x	
Potential			
Quantity	Medium	Medium	
Leachate Impacts			
Potential Receptors		Potential Pathways	
Residential		Soil ingestion	
Agricultural		Dermal absorption	
Commercial/industrial		Maintenance/excavation	
Recreational		Surface water	
Groundwater user		Groundwater	
Surface water user			
Site Priority Ranking			Low
Landfill Gas Impacts			
Potential Receptors (within 300 m)		Gas Production (m³/day)	
Residential		Nil	
Commercial/industrial		< 1,000	
		< 10,000	
		> 10,000	
Site Priority Ranking			Low



MWH

BUILDING A BETTER WORLD

REPORT

ING Environmental Site Investigation – McKenzies Building

Prepared for ING Real Estate Community Living Group

MAY 2009

This document has been prepared for the benefit of ING Real Estate Community Living Group. No liability is accepted by this company or any employee or sub-consultant of this company with respect to its use by any other person.

This disclaimer shall apply notwithstanding that the report may be made available to other persons for an application for permission or approval to fulfil a legal requirement.

QUALITY ASSURANCE STATEMENT

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Laurie Gardiner	Catherine Daniel <i>CP Dally</i>
PREPARED BY	APPROVED FOR ISSUE BY
Vanessa Dally	Laurie Gardiner <i>[Signature]</i>

WELLINGTON

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P + 64-4-381 6700, F + 64-4-381 6739

REVISION SCHEDULE

Rev No	Date	Description	Prepared By	Reviewed By	Approved By

ING REAL ESTATE COMMUNITY LIVING GROUP

ING Environmental Site Investigation – McKenzies Building

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1 Introduction

MWH New Zealand Limited (MWH) was commissioned by ING Real Estate Community Living Group (ING) to undertake an environmental site investigation at McKenzies Building, Willis Street, Wellington.

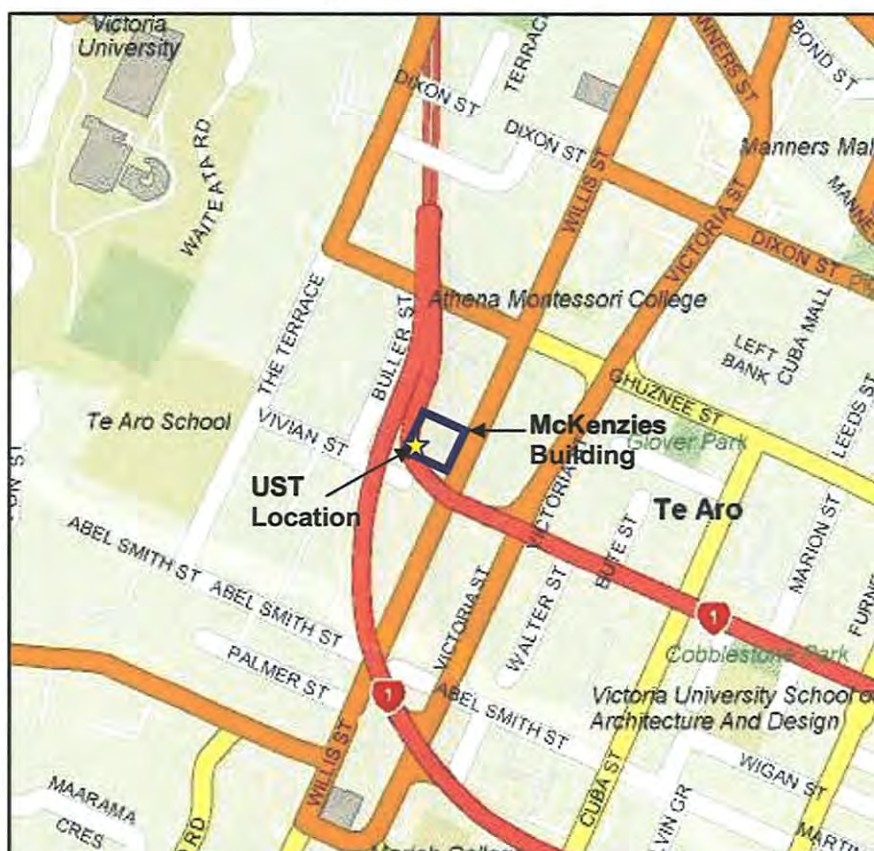
An unused underground storage tank (UST) used for storing petroleum is located in the south-western corner of the site in the carpark for the McKenzies Building. The objective of the environmental site investigation is to determine the extent and significance of any soil contamination at the site associated with the underground petroleum storage system (UPSS).

The site investigation and subsequent environmental assessment was conducted in accordance with the Ministry for the Environment (MfE) "Contaminated Land Management Guidelines, 2003".

1.1 Site Location

McKenzies Building is located at 222 to 232 Willis Street in Wellington. The legal description is PT SEC 141 TOWN OF WELLINGTON. The investigation is limited to the north-western corner of the property (See annotated area, Figure 1).

Figure 1: Site Location



2 Scope of Work

The following outlines the scope of works conducted on site and was prepared in accordance with Ministry for the Environment (MfE) Contaminated Land Management Guidelines¹.

¹ Ministry for the Environment 2001, *Contaminated Land Management Guidelines No. 1: Reporting on Contaminated Sites in New Zealand*. Wellington, New Zealand

- Drilling of 3 bores. Three bores were drilled to a depth of 3m below ground level (bgl) around the UST (See Figure 2, Appendix A for sampling locations).
- Collection of 6 soil samples for laboratory analysis. One sample will be collected from 1 to 1.5m (bgl) and another from 2.5 to 3m (bgl) depth².
- Analysis of soils for total petroleum hydrocarbon (TPH), benzene, toluene, ethylbenzene, and xylene (BTEX) constituents and polycyclic aromatic hydrocarbons (PAH)³.
- Comparison of results against relevant MfE Contaminated Land Guidelines⁴.
- A confidential report based on the findings from the environmental site investigation with a description of the type and concentration of any identified soil contamination and recommendations as appropriate in respect of its land use.

3 Site Description

3.1 Site History

The building was originally McKenzies Department Store and is made up of interconnecting buildings first built in the 1950s. Use of the site prior to this time is unknown. It is understood that a generator or boiler room existed on the ground floor in the south-western corner of the building and that the UST was installed for this purpose.

3.1.1 Property File and Selected Land Use Register

Wellington City Council (WCC) records show that the property has held dangerous goods licences for the storage of hydrocarbons at the property. A letter dated 31 January 1994 was sent by the Wellington City Council Dangerous Goods/Hazardous Substances Officer informing the site owner that a dangerous goods licence was no longer held by the premises and the UST was required to be removed.

WCC contacted ING in 2008 to inform them that the tank was still on site and that they were required to comply with the Hazardous Substances and New Organisms Act, 1996 (HSNO) requirements for underground tanks that are no longer used.

The property does not appear on the Greater Wellington Regional Council (GWRC) Selected Land Use Register (SLUR) as a site that has used, stored or disposed of hazardous substances. The SLUR did not identify any potentially contaminating activities that have occurred at the site. Absence of the site from the register does not mean the site is not contaminated only that GWRC do not have any evidence of contamination at the site, and they recommend a physical site investigation for confirmation.

3.2 Current Site Use

The ground floor is currently occupied by a grocery store, garage bay and pizza bar and café. The upper floors are student accommodation with 63 apartments over 5 levels.

3.3 Hydrology

The property is located in a built up area and all natural surface water bodies have been culverted and diverted to stormwater drains. The closest surface water body is Wellington Harbour, located

² Samples could not be collected from the top metre because the top 1m of soil was removed using suction. This method was considered the safest way to excavate the top metre since a large number of services were expected to 1 metre.

³ PAH only to be analysed for in samples exceeding MfE Hydrocarbon Guidelines for PAH Surrogate.

⁴ Ministry for the Environment, 1999, Guidelines for assessing and managing petroleum hydrocarbon contaminated sites in New Zealand, Wellington, New Zealand

approximately 1km to the northeast of the site. No sensitive ecosystems have been identified within 1 km of the site.

3.4 Geology and Hydrogeology

With reference to the 1:250, 000 IGNS Geological Map No. 10 (2000) 'Geology of the Wellington Area', the typical vadose zone soil type appears to be clays with organic material and silty sand. During the site investigation sandy gravel was encountered in the top 3m. Bedrock is likely to be the basement rock of the area which is the alternating argillite and greywacke sandstone of the Rakaia Terrace. Depth to bedrock is unknown but is likely to be greater than 15m.

Groundwater within the area flows in a north-easterly direction, with the depth to groundwater being between 3-4m. However, groundwater flow in the immediate vicinity of the site is most likely to have been influenced by the excavation for the Terrace Tunnel entrance and exit ways. The aquifer does not meet the Ministry for the Environment definition of a sensitive aquifer. According to the Greater Wellington Regional Council database, there are no shallow groundwater bores located in the Wellington City area as potable water is supplied via a reticulated town supply. Groundwater is not utilised within the area and future use is unlikely. The shallow groundwater aquifer was not encountered during the March 2009 investigation.

4 Sampling Methodology

Site work was conducted on 28 March 2009. The site work consisted of drilling 3 bores and collecting soil samples from the auger flights. A judgemental sampling method was adopted to determine the position of the bores based on UST location and direction of groundwater flow. Samples were collected from bores positioned around the tank in the pathway of any potential liquid or residual phase plume.

A total of 6 representative soil samples were collected from around the UST and tested for potential contaminants of concern.

4.1 Sampling Rationale

Three bores were placed around the former UST to detect any hydrocarbon plume resulting from a tank or pipe leak, or spill during filling. Samples were collected from 1 to 1.5m, and 2 to 3m depth. Samples were not collected from less than 1m as suction was used to remove the top 1m for protection of underground services.

4.2 Soil Sampling

The bore holes were drilled using a solid stem auger. To eliminate the risk of cross-contamination, soil samples were collected directly from the auger flights using clean disposable gloves for each sample. The auger was then steamed cleaned between bore locations. Soil samples were placed in clean airtight bags and agitated after five minutes and then screened on site using an intrinsically safe, portable photo ionisation detector (PID). This test monitors the concentrations of Volatile Organic Compounds (VOCs) in the air void (headspace) above the soil in the sample bag (See Field Observations for PID readings, Appendix B). Samples were then placed in jars supplied by the laboratory, labelled, chilled and sent for analysis under chain-of-custody (COC) documentation.

4.3 Field Quality Assurance and Quality Control

One blind replicate sample was collected during sampling as recommended by MfE Contaminated Land Guidelines No. 5: *Site Investigation and Analysis of Soils*. The guidelines recommend one duplicate sample to be collected for every 10 samples collected to provide information on the overall variability and precision of the sampling technique and the analytical laboratory.

4.4 Laboratory Analysis

Laboratory testing was carried out by RJ Hill Laboratories Limited, Hamilton. The laboratory report can be found in Appendix B along with the COC forms. Hill Laboratories are IANZ (International Accreditation New Zealand) accredited for the tests performed.

4.5 Basis for Guideline Values

Site observations and laboratory analytical results were evaluated against current New Zealand guidelines for their significance to human health and the environment. The hierarchy of guideline values used are in line with those recommended by the Contaminated Land Management Guidelines No. 2: *Hierarchy and Application in New Zealand of Environmental Guideline Values* (Ministry for the Environment, 2003) and included Ministry for the Environment. 1999, Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand.

5 Results

The analytical results are summarised in

Table 5-2 and Table 5-3. Full analytical results with detection limits are given in Appendix C.

The property is used for both commercial and residential purposes and has been compared with MfE guidelines for commercial/industrial and residential landuse for protection of all receptor pathways.

All results are within both commercial/industrial and residential guidelines. Only two samples had TPH above the laboratory detection limits. PAH was not analysed for since TPH concentrations were well below the MfE PAH surrogate guideline value.

5.1 Quality Assurance/Quality Control Data Analysis

Soil sample MKB1 2.5 and its duplicate MKBX show a small but acceptable variation in $C_7 - C_9$ concentrations. The results are presented in Table 5-1.

Table 5-1: Duplicate Sample Results

Duplicate Samples	MKB1 2.5	MKBX	Relative difference
	mg/kg dry weight		%
$C_7 - C_9$	<8.3	8.2	1
$C_{10} - C_{14}$	<20	<20	-
$C_{15} - C_{36}$	<30	<30	-
Benzene	<0.05	<0.05	-
Toluene	<0.05	<0.05	-
Ethylbenzene	<0.05	<0.05	-
Total Xylenes	<0.15	<0.15	-

For sample analysis of this nature, an acceptable relative percent difference (RPD) for a sample is less than 30 – 50%. It can be seen from this table that the duplicate sample returned an RPD figure that is below or within this acceptable limit, with all but $C_7 - C_9$ below the detection limit. This data confirms accurate laboratory testing procedures and accurate collection of quality duplicate samples in the field for this investigation.

Table 5-2: Laboratory Analysis Results

Laboratory Analysis Results (Sand, 1m – 4m)							
Sample Reference	MKB1 1.5	MKB1 2.5	MKBX	MKB2 1.5	Residential All Pathways	Commercial / Industrial All Pathways	Protection of Groundwater Quality (4m)
Represents soil	Remaining	Remaining	Remaining	Remaining			
Sample Location	Bore hole 1	Bore hole 1	Duplicate of MKB1 2.5	Bore hole 2			
Sample Depth (m)	1.5	2.5	2.5	1.5			
Soil type	Sand	Sand	Sand	Sand	Sand	Sand	Sand
Parameters	Results in mg/kg dry weight				(mg/kg)		
TPH							
C ₇ - C ₉	<8.3	15	<8.3	8.2	120	120	NA ³
C ₁₀ - C ₁₄	<20	<20	<20	<20	(470)	(1,900)	NA ³
C ₁₅ - C ₃₆	<30	<30	<30	<30	NA ¹	NA ¹	NA ³
BTEX							
Benzene	<0.052	<0.05	<0.05	<0.05	1.9	3.0	0.78
Toluene	<0.052	<0.05	<0.05	<0.05	(94)	(94)	(200)
Ethylbenzene	<0.052	<0.05	<0.05	<0.05	(92)	(300)	(280)
Xylenes	<0.162	<0.15	<0.15	<0.15	(130)	(150)	(120)

Note: Reference MfE Guidelines Tables 4.10 – 4.15 and 4.20

Site environmental criteria used are: Commercial/Industrial and Residential Land Use, Sand / Gravel Soil, 1- 4 m Contamination Depth, 4 m Groundwater Depth.

NA¹ indicates estimated criterion exceeds 20,000mg/kg. At 20,000mg/kg residual separate phase is expected to have formed in the soil matrix. Some aesthetic impact may be noted.

NA² indicates contaminant not limiting as estimated health-based criterion is significantly higher than that likely to be encountered on site.

NA³ indicates contaminant not limiting as estimated health-based criterion is significantly higher than that likely to be encountered on site (i.e. 20,000mg/kg for TPH, 10,000mg/kg for other contaminants).

Brackets denote values exceed threshold likely to correspond to formation of residual separate phase hydrocarbons.

Table 5-3: Laboratory Analysis Results

Laboratory Analysis Results (Sand, 1m – 4m)						
Sample Reference	MKB2 2.5	MKB3 1.5	MKB3 2.5	Residential All Pathways	Commercial / Industrial All Pathways	Protection of Groundwater Quality (4m)
Represents soil	Remaining	Remaining	Remaining			
Sample Location	Bore hole 2	Bore hole 3	Bore hole 3			
Sample Depth (m)	2.5	1.5	2.5			
Soil type	Sand	Sand	Sand	Sand	Sand	Sand
Parameters	Results in mg/kg dry weight			(mg/kg)		
TPH						
C ₇ - C ₉	<8	<8	<8	120	120	NA ³
C ₁₀ - C ₁₄	<20	<20	<20	(470)	(1,900)	NA ³
C ₁₅ - C ₃₆	<30	<30	<30	NA ¹	NA ¹	NA ³
BTEX						
Benzene	<0.05	<0.05	<0.05	1.9	3.0	0.78
Toluene	<0.05	<0.05	<0.05	(94)	(94)	(200)
Ethylbenzene	<0.05	<0.05	<0.05	(92)	(300)	(280)
Xylenes	<0.15	<0.15	<0.15	(130)	(150)	(120)

Note: Reference MfE Guidelines Tables 4.10 – 4.15 and 4.20

Site environmental criteria used are: Commercial/Industrial and Residential Land Use, Sand / Gravel Soil, 1- 4 m Contamination Depth, 4 m Groundwater Depth.

NA¹ indicates estimated criterion exceeds 20,000mg/kg. At 20,000mg/kg residual separate phase is expected to have formed in the soil matrix. Some aesthetic impact may be noted.

NA² indicates contaminant not limiting as estimated health-based criterion is significantly higher than that likely to be encountered on site.

NA³ indicates contaminant not limiting as estimated health-based criterion is significantly higher than that likely to be encountered on site (i.e. 20,000mg/kg for TPH, 10,000mg/kg for other contaminants).

Brackets denote values exceed threshold likely to correspond to formation of residual separate phase hydrocarbons.

6 Discussion

All soil sample results were within MfE recommended guideline values for both commercial and residential land use. There were only two detections of hydrocarbons, and both were within the GWRC background soil concentrations⁵ for total TPH of <40 to 260 mg/kg for soils in the Wellington City area.

Samples were collected from greater than 1m so the condition of the top 1m of soil is unknown. Therefore there is potential for limited contamination in this soil horizon. However, it is unlikely that the top 1m of soil is significantly contaminated as this would result in some contamination below 1m which was not observed in the 1 to 1.5m samples.

Although the bores that were drilled were positioned in areas most likely to detect any hydrocarbon contamination from the tank and associated pipe work there is a possibility that some contamination exists beneath the tank. Any contamination is likely to be limited since hydrocarbons were not detected above background levels in the samples collected.

7 Conclusions

An environmental site investigation was conducted around the UST in the car park of the McKenzies Building at 222 to 232 Willis Street on 28 March 2009. This investigation was conducted to assess whether any subsurface contamination had occurred from the UPSS on site. The investigation involved drilling bores and the collection of soil samples. These soil samples were analysed for total petroleum hydrocarbons and BTEX constituents.

The result of the analysis indicated that hydrocarbon contamination of the subsurface soil was not detected at the property in the location of the UPSS. There is potential for some limited contamination in the top 1m or directly beneath the tank. However, significant contamination in the region of the UPSS is unlikely as all samples collected showed TPH and BTEX to be within soil background limits.

⁵ Greater Wellington Regional Council, Background concentrations of common pollutants in soils in the Wellington Region, 2003.

8 Limitations

MWH New Zealand Limited (MWH) has prepared this report for the use of ING Real Estate Community Living Group in accordance with the usual care and thoroughness of the consulting profession. It has been prepared in accordance with the scope of work and for the purpose outlined in this report and the Project Change Notice (PCN) dated 16 March 2009. It is based on accepted practices and standards at the time it was prepared. No other warranty, expressed or implied, is made as to the professional advice included in this report. MWH makes no determination or recommendation regarding a decision to provide or not to provide financing with respect to the site.

There is no investigation that is thorough enough to preclude the presence of materials at the site, which presently, or in the future, may be considered hazardous. As regulatory evaluation criteria are subject to change, concentrations of contaminants present and considered acceptable may, in the future, become subject to different regulatory standards which cause them to become unacceptable and require remediation for the site to be suitable for the existing or proposed land use activities.

The methodology adopted and sources of information used by MWH are outlined in this report. MWH has made no independent verification of the information beyond the agreed scope of works and MWH assumes no responsibility for any inaccuracies or omissions. No indications were found during our investigations that information contained in this report as provided to MWH was false.

This report was prepared in May 2009 and is based on the conditions encountered and information reviewed at the time of preparation. MWH disclaims any responsibility for any changes that may have occurred after this time.

This report should be read in full. No responsibility is accepted for use of any part of this report in any other context or for any other purpose or by third parties. This report does not purport to give legal advice. Legal advice can only be given by qualified legal practitioners.

References

Greater Wellington Regional Council, 2003, Background concentrations of common pollutants in soils in the Wellington Region.

Ministry for the Environment (2004a), Contaminated Land Guidelines No.5: Site Investigation and Analysis of Soils.

Ministry for the Environment (2004b), Contaminated Land Guidelines No.3: Risk Screening System.

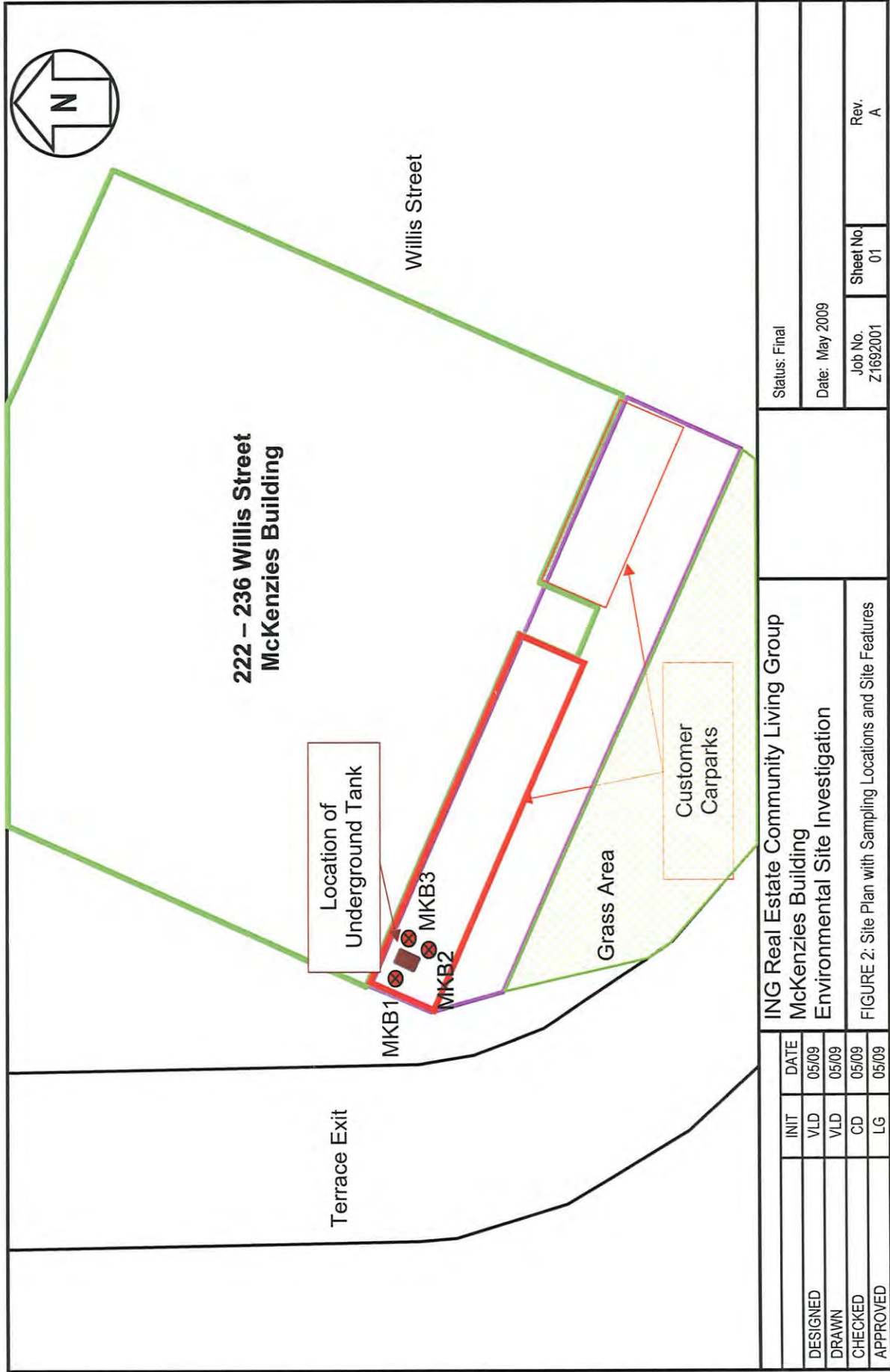
Ministry for the Environment (2004c), Contaminated Land Guidelines No.4: Classification and Information Management Protocols.

Ministry for the Environment (2003a), Contaminated Land Guidelines No.1: Reporting on Contaminated Sites in New Zealand.

Ministry for the Environment (2003b), Contaminated Land Management Guidelines No. 2: Hierarchy and Application in New Zealand of Environmental Guideline Values.

Ministry for the Environment (1999), Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand.

Appendix A: Site Photographs and Site Plan



ING Real Estate Community Living Group McKenzies Building Environmental Site Investigation			Status: Final	
FIGURE 2: Site Plan with Sampling Locations and Site Features			Date: May 2009	
DESIGNED	INIT	DATE	Job No. Z1692001	Sheet No. 01
DRAWN	VLD	05/09		
CHECKED	VLD	05/09		
APPROVED	CD	05/09		
	LG	05/09		Rev. A



Tank Location looking north-east



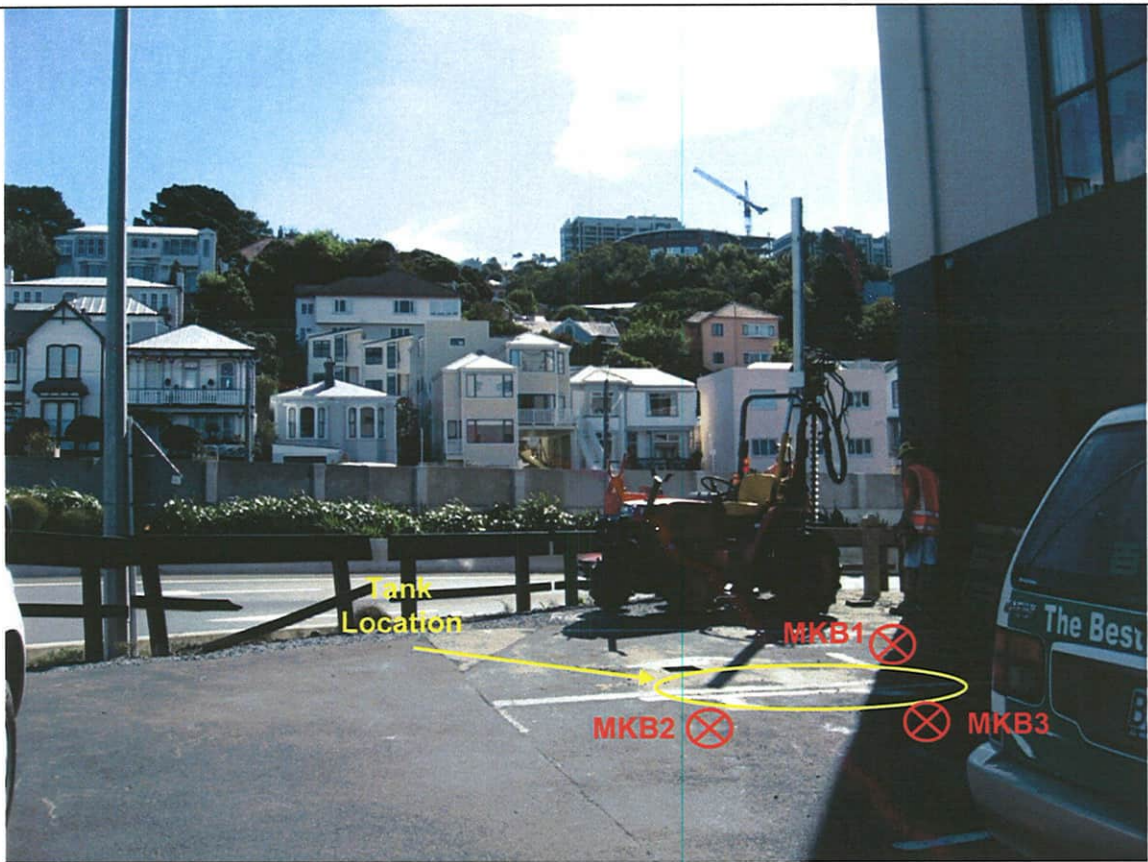
View to the east of the site towards Willis Street.



View to the south of the site across Motorway off ramp and Vivian Street.



View of the site looking west.



Drilling of MKB1

Appendix B: Site Observations

FIELD OBSERVATIONS

This appendix lists the samples collected and relevant site observations.

Sampling (locations shown on plan)

Sample #	Location	Depth (mm)	Soil type /staining	PID (ppm)
MKB1 1.5	Bore Hole 1	1.2	Light brown SAND and gravel	1.5
MKB1 2.5	Bore Hole 1	2.5	Light brown SAND and gravel	1.5
MKBX	Bore Hole 1	2.5	Duplicate of CHB1 2.5	1.5
MKB2 1.5	Bore Hole 2	1.2	Light brown SAND and gravel	1.8
MKB2 2.5	Bore Hole 2	2.5	Light brown SAND and gravel	1.9
MKB3 1.5	Bore Hole 3	1.2	Light brown SAND and gravel	1.4
MKB3 2.5	Bore Hole 3	2.5	Light brown SAND and gravel	1.6

Appendix C: Laboratory Report and Chain of Custody Documentation



ANALYSIS REPORT

Page 1 of 2

Client:	MWH New Zealand Limited	Lab No:	686554	SPV1
Contact:	V L Dally	Date Registered:	31-Mar-2009	
	C/- MWH New Zealand Limited	Date Reported:	15-Apr-2009	
	P O Box 9624	Quote No:	35417	
	WELLINGTON	Order No:		
		Client Reference:		
		Submitted By:	V L Dally	

Sample Type: Soil						
Sample Name:	MKB1 1.5	MKB1 2.5	MKB2 1.5	MKB2 2.5	MKB3 1.5	
	28-Mar-2009	28-Mar-2009	28-Mar-2009	28-Mar-2009	28-Mar-2009	
Lab Number:	686554.1	686554.2	686554.3	686554.4	686554.5	
Individual Tests						
Dry Matter	g/100g as rcvd	78	83	88	89	92
BTEX in Soil by Headspace GC-MS						
Benzene	mg/kg dry wt	< 0.052	< 0.050	< 0.050	< 0.050	< 0.050
Toluene	mg/kg dry wt	< 0.052	< 0.050	< 0.050	< 0.050	< 0.050
Ethylbenzene	mg/kg dry wt	< 0.052	< 0.050	< 0.050	< 0.050	< 0.050
m&p-Xylene	mg/kg dry wt	< 0.11	< 0.10	< 0.10	< 0.10	< 0.10
o-Xylene	mg/kg dry wt	< 0.052	< 0.050	< 0.050	< 0.050	< 0.050
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	< 8.3	15	8.2	< 8.0	< 8.0
C10 - C14	mg/kg dry wt	< 20	< 20	< 20	< 20	< 20
C15 - C36	mg/kg dry wt	< 30	< 30	< 30	< 30	< 30
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 60	< 60	< 60	< 60	< 60

Sample Name:	MKB3 2.5	MKBX				
	28-Mar-2009	28-Mar-2009				
Lab Number:	686554.6	686554.7				
Individual Tests						
Dry Matter	g/100g as rcvd	91	83	-	-	-
BTEX in Soil by Headspace GC-MS						
Benzene	mg/kg dry wt	< 0.050	< 0.050	-	-	-
Toluene	mg/kg dry wt	< 0.050	< 0.050	-	-	-
Ethylbenzene	mg/kg dry wt	< 0.050	< 0.050	-	-	-
m&p-Xylene	mg/kg dry wt	< 0.10	< 0.10	-	-	-
o-Xylene	mg/kg dry wt	< 0.050	< 0.050	-	-	-
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	< 8.0	< 8.3	-	-	-
C10 - C14	mg/kg dry wt	< 20	< 20	-	-	-
C15 - C36	mg/kg dry wt	< 30	< 30	-	-	-
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 60	< 60	-	-	-

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	Samples
BTEX in Soil by Headspace GC-MS	Solvent extraction, Headspace GC-MS analysis US EPA 8260B	-	1-7
Total Petroleum Hydrocarbons in Soil	Sonication extraction, Silica cleanup, GC-FID analysis US EPA 8015B/MfE Petroleum Industry Guidelines	-	1-7



This Laboratory is accredited by International Accreditation New Zealand (IANZ), which represents New Zealand in the International Laboratory Accreditation Cooperation (ILAC). Through the ILAC Mutual Recognition Arrangement (ILAC-MRA) this accreditation is internationally recognised.

The tests reported herein have been performed in accordance with the terms of accreditation, with the exception of tests marked *, which are not accredited.

Sample Type: Soil			
Test	Method Description	Default Detection Limit	Samples
Dry Matter (Env)	Dried at 103°C (removes 3-5% more water than air dry) for 18hr, gravimetry.	0.10 g/100g as rcvd	1-7

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.

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



Graham Corban MSc Tech (Hons)
Client Services Manager - Environmental Division



Hill Laboratories

BETTER TESTING BETTER RESULTS

ClientName **MWH New Zealand Limited** 45216Address **P O Box 9624, WELLINGTON**

Phone

Client Reference

Quote No **35417**

Order No

Primary Contact **Dally, Vanessa** 93858

Submitted By

Charge To **MWH New Zealand Limited (H/C)** 45200Results To ☒ Mail Primary Contact ☐ Mail Submitter☐ Fax Results☒ Email Results**ADDITIONAL INFORMATION**

Time Received 31-Mar-2009 10:20:42 am

Job No.

686554R J Hill Laboratories Limited
1 Clyde Street,
Private Bag 3205
Hamilton, New ZealandNo of Samples: **7**No of Fractions: **0**

031865541

Office use only: Job No:

CHAIN OF CUSTODY REPORTSent to
Hill LaboratoriesDate & Time: **30/3/09**☒ Please tick if you
require COC to be
faxed backName: **V. Dally**

Signature:

Received at
Hill LaboratoriesDate & Time: **31/3/09 9:50 am**Name: **Sophie Irvine**

Signature:

Condition

☐ Room Temp ☐ Chilled ☐ FrozenTemp: **17.2°C**☐ Sample & Analysis details checked

Signature:

Priority

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

Requested Reporting Date:

Quoted Sample Types

Soil (Soil)

No.	Sample Name	Sample Date/Time	Sample Type	Tests Required
1	MKB1 1.5	28/3/09	1xju	TEST for BTEX AND
2	MKB1 2.5	"	"	TPH ONLY hold.
3	MKB2 1.5	"	"	REMAINING SAMPLE
4	MKB2 2.5	"	"	for further tests (PAH)
5	MKB3 1.5	"	"	if required
6	MKB3 2.5	"	"	"
7	MKBX	"	"	"
8				
9				
10				



Hill Laboratories
BETTER TESTING BETTER RESULTS

R J Hill Laboratories Limited
1 Clyde Street
Private Bag 3205
Hamilton 3240, New Zealand

Tel +64 7 858 2000
Fax +64 7 858 2001
Email mail@hill-labs.co.nz
Web www.hill-labs.co.nz

Job Information Summary

Page 1 of 1

Client:	MWH New Zealand Limited	Lab No:	686554
Contact:	V L Dally	Date Registered:	31-Mar-2009 10:26:55 am
	C/- MWH New Zealand Limited	Priority:	High
	P O Box 9624	Quote No:	35417
	WELLINGTON	Order No:	
		Client Reference:	
		Add. Client Ref:	
		Submitted By:	V L Dally
		Charge To:	MWH New Zealand Limited

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	MKB1 1.5 28-Mar-2009	Soil	cGSoil	TPH + BTEX profile, Soil
2	MKB1 2.5 28-Mar-2009	Soil	cGSoil	TPH + BTEX profile, Soil
3	MKB2 1.5 28-Mar-2009	Soil	cGSoil	TPH + BTEX profile, Soil
4	MKB2 2.5 28-Mar-2009	Soil	cGSoil	TPH + BTEX profile, Soil
5	MKB3 1.5 28-Mar-2009	Soil	cGSoil	TPH + BTEX profile, Soil
6	MKB3 2.5 28-Mar-2009	Soil	cGSoil	TPH + BTEX profile, Soil
7	MKBX 28-Mar-2009	Soil	cGSoil	TPH + BTEX profile, Soil



ALL WORK EXECUTED AT OWNER'S RISK

J. L. KAY & CO.

ACETONE, ELECTRIC & FORGE WELDING EXPERTS

©



PHONE 52-859

38 FREDERICK ST.

(Opp. John Dickinson & Co.)

WELLINGTON 25th. February, 1948.

MOTOR,
GENERAL
ENGINEERING
AND
GENERAL
BLACKSMITHS

STEELITE
SPECIALISTS

Wellington City Council.
Chief Building Inspector,
City Hall,
WELLINGTON.

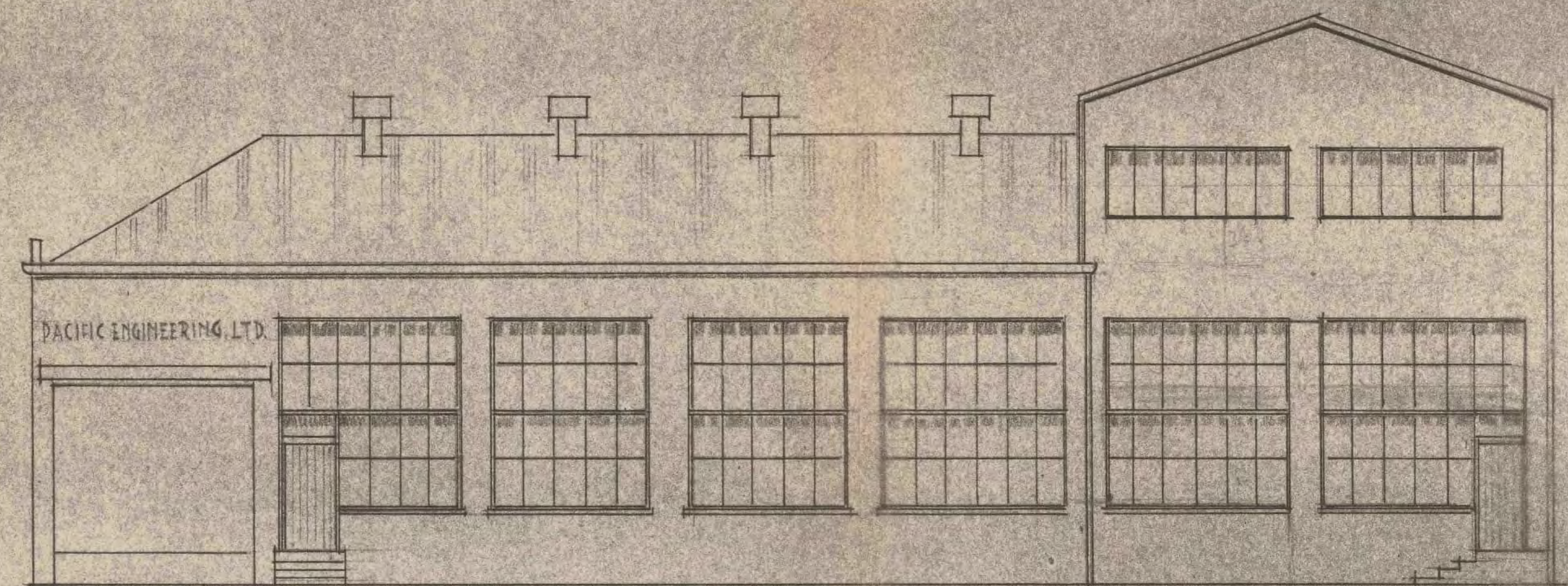
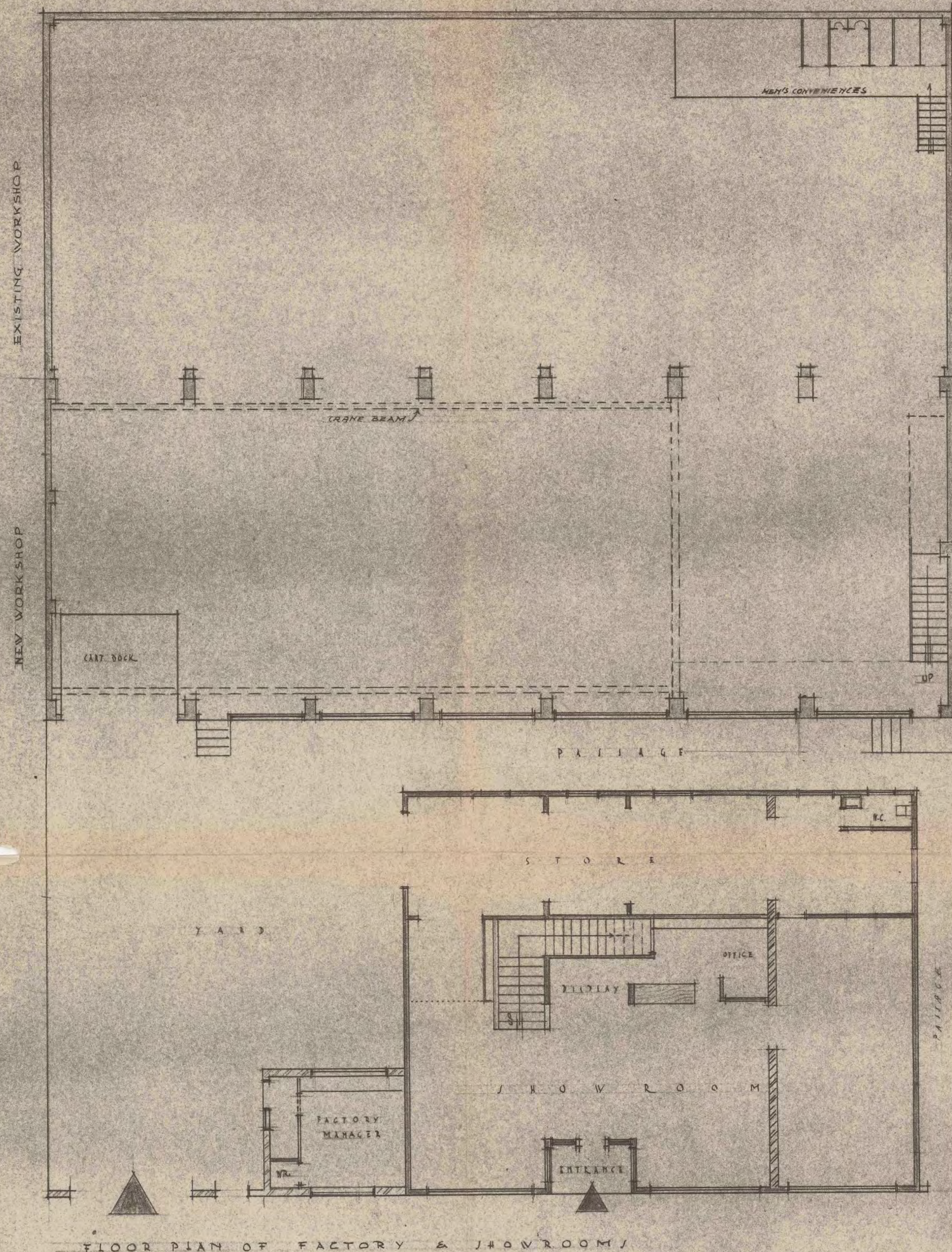


Dear Sir,

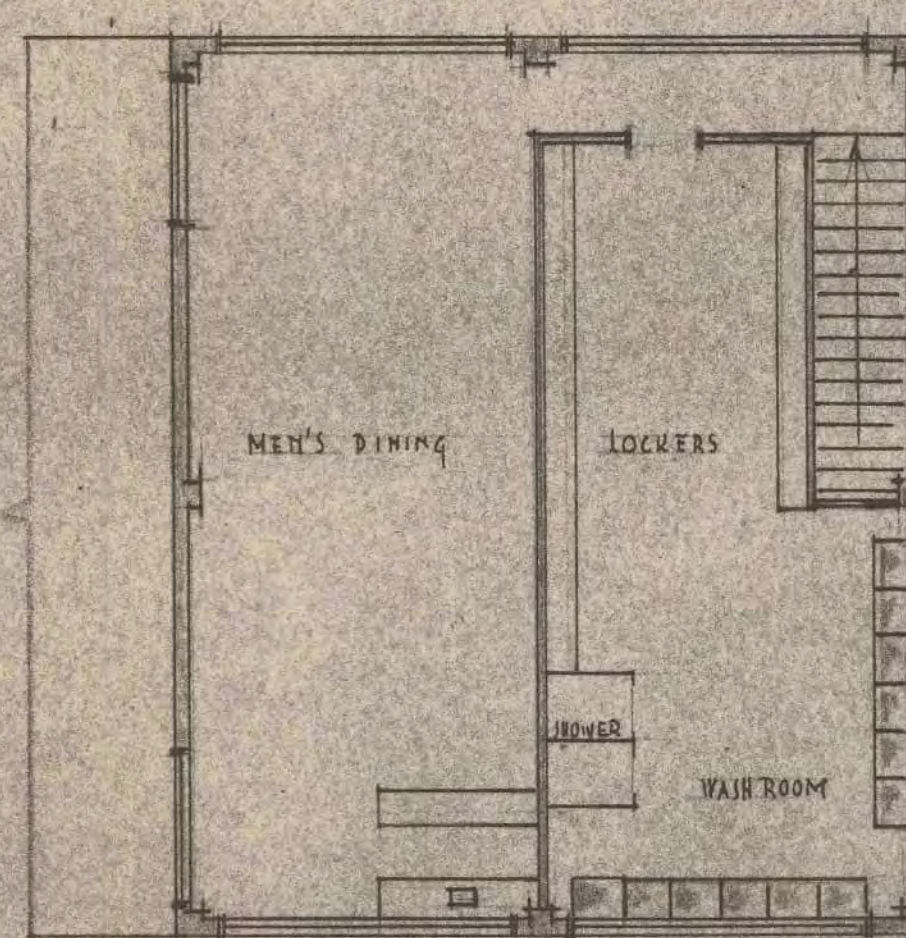
I herewith apply for permission to erect a structure at the rear of an existing building on No. 30, Frederick Street, to cover in the existing yard. An existing back wall which is also on my property will serve as one wall and the wall of the Pacific Engineering Company which is on my property will serve as another on the north side. Attached is a letter from the Pacific Engineering Company giving their permission. The building will be constructed in accordance with the accompanying plan and specifications.

Plans were originally drawn up for a major Building programme to embrace all the properties I own on this site including numbers 20, 22, 24, 26, 28, 30 & 32. But owing to the shortage of building material, it was considered preferable to make the best use of the existing premises as they stand, and to enable the Company to efficiently operate, additional covered area is required. To attain this it is proposed to build over the area as shown in plan and specifications attached.

/Our



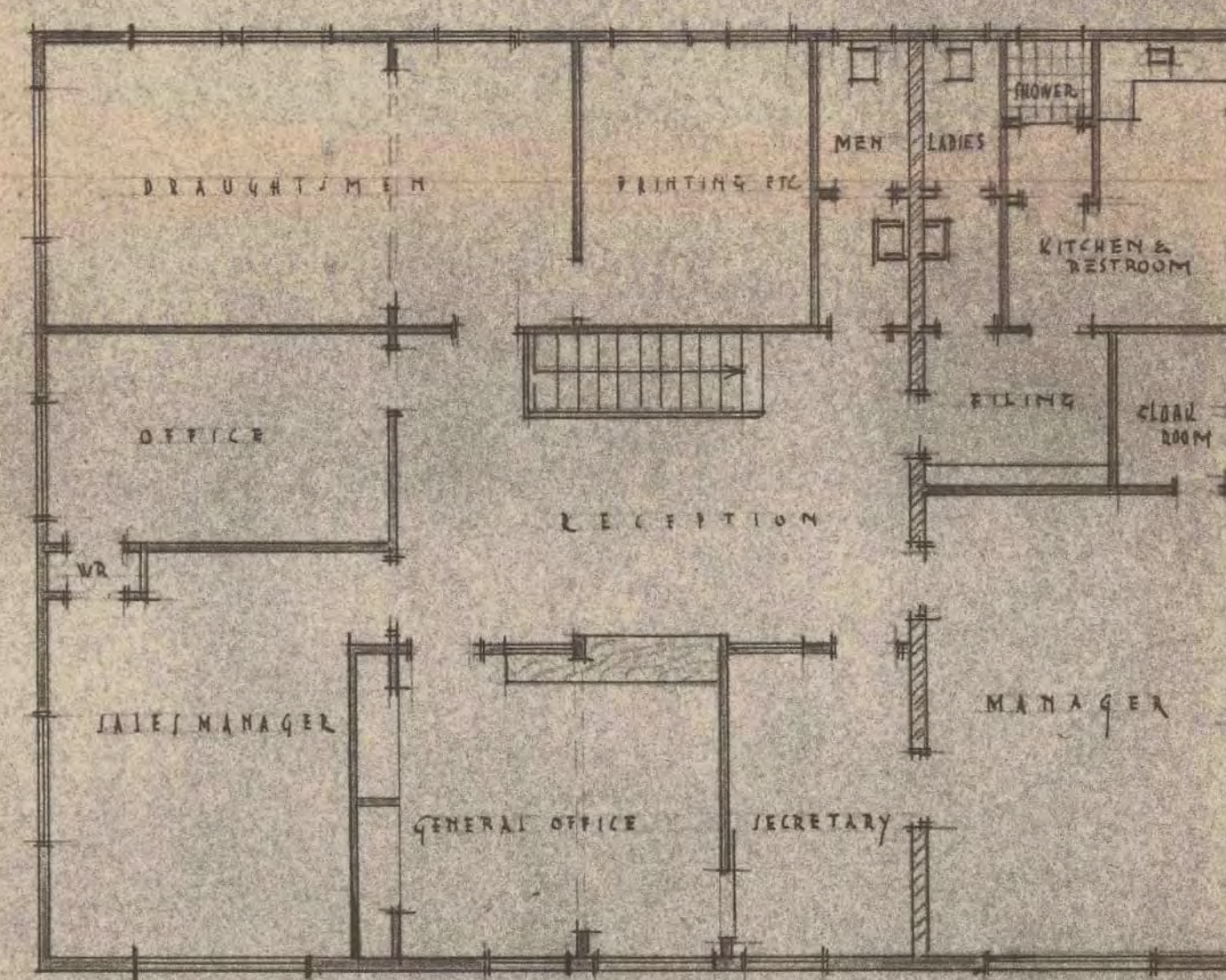
ELEVATION



FIRST FLOOR



PERSPECTIVE VIEW



FIRST FLOOR : OFFICES

Quoted Plan No 1

FREDERICK OST S.F.A.
ARCHITECT
37 MAIRAS ST. WELLINGTON

FACTORY & OFFICE BLOCK FOR PACIFIC ENGINEERING LTD.
VIVIAN STREET WELLINGTON.

BUILDERS: FLACK & SIDET
WELLINGTON
started. finished.

23/11/82

C 61476

District No. 3

Est. Value \$ 20,000

To Be collected within the next 7 Days
22-2-83 M.A.

BUSINESS ADDS. + ALIS.

"DEMOLISH COMMERCIAL B'LTGS" in
65-73 VZVIAN 26.38 FREDERICK Road, Street

for PROPERTY SECURITIES LTD.

Builder TRANT WRECKING CO, LTD.

15,3

1983

C.E. 430

Referred to Legal
2/3/83. 45/35/26

MM:MD 45/35/26

Building Branch
Works Department
WELLINGTON CITY COUNCIL

24 November 1982

DEMOLITION OF PREMISES

65-73 VIVIAN STREET
26-38 FREDERICK STREET
TE ARO :

PROPERTY SECURITIES LIMITED

1. The Contractor is responsible for the safety of the public at all times insofar as these works are concerned.
2. The requirements of the Construction Act 1959 and the Construction Regulations 1961 and their subsequent amendments are to be complied with in all respects. The Contractor is to consult with the Labour Department District Safety Inspectors for these requirements.
3. A Public Liability Insurance Policy for not less than \$500,000 for any one accident in the name of Trent Wrecking Co. Ltd and extended to indemnify the Wellington City Council (WCC) as per the local body endorsement arranged with the Underwriters Association is to be taken out by and at the expense of Trent Wrecking Co. Ltd and lodged with the Council before any work is undertaken.
4. The Contractor is responsible for arranging the location and protection of any services within the affected area or within adjacent public roads and is to notify the respective Authority including the Municipal Electricity Department, WCC Transport, Drainage and Traffic Management Departments, Post Office, Wellington Regional Water Board and Wellington Gas Company of any services that may be affected at least seven days prior to the commencement of the work to enable the necessary relocating or disconnecting to be carried out. This also includes all negotiations necessary for the protection and relocation of trolley bus overhead wires.
5. All demolition work shall comply with the requirements of Clause 3.21, Chapter 3, N.Z.S.S. 1900, unless otherwise stated below.
6. All demolition work is to be done under the control of a Certified Safety Supervisor at all times. The Contractor must nominate the Supervisor or Supervisors controlling the work.

7. The Contractor must either be on site when any work is in progress or else leave a nominated representative on site who shall have the same powers of authority as the Contractor. The Contractor's representative function may be filled by the Safety Supervisor required in clause 6 providing he is given the necessary powers of authority by the Contractor.
8. The Contractor must maintain on site in legible order and condition a copy of the permit conditions and addenda and this copy must be available for use by Council staff whenever work is in progress.
9. The Contractor shall maintain a sign board on site for the duration of the works. This sign board shall give the Contractor's name, business telephone number and after hours telephone numbers and shall be kept in a clear, legible condition and sited such that it can be easily read at all times by the Council, Police and other service and emergency authorities.
10. During the course of demolition, it is the Contractor's responsibility to ensure that adequate precautions are taken at all times to prevent unauthorised persons from entering the building. The above requirement is applicable, whether work is in progress or not.
11. All glazing is to be removed from street facades and the openings blocked off to the satisfaction of this Department before structural demolition commences. Any damage to window blocking must be repaired immediately.
12. After the building is vacated and securely sealed but before demolition commences the Contractor is to lay rat poison around the building. The Council's Health Branch can provide appropriate advice if required.
13. Verandahs are to be adequately supported and decked on top with 50 mm timber. Where there are no verandahs to the buildings, protection for pedestrians is to be provided, by provision of a weatherproof gantry full width of footpath and decked on top with 50 mm thick timber to satisfaction of this Department.
14. Unless stated otherwise in any amendment included with this permit there will be no basic restriction of working hours imposed by the Council. However, this does not negate the Contractor's obligation to comply with the Council's Bylaw Amendment No.66 (General) 1976, which makes specific reference to noise in streets and public places particularly between the hours of 11.00 p.m. and 7.00 a.m. The Contractor's attention is also drawn to the adjoining occupiers rights to bring a Court action for an injunction based on nuisance factor. Work on the street facade or work affecting the same or affecting the public footpath or roadway will not be permitted on weekdays between the hours of 7.00 a.m. and 6.00 p.m., extended to 9.30 p.m. on late shopping nights. All work on the street facade shall be carried out in such a manner that the footpath and roadway are left clear and safe for use by the public when work is not in progress on the street facade. No reversing in Vivian Street to the site is permitted between the hours of 7.00 a.m. to 9.00 a.m. and 4.00 p.m. to 6.00 p.m. on weekdays. Drive in and out in a forward direction to the site, then no restriction as to hours of access. When the Frederick Street frontage is being demolished, a flagman is required at the intersection of Frederick Street/ Taranaki Street.

15. All work on the street facade or work affecting the public footpath or carriageway must be programmed to be undertaken during the times specified in Item No.14. Should this work present any potential danger to the public then the Contractor may make application to close the footpath and/or part of the carriageway to the public during the above hours. The Contractor shall make specific application to the City Engineer (Attention: Streetworks Engineer) giving reasons for and details of each proposed closure at least four working days in advance and such work cannot proceed until he receives written approval from the City Engineer. The Contractor shall be responsible for notifying and meeting the requirements, including fees, of the following organisations: Road Transport Division, Ministry of Transport; Police; Fire Brigade; Ambulance; WCC Traffic Management and Passenger Transport Departments. Any closure may be revoked at any time without notice by the Road Transport Division, M.O.T., Police, Fire Brigade or the WCC where such action may be considered necessary in emergency situations. The Contractor is to make every endeavour to keep at least one 4.0m wide strip of carriageway available at all times for use by emergency service vehicles. When closed, the affected part of the street must be suitably barricaded off and signposted and the Contractor must provide staff at each point of closure to suitably direct vehicular and pedestrian traffic. The Contractor shall supply all signs and lights necessary and these shall be to the satisfaction of the Engineer. The work intended for periods of closure must be planned such that the street can be re-opened to the public and the site left in a safe condition within the time limits of the specific approval.
16. All loading shall be carried out on site. Loading across the footpath is not permitted.
17. The Contractor is to make all efforts to minimise any noise generated by the works and is to programme the work to give a reasonable relief from noise for residents and occupants in the area. All mechanical equipment including combustion engines, electrically powered plant, hydraulic and pneumatic plant is to be silenced in line with current standards and to Council approval.
18. "If the Contractor requires or is required to use water from the City's reticulation system for any purpose during the Works, a separate application for a permit for supply, for which a fee is payable, must be made to the Water Board Distribution Office, Chaffers Street. Any use of water by the Contractor must comply with the conditions laid down in the permit, which may limit the hydrant supply to a specified street hydrant. Under no circumstances must the Contractor operate any street hydrant other than the hydrant or hydrants for which the permit is issued. Failure to comply with this requirement may result in confiscation of the Contractor's standpipe, or the prosecution of the Contractor for unauthorised interference with the waterworks system".
19. The Contractor is to make all efforts to minimise dust generation and diffusion during the works. This shall include the use of water, sacking screens and/or other approved methods when required. The Contractors shall also take all actions necessary including wheel washing and provision of a metalled exit ramp, to prevent the shedding of mud, clay and similar materials onto public roads and footpaths.

20. If water is to be discharged from the site to the street channel, across the footpath then it must be discharged through hoses or pipes not exceeding 80 mm in diameter. The pipes or hoses are to be covered full footpath width and with wooden or steel ramps on a slope not greater than 1 in 12.
21. Storage of rubble and materials outside the site boundaries is not permitted at any time. Use or storage of plant, gear and equipment including air, water or gas hoses or electrical leads outside the site boundaries is not permitted except in those portions of the street which may be temporarily closed as set out in Item No.15 and then only for the time of the closure.
22. The site is to be fenced off immediately the demolition work is completed. Where the site is basically level or moderately sloped and flush with the back of footpath, a one metre high post and wire (three strands) fence will suffice. Where foundation or basement demolitions leave a steep or vertically drop along or adjacent to the street boundary or leave steep sided holes on the site then such areas shall be securely fenced to prevent access by the public. If construction of the new building starts before the end of the demolition works then the fencing must be constructed to building permit requirements before building work commences. If the new building construction project is not to commence on completion of the demolition then the fence constructed must be of sufficient strength to prevent the use of the site as an unauthorised car park.
23. All buildings and walls must be demolished one storey at a time except that the bottom two storeys may be demolished as one unit.
24. Pedestrian protection gantries will not be required on both Vivian Street and Frederick Street frontages providing the builder strictly observes the window blocking off requirements of Clause 11 and the working restrictions as set in Clauses 14 & 15. Should inconsiderate or dangerous practices by the builder generate justifiable complaints from either the public or Council Inspectors then the permit requirements will be reviewed and restrictions imposed as necessary.
25. All the builders parking must comply with Traffic Regulations applicable to the area. Any breach of Bylaws will result in requests to the Ministry of Transport to ticket and tow away. Use of metal tracked vehicles on public streets is prohibited by Traffic Regulations and breach of this law will also result in requests for policing action by Ministry of Transport plus any gouging or deformation of street surface will be included in the street damage assessment. Fuel and oil tankers or containers are not permitted to be parked or stored on the street. Any action of the builder which denies the public the use of any metered spaces during the payable hours stated on the meter will result in the builder being directed to make the space re-available for public use promptly and in the builder being charged a full days hire for every day or part thereof that the space is not available to the public.
26. The builder upholding this permit is responsible for ensuring that all staff and/or sub-contractors are aware of, and abide by, the conditions of the Permit.

27. The builder must supply and maintain on site adequate fire fighting equipment as required by the Construction Regulations, particularly when gas cutting.
28. The builder will be held responsible for any damage to the footpath or carriageway caused by the works and for any other Council costs including extra supervision arising from his actions. A restitution and costs deposit of ~~\$2,500.00~~ ^{\$2,000.00} is required as a guarantee that these charges will be met. This deposit is substantially less than that required and the contractor will be required to meet any extra costs incurred as a result of damage.
29. A licensed Drainlayer is to lift a separate permit to seal off sewer drain at junctions common sewer drain. The District Plumbing and Drainage Inspector is to be notified for inspection. Four sewer and three stormwater seal off fees to pay \$1,680.00. The Contractor is to notify the Plumbing and Drainage Branch of the name of the licensed drainlayer. The Demolition Contractor is to be advised of the WCC sewer main under these properties.
30. A fee of \$300.00 is to be paid to cover the cost of four water disconnections.
31. The above requirements are subject to review at any time.

CONTRACTORS FULL NAME:

J.H. Drent Wrecking Co.

UPLIFTED BY:

E. Glenner

(Must be authorised agent of Contractor)

DATE:

14-3-83

CONTRACTORS ADDRESS:

Box 511

BUSINESS TELEPHONE:

851-952

AFTER HOURS TELEPHONE:

SAFETY SUPERVISOR

NAME	CERTIFICATE NO.	DATE OF ISSUE	VERIFIED
------	-----------------	------------------	----------

WORKS DEPARTMENT
BUILDING INSPECTION BRANCH
21 NOV 1962
RECEIVED
MERCER STREET, WELLINGTON

WORKS DEPARTMENT
BUILDING INSPECTION BRANCH
21 NOV 1962
RECEIVED
MERCER STREET, WELLINGTON

[illegible]

DEMOLITION FORM

WORKS DEPARTMENT
RECEIVED
- 8 NOV 1982
STREET ENGINEERING
WELLINGTON

1 NOV 1982

Demolition of: BUILDINGS (Two)Located at: 65-73 VIVIAN STREET 26-38 FREDOCK STREETOwner: PROPERTY SECURITIES LTD.Builder: TRENT WRECKING CO. LTD PO BOX 511 WGTN. (851 952)To Building Superintendent -

In connection with the above proposed work, I recommend that the following conditions be imposed:-

1. District Engineer:

2. Plumbing and Drainage: Licensed Drainlayer PERMIT V. SEAL
OFF SEWER DRAINAGE AT JUNCTIONS COMMON
TO DRAINAGE INSPECTOR TO BE NOTIFIED.
DEMOLITION CONTRACTOR TO BEWARE OF A/C
THESE PROPERTIES.

4 SAN. POWER & 3 STORMWATER SEAL OFF FEES TO PAID TOTAL \$1680.00

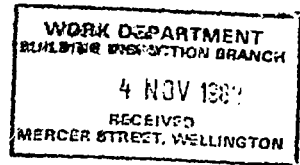
3. Water Works: 1-11-824. Traffic Engineers:5. Structural:6. Building Inspector: P.A. No. 2079 \$2,381.507. Transport: M.R.8. (a) Health: 1-11-82(b) M.E.O: 1-11-82(c) Gas Co: 1-11-82(d) Post Office: 1-11-829. To District Engineers: 3/11/82

Entered Day Book

10. To Plumbing and Drainage: 4/11/82 4/11/82

Entered Demo. Book

11. GENERAL REMARKS: GAS COMPANY LETTER REQUESTED 1-11-82Two Shoring & over require specificationKAP 3/11/82 Approved & A. Wilson 4/11/82



WELLINGTON GAS COMPANY

Private Bag, Wellington.

Tel. 847 779 / 87 or 48

DEMOLITION PERMIT

NOTE:- All known services will be Cut Off, however no responsibility is accepted for services which cannot be located. It is the contractors responsibility to advise the company should further services be found during demolition.

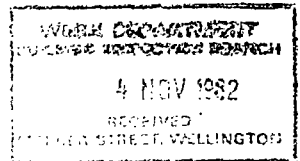
Name of Company Trent Wrecking Co. Date 1.11.82
Address of Company P.O. Box 511 Phone 851-952
Address of Work 65-73 VIVIAN ST.
Date building to be demolished 8.11.82
Number of services to be Cut Off 5 Services in N. Footpath
Location and size of main 6" C.I. in Footpath

Special Conditions:-

O'Docket - 3792.
Receipt No - 32668.
Amount - \$374.704.

W. J. Cox
Wellington Gas Co. Ltd.

W. J. Cox P P E S
Demolition Contractor



WELLINGTON GAS COMPANY

Private Bag, Wellington.

Tel. 847 779 / 87 or 48

DEMOLITION PERMIT

NOTE:- All known services will be Cut Off, however no responsibility is accepted for services which cannot be located. It is the contractors responsibility to advise the company should further services be found during demolition.

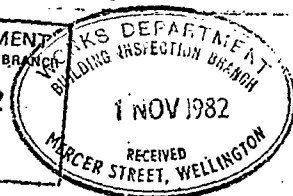
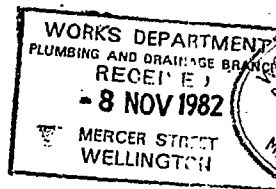
Name of Company Trent Wrecking Co. Date 1.11.82
Address of Company P.O. Box 511 Phone 851-952
Address of Work 26-38 Frederick St.
Date building to be demolished 8.11.82
Number of services to be Cut Off NONE
Location and size of main NONE

Special Conditions:-

Company Records Indicate no gas on property. Permit issued without fee. Notwithstanding note above.

[Signature]
Wellington Gas Co. Ltd.

W. Trent PP 88
Demolition Contractor



DEMOLITIONS :

Do you require the following services disconnected?

Water YES Yes / ☒ No

Sewer & Stormwater YES Yes / ☒ No

Are you, (or is any other party) intending to rebuild on this site? DO NOT KNOW Yes / No / Do not know

Note:

Any drains laid prior to 1959 do not comply with Drainage Regulations 1978 and will require relaying for new buildings.)

SIGNED: W. H. Trent

WELLINGTON CITY COUNCIL
WORKS DEPARTMENT BUILDING BRANCH
PAYMENT ADVICE (PLEASE FORWARD WITH YOUR PAYMENT)

To Department of Administration & Finance
(Postal Address:— The Town Clerk, P.O. Box 2199, Wellington)

No 2079

Received From: THE TRENT WRECKING COMPANY LTD.
of (Postal Address) P.O. Box 511 WELLINGTON

By Cash/Cheque Being Building Permit For: Property Securities Ltd.
At: 63-75 Vivian Street.

Account	Item	Payments	
Deposit No.		Access Guarantee Deposit	\$ _____
Deposit No.		Damage Deposit	\$ _____
225	971	Light Duty Crossing	\$ _____
225	972	Builders Road Fee	\$ _____
225	970	Heavy Duty Crossing	\$ _____
294	902	Water Fee	\$ _____
065	955	Inspection of Works/Documents	\$ <u>201.50.</u>
061 243	902	Drainage Fee	\$ _____
061 243	902	Plumbing Fee	\$ _____
704	902	Building Research Levy	\$ _____
745	909	Reserves Contribution	\$ _____
225	972	Resealing Charges	\$ _____
Deposit No.		Drainlayers Deposit	\$ _____
263	939	Junction Fees	\$ _____
263	941	Manhole/LHCE/Raising Lowering	\$ _____
Deposit No. <u>938803</u>		Road & Footpath Deposit	\$ <u>2.00 - 00</u> <u>2,500.00</u> <u>6.11.14.3.83</u>
263	940	Sewer & Stormwater Disconnection	\$ <u>1680.00</u>
294	940	Water Disconnection	\$ <u>300.00</u>
			\$ _____
			\$ _____

TOTAL \$ 2,381.50 6.11.14.3.83
4,681.50

Rates Office Machine Receipt No. 604 638

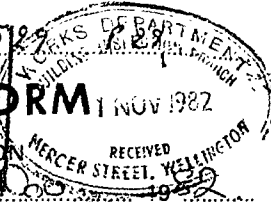
Signed _____ Date 14.3.83

Drainage Plan No.

5754 366

BUILDING APPLICATION FORM

WORKS DEPARTMENT
PLUMBING AND DRAINAGE BRANCH
RECEIVED
MERCER STREET, WELLINGTON
Date 1 NOV 1982



To the City Engineer,
Wellington

Sir,

I hereby apply for permission to Convert
Reinstate
Demolish

DEMOLISH

* 65-13 U.S. SLADER
at 26-38 FREDERICK
(House No. and Street) for

PROPERTY SECURITIES LTD
(Owner)

126 THE TERRACE

(Owner's Address)

according to Plans

and Specifications deposited herewith.

Particulars of Land Lot No.

Town Acre
or D/P

Frontage by Depth of Area

Particulars of Building — Foundations Walls Roof

Area of Ground Floor

Estimated Value of Work:

Number of Storeys Building \$ 20,000

Area of Outbuildings Drainage \$

Number of Occupants Plumbing \$

Water Fee n/a Mechanical \$

TOTAL \$ 20,000

Signed by Applicant N. H. Forster

Full Name of Building Company TRENT WRECKING CO LTD

(Please Print)

Full Postal Address of Building Company PO Box 511

WATN

Telephone No. of Building Company 851-952



29 July 2011

Jim Ginty
Director
Multi Civil Contractors Limited
PO Box 6873
Marion Square
WELLINGTON 6141

Dear Jim

Tank Removal Soil Validation Investigation – 129-133 Taranaki Street and 40-44 Frederick Street (V2), Wellington

Multi Civil Contractors Limited (MCC) has commissioned Pattle Delamore Partners Limited (PDP) to undertake a soil validation investigation after the removal of seven underground storage tanks (USTs) at 129-133 Taranaki Street and 40-44 Frederick Street, Te Aro, Wellington. The site was formerly occupied by Murdochs Building. Four of the tanks were beneath the building and another three were to the rear of the building in an area used for car parking. As part of the resource consent conditions for redevelopment at the site, Wellington City Council requires the USTs to be removed and the soil tested. The following report presents the results of the soil testing after the tanks were removed.

Background

The former Murdoch Building covered two lots, Pt Section 232 Town of Wellington (379m², and referred to as Sec 232 in report) and Pt Section 231 Town of Wellington (347 m², and referred to a Sec 231 in report) (see attached Figure). To the east and south-east of these two properties is a historic church situated on Pt Section 231 Town of Wellington (139 m², referred to as historic church in report), Lot 4 DP 55416 (182 m², referred to as Lot 4 in report) currently containing a double-bay garage and Lot 5 DP 55416 (333 m², referred to as Lot 5 in the report) was formerly a car park and is currently covered by asphalt and concrete.

The building consisted of a complex of office space, warehouse, bottle filling area and a small open courtyard. The former factory occupied by Murdochs food manufacturing company was constructed in 1919, and amongst other activities on site, turpentine, methylated spirits and kerosene were stored and bottled into smaller containers for distribution to retail outlets. Beneath the bottle filling area were three small USTs, and Sec 231 contained a small diesel UST which was under the former warehouse/office space. It is understood that these tanks were approximately 60 years in age and where built over at a later date. Three larger, more recent, USTs (~30 years old) were in the car park in Lot 5 (see attached Photographs).

In 2004 an environmental benchmarking investigation was undertaken by URS NZ Ltd on behalf of the owner of the three USTs in Lot 5. The investigation involved drilling three bores, collecting soil samples, installation of three groundwater monitoring wells and collection of groundwater samples. In the URS investigation the groundwater flow direction was inferred to be northwards towards the harbour and the bores were placed alongside and down-hydraulic

Tank Removal Soil Validation Investigation – 129-133 Taranaki Street and 40-44 Frederick Street (V2), Wellington

gradient of the USTs. The investigation summarised that the soil and groundwater results indicated some small losses of the stored petroleum products on Lot 5. However these results complied with the applicable Tier 1 acceptance criteria for commercial/industrial purposes.

Secs 231 and 232 are currently being redeveloped with an intended end use as residential apartments. The apartments will cover the majority of the site and there will be no access to soils. It is unknown at this stage what the intended end use of Lot 5 will be. Therefore, the following report compares the results of the investigation for the most sensitive land use which is residential criteria.

Scope of Work

The scope of work included:

- ✧ Collection of 43 soil samples (including one duplicate) from three tank pits (total of 7 tanks).
- ✧ Analysis of soil samples for total petroleum hydrocarbons (TPH) and BTEX compounds (benzene, toluene, ethylbenzene and total xylenes).
- ✧ Comparison of soil results against Ministry for the Environment Tier 1 Residential Guidelines.
- ✧ Preparation of an environmental site investigation report summarising the results of the TPH and BTEX results.

Site Setting and Surrounds

The site is located within the Te Aro commercial area. The site is bounded by a carpark and office building to the north. There is another office building directly to the east. The south of the site is bound by Frederick Street with apartment buildings on the other side of the road. To the west the site is bound by Taranaki Street. Across Taranaki Street is more commercial buildings and a hostel. Murdochs Building previously covered Part Sec 231 and 232 and this part of the site is currently free of buildings and has been covered with approximately 0.5m of compacted gravel fill post-demolition. The site is relatively flat with a slight slope towards Taranaki Street.

There is one UST near the western boundary (1m from site boundary) belonging to the office building to the west. The contents of the UST are unknown.

Geology and Hydrogeology

The 1:250,000 IGNS Geological Map No. 10 (2000) 'Geology of the Wellington Area' shows the typical natural soil type appears to be clays with organic material and silty sand. During the site investigation silty clay and sandy gravel was encountered in the top 4m. The basement rock of the area is likely to be alternating argillite and greywacke sandstone of the Rakaia Terrace. Depth to bedrock is unknown but likely to be greater than 15m.

Groundwater within the area flows in a northerly direction, with the depth to groundwater between 2.5 and 3 m. The aquifer does not meet the Ministry for the Environment definition of a sensitive aquifer. According to the Greater Wellington Regional Council database, there are no shallow groundwater bores located in the Wellington City area (with the exception of monitoring wells) as potable water is supplied via a reticulated town supply. Shallow groundwater is not utilised within the area and future use is unlikely. A monitoring groundwater well was located in Lot 5 and dipped on 5 July 2011. The groundwater was at a depth of 2.75 m below ground level (bgl).

Tank and Pit Details

A figure of the tank locations is appended along with photographs (Photographs 2 to 6).

Tank Removal Soil Validation Investigation – 129-133 Taranaki Street and 40-44 Frederick Street (V2), Wellington

Tank Pit 1 Three USTs (Tanks 1 - 3) were removed from an unlined pit excavated to a depth of approximately 2.5 m bgl. The pit location is in the former car park area on Lot 5 (Photographs 2 and 3). Surface cover over the USTs comprised of approximately 20 mm of asphalt underlain by gravel fill to one metre and gravelly sand to the base of the pit (mix of bedding material and natural material). Groundwater was encountered at approximately 2.8m.

Tank 1 - 4,500 L, disused kerosene, remote fill, single-walled steel UST. The tank, estimated to be 30 years old based on the owner's recollection, was in average condition with minor superficial surface rusting. No holes or significant pitting were noted in the tank.

Tank 2 - 10,000 L, remote fill, single-walled steel UST, disused, formerly containing turpentine. The tank was approximately 30 years old based on the owner's recollection and in a reasonable condition with some surface rusting. No holes or significant pitting were noted in the tank.

Tank 3 - 10,000 L, remote fill, single-walled steel UST, disused, formerly containing methylated spirits. The tank was approximately 30 years old based on the owner's recollection and in a reasonable condition with some surface rusting. No holes or significant pitting were noted in the tank.

Tank Pit 2 One disused diesel UST (Tank 4) was removed from an unlined pit on Sec 231, excavated to a depth of approximately 2 m bgl (Photograph 4). The tank was formerly covered by the Murdoch Building warehouse. Surface cover at the time of removal was compacted hard fill to 0.5 m bgl and then was a mix of silty clay and sand and gravel to the base of the pit. There was some fluid in the base of the pit. However, this fluid appeared to all come from the tank as it was removed from the pit and was not groundwater.

Tank 4 - ~2,000 L, disused diesel, single-walled steel UST. The tank, estimated to be 60 years old based on the owner's recollection, was in poor condition with major surface rusting. Holes and significant pitting were noted in the tank.

Tank Pit 3 Three USTs (Tanks 5 - 7) were removed from a concrete-bunded pit excavated to a depth of approximately 2 m bgl (Photograph 5). The pit location is in the former Murdoch Building bottle filling area on Sec 232. Surface cover over the USTs was gravel fill to the top of the concrete bunding. The fill within the bunding was sand. After the tanks and fluid within the pit were removed (see next section) the concrete bunding was broken up and removed so soil samples could be collected. Groundwater was not encountered in the pit.

Tank 5 - ~2,000 L, disused kerosene, single walled steel UST. The tank, estimated to be 60 years old based on the owner's recollection, was in poor condition with major surface rusting. Holes and significant pitting were noted in the tank.

Tank 6 - ~2,000 L, disused methylated spirits, single-walled steel UST. The tank, estimated to be 60 years old based on the owner's recollection, was in poor condition with major surface rusting. Holes and significant pitting were noted in the tank.

Tank 7 - ~2,000 L, disused turpentine, single-walled steel UST. The tank, estimated to be 60 years old based on the owner's recollection, was in poor condition with major surface rusting. Holes and significant pitting were noted in the tank.

Tank Removal Soil Validation Investigation – 129-133 Taranaki Street and 40-44 Frederick Street (V2), Wellington

Dispensers and Pipework

It is believed the remote fill points for the USTs in Tank Pit 1 were approximately 1.5 metres south of the tank pit on the verge of the public footpath on Frederick Street. At the time of the site investigation this area was covered in safety fencing and their location could not be confirmed. The pipework to the remote fill points were visible in the southern pit wall but the contractor did not want to remove them to avoid damaging the public footpath. A sample was collected from beneath the pipes (TP1 SW 0.8).

The dispenser lines ran northwards from Tank Pit 1 and then westwards to the bottle filling area. These pipes were apparently in poor condition when removed with some holes (PDP not present during removal).

Vents for the tanks in Tank Pit 1 were along the northern fence line. The parts of the vent pipes that were above ground were removed and in reasonable condition. The underground parts of the pipework were left in place as the concrete was not to be disturbed on this part of the site.

Pipe work associated with the other two tank pits was not evident apart from three narrow pipes near Tank Pit 3, which were removed when fuel dispenser lines for tanks 1-3 were removed.

Soil Sampling

Seven tanks were removed by Multi Civil on 5 July 2011 and fuel dispenser lines were removed on 11 July 2011. A PDP environmental engineer was present on site during the removal of the tanks but not the fuel dispenser lines. Samples were collected from each pit after the tank was removed using a hydraulic excavator. Samples were collected directly from the excavator bucket and were collected into glass jars provided by the laboratory and kept in chilled storage before being sent to RJ Hill Laboratories Limited, Hamilton, New Zealand for analysis, under PDP chain-of-custody procedures. The samples were sent via courier on the day of collection and were received by the laboratory on the day following dispatch.

Forty-one soil samples were collected for laboratory analysis during the site investigation to provide a preliminary assessment of the environmental effects of any petroleum hydrocarbon residues remaining in soils following the removal of the UPSS. The samples were analysed for TPH and individual BTEX compounds based on the former storage of petroleum products, turpentine, kerosene and diesel¹.

In addition to the samples collected for laboratory analyses, soil samples were collected from each sample location for the sole purpose of field screening [using a photo-ionisation detector (PID)²]. These soil samples were placed into individual zip lock sealed plastic storage bags. The samples were allowed to stand for several minutes prior to the bag being pierced and measuring the headspace vapour readings with the PID.

Petroleum Hydrocarbon Observations

Tank Pits

Tank Pit 1 (4,500L kerosene UST, 10,000 turpentine UST and a 10,000L methylated spirits UST): There were no hydrocarbon odours noted during the removal of these tanks. There were some dark areas in the top metre that

¹ Methylated spirits was also stored on site but ethanol (the main component of methylated spirits) was not analysed in soil as it has a low toxicity and no guidelines exist.

² A PID measures most volatile photo-ionisable compounds providing they have an ionisation potential below 10.6 eV. This includes most petroleum hydrocarbon compounds with a carbon range of between 1 and 10.

Tank Removal Soil Validation Investigation – 129-133 Taranaki Street and 40-44 Frederick Street (V2), Wellington

appeared to be staining but at closer inspection this appears to be either swamp deposits or remains of fires. PID readings were all low (ranged from 0 to 50 ppm).

Tank Pit 2 (2,000L disused (formerly diesel) UST): When the tank was removed hydrocarbon tainted water came out of the bottom of the tank. The fluid was a dark grey and had a strong petroleum hydrocarbon smell. This fluid was removed by a sucker truck and taken for treatment at Transpacific Technical Services (Transpacific) Seaview Terminal. There were some residual fluids left in the bedding material and soil at the base of the tank pit. Samples collected from the material did not have high PID readings (ranged from 0 to 117ppm), however, since there was some phase separated hydrocarbons (PSH) remaining in the pit the decision was made to remove soil at the base for treatment at the Transpacific Seaview Terminal.

Tank Pit 3 (3 x 2,000L disused (formerly kerosene, turpentine and methylated spirits) USTs): When the tanks were removed hydrocarbon tainted water came out of the bottom of the tanks and PSH was observed floating on top, there was also a strong hydrocarbon smell. The fluid was also removed from site and taken to Seaview for treatment. There was a small amount of fluid left in the base of the bunding and when the concrete was broken up it was spilt on the soil beneath. The bedding material and some of the soil at the base and walls of the pit were also removed to Transpacific's Seaview Terminal for treatment. PID readings in samples from this pit ranged from 0.8 to 1542 ppm. The highest readings were from 2 m depth.

Fuel dispenser lines (between Tank Pit 1 and the Filling Area): A PDP site representative was not on site when the pipework was removed. However, the contractor noted the pipes were leaking fluid as they were being removed and there was a strong hydrocarbon odour. Soil from the trench was sent to Transpacific Seaview Terminal for treatment. PDP were contacted to collect a spoil sample of the material that was to go off site and to collect validation samples along the base of where the fuel dispenser lines were located. There was no odour associated with the samples and PID readings were low (ranged from 1.3 to 1.4 ppm).

Laboratory Results

The laboratory results for TPH and BTEX are presented in Tables 1 to 6, appended, and compared with the Ministry for the Environment Hydrocarbon Guidelines³ for the protection of human health. The full laboratory reports are appended.

Tank Pit 1 (Table 1, appended)

TPH concentrations were detected above laboratory detection limits in only one sample from this tank pit, sample TP1 EW 0.8 from 0.8 metres depth on the eastern wall. However, a total TPH concentration of only 111 mg/kg was measured which is well within MfE Tier 1 Residential Acceptance Criteria. There were no BTEX detects in any of the samples collected from this location.

Tank Pit 2 (Table 2, appended)

There were TPH detects above laboratory detection limits in all but one sample collected from this location. However, all TPH concentrations were within the Tier 1 Residential Acceptance Criteria. Chromatograms were typical of weathered diesel.

³ MfE, 1999, Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand, Ministry for the Environment.

Tank Removal Soil Validation Investigation – 129-133 Taranaki Street and 40-44 Frederick Street (V2), Wellington

There were BTEX detects above laboratory detection limits for ethylbenzene and total xylenes in sample TP2 EW 0.8 which was from 0.8 m depth along the eastern wall of the tank pit. However, these concentrations were well within Tier 1 Residential Acceptance Criteria.

Tank Pit 3 (Table 3, appended)

There were TPH detects above the laboratory detection limits for six out of ten samples tested. Four of these samples had concentrations above Tier 1 Residential Acceptance Criteria for C₇-C₉ and C₁₀-C₁₄ carbon ranges. The four samples all came from 2 m depth from each of the four pit walls. All four exceeded the indoor air inhalation criteria for the C₁₀-C₃₆ carbon range (Table 6). Two samples from the south wall and east wall exceeded the protection of maintenance/excavation workers for C₇-C₉ and C₁₀-C₃₆. Exceedances for several samples of the TPH surrogate for polycyclic aromatic hydrocarbons (PAH) in diesel are not relevant as none of the products in the tanks in Tank Pit 3 were diesel. Consequently none of the samples with these exceedances were analysed for PAHs.

Total xylenes were the only BTEX compound where Tier 1 exceedances of Residential Acceptance Criteria were observed. This was in sample TP3 SW 2.0 collected from 2 m depth on the southern wall. This sample exceeded the maintenance/excavation workers criteria and the indoor air criteria. This sample and TP3 EW 2.0 also exceeded the protection of groundwater criteria.

Due to high PID readings a trench was dug approximately 1.5m on the western side of the tank pit from a depth of 2 m and 2.5 m bgl to help delineate the extent of residual hydrocarbons in this area (TR3 1.5 and TR3 2.0). These samples returned TPH and BTEX below the laboratory detection limits.

Fuel Dispenser Lines (Table 4, appended)

TPH concentrations were not detected above laboratory detection limits in these samples. There were no BTEX detects in any of the samples collected from this location.

Quality Control/Quality Assurance Sample

A duplicate of TP1 WW 2.0 was collected (TP1WW 2.5). The samples were in good agreement and both returned results below the analytical detection limit.

Assessment

Human Health Risk

There were only four samples on site that had exceedances above Tier 1 Residential Acceptance Criteria. These four samples were all from Tank Pit 3 and were all from an approximate depth of 2 m bgl. The site is intended for apartments and access to soil (currently buried beneath 0.5m of compacted hard fill) will not be possible, therefore only maintenance /excavation workers and indoor air inhalation are considered complete pathways.

With respect to risk to excavation workers, it is appropriate that a management plan be implemented if future excavation in the vicinity of Tank Pit 3 is contemplated. Should any soil require disposal from such excavation, it should be disposed of to a licensed facility.

The indoor air pathway is considered complete for this small area. Depending on the design of the future residential development, investigation for soil gas, removal of the remaining impacted soil and additional validation sampling, or a simple engineered solution for the area of Tank Pit 3 may be appropriate.

Protection of Groundwater

Tank Removal Soil Validation Investigation – 129-133 Taranaki Street and 40-44 Frederick Street (V2), Wellington

Two samples exceeded the protection of groundwater criteria. However, the criteria are based on a contaminated soil layer assumed to be 2 m thick which was not observed at the site. Given the limited residual hydrocarbons observed on site, and the non-sensitive nature of the groundwater, it is not considered a complete pathway.

Summary

In summary, seven tanks were removed from 129-133 Taranaki Street, formerly Murdochs Building. Residual hydrocarbons were observed at the site but were well within MfE Tier 1 Residential Acceptance Criteria with the exception of four samples from Tank Pit 3 to the eastern end of Sec 232. Four exceedances of indoor air inhalation criteria were detected in samples from a depth of 2 m bgl and two of these samples were also above the criteria for maintenance/excavation workers also.

Implementation of a management plan during any future excavation of this area is appropriate. The indoor air pathway is complete for an apparently limited area around Tank Pit 3. Depending on the design of the future residential development, additional investigation, soil removal or a simple engineered solution for the area of Tank Pit 3 may be appropriate.

References

Ministry for the Environment (1999), Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand.

URS (2004), Environmental Benchmarking – Murdoch & Co (Wellington) Limited, Wellington, Letter dated 23 August 2004.

Limitations

This report has been prepared by PDP on the specific instructions of Multi Civil Contractors Limited for the limited purposes described in the report. PDP 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.

This report has been prepared based on: visual observations of the site vicinity, PID results from field headspace analysis, and analysis of 41 soil samples from three tank pits. All soil samples were analysed by an analytical laboratory for TPH and individual BTEX compound concentrations. The site conditions as described in this report have been interpreted from, and are subject to, this information and its limitations and accordingly PDP does not represent that its interpretation accurately represents the full site conditions. The laboratory test results provide an approximation of the concentration of petroleum hydrocarbon compounds and geochemical parameters and are subject to the inherent limitations of the laboratory techniques used for the tests.

PDP has sampled and tested only for those chemicals that are described in this report in the tank pit locations. The presence or absence of other chemicals at the site or in other locations is not considered in this report.

If contaminants have been found at the site, it is possible that the contaminants could extend off-site, or that any contaminants existing on neighbouring sites might have contributed to the contamination that exists at the site. The presence or absence of contaminants off-site, and risks associated with any off-site contaminants, are not considered by this report.

The information contained within this report applies to sampling soil and groundwater undertaken on the dates stated in this report, or if none is stated, the date of this report. With time, the site conditions and environmental standards could change so that the reported assessment and conclusions are no longer valid. Accordingly, the report should not

Tank Removal Soil Validation Investigation – 129-133 Taranaki Street and 40-44 Frederick Street (V2), Wellington

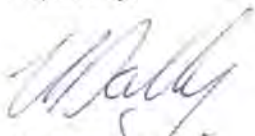
be used to refer to site conditions and environmental standards applying at a later date without first confirming the validity of the report's information at that time.

This report should be read in full.

Yours sincerely

PATTLE DELAMORE PARTNERS LIMITED

Prepared by:



Vanessa Dally

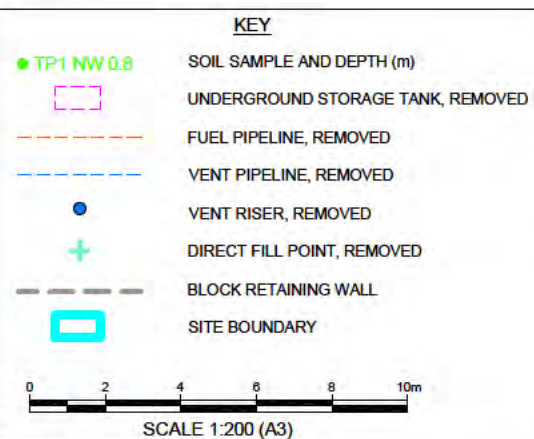
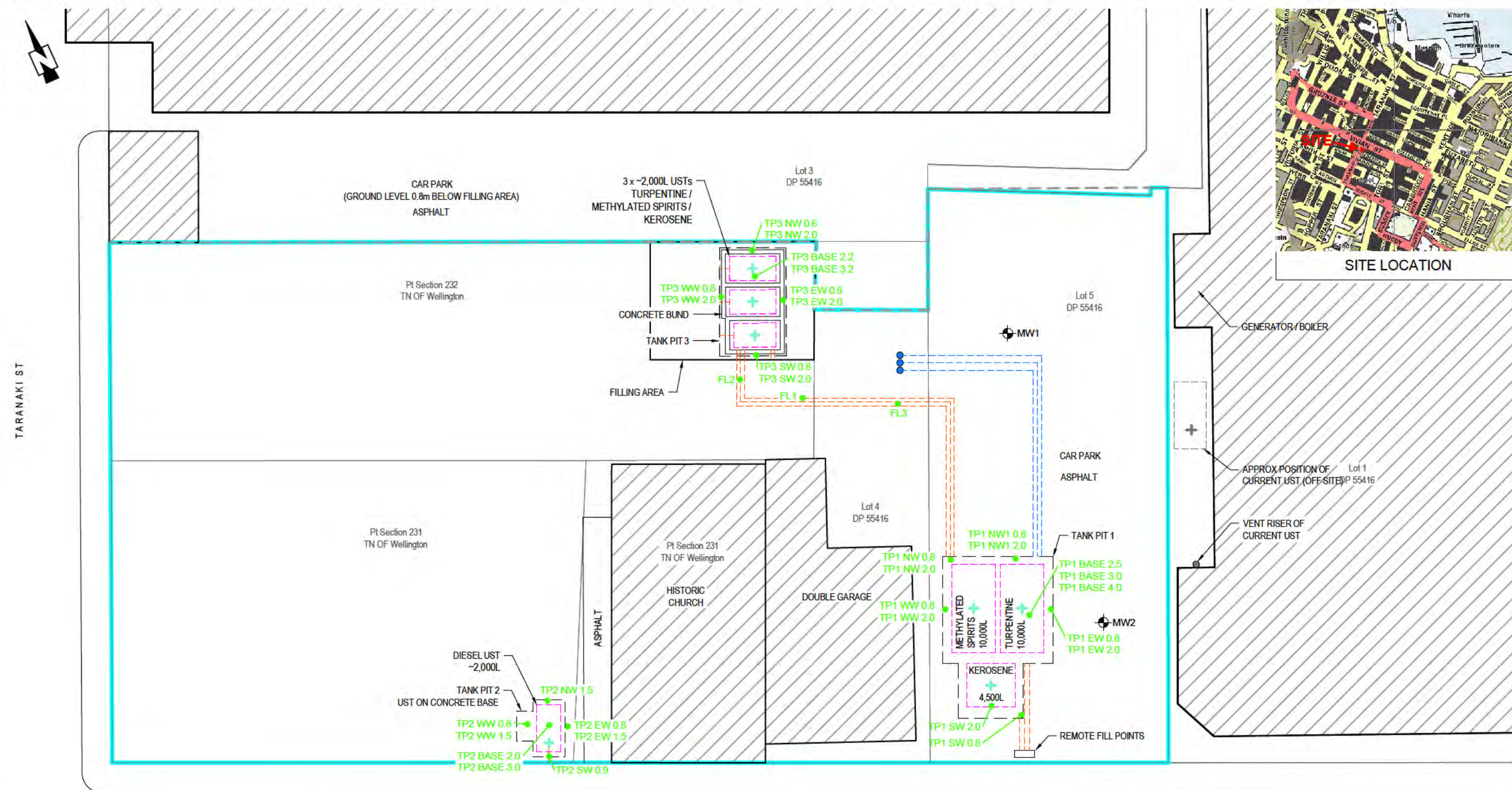
Environmental Scientist

Directed, reviewed and approved by:



Graeme Proffitt

Director



SOURCE: CADASTRAL INFORMATION AND INSET DERIVED FROM LINZ DATA.

FIGURE 1 : SITE PLAN

Table 1: Tank Pit 1 Soil Sample Results - Tank Pit & Bedding Material - ALL PATHWAYS

Soil Samples Collected at a Depth of <1 m Below Ground Level ¹													
Sample Name	TP1 SW 0.8	TP1 WW 0.8	TP1 NW 0.8	TP1 NW1 0.8	TP1 EW 0.8						Tier 1 Soil Acceptance Criteria ^{2,3} Residential Land Use ALL PATHWAYS	Tier 1 Soil Acceptance Criteria ^{2,3} Residential Land Use ALL PATHWAYS	Tier 1 Soil Acceptance Criteria ^{2,3}
Sample Location	Tank Pit 1	Tank Pit 1	Tank Pit 1	Tank Pit 1	Tank Pit 1								Protection of Groundwater Quality (a,b,c)
Soil Fate	Remaining	Remaining	Remaining	Remaining	Remaining								
Soil Type - Field	Silty Clay	Silty Clay	Silty Clay	Sandy Silt	Sandy Silt								
Soil Type - MfE (1999)	Silty Clay	Silty Clay	Silty Clay	Sandy Silt	Sandy Silt								
Sample Depth (m bgl)	0.8	0.8	0.8	0.8	0.8								<1 m
PID Reading (ppm)	0.5	24	0.4	0.4	0.2								Depth to Groundwater - 2 m
C ₇ -C ₉ hydrocarbons	<9	<9	<10	<9	<9						(2,700) ^{6,v}	(500) ^{6,m}	NA ⁴
C ₁₀ -C ₁₄ hydrocarbons	<20	<20	<20	<20	<20						(560) ^{6,x}	(510) ^{6,x}	NA ⁴
C ₁₅ -C ₃₆ hydrocarbons	<40	<40	<40	111	<40						NA ⁴	NA ⁴	NA ⁴
TPH	<70	<70	<70	111	<70						-	-	-
Benzene	<0.06	<0.06	<0.06	<0.06	<0.06						1.7 ^v	1.1 ^v	0.17
Toluene	<0.06	<0.06	<0.06	<0.06	<0.06						(210) ^{6,v}	(82) ^{6,v}	(39)
Ethylbenzene	<0.06	<0.06	<0.06	<0.06	<0.06						(110) ^{6,v}	(59) ^{6,v}	(50)
Total xylenes ⁷	<0.17	<0.17	<0.18	<0.18	<0.17						(160) ^{6,v}	(59) ^{6,v}	(24)
Soil Samples Collected at a Depth of 1 - 4 m Below Ground Level ¹													
Sample Name	TP1 SW 2.0	TP1 WW 2.0	TP1 WW 2.5	TP1 NW 2.0	TP1 NW1 2.0	TP1 EW 2.0	TP1 Base 2.5	TP1 Base 3.0	TP1 Base 4.0	TP1 Bedding	Tier 1 Soil Acceptance Criteria ^{2,3} Residential Land Use ALL PATHWAYS		Tier 1 Soil Acceptance Criteria ^{2,3}
Sample Location	Tank Pit 1	Tank Pit 1	Duplicate of	Tank Pit 1	Tank Pit 1	Tank Pit 1	Tank Pit 1	Tank Pit 1	Tank Pit 1	Tank Pit 1			Protection of Groundwater Quality (a,b,c)
Soil Fate	Remaining	Remaining	Remaining	Remaining	Remaining	Remaining	Remaining	Remaining	Remaining	Remaining			
Soil Type - Field	Sandy Gravel	Sandy Gravel	Sandy Gravel	Sandy Gravel	Sandy Gravel	Sandy Gravel	Sandy Gravel	Sandy Gravel	Sandy Gravel	Silty Sand and Gravel			Sand
Soil Type - MfE (1999)	Sand	Sand	Sand	Sand	Sand	Sand	Sand	Sand	Sand	Sand			
Sample Depth (m bgl)	2	2	2	2	2	2	2.5	3	4	-			1 - 4 m
PID Reading (ppm)	0.5	0	0	0.1	0.2	0.6	0.9	0	0	50.1			Depth to Groundwater - 4 m
C ₇ -C ₉ hydrocarbons	<9	<9	<8	<9	<9	<8	<8	<9	<9	<9	120 ^m		NA ⁴
C ₁₀ -C ₁₄ hydrocarbons	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	(560) ^{6,x}		NA ⁴
C ₁₅ -C ₃₆ hydrocarbons	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	NA ⁴		NA ⁴
TPH	<70	<70	<70	<70	<70	<70	<70	<70	<70	<70	-		-
Benzene	<0.06	<0.06	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.06	1.9 ^{8,v}		0.78
Toluene	<0.06	<0.06	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.06	(94) ^{6,m}		(200)
Ethylbenzene	<0.06	<0.06	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.06	(92) ^{6,8,v}		(280)
Total xylenes ⁷	<0.17	<0.17	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.17	(130) ^{6,v}		(120)

Note:

1. All results in mg/kg.

2. Criteria from Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand (MfE, August 1999).

3. Criteria assume residential land use, 'silty clay', 'sandy silt' and 'sand' soil types and contamination depths of <1 m and 1 - 4 m below ground level.

4. NA indicates contaminant is not limiting as health based criterion is significantly higher than may be encountered on site (i.e. 20,000 mg/kg for TPH, 10,000 mg/kg for other contaminants).

5. The following notes indicate the limiting pathway for each criterion: d - dermal, m - maintenance/excavation, p - produce, s - soil ingestion, v - volatilisation, x - PAH surrogate.

6. Brackets denote values exceed threshold likely to correspond to formation of residual separate phase hydrocarbons.

7. Total xylenes was calculated by adding the laboratory results of the individual xylene isomers.

a. Contaminated soil layer is in direct contact with groundwater and hence no attenuation associated with vertical migration through the soil column occurs.

b. Based on Tier 1 groundwater acceptance criteria for potable use.

c. Criteria based on the assumption of adsorbed phase hydrocarbons only and 1st order biodegradation. Migration of separate phase hydrocarbons through soil profile may result in greater impact than indicated by above criteria.

	Concentration above MfE (1999) Tier 1 soil acceptance criteria - ALL PATHWAYS
802	Concentration above MfE (1999) Tier 1 soil acceptance criteria for - PROTECTION OF GROUNDWATER QUALITY

Table 2: Tank Pit 2 Soil Sample Results - Tank Pit & Bedding Material - ALL PATHWAYS

Soil Samples Collected at a Depth of <1 m Below Ground Level ¹									
Sample Name	TP2 WW 0.8	TP2 SW 0.9	TP2 EW 0.8			Tier 1 Soil Acceptance Criteria ^{2,3} Residential Land Use ALL PATHWAYS	Tier 1 Soil Acceptance Criteria ^{2,3} Residential Land Use ALL PATHWAYS	Tier 1 Soil Acceptance Criteria ^{2,3} Residential Land Use ALL PATHWAYS	Tier 1 Soil Acceptance Criteria ^{2,3} Protection of Groundwater Quality (a,b,c)
Sample Location	Tank Pit 2	Tank Pit 2	Tank Pit 2						
Soil Fate	Remaining	Remaining	Remaining						
Soil Type - Field	Silty Clay	Sandy Gravel	Sandy Silt						
Soil Type - MfE (1999)	Silty Clay	Sand	Sandy Silt						
Sample Depth (m bgl)	0.8	0.9	0.8			<1 m	<1 m	<1 m	Depth of Contamination < 1 m
PID Reading (ppm)	0	79	117						Depth to Groundwater - 2 m
C ₇ -C ₉ hydrocarbons	<10	<9	<9			(2,700) ^{6,v}	(500) ^{6,m}	120 ^m	NA ⁴
C ₁₀ -C ₁₄ hydrocarbons	<20	137	520			(560) ^{6,x}	(510) ^{6,x}	(470) ^{6,x}	NA ⁴
C ₁₅ -C ₃₆ hydrocarbons	<40	730	990			NA ⁴	NA ⁴	NA ⁴	NA ⁴
TPH	<70	860	1510			-	-	-	-
Benzene	<0.06	<0.05	<0.06			1.7 ^v	1.1 ^v	1.1 ^v	0.17
Toluene	<0.06	<0.05	<0.06			(210) ^{6,v}	(82) ^{6,v}	(68) ^{6,v}	(39)
Ethylbenzene	<0.06	<0.05	0.07			(110) ^{6,v}	(59) ^{6,v}	(53) ^{6,v}	(50)
Total xylenes ⁷	<0.18	<0.15	0.3			(160) ^{6,v}	(59) ^{6,v}	(48) ^{6,v}	(24)
Soil Samples Collected at a Depth of 1 - 4 m Below Ground Level ¹									
Sample Name	TP2 WW 1.5	TP2 NW 1.5	TP2 Base 2.0	TP2 Base 3.0	TP2 EW 1.5	Tier 1 Soil Acceptance Criteria ^{2,3} Residential Land Use ALL PATHWAYS	Tier 1 Soil Acceptance Criteria ^{2,3} Residential Land Use ALL PATHWAYS		Tier 1 Soil Acceptance Criteria ^{2,3} Protection of Groundwater Quality (a,b,c)
Sample Location	Tank Pit 2	Tank Pit 2	Tank Pit 2	Tank Pit 2	Tank Pit 2				
Soil Fate	Remaining	Remaining	Remaining	Remaining	Remaining				
Soil Type - Field	Silty Clay	Silty Clay	Sandy Gravel	Silty Clay	Silty Clay				
Soil Type - MfE (1999)	Silty Clay	Silty Clay	Sand	Silty Clay	Silty Clay				
Sample Depth (m bgl)	1.5	1.5	2	3	1.5	1 - 4 m	1 - 4 m		Depth of Contamination 1 - 4 m
PID Reading (ppm)	36.9	22.1	88	48	69				Depth to Groundwater - 4 m
C ₇ -C ₉ hydrocarbons	<9	<9	<8	<9	<9	120 ^m	(7,300) ^{6,v}		NA ⁴
C ₁₀ -C ₁₄ hydrocarbons	198	114	460	148	670	(560) ^{6,x}	(2,700) ^{6,x}		NA ⁴
C ₁₅ -C ₃₆ hydrocarbons	290	193	1270	410	1060	NA ⁴	NA ⁴		NA ⁴
TPH	490	310	1730	560	1730	-	-		-
Benzene	<0.06	<0.06	<0.05	<0.06	<0.05	1.9 ^{8,v}	4.6 ^v		0.78
Toluene	<0.06	<0.06	<0.05	<0.06	<0.05	(94) ^{6,m}	(950) ^{6,v}		(200)
Ethylbenzene	<0.06	<0.06	<0.05	<0.06	<0.05	(92) ^{6,8,v}	(800) ^{6,v}		(280)
Total xylenes ⁷	<0.17	<0.17	<0.15	<0.17	<0.15	(130) ^{6,v}	(710) ^{6,v}		(120)

- Note:
1. All results in mg/kg.
 2. Criteria from Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand (MfE, August 1999).
 3. Criteria assume residential land use, 'silty clay', 'sandy silt' and 'sand' soil types and contamination depths of <1 m and 1 - 4 m below ground level.
 4. NA indicates contaminant is not limiting as health based criterion is significantly higher than may be encountered on site (i.e. 20,000 mg/kg for TPH, 10,000 mg/kg for other contaminants).
 5. The following notes indicate the limiting pathway for each criterion: d - dermal, m - maintenance/excavation, p - produce, s - soil ingestion, v - volatilisation, x - PAH surrogate.
 6. Brackets denote values exceed threshold likely to correspond to formation of residual separate phase hydrocarbons.
 7. Total xylenes was calculated by adding the laboratory results of the individual xylene isomers.
 - a. Contaminated soil layer is in direct contact with groundwater and hence no attenuation associated with vertical migration through the soil column occurs.
 - b. Based on Tier 1 groundwater acceptance criteria for potable use.
 - c. Criteria based on the assumption of adsorbed phase hydrocarbons only and 1st order biodegradation. Migration of separate phase hydrocarbons through soil profile may result in greater impact than indicated by above criteria.

	Concentration above MfE (1999) Tier 1 soil acceptance criteria - ALL PATHWAYS
802	Concentration above MfE (1999) Tier 1 soil acceptance criteria for - PROTECTION OF GROUNDWATER QUALITY

Table 3: Tank Pit 3 Soil Sample Results - Tank Pit & Bedding Material - ALL PATHWAYS

Soil Samples Collected at a Depth of <1 m Below Ground Level ¹											
Sample Name	TP3 NW 0.6	TP3 SW 0.8	TP3 EW 0.8	TP3 WW 0.8					Tier 1 Soil Acceptance Criteria ^{2,3} Residential Land Use ALL PATHWAYS		Tier 1 Soil Acceptance Criteria ^{2,3}
											Protection of Groundwater Quality (a,b,c)
Sample Location	Tank Pit 3	Tank Pit 3	Tank Pit 3	Test Pit 3							
Soil Fate	Remaining	Remaining	Remaining	Remaining							
Soil Type - Field	Sandy Gravel	Sandy Gravel	Silty Sand and Gravel	Silty Sand and Gravel							Sand
Soil Type - MfE (1999)	Sand	Sand	Sand	Sand							
Sample Depth (m bgl)	0.6	0.8	0.8	0.8					<1 m		Depth of Contamination < 1 m
PID Reading (ppm)	3.5	8.4	41.5	0.8							Depth to Groundwater - 2 m
C ₇ -C ₉ hydrocarbons	<9	<8	<10	<9					120 ^m		NA ⁴
C ₁₀ -C ₁₄ hydrocarbons	<20	<20	<20	<20					(470) ^{6,x}		NA ⁴
C ₁₅ -C ₃₆ hydrocarbons	194	<40	<40	<40					NA ⁴		NA ⁴
TPH	194	<70	<70	<70					-	-	-
Benzene	<0.06	<0.05	<0.06	<0.05					1.1 ^v		0.17
Toluene	<0.06	<0.05	<0.06	<0.05					(68) ^{6,v}		(39)
Ethylbenzene	<0.06	<0.05	<0.06	<0.05					(53) ^{6,v}		(50)
Total xylenes ⁷	<0.17	<0.15	<0.18	<0.15					(48) ^{6,v}		(24)
Soil Samples Collected at a Depth of 1 - 4 m Below Ground Level ¹											
Sample Name	TP3 NW 2.0	TP3 SW 2.0	TP3 EW 2.0	TP3 WW 2.0	TP3 Base 2.2	TP3 Base 3.2	TR3 1.5	TR3 2.0	Tier 1 Soil Acceptance Criteria ^{2,3} Residential Land Use ALL PATHWAYS	Tier 1 Soil Acceptance Criteria ^{2,3} Residential Land Use ALL PATHWAYS	Tier 1 Soil Acceptance Criteria ^{2,3}
											Protection of Groundwater Quality (a,b,c)
Sample Location	Tank Pit 3	Tank Pit 3	Tank Pit 3	Tank Pit 3	Tank Pit 3	Tank Pit 3	Trench 3	Trench 3			
Soil Fate	Remaining	Remaining	Remaining	Remaining	Remaining	Remaining	Remaining	Remaining			
Soil Type - Field	Sandy Gravel	Sandy Gravel	Sandy Gravel	Sandy Gravel	Sandy gravel	Sandy Gravel	Silty Clay	Sandy Gravel			Sand
Soil Type - MfE (1999)	Sand	Sand	Sand	Sand	Sand	Sand	Silty Clay	Sand			Silty Clay
Sample Depth (m bgl)	2	2	2	2	2.2	3.2	2	2.5	1 - 4 m	1 - 4 m	Depth of Contamination 1 - 4 m
PID Reading (ppm)	543	1542	1048	740	360	58					Depth to Groundwater - 4 m
C ₇ -C ₉ hydrocarbons	98	1190	680	115	12	<8	<9	<9	120 ^m	(7,300) ^{6,v}	NA ⁴
C ₁₀ -C ₁₄ hydrocarbons	4400	7900	8300	3300	780	<20	<20	<20	(560) ^{6,x}	(2,700) ^{6,x}	NA ⁴
C ₁₅ -C ₃₆ hydrocarbons	1110	550	410	490	200	<40	<40	<40	NA ⁴	NA ⁴	NA ⁴
TPH	5700	9600	9400	3900	990	<70	<70	<70	-	-	-
Benzene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	1.9 ^{8,v}	4.6 ^v	0.78
Toluene	<0.05	1.54	0.32	<0.05	<0.05	<0.05	<0.05	<0.05	(94) ^{6,m}	(950) ^{6,v}	(200)
Ethylbenzene	<0.05	20	11.8	0.97	0.09	<0.05	<0.05	<0.05	(92) ^{6,8,v}	(800) ^{6,v}	(280)
Total xylenes ⁷	<0.15	177	126	3.7	0.2	<0.15	<0.15	<0.15	(130) ^{6,v}	(710) ^{6,v}	(120)

- Note:
1. All results in mg/kg.
 2. Criteria from Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand (MfE, August 1999).
 3. Criteria assume residential land use, 'sand' soil type and contamination depths of <1 m and 1 - 4 m below ground level.
 4. NA indicates contaminant is not limiting as health based criterion is significantly higher than may be encountered on site (i.e. 20,000 mg/kg for TPH, 10,000 mg/kg for other contaminants).
 5. The following notes indicate the limiting pathway for each criterion: d - dermal, m - maintenance/excavation, p - produce, s - soil ingestion, v - volatilisation, x - PAH surrogate.
 6. Brackets denote values exceed threshold likely to correspond to formation of residual separate phase hydrocarbons.
 7. Total xylenes was calculated by adding the laboratory results of the individual xylene isomers.
- a. Contaminated soil layer is in direct contact with groundwater and hence no attenuation associated with vertical migration through the soil column occurs.
- b. Based on Tier 1 groundwater acceptance criteria for potable use.
- c. Criteria based on the assumption of adsorbed phase hydrocarbons only and 1st order biodegradation. Migration of separate phase hydrocarbons through soil profile may result in greater impact than indicated by above criteria.

	Concentration above MfE (1999) Tier 1 soil acceptance criteria - ALL PATHWAYS
802	Concentration above MfE (1999) Tier 1 soil acceptance criteria for - PROTECTION OF GROUNDWATER QUALITY

Table 4: Soil Sample Results - Fuel Lines - ALL PATHWAYS

Soil Samples Collected at a Depth of <1 m Below Ground Level ¹					
Sample Name	FL1 1.3	FL2 1.4	FL3 1.4	Tier 1 Soil Acceptance Criteria ^{2,3} Residential Land Use ALL PATHWAYS	Tier 1 Soil Acceptance Criteria ^{2,3} Protection of Groundwater Quality (b,c)
Sample Location	Base of Fuel Line Trench	Base of Fuel Line Trench	Base of Fuel Line Trench		
Soil Fate	Remaining	Remaining	Remaining		
Soil Type - Field	Silty Sand and some Gravel	Silty Sand and some Gravel	Silty Sand and some Gravel	Sand	Sand
Soil Type - MfE (1999)	Sand	Sand	Sand		
Sample Depth (m bgl)	1.3	1.4	1.4	1 - 4 m	Depth of Contamination 1 - 4 m
PID Reading (ppm)	1.5	1.8	0.7		Depth to Groundwater - 4 m
C ₇ -C ₉ hydrocarbons	<10	<8	<9	120 ^m	NA ⁴
C ₁₀ -C ₁₄ hydrocarbons	<20	<20	<20	(560) ^{6,x}	NA ⁴
C ₁₅ -C ₃₆ hydrocarbons	<40	<40	<40	NA ⁴	NA ⁴
TPH	<70	<70	<70	-	-
Benzene	<0.06	<0.05	<0.05	1.9 ^{8,v}	0.78
Toluene	<0.06	<0.05	<0.05	(94) ^{6,m}	(200)
Ethylbenzene	<0.06	<0.05	<0.05	(92) ^{6,8,v}	(280)
Total xylenes ⁷	<0.17	<0.15	<0.15	(130) ^{6,v}	(120)

Note:

1. All results in mg/kg.
 2. Criteria from Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand (MfE, August 1999).
 3. Criteria assume residential land use, 'silty clay', 'clay' and 'sand' soil types and contamination depths of <1 m and 1 - 4 m below ground level.
 4. NA indicates contaminant is not limiting as health based criterion is significantly higher than may be encountered on site (i.e. 20,000 mg/kg for TPH, 10,000 mg/kg for other contaminants).
 5. The following notes indicate the limiting pathway for each criterion: d - dermal, m - maintenance/excavation, p - produce, s - soil ingestion, v - volatilisation, x - PAH surrogate.
 6. Brackets denote values exceed threshold likely to correspond to formation of residual separate phase hydrocarbons.
 7. Total xylenes was calculated by adding the laboratory results of the individual xylene isomers.
- a. Contaminated soil layer is in direct contact with groundwater and hence no attenuation associated with vertical migration through the soil column occurs.
- b. Based on Tier 1 groundwater acceptance criteria for potable use.
- c. Criteria based on the assumption of adsorbed phase hydrocarbons only and 1st order biodegradation. Migration of separate phase hydrocarbons through soil profile may result in greater imp

	Concentration above MfE (1999) Tier 1 soil acceptance criteria - ALL PATHWAYS.
802	Concentration above MfE (1999) Tier 1 soil acceptance criteria for - PROTECTION OF GROUNDWATER QUALITY

Table 5 : Soil Sample Results - Area of Interest - ROUTE SPECIFIC CRITERIA

Soil Samples Collected at a Depth of 1 - 4 m Below Ground Level ¹										
Sample Name	TP3 NW 2.0	TP3 SW 2.0	TP3 EW 2.0	TP3 WW 2.0	Route Specific Tier 1 Soil Acceptance Criteria ^{2,3}				Route Specific Tier 1 Soil Acceptance Criteria ^{2,3} Residential/ Agricultural Land Use	
Sample Location	Tank Pit 3	Tank Pit 3	Tank Pit 3	Tank Pit 3	Excavation Workers	Excavation Workers	Maintenance Workers		Indoor Air Inhalation	Outdoor Air Inhalation
Soil Fate	Remaining	Remaining	Remaining	Remaining			Dermal Contact	Soil Ingestion		
Soil Type - Field	Sandy Gravel	Sandy Gravel	Sandy Gravel	Sandy Gravel	Sand	Sand		Sand		
Soil Type - MfE (1999)	Sand	Sand	Sand	Sand	Inhalation	Inhalation				
Sample Depth (m bgl)	2	2	2	2		1 - 4 m (5)		1 - 4 m (5)		
PID Reading (ppm)	543	1542	1048	740	120	120	NA ⁴	NA ⁴	3,000 ⁸	NA ⁴
C ₇ -C ₉ hydrocarbons	98	1190	680	115	6,500	6,500	NA ⁴	NA ⁴	2,900	NA ⁴
C ₁₀ -C ₁₄ hydrocarbons	4400*	7900*	8300*	3300*	NA ⁴	NA ⁴	NA ⁴	NA ⁴	NA ⁴	NA ⁴
C ₁₅ -C ₃₆ hydrocarbons	1110	550	410	490	-	-	-	-	-	-
TPH	5700	9600	9400	3900	3	3	6,200	870	1.9 ⁸	180
Benzene	<0.05	<0.05	<0.05	<0.05	94	94	NA ⁴	NA ⁴	170 ⁸	6,900
Toluene	<0.05	1.54	0.32	<0.05	670	670	NA ⁴	NA ⁴	92 ⁸	2,300
Ethylbenzene	<0.05	20	11.8	0.97	150	150	NA ⁴	NA ⁴	130 ⁸	5,600
Total xylenes ⁷	<0.15	<u>177*</u>	<u>126</u>	3.7						

Note:

1. All results in mg/kg.
2. Criteria from Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand (MfE, August 1999).
3. Criteria assume residential land use, 'silty clay', 'clay' and 'sand' soil types and contamination depths of <1 m and 1 - 4 m below ground level.
4. NA indicates contaminant is not limiting as health based criterion is significantly higher than may be encountered on site (i.e. 20,000 mg/kg for TPH, 10,000 mg/kg for other contaminants).
5. Assumes a 2 m thick layer of contaminated soil extending down from the depth indicated.
6. Brackets denote values exceed threshold likely to correspond to formation of residual separate phase hydrocarbons.
7. Total xylenes was calculated by adding the laboratory results of the individual xylene isomers.

	Concentration above MfE (1999) Tier 1 Route Specific soil acceptance criteria - PROTECTION OF MAINTENANCE/EXCAVATION WORKERS
13.1*	Concentration above MfE (1999) Tier 1 Route Specific soil acceptance criteria - INDOOR AIR INHALATION
802	Concentration above MfE (1999) Tier 1 soil acceptance criteria - PROTECTION OF GROUNDWATER QUALITY (See Table 3 for guideline comparison)

Table 6: Soil Sample Results - Soil Removed Offsite

	Analytical Results ¹				
Sample Name	TP2 Bedding	TP3 BF	SV BF1	SV BF2	FLP
Sample Location	TP2 Spoil Pile	TP3 Spoil Pile	TP3 Spoil Pile	TP2 Spoil Pile	Fuel Line Spoil Pile
Soil Fate	Removed	Removed	Removed	Removed	Removed
Soil Type - Field	Sand and Gravel	Sandy Gravel	Sand, Clay and Gravel Mix	Sand, Clay and Gravel Mix	Silty Sand and Gravel
Sample Depth (m bgl)					
PID Reading (ppm)	6.2	5.1	1.2	41	1.4
C ₇ -C ₉ hydrocarbons	<8	<8	<9	<8	<9
C ₁₀ -C ₁₄ hydrocarbons	<20	<20	<20	530	<20
C ₁₅ -C ₃₆ hydrocarbons	230	<40	<40	1590	<40
TPH	230	<70	<70	2100	<70
Benzene	<0.05	<0.05	<0.05	<0.06	<0.06
Toluene	<0.05	<0.05	<0.05	<0.06	<0.06
Ethylbenzene	<0.05	<0.05	<0.05	<0.06	<0.06
Total xylenes ²	<0.15	<0.15	<0.15	0.12	<0.17

Note:

1. All results in mg/kg.

2. Total xylenes was calculated by adding the laboratory results of the individual xylene isomers.



Photograph 1: Location of former Murdochs Building on the corner of Taranaki and Fredrick Streets – 129-133 Taranaki Street.



Photograph 2: Location of Tank Pit 1 To the rear of the two bay garage. Back of the historic church on extreme right.



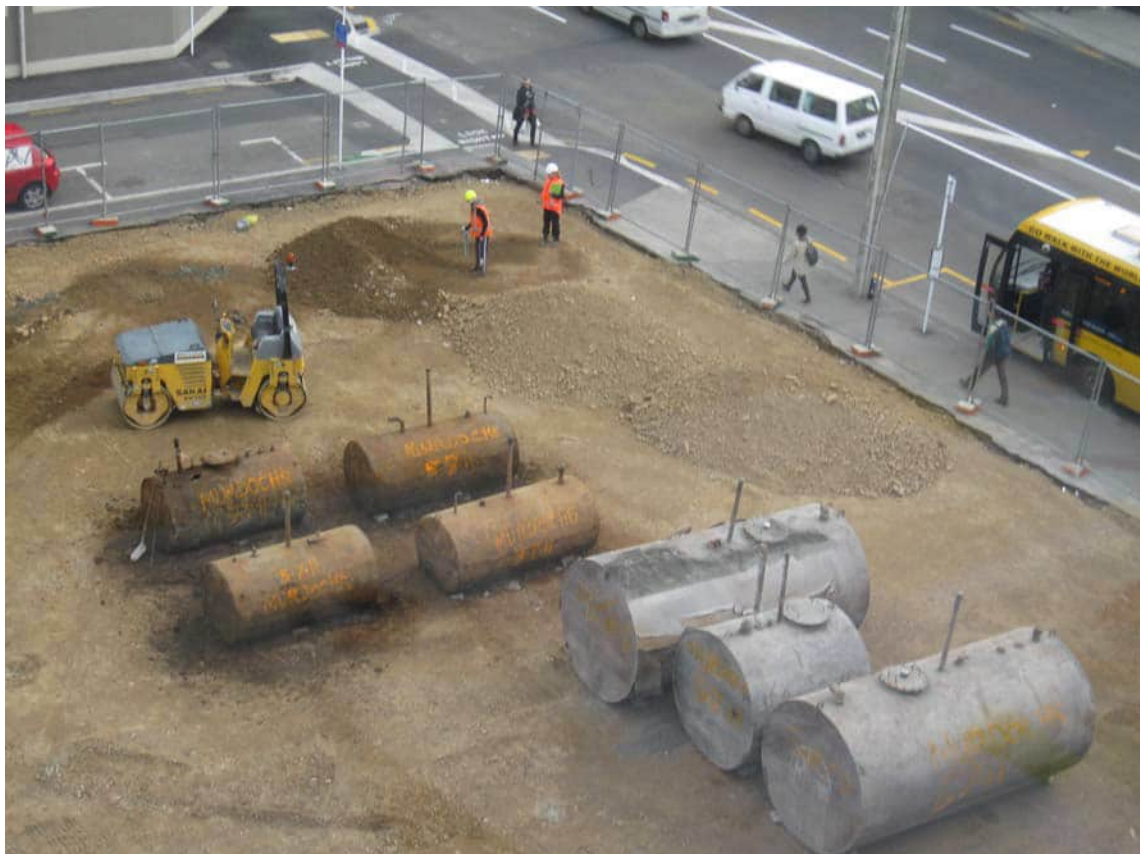
Photograph 3: Tank Pit 1



Photograph 4: Location of Tank Pit 2 and rear of historic Church.



Photograph 5: Location of Tank Pit 3. Removal of one of the 2,000 L USTs from concrete banded pit.



Photograph 6: Removed USTs on front of site.



ANALYSIS REPORT

Page 1 of 3

Client:	Pattle Delamore Partners Ltd	Lab No:	912217	SPV1
Contact:	V Dally C/- Pattle Delamore Partners Ltd PO Box 6136 WELLINGTON 6141	Date Registered:	07-Jul-2011	
		Date Reported:	14-Jul-2011	
		Quote No:	45437	
		Order No:		
		Client Reference:	W01843100	
		Submitted By:	R Smith	

Sample Type: Soil						
Sample Name:	TP1 Bedding	TP1 Base 2.5	TP1 Base 3.0	TP1 Base 4.0	TP1 NW 0.8	
	05-Jul-2011	05-Jul-2011	05-Jul-2011	05-Jul-2011	05-Jul-2011	
Lab Number:	912217.1	912217.2	912217.3	912217.4	912217.5	
Individual Tests						
Dry Matter	g/100g as rcvd	80	86	86	86	74
BTEX in Soil by Headspace GC-MS						
Benzene	mg/kg dry wt	< 0.06	< 0.05	< 0.05	< 0.05	< 0.06
Toluene	mg/kg dry wt	< 0.06	< 0.05	< 0.05	< 0.05	< 0.06
Ethylbenzene	mg/kg dry wt	< 0.06	< 0.05	< 0.05	< 0.05	< 0.06
m&p-Xylene	mg/kg dry wt	< 0.11	< 0.10	< 0.10	< 0.10	< 0.12
o-Xylene	mg/kg dry wt	< 0.06	< 0.05	< 0.05	< 0.05	< 0.06
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	< 9	< 8	< 9	< 9	< 10
C10 - C14	mg/kg dry wt	< 20	< 20	< 20	< 20	< 20
C15 - C36	mg/kg dry wt	< 40	< 40	< 40	< 40	< 40
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 70	< 70	< 70	< 70	< 70
Sample Name:	TP1 NW 2.0	TP1 NW 1 2.0	TP1 EW 0.8	TP1 EW 2.0	TP1 WW 0.8	
	05-Jul-2011	05-Jul-2011	05-Jul-2011	05-Jul-2011	05-Jul-2011	
Lab Number:	912217.6	912217.7	912217.8	912217.9	912217.10	
Individual Tests						
Dry Matter	g/100g as rcvd	87	81	79	88	77
BTEX in Soil by Headspace GC-MS						
Benzene	mg/kg dry wt	< 0.05	< 0.05	< 0.06	< 0.05	< 0.06
Toluene	mg/kg dry wt	< 0.05	< 0.05	< 0.06	< 0.05	< 0.06
Ethylbenzene	mg/kg dry wt	< 0.05	< 0.05	< 0.06	< 0.05	< 0.06
m&p-Xylene	mg/kg dry wt	< 0.10	< 0.10	< 0.11	< 0.10	< 0.11
o-Xylene	mg/kg dry wt	< 0.05	< 0.05	< 0.06	< 0.05	< 0.06
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	< 9	< 9	< 9	< 8	< 9
C10 - C14	mg/kg dry wt	< 20	< 20	< 20	< 20	< 20
C15 - C36	mg/kg dry wt	< 40	< 40	< 40	< 40	< 40
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 70	< 70	< 70	< 70	< 70
Sample Name:	TP1 WW 2.0	TP1 WW 2.5	TP1 SW 0.8	TP1 SW 2.0	TP1 NW 1 0.8	
	05-Jul-2011	05-Jul-2011	05-Jul-2011	05-Jul-2011	05-Jul-2011	
Lab Number:	912217.11	912217.12	912217.13	912217.14	912217.15	
Individual Tests						
Dry Matter	g/100g as rcvd	79	88	75	80	74
BTEX in Soil by Headspace GC-MS						
Benzene	mg/kg dry wt	< 0.06	< 0.05	< 0.06	< 0.06	< 0.06
Toluene	mg/kg dry wt	< 0.06	< 0.05	< 0.06	< 0.06	< 0.06
Ethylbenzene	mg/kg dry wt	< 0.06	< 0.05	< 0.06	< 0.06	< 0.06



This Laboratory is accredited by International Accreditation New Zealand (IANZ), which represents New Zealand in the International Laboratory Accreditation Cooperation (ILAC). Through the ILAC Mutual Recognition Arrangement (ILAC-MRA) this accreditation is internationally recognised.

The tests reported herein have been performed in accordance with the terms of accreditation, with the exception of tests marked *, which are not accredited.

Sample Type: Soil						
Sample Name:		TP1 WW 2.0 05-Jul-2011	TP1 WW 2.5 05-Jul-2011	TP1 SW 0.8 05-Jul-2011	TP1 SW 2.0 05-Jul-2011	TP1 NW 1 0.8 05-Jul-2011
Lab Number:		912217.11	912217.12	912217.13	912217.14	912217.15
BTEX in Soil by Headspace GC-MS						
m&p-Xylene	mg/kg dry wt	< 0.11	< 0.10	< 0.11	< 0.11	< 0.12
o-Xylene	mg/kg dry wt	< 0.06	< 0.05	< 0.06	< 0.06	< 0.06
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	< 9	< 8	< 9	< 9	< 9
C10 - C14	mg/kg dry wt	< 20	< 20	< 20	< 20	< 20
C15 - C36	mg/kg dry wt	< 40	< 40	< 40	< 40	111
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 70	< 70	< 70	< 70	111
Sample Name:		TP2 Bedding 05-Jul-2011	TP2 Base 2.0 05-Jul-2011	TP2 Base 3.0 05-Jul-2011	TP2 NW 1.5 05-Jul-2011	TP2 EW 0.8 05-Jul-2011
Lab Number:		912217.16	912217.17	912217.18	912217.19	912217.20
Individual Tests						
Dry Matter	g/100g as rcvd	90	81	80	80	80
BTEX in Soil by Headspace GC-MS						
Benzene	mg/kg dry wt	< 0.05	< 0.05	< 0.06	< 0.06	< 0.06
Toluene	mg/kg dry wt	< 0.05	< 0.05	< 0.06	< 0.06	< 0.06
Ethylbenzene	mg/kg dry wt	< 0.05	< 0.05	< 0.06	< 0.06	0.07
m&p-Xylene	mg/kg dry wt	< 0.10	< 0.10	< 0.11	< 0.11	0.30
o-Xylene	mg/kg dry wt	< 0.05	< 0.05	< 0.06	< 0.06	< 0.06
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	< 8	< 8	< 9	< 9	< 9
C10 - C14	mg/kg dry wt	< 20	460	148	114	520
C15 - C36	mg/kg dry wt	230	1,270	410	193	990
Total hydrocarbons (C7 - C36)	mg/kg dry wt	230	1,730	560	310	1,510
Sample Name:		TP2 EW 1.5 05-Jul-2011	TP2 SW 0.9 05-Jul-2011	TP2 WW 0.8 05-Jul-2011	TP2 WW 1.5 05-Jul-2011	TP3 BF 05-Jul-2011
Lab Number:		912217.21	912217.22	912217.23	912217.24	912217.25
Individual Tests						
Dry Matter	g/100g as rcvd	81	81	73	78	88
BTEX in Soil by Headspace GC-MS						
Benzene	mg/kg dry wt	< 0.05	< 0.05	< 0.06	< 0.06	< 0.05
Toluene	mg/kg dry wt	< 0.05	< 0.05	< 0.06	< 0.06	< 0.05
Ethylbenzene	mg/kg dry wt	< 0.05	< 0.05	< 0.06	< 0.06	< 0.05
m&p-Xylene	mg/kg dry wt	< 0.10	< 0.10	< 0.12	< 0.11	< 0.10
o-Xylene	mg/kg dry wt	< 0.05	< 0.05	< 0.06	< 0.06	< 0.05
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	< 9	< 9	< 10	< 9	< 8
C10 - C14	mg/kg dry wt	670	137	< 20	198	< 20
C15 - C36	mg/kg dry wt	1,060	730	< 40	290	< 40
Total hydrocarbons (C7 - C36)	mg/kg dry wt	1,730	860	< 70	490	< 70
Sample Name:		TP3 Base 2.2 05-Jul-2011	TP3 Base 3.2 05-Jul-2011	TP3 NW 0.6 05-Jul-2011	TP3 NW 2.0 05-Jul-2011	TP3 EW 0.8 05-Jul-2011
Lab Number:		912217.26	912217.27	912217.28	912217.29	912217.30
Individual Tests						
Dry Matter	g/100g as rcvd	81	86	79	86	76
BTEX in Soil by Headspace GC-MS						
Benzene	mg/kg dry wt	< 0.05	< 0.05	< 0.06	< 0.05	< 0.06
Toluene	mg/kg dry wt	< 0.05	< 0.05	< 0.06	< 0.05	< 0.06
Ethylbenzene	mg/kg dry wt	0.09	< 0.05	< 0.06	< 0.05	< 0.06
m&p-Xylene	mg/kg dry wt	0.20	< 0.10	< 0.11	< 0.10	< 0.12
o-Xylene	mg/kg dry wt	< 0.05	< 0.05	< 0.06	< 0.05	< 0.06
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	12	< 8	< 9	98	< 10
C10 - C14	mg/kg dry wt	780	< 20	< 20	4,400	< 20
C15 - C36	mg/kg dry wt	200	< 40	194	1,110	< 40

Sample Type: Soil						
Sample Name:		TP3 Base 2.2 05-Jul-2011	TP3 Base 3.2 05-Jul-2011	TP3 NW 0.6 05-Jul-2011	TP3 NW 2.0 05-Jul-2011	TP3 EW 0.8 05-Jul-2011
Lab Number:		912217.26	912217.27	912217.28	912217.29	912217.30
Total Petroleum Hydrocarbons in Soil						
Total hydrocarbons (C7 - C36) mg/kg dry wt		990	< 70	194	5,700	< 70
Sample Name:		TP3 EW 2.0 05-Jul-2011	TP3 SW 0.8 05-Jul-2011	TP3 SW 2.0 05-Jul-2011	TP3 WW 0.8 05-Jul-2011	TP3 WW 2.0 05-Jul-2011
Lab Number:		912217.31	912217.32	912217.33	912217.34	912217.35
Individual Tests						
Dry Matter g/100g as rcvd		86	82	87	84	86
BTEX in Soil by Headspace GC-MS						
Benzene mg/kg dry wt		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Toluene mg/kg dry wt		0.32	< 0.05	1.54	< 0.05	< 0.05
Ethylbenzene mg/kg dry wt		11.8	< 0.05	20	< 0.05	0.97
m&p-Xylene mg/kg dry wt		77	< 0.10	112	< 0.10	3.7
o-Xylene mg/kg dry wt		49	< 0.05	65	< 0.05	< 0.05
Total Petroleum Hydrocarbons in Soil						
C7 - C9 mg/kg dry wt		680	< 8	1,190	< 9	115
C10 - C14 mg/kg dry wt		8,300	< 20	7,900	< 20	3,300
C15 - C36 mg/kg dry wt		410	< 40	550	< 40	490
Total hydrocarbons (C7 - C36) mg/kg dry wt		9,400	< 70	9,600	< 70	3,900

Analyst's Comments

Appendix No.1 - Total Petroleum Hydrocarbon Chromatograms

Appendix No.2 - Total Petroleum Hydrocarbon Chromatograms

Appendix No.3 - Total Petroleum Hydrocarbon Chromatograms

Appendix No.4 - Total Petroleum Hydrocarbon Chromatograms

Appendix No.5 - Total Petroleum Hydrocarbon Chromatograms

Appendix No.6 - Total Petroleum Hydrocarbon Chromatograms

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	Samples
BTEX in Soil by Headspace GC-MS	Solvent extraction, Headspace GC-MS analysis US EPA 8260B. Tested on as received sample	-	1-35
Total Petroleum Hydrocarbons in Soil	Sonication extraction in DCM, Silica cleanup, GC-FID analysis US EPA 8015B/MfE Petroleum Industry Guidelines. Tested on as received sample	-	1-35
Dry Matter (Env)	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. US EPA 3550.	0.10 g/100g as rcvd	1-35

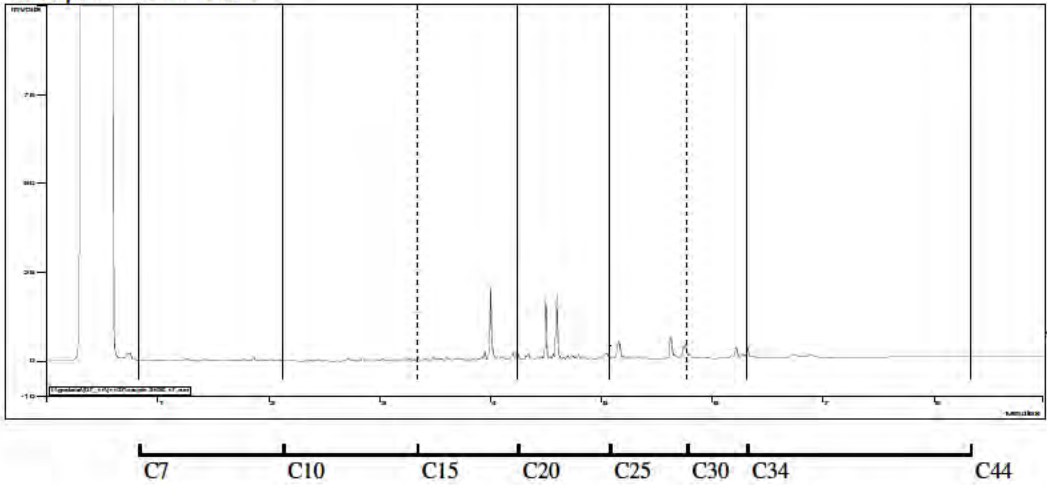
These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

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.

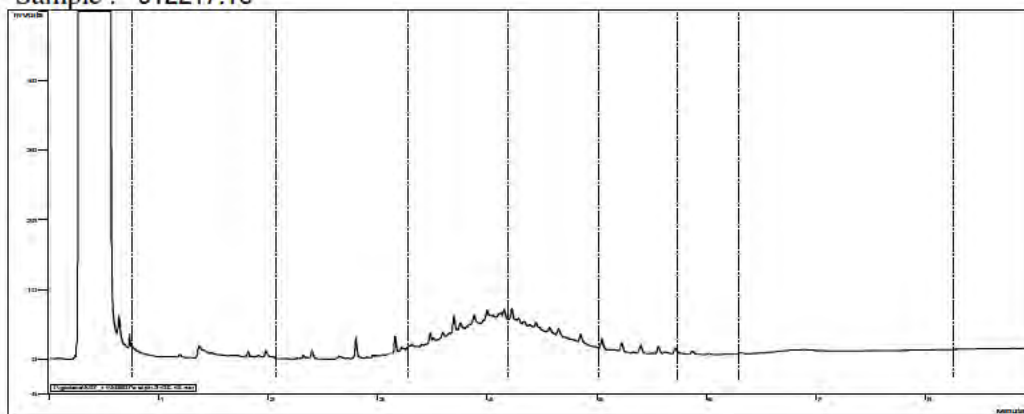
This report must not be reproduced, except in full, without the written consent of the signatory.

Ara Heron BSc (Tech)
Client Services Manager - Environmental Division

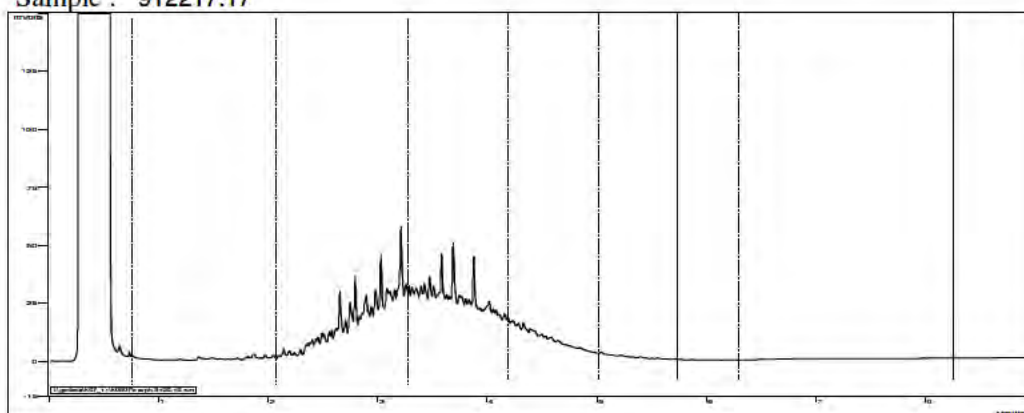
Sample : 912217.15



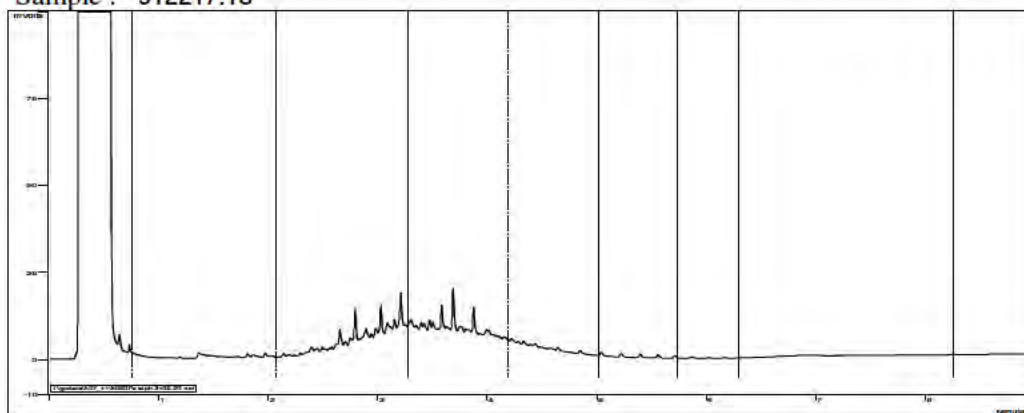
Sample : 912217.16



Sample : 912217.17

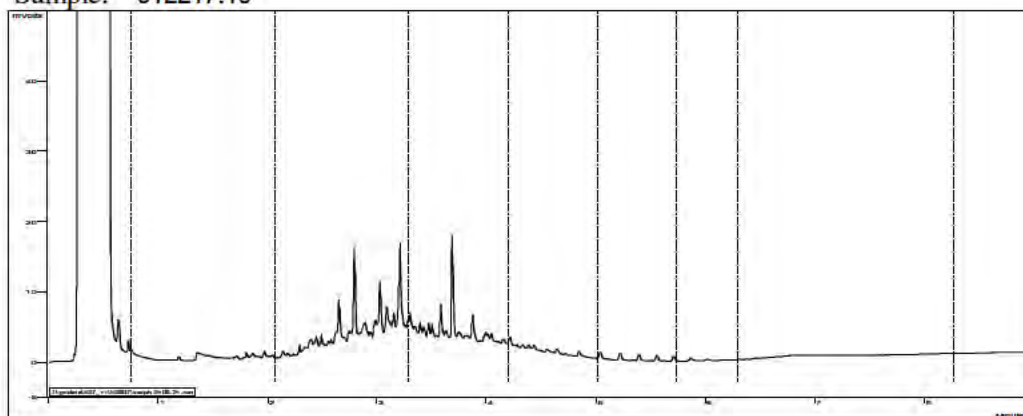


Sample : 912217.18

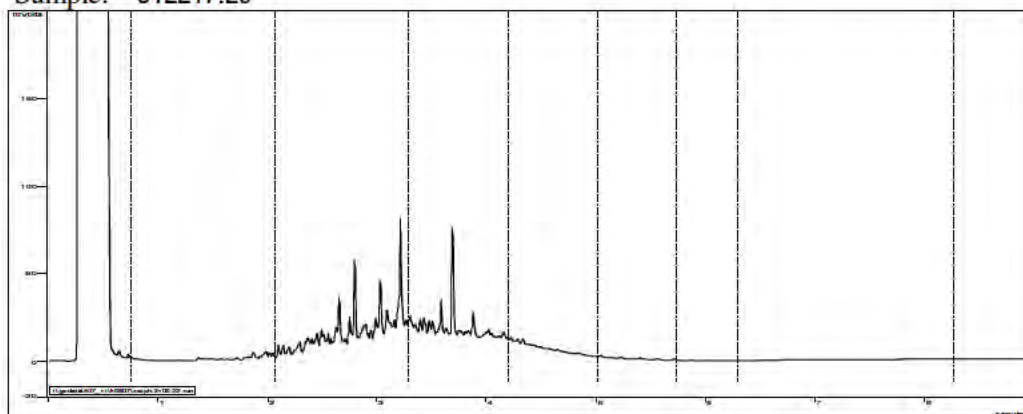


C7 C10 C15 C20 C25 C30 C34 C44

Sample: 912217.19

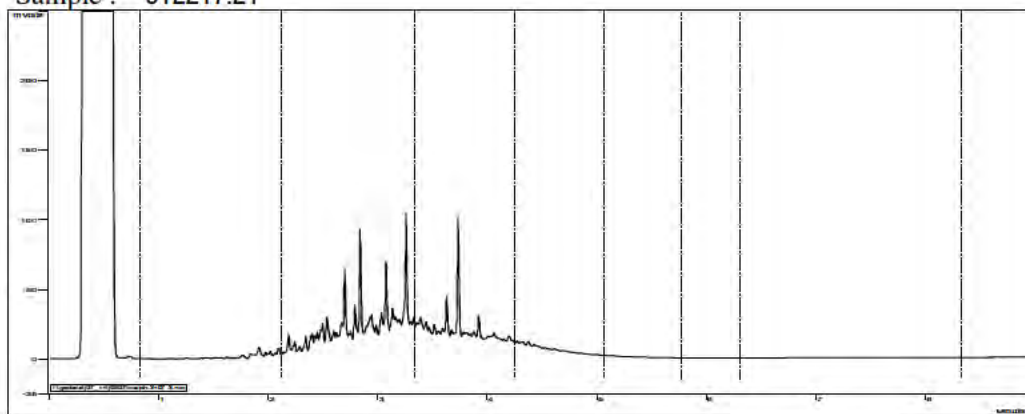


Sample: 912217.20

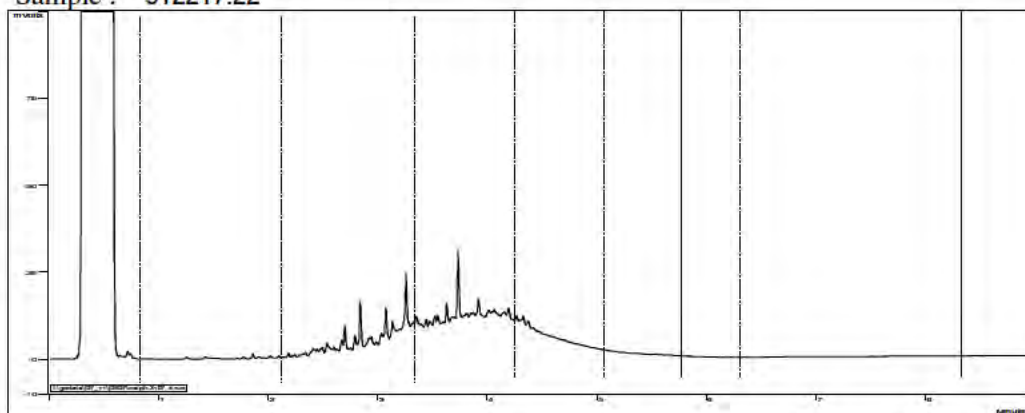


C7 C10 C15 C20 C25 C30 C34 C44

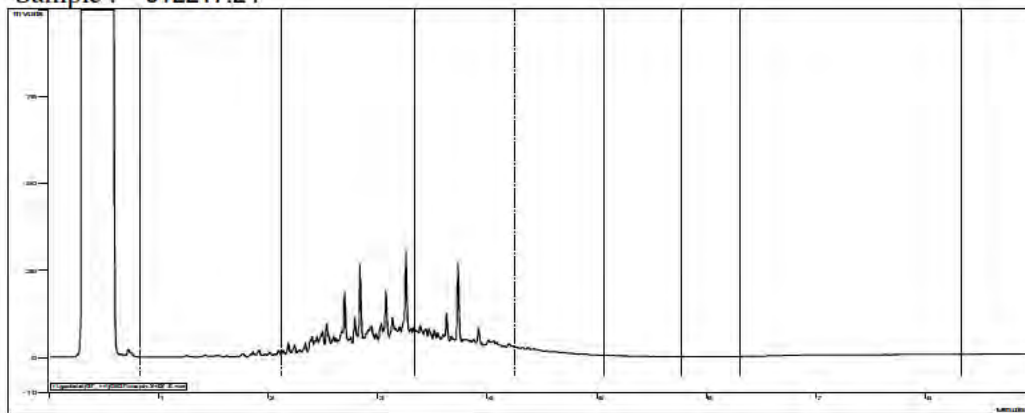
Sample : 912217.21



Sample : 912217.22

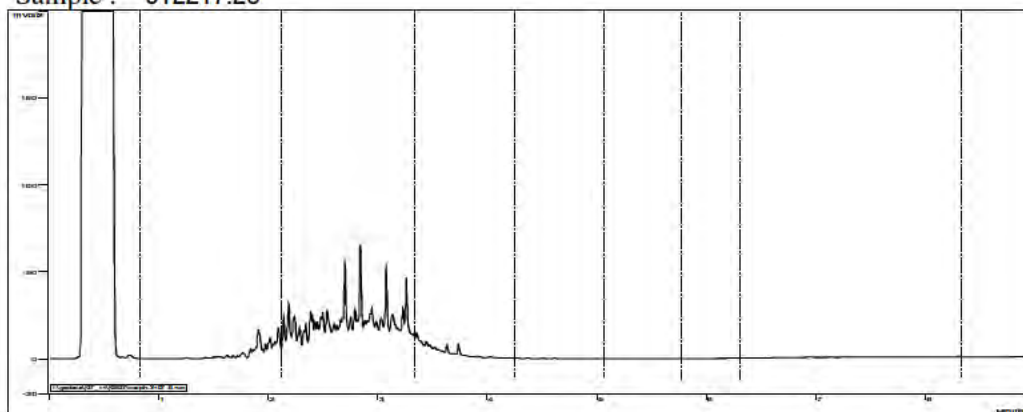


Sample : 912217.24

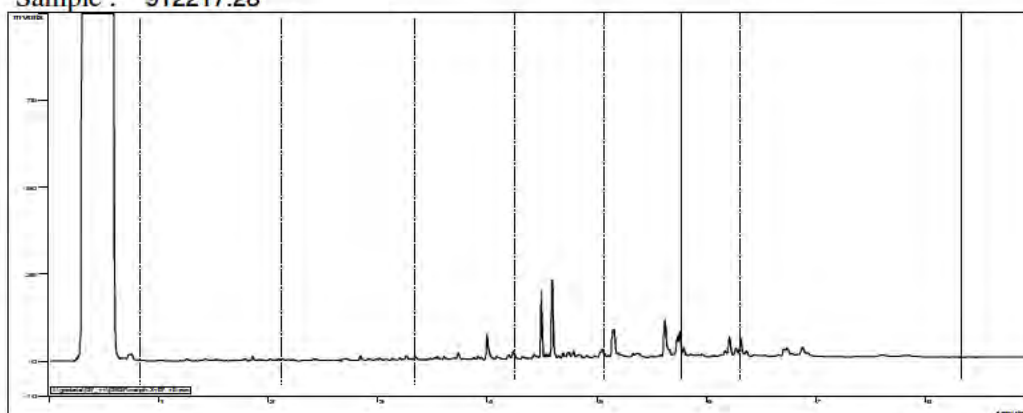


C7 C10 C15 C20 C25 C30 C34 C44

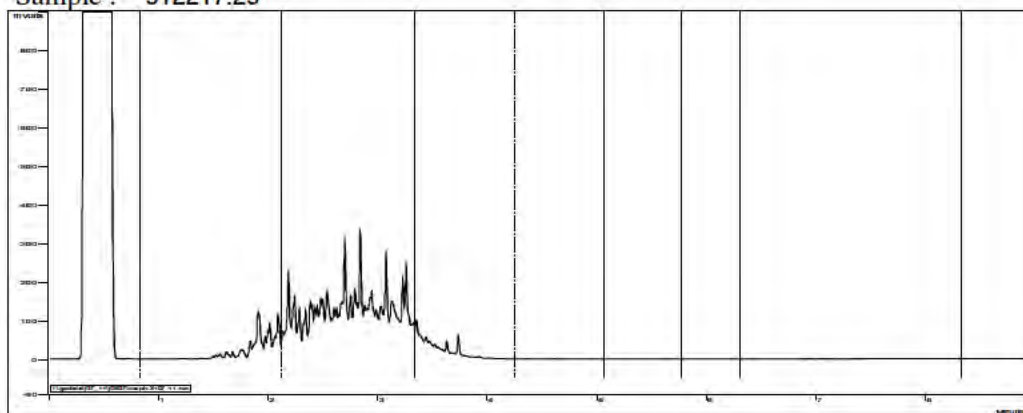
Sample : 912217.26



Sample : 912217.28

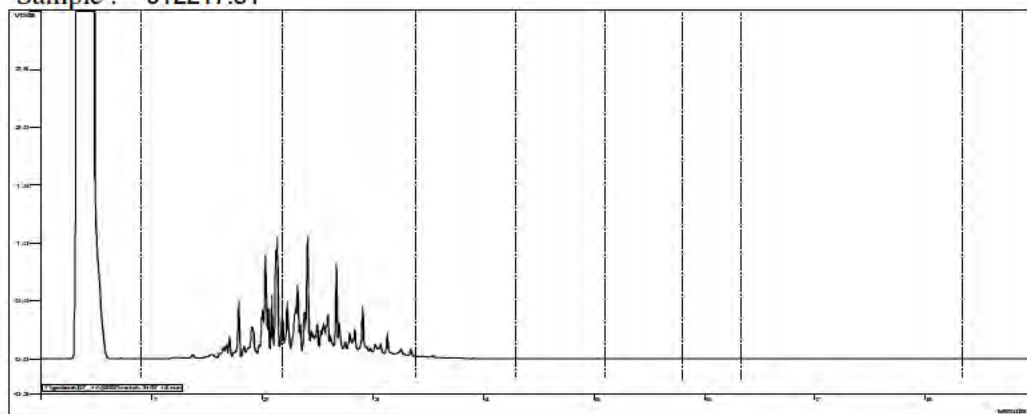


Sample : 912217.29

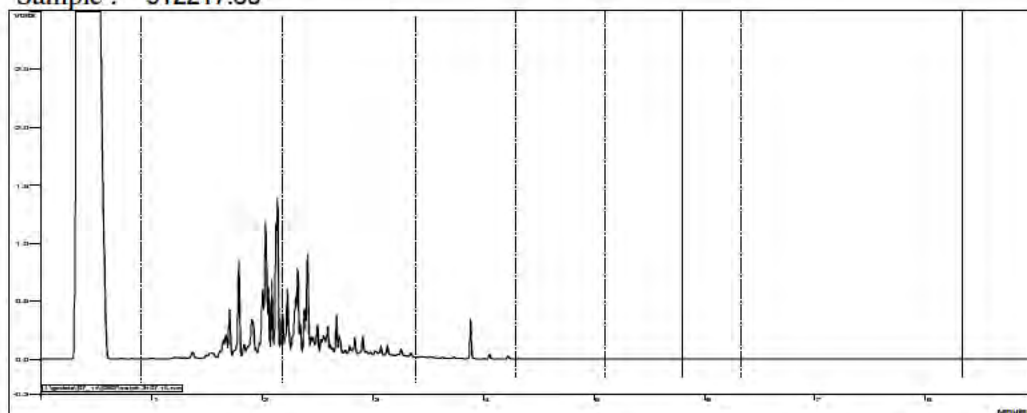


C7 C10 C15 C20 C25 C30 C34 C44

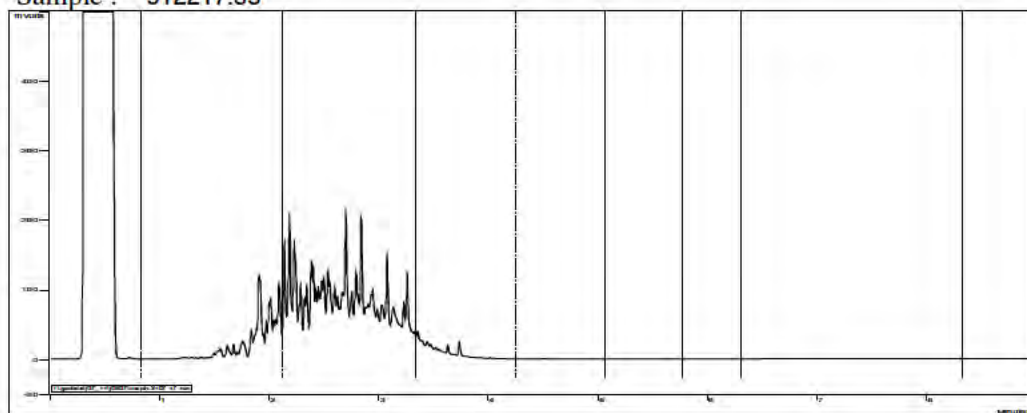
Sample : 912217.31



Sample : 912217.33



Sample : 912217.35



C7 C10 C15 C20 C25 C30 C34 C44

NOTE: Please acknowledge receipt of these samples by signing this form and emailing to submitter.

From: Pattle Delamore Partners Ltd

Address (Refer to base of sheet):

 PDP Auckland

☒ PDP v

Submitted by: ROR SMITH

Ph No.:

Page No.:

PDP Job No.: W01843100

Chain of Custody Record

Sent:

Name: Log Smith

Signature: [Signature]

Date and time: 10am 6-7-11

Received: ☐ Room temp. ☐ Chilled Temp.: _____ °C

Name: _____

Signature:

Date and time:

Notes:

2 Chilly Bins

Results by: ☒ Email submitter:

☒ Email other:

☒ Mail (address below)☐ Fax (number below)

Priority: ☒ Normal ☐ High ☐ Urgent

Results required by: ____ / ____ / ____

Invoice to: ☐ PDP

☐ Other: _____[illegible]

Sample type:	S Soil	GW Groundwater	SAL Seawater/saline	FW Freshwater	LEACH Leachate	GEO Geothermal
	SED Sediment	BIO Biota	TW Tradewaste	WW Wastewater	P Potable	Other: _____

Note: Samples may contain dangerous or hazardous substances

Page 7 of 7

PDP Auckland
PDP House, 235 Broadway, Newmarket, Auckland
PO Box 9528, Newmarket, Auckland 1149

PDP Wellington
ISOFT House, Level 1, 111 Customhouse Quay, Wellington
PO Box 6136, Wellington 6141

PDP Christchurch
Radio NZ House, 51 Chester St West, Christchurch
PO Box 389, Christchurch 8140
Tel: +64 3 363 3159 | Fax: +64 3 363 3151

Request for Analyses

NOTE: Please acknowledge receipt of these samples by signing this form and emailing to submitter.

From: **Pattle Delamore Partners Ltd**

Address (Refer to base of sheet): ☐ PDP Auckland ☒ PDP Wellington ☐ PDP Christchurch

Submitted by: Rob Smith Ph No.: 04 4714137

To: HILL LAB

Quote No.: _____

PDP Job No.: W01843100

Chain of Custody Record

Sent:

Name: Rob Smith

Signature: [Signature]

Date and time: 10am 6-7-11

Received: ☐ Room temp. ☐ Chilled Temp.: 9.5 °C

Name: Baranilson

Signature: [Signature]

Date and time: 7/7/11 9.49

Notes:

2 Chilly Bins

Results by: ☒ Email submitter: rob.smith @pdp.co.nz ☒ Mail (address below)

☒ Email other: vanessa.dally @pdp.co.nz ☐ Fax (number below)

Priority: ☒ Normal ☐ High ☐ Urgent

Results required by: ____ / ____ / ____

Invoice to: ☒ PDP ☐ Other:

Sample ID	Sample type	No. bottles	Analyses requested	Notes
TP1 BEDDING	<u>S</u>	<u>1</u>	<u>(9801300) MOLD COLD - will notify analyses required</u>	
TP1 BASE 2.5				
TP1 BASE 3.0				
TP1 BASE 4.0				
TP1 NW 0.8				
TP1 NW 2.0				
TP1 NW 2.0				
TP1 EW 0.8				
TP1 EW 2.0				
TP1 WW 0.8				
TP1 WW 2.0				
TP1 WW 2.5				
TP1 SW 0.8				
TP1 SW 2.0				
TP1 NW 0.8				
TP2 BEDDING				
TP2 BASE 2.0				
TP2 BASE 3.0				
TP2 NW 1.5				
TP2 EW 0.8				
TP2 EW 1.5				
TP2 SW 0.9				

Sample type: S Soil GW Groundwater SAL Seawater/saline FW Freshwater LEACH Leachate GEO Geothermal
SED Sediment BIO Biota TW Tradewaste WW Wastewater P Potable Other: _____

Note: Samples may contain dangerous or hazardous substances

Page 1 of 2

Greg Brittan

From: Vanessa Dally [REDACTED]
Date: Thu, 7/7/2011 14:48
To: Sample.Reception@hill-labs.co.nz
Cc: Jean Connick [REDACTED]
Subject: FW: Hill Laboratories Job Request Form and Summary Page for Job Number 912217
Attachment(s): 912217 - COC+Summary.pdf

To Whom It May Concern:

~~I would like to request the samples for the attached COC are all analysed for TPH and BTEX as per quote~~
45437. Please address any queries and the results to myself rather than Robert Smith.

Thank you
Vanessa Dally

From: Robert Smith
Sent: Thursday, 7 July 2011 1:14 p.m.
To: Vanessa Dally
Subject: FW: Hill Laboratories Job Request Form and Summary Page for Job Number 912217

From: Emma Bartlett [mailto:[REDACTED]]
Sent: Thursday, 7 July 2011 1:10 p.m.
To: Robert Smith
Subject: Hill Laboratories Job Request Form and Summary Page for Job Number 912217

Please address any replies to Sample.Reception@hill-labs.co.nz

This email's attachment contains a Hill Laboratories Job Request Form and Summary Page, for Job Number 912217

Attention:

The information in this email and in any attachments is confidential. If you are not the intended recipient then please do not distribute, copy or use this information. Please notify us immediately and then delete the message from your computer. Any views or opinions presented are solely those of the author.

This electronic mail message together with any attachments is confidential and legally privileged between Pattle Delamore Partners Limited and the intended recipient. If you have received this



Job Information Summary

Page 1 of 2

Client:	Pattle Delamore Partners Ltd	Lab No:	912217
Contact:	V Dally	Date Registered:	07-Jul-2011 9:57:37 am
	C/- Pattle Delamore Partners Ltd	Priority:	High
	PO Box 6136	Quote No:	45437
	WELLINGTON 6141	Order No:	
		Client Reference:	W01843100
		Add. Client Ref:	
		Submitted By:	R Smith
		Charge To:	Pattle Delamore Partners Ltd

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	TP1 Bedding 05-Jul-2011	Soil	GSoil300	TPH + BTEX profile, Soil
2	TP1 Base 2.5 05-Jul-2011	Soil	GSoil300	TPH + BTEX profile, Soil
3	TP1 Base 3.0 05-Jul-2011	Soil	GSoil300	TPH + BTEX profile, Soil
4	TP1 Base 4.0 05-Jul-2011	Soil	GSoil300	TPH + BTEX profile, Soil
5	TP1 NW 0.8 05-Jul-2011	Soil	GSoil300	TPH + BTEX profile, Soil
6	TP1 NW 2.0 05-Jul-2011	Soil	GSoil300	TPH + BTEX profile, Soil
7	TP1 NW1 2.0 05-Jul-2011	Soil	GSoil300	TPH + BTEX profile, Soil
8	TP1 EW 0.8 05-Jul-2011	Soil	GSoil300	TPH + BTEX profile, Soil
9	TP1 EW 2.0 05-Jul-2011	Soil	GSoil300	TPH + BTEX profile, Soil
10	TP1 WW 0.8 05-Jul-2011	Soil	GSoil300	TPH + BTEX profile, Soil
11	TP1 WW 2.0 05-Jul-2011	Soil	GSoil300	TPH + BTEX profile, Soil
12	TP1 WW 2.5 05-Jul-2011	Soil	GSoil300	TPH + BTEX profile, Soil
13	TP1 SW 0.8 05-Jul-2011	Soil	GSoil300	TPH + BTEX profile, Soil
14	TP1 SW 2.0 05-Jul-2011	Soil	GSoil300	TPH + BTEX profile, Soil
15	TP1 NW1 0.8 05-Jul-2011	Soil	GSoil300	TPH + BTEX profile, Soil
16	TP2 Bedding 05-Jul-2011	Soil	GSoil300	TPH + BTEX profile, Soil
17	TP2 Base 2.0 05-Jul-2011	Soil	cGSoil	TPH + BTEX profile, Soil
18	TP2 Base 3.0 05-Jul-2011	Soil	GSoil300	TPH + BTEX profile, Soil
19	TP2 NW 1.5 05-Jul-2011	Soil	GSoil300	TPH + BTEX profile, Soil
20	TP2 EW 0.8 05-Jul-2011	Soil	cGSoil	TPH + BTEX profile, Soil
21	TP2 EW 1.5 05-Jul-2011	Soil	GSoil300	TPH + BTEX profile, Soil
22	TP2 SW 0.9 05-Jul-2011	Soil	GSoil300	TPH + BTEX profile, Soil
23	TP2 WW 0.8 05-Jul-2011	Soil	GSoil300	TPH + BTEX profile, Soil
24	TP2 WW 1.5 05-Jul-2011	Soil	GSoil300	TPH + BTEX profile, Soil
25	TP3 BF 05-Jul-2011	Soil	GSoil300	TPH + BTEX profile, Soil
26	TP3 Base 2.2 05-Jul-2011	Soil	cGSoil	TPH + BTEX profile, Soil
27	TP3 Base 3.2 05-Jul-2011	Soil	GSoil300	TPH + BTEX profile, Soil
28	TP3 NW 0.6 05-Jul-2011	Soil	GSoil300	TPH + BTEX profile, Soil
29	TP3 NW 2.0 05-Jul-2011	Soil	GSoil300	TPH + BTEX profile, Soil
30	TP3 EW 0.8 05-Jul-2011	Soil	GSoil300	TPH + BTEX profile, Soil
31	TP3 EW 2.0 05-Jul-2011	Soil	GSoil300	TPH + BTEX profile, Soil
32	TP3 SW 0.8 05-Jul-2011	Soil	GSoil300	TPH + BTEX profile, Soil
33	TP3 SW 2.0 05-Jul-2011	Soil	GSoil300	TPH + BTEX profile, Soil
34	TP3 WW 0.8 05-Jul-2011	Soil	GSoil300	TPH + BTEX profile, Soil
35	TP3 WW 2.0 05-Jul-2011	Soil	GSoil300	TPH + BTEX profile, Soil

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	Samples
BTEX in Soil by Headspace GC-MS	Solvent extraction, Headspace GC-MS analysis US EPA 8260B. Tested on as received sample	-	1-35
Total Petroleum Hydrocarbons in Soil	Sonication extraction in DCM, Silica cleanup, GC-FID analysis US EPA 8015B/MfE Petroleum Industry Guidelines. Tested on as received sample	-	1-35
Dry Matter (Env)	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. US EPA 3550.	0.10 g/100g as rcvd	1-35



ANALYSIS REPORT

Page 1 of 1

Client:	Pattle Delamore Partners Ltd	Lab No:	913303	SPv1
Contact:	V Dally	Date Registered:	12-Jul-2011	
	C/- Pattle Delamore Partners Ltd	Date Reported:	14-Jul-2011	
	PO Box 6136	Quote No:	45437	
	WELLINGTON 6141	Order No:		
		Client Reference:	W01843100	
		Submitted By:	R Smith	

Sample Type: Soil						
Sample Name:	FLP 11-Jul-2011 10:30 am	FL1 1.3 11-Jul-2011 10:35 am	FL2 1.4 11-Jul-2011 10:40 am	FL3 1.4 11-Jul-2011		
Lab Number:	913303.1	913303.2	913303.3	913303.4		
BTEX in Soil by Headspace GC-MS						
Benzene	mg/kg dry wt	< 0.06	< 0.06	< 0.05	< 0.05	-
Toluene	mg/kg dry wt	< 0.06	< 0.06	< 0.05	< 0.05	-
Ethylbenzene	mg/kg dry wt	< 0.06	< 0.06	< 0.05	< 0.05	-
m&p-Xylene	mg/kg dry wt	< 0.11	< 0.11	< 0.10	< 0.10	-
o-Xylene	mg/kg dry wt	< 0.06	< 0.06	< 0.05	< 0.05	-
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	< 9	< 10	< 8	< 9	-
C10 - C14	mg/kg dry wt	< 20	< 20	< 20	< 20	-
C15 - C36	mg/kg dry wt	< 40	< 40	< 40	< 40	-
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 70	< 70	< 70	< 70	-
Individual Tests						
Dry Matter	g/100g as rcvd	78	77	83	86	-

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	Samples
BTEX in Soil by Headspace GC-MS	Solvent extraction, Headspace GC-MS analysis US EPA 8260B. Tested on as received sample	-	1-4
Total Petroleum Hydrocarbons in Soil	Sonication extraction in DCM, Silica cleanup, GC-FID analysis US EPA 8015B/MfE Petroleum Industry Guidelines. Tested on as received sample	-	1-4
Dry Matter (Env)	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. US EPA 3550.	0.10 g/100g as rcvd	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.

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

Ara Heron BSc (Tech)
Client Services Manager - Environmental Division



This Laboratory is accredited by International Accreditation New Zealand (IANZ), which represents New Zealand in the International Laboratory Accreditation Cooperation (ILAC). Through the ILAC Mutual Recognition Arrangement (ILAC-MRA) this accreditation is internationally recognised.

The tests reported herein have been performed in accordance with the terms of accreditation, with the exception of tests marked *, which are not accredited.

To: HILL LAB
Quote No.: 45437
PDP Job No.: W01843100



Job Information Summary

Page 1 of 1

Client:	Pattle Delamore Partners Ltd	Lab No:	913303
Contact:	R Smith	Date Registered:	12-Jul-2011 9:10:39 am
	C/- Pattle Delamore Partners Ltd	Priority:	High
	PO Box 6136	Quote No:	45437
	WELLINGTON 6141	Order No:	
		Client Reference:	W01843100
		Add. Client Ref:	
		Submitted By:	R Smith
		Charge To:	Pattle Delamore Partners Ltd

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	FLP 11-Jul-2011 10:30 am	Soil	GSoil300	TPH + BTEX profile, Soil
2	FL1 1.3 11-Jul-2011 10:35 am	Soil	GSoil300	TPH + BTEX profile, Soil
3	FL2 1.4 11-Jul-2011 10:40 am	Soil	GSoil300	TPH + BTEX profile, Soil
4	FL3 1.4 11-Jul-2011	Soil	GSoil300	TPH + BTEX profile, Soil

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	Samples
BTEX in Soil by Headspace GC-MS	Solvent extraction, Headspace GC-MS analysis US EPA 8260B. Tested on as received sample	-	1-4
Total Petroleum Hydrocarbons in Soil	Sonication extraction in DCM, Silica cleanup, GC-FID analysis US EPA 8015B/MfE Petroleum Industry Guidelines. Tested on as received sample	-	1-4
Dry Matter (Env)	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. US EPA 3550.	0.10 g/100g as rcvd	1-4



18 June 2013

Martin Robertson
Environmental Manager
Z Energy Limited
PO Box 2091
WELLINGTON 6140

Dear Martin

PRE-EXCAVATION SOIL SAMPLING AND VALIDATION INVESTIGATION – Z VIVIAN STREET REDEVELOPMENT WORKS, 166-180 VIVIAN STREET, WELLINGTON

1.0 Introduction

Z Energy Limited has engaged Pattle Delamore Partners Limited (PDP) to report the results of a pre-excitation soil sampling and validation investigation at the former Shell Vivian Street service station (the site) located at 166 – 180 Vivian Street, Wellington. The site is currently being redeveloped into the Z Vivian Street service station.

Redevelopment of the site has involved several significant soil excavations for the creation of tank pits, foundations for buildings, service trenches and for the relocation and upgrade of the historic culvert which previously crossed beneath the site. Validation soil testing was undertaken at the base of significant excavations around the site, except where excavations extended below the groundwater table. In addition, sampling was carried out to provide guidance on soil disposal; whether to clean fill, landfill or to a treatment facility. Redevelopment works were conducted in accordance with the *Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand* (MfE, 2011a).

The following letter report presents the results of soil testing conducted in areas of soil excavation and briefly discusses the management of excavated material removed from site, including stockpiling and test-pitting of material to segregate and remove soil to the appropriate disposal facility. Site visits were completed by PDP between 5 September 2012 and 23 January 2013.

2.0 Site Description

The site is located within the Te Aro commercial area of central Wellington. To the north, the site is bounded by a parking lot and by Vivian Street to the south, beyond which are commercial buildings. To the west, the site is bounded by Bute Street, beyond which are commercial buildings. To the east, the site is bounded by commercial buildings extending eastwards to Cuba Street, including a restaurant at the southeastern corner. Prior to construction the site existed as a vacant lot following its decommissioning as a Shell service station in 2008.

3.0 Background

The site, located at 166 – 180 Vivian Street, Wellington, Lot 1 District Plan 54050, operated as a service station from an unknown date until decommissioning in 2008. Historical information suggests that when decommissioned, four underground storage tanks were located on site, storing 96 Octane Petrol (30,000 L), 91 Octane Petrol (50,000 L), diesel fuel (15,000 L) and Waste Oil (2,200 L). Above ground tanks were also historically present on the site for the storage of liquid petroleum gas (LPG) and compressed natural gas (CNG). A removed brickwork culvert which crossed diagonally under the northern third of the site was understood to have been constructed in 1870 and was 1 m in diameter (MWH 2006).

4.0 Geology and Hydrogeology

4.1 Geology

The 1:250,000 IGNS Geological Map No. 10 (2000) 'Geology of the Wellington Area' shows the typical natural soil type is clay with organic material and silty sand. During test pitting, sandy gravel was encountered from the ground surface to a depth of 3.5 m bgl. A bluish grey silty clay existed from a depth of 3.5 m bgl to 4.5 m bgl (see attached log). The basement rock of the area is alternating argillite and greywacke sandstone of the Rakaia Terrace.

4.2 Groundwater Sensitivity

Groundwater within the area flows in a northerly direction towards the Wellington Harbour. Depth to groundwater was observed at approximately 3.5 m bgl throughout the site.

The sensitivity of the underlying aquifer was assessed in accordance with Section 5.2.3 of the MfE (2011a) guidelines:

- ✧ The shallow aquifer beneath the site is not artesian;
- ✧ The depth of the first water bearing unit is less than 10 m below the potential contaminant source (the UPSS); and
- ✧ The shallow aquifer in the vicinity of the site is not currently utilised, and given the presence of a reticulated water supply, future use of the shallow groundwater for water supply purposes is unlikely.

Therefore, based on the criteria above, the shallow groundwater is not considered to be sensitive with regard to groundwater use.

According to Section 5.2.3 of the MfE (2011a) guidelines, a surface water body greater than 100 m from a contaminant source is unlikely to be sensitive, given that natural attenuation processes generally limit the extent of dissolved phase plumes to less than 100 m. The nearest surface water body is the Wellington Harbour located approximately 760 m to the north-east of the site and is therefore considered not sensitive with respect to potential impacts from the migration of impacted groundwater away from the site.

5.0 Summary of Excavation Works

Soil sampling was conducted in several phases during site development between 5 September 2012 and 23 January 2013. Site redevelopment works have involved soil disturbance via excavation of soil for the creation of tank pits, canopy column foundations, foundations for buildings, service trenches and for the installation of a stormwater drain, crossing the site (Figure 1). The total volume of soil removed from the site was approximately 2000 m³ (not including bulking). The maximum excavation depth was in the tank pit, extending to a depth of 4.5 m bgl. Some hydrocarbon-

contaminated soil (based on Photo Ionisation Detection (PID)¹, laboratory soil testing and observations) excavated within the site required disposal to Transpacific Technical Services (TTS) in Seaview for treatment prior to disposal. All other removed soil was taken to either Southern Landfill or T & T Landfill (cleanfill) in Happy Valley for disposal only.

Test pitting and soil sampling was conducted prior to soil removal for all excavations except the stormwater excavation in order to assess whether the soil concentrations met landfill contamination criteria. Due to the incremental nature of the stormwater excavation, soil removed was stockpiled onsite, pending sampling.

Details of excavations and removed volumes are provided below in chronological order of works:

5.1 Shop Excavation

Approximately 450 m³ of material was removed from the area of the new service station shop, an area of 9 m by 20 m, to a depth of 2.5 m bgl. Excavation followed investigative test pitting at five locations within the area.

5.2 Canopy Support Excavation

Approximately 895 m³ of material was removed from the area of the new service station canopy, an area of 10 m by 25.5 m, to a depth of 3.5 m bgl. Excavation followed investigative test pitting at four locations within the area.

5.3 Stormwater Excavation

Approximately 260 m³ of material was removed from the area to contain the new stormwater drainage system. Soil was stockpiled on site, pending sampling.

5.4 Tank Pit Excavation

Approximately 445 m³ of material was removed from the area to contain the new underground petroleum storage system (UPSS) including three USTs, an area of 10 m by 10 m, to a depth of 4.5 m bgl. Excavation followed investigative test pitting at five locations within the area.

6.0 Soil Sampling

Soil sampling at the site was conducted via initial test pitting and sampling from the exposed base of excavations. Soil sampling was conducted primarily to determine disposal locations for soil, as soil was being removed for the installation and replacement of underground infrastructure. Southern Landfill in Happy Valley required Class A landfill criteria to be met prior to accepting potentially contaminated soils, therefore representative soil sampling and analysis was conducted to demonstrate that soil for disposal met this criteria. T & T landfill (a cleanfill facility) also required representative soil sampling and analysis prior to the acceptance of soil, requiring hydrocarbon contaminant concentrations be at or below the laboratory limit of detection.

Samples were collected from each excavation after soil was removed using an excavator. Samples were collected directly from the excavator bucket and were collected into glass jars provided by the laboratory and kept in chilled storage before being sent to RJ Hill Laboratories Limited, Hamilton for analysis, under PDP chain-of-custody procedures. The samples were sent via courier on the day of collection and were received by the laboratory on the day following dispatch (Chain of Custody documentation attached).

In addition to samples collected for laboratory analyses, soil samples were collected from each sample location for the purpose of field screening (using a PID). These soil samples were placed into individual zip lock sealed plastic storage

¹ A PID measures most volatile photo-ionisable compounds providing they have an ionisation potential below 10.6 eV. This includes most petroleum hydrocarbon compounds with a carbon range of between 1 and 10.

bags. The samples were allowed to stand for several minutes prior to the bag being pierced and measuring the headspace vapour readings with the PID.

Groundwater was observed at 3.5 m bgl throughout the site, and contained a strong, hydrocarbon odour. No product or sheen was observed on the water table.

6.1 Validation Soil Sampling

Fifteen soil samples were collected for laboratory analysis during the initial test pit site investigation from the areas of the shop and canopy excavations to determine the concentrations of petroleum hydrocarbon residues likely to be excavated within selected excavations. The samples were analysed for Total Petroleum Hydrocarbons (TPH) and individual Benzene, Toluene, Ethylbenzene and Xylene (BTEX) compounds based on the former storage of petroleum products on the site.

Validation samples were collected from the following locations:

- ✧ Four soil samples were collected from the base of the shop excavation at 2.5 m bgl via test pitting prior to soil removal, these were treated as validation samples as they represented the proposed excavation base.
- ✧ Four soil samples were collected from the base of the canopy excavation at 3.5 m bgl via test pitting prior to soil removal, these were treated as validity as they represented the proposed excavation base. An additional six validation samples were taken from the base of the open excavation (3.4 m bgl) immediately above the groundwater smear zone.
- ✧ Five soil samples were collected from the base of the tank pit excavation at 4.5 m bgl via test pitting, prior to soil removal. These were analysed by PID only as samples were impacted by groundwater. PID analysis showed volatile organic compounds (VOCs) concentrations ranging between 1.2 to 1270 ppm, likely attributable to hydrocarbons at the groundwater surface impacting excavated soil. All samples displayed a strong odour and hydrocarbon staining.

6.2 Test pit Soil Sampling

Test pitting also included shallow depth sampling to ascertain hydrocarbon impacts in soil to be removed from site. This was done to ensure that excavated materials were disposed of at the appropriate facility. Visual observations and PID readings were taken to the base of test pits and to the level of validation sampling in order to assess soil throughout the underlying strata.

All test pits included a shallow sample at 0.5 m bgl including:

- ✧ Five samples collected from within the soil of the shop excavation.
- ✧ Four samples collected from within the soil of the canopy excavation.
- ✧ Ten samples collected from within the soil of the tank pit excavation (five at 0.5 m bgl, and five between 3.1-3.8m bgl).

Soil represented by the test pit soil samples was removed from site as part of excavation works.

6.3 Stockpile Soil Sampling

The results of soil sampling were forwarded to the appropriate landfill facilities including results from validation-level sampling. PDP was on site during the majority of soil excavations and provided guidance as to whether soil was required to be initially stockpiled by the landfill facility (pending further testing), or if pockets of soil that appeared contaminated were discovered during excavation required temporarily stockpiling on site. Representative soil samples were then taken of stockpiled material at an approximate ratio of one sample per 100 m³ of soil, unless PID testing

and visual observations showed that the pile contained sufficient contamination to be removed (without testing) by Transpacific Technical Services.

7.0 Laboratory Results

Laboratory results are presented in Table 1, representing soil removed from site, and Table 2, representing soil retained on site. All laboratory results are appended. Stockpile and test pit soil sample results are shown in Figure 1 and sample results shown in Figure 2. Laboratory reports are also appended.

7.1 Test Pits / Stockpiles

The results of test pit and stockpile sampling are summarised below:

- ✧ Shop excavation: All five samples from within the soil to be removed contained TPH and BTEX concentrations below laboratory detection limits. Soil was therefore accepted as clean fill by Southern Landfill, with the exception of a single isolated area of dark stained soil, discovered during excavation, of approximately 10 m³. This material was analysed using a PID which confirmed the material as hydrocarbon impacted, and as a result it was separated and disposed of to Transpacific Technical Services, Seaview.
- ✧ Stormwater excavation stockpile: Three representative samples were collected from this stockpile, and all reported TPH and BTEX concentrations below the laboratory limit of detection. As a result the soil was accepted by T&T Landfill for disposal as cleanfill.
- ✧ Canopy excavation: Three of the four initial samples from test pitting within the excavation area returned TPH and BTEX concentrations below laboratory detection limits. A single sample (TP7-1) contained a concentration of 2,800 mg/kg for petroleum hydrocarbons for the TPH C₁₅ and C₃₆ carbon compound range. BTEX and remaining TPH carbon compounds contained concentrations below the laboratory detection limit. Further analysis was requested by Southern Landfill prior to acceptance, and the soil (approximately 500 m³) was temporarily stockpiled at their site on Happy Valley Road pending further sampling.
- ✧ Canopy excavation stockpile: Five representative samples were collected from the stockpile, and all reported TPH and BTEX concentrations below the laboratory limit of detection. As a result the soil was accepted by Southern Landfill for disposal.
- ✧ Tank pit excavation: Nine of the ten samples taken from within the soil to be excavated from the tank pit area returned TPH and BTEX concentrations below laboratory detection limits. TP12/2 returned TPH and BTEX concentrations above the laboratory limit of detection. The results of this sampling dictated where material was disposed of. This being; all material above the groundwater smear zone (approximately 3.5 m bgl) would be accepted by Southern Landfill, and (based on the results of PID analysis) all material below the smear zone (3.5 to 4.5 m bgl) would be removed to TTS.

7.2 Validation Samples

The results of validation sampling at the base of excavations are summarised below:

- ✧ Shop excavation: All five samples from the base of the shop excavation (2.5 m bgl) returned TPH and BTEX concentrations below laboratory detection limits.
- ✧ Canopy excavation: Of the ten samples collected from the base of the canopy excavation, two returned TPH and BTEX concentrations slightly above laboratory detection limits: TP8-2 and CP2. The remaining eight samples returned TPH and BTEX concentrations below laboratory detection limits.

8.0 Comparison of Validation Results to Applicable Criteria – All Pathways

The MfE (2011a) Tier 1 soil acceptance criteria have been developed on a risk-based approach with the primary consideration being the protection of human health for commercial/industrial land use. The criteria have also been developed to account for the protection of maintenance/excavation workers and for the protection of groundwater quality. In addition to site usage the Tier 1 acceptance criteria take into consideration the environmental settings including soil type (permeability) and depth to contamination. Commercial/industrial criteria are considered appropriate for this site given its continued use as a service station.

As such, the Tier 1 soil acceptance criteria via All Pathways are a reflection of the most stringent criteria associated with the protection of human health via several exposure routes. Comparison of analytical results to these criteria reveals whether a more in-depth review of the potential exposure pathways is required at the site. Where a detailed review is required, route specific criteria are determined based on a site-specific assessment of both potential receptors and exposure pathways.

None of the validation soil samples representing soil remaining on site reported petroleum hydrocarbon concentrations above the MfE (2011) Tier 1 soil acceptance criteria via All Pathways for commercial/industrial land use.

9.0 Environmental Assessment

9.1 Health Risk Assessment

As none of the validation soil samples reported petroleum hydrocarbon concentrations above the MfE (2011) Tier 1 soil acceptance criteria via All Pathways for commercial/industrial land use, the risk to future site users or workers involved in subsurface excavations via any pathway in the vicinity of the site shop and canopy is considered negligible. The health risk associated with sub surface excavations in the vicinity of the stormwater system and tank pit has not been assessed as part of this investigation.

Some hydrocarbon odour was detected at the groundwater surface throughout the site, with PID headspace readings of water-impacted samples recorded at a maximum of 1786 ppm. However, given that there are no registered water bores for potable use within 500 m of the site and that future drinking-water bores are unlikely to be drilled in the vicinity of the site due to the city's reticulated water supply the risk to human health is low. The depth to the water table is 3.5 m bgl, and as such, the risk to future maintenance and site workers is low.

9.2 Ecological Risk Assessment

A Tier 1 ecological risk assessment has been conducted in accordance with the MfE (2011) guidelines. The closest significant ecological receptor to the site is Wellington Harbour, 760 m to the northeast of the site. The separation distance between the site and this nearest recorded surface waterway suggests that the risk to any ecological receptors within this water body is low.

10.0 Conclusions

In summary, fifteen soil samples were taken from the base of two large excavations at 166 – 180 Vivian Street, Wellington. Some residual hydrocarbons were observed through observation, soil sampling and PID testing at the level of validation above groundwater for the canopy and shop excavations, however, laboratory testing confirmed that these samples were below the MfE (2011) Tier 1 soil acceptance criteria via All Pathways for commercial/industrial land use. These samples were treated as validatory with regards to remaining site conditions for the areas of excavation that were sampled.

Groundwater at the site was observed to contain strong hydrocarbon odours and recorded high PID readings, likely attributable to hydrocarbon products at the groundwater surface. The strong odours and high PID readings are unlikely

to cause a risk to human health as the depth to the groundwater table is approximately 3.5 m bgl, there are no registered water bores for potable use in the surrounding area, and the distance to the nearest surface water body (Wellington Harbour) is greater than 100 m.

Approximately 2000 m³ of excavated material was removed from site, with varying levels of hydrocarbon contamination. This material was segregated for disposal at either Southern landfill, T & T landfill or TTS, using a combination of visual observation, PID testing and soil sampling.

Validation sampling was not conducted as part of a site wide plan, but only within discrete excavations as part of redevelopment works. As such, this investigation cannot be considered representative of the site as a whole, as large areas of the property remain untested.

11.0 Limitations

This report has been prepared based on: visual observations of the site vicinity, PID results from field headspace analysis, analysis of fifteen validation soil samples from the base of site excavations, and analysis of twenty four soil samples from three excavations and three soil stockpiles. Soil samples were analysed by an analytical laboratory for TPH and individual BTEX compound concentrations. The site conditions as described in this report have been interpreted from, and are subject to, this information and its limitations and accordingly PDP does not represent that its interpretation accurately represents the full site conditions.

The information contained within this report applies to sampling soil and groundwater undertaken on the dates stated in this report, or if none is stated, the date of this report. With time, the site conditions and environmental standards could change so that the reported assessment and conclusions are no longer valid. Accordingly, the report should not be used to refer to site conditions and environmental standards applying at a later date without first confirming the validity of the report's information at that time.

This report has been prepared by PDP on the specific instructions of Z Energy Limited for the limited purposes described in the report. PDP accepts no liability if it is used for any other purpose without PDP's prior written consent. In addition, unless PDP agrees in writing to a request from a third party to rely on or use this report, PDP also 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.

12.0 References

Begg, J.G., Johnston, M.R. (compilers) 2000. *Geology of the Wellington area*. Institute of Geological and Nuclear Sciences 1:250,000 geological map 10. 1 sheet + 64p. Lower Hutt, New Zealand: Institute of Geological and Nuclear Sciences Limited.

MfE, 2011. *Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand*. Ministry for the Environment, Wellington, New Zealand.

URS (2004), *Environmental Benchmarking – Murdoch & Co (Wellington) Limited*, Wellington, Letter dated 23 August 2004.

Z Energy (2011), *Environmental Management Plan for Site Works at Petroleum Handling Facilities*.

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WORKS, 166-180 VIVIAN STREET, WELLINGTON

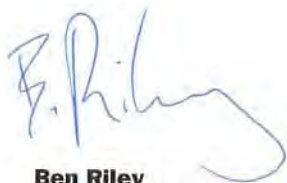
Yours sincerely

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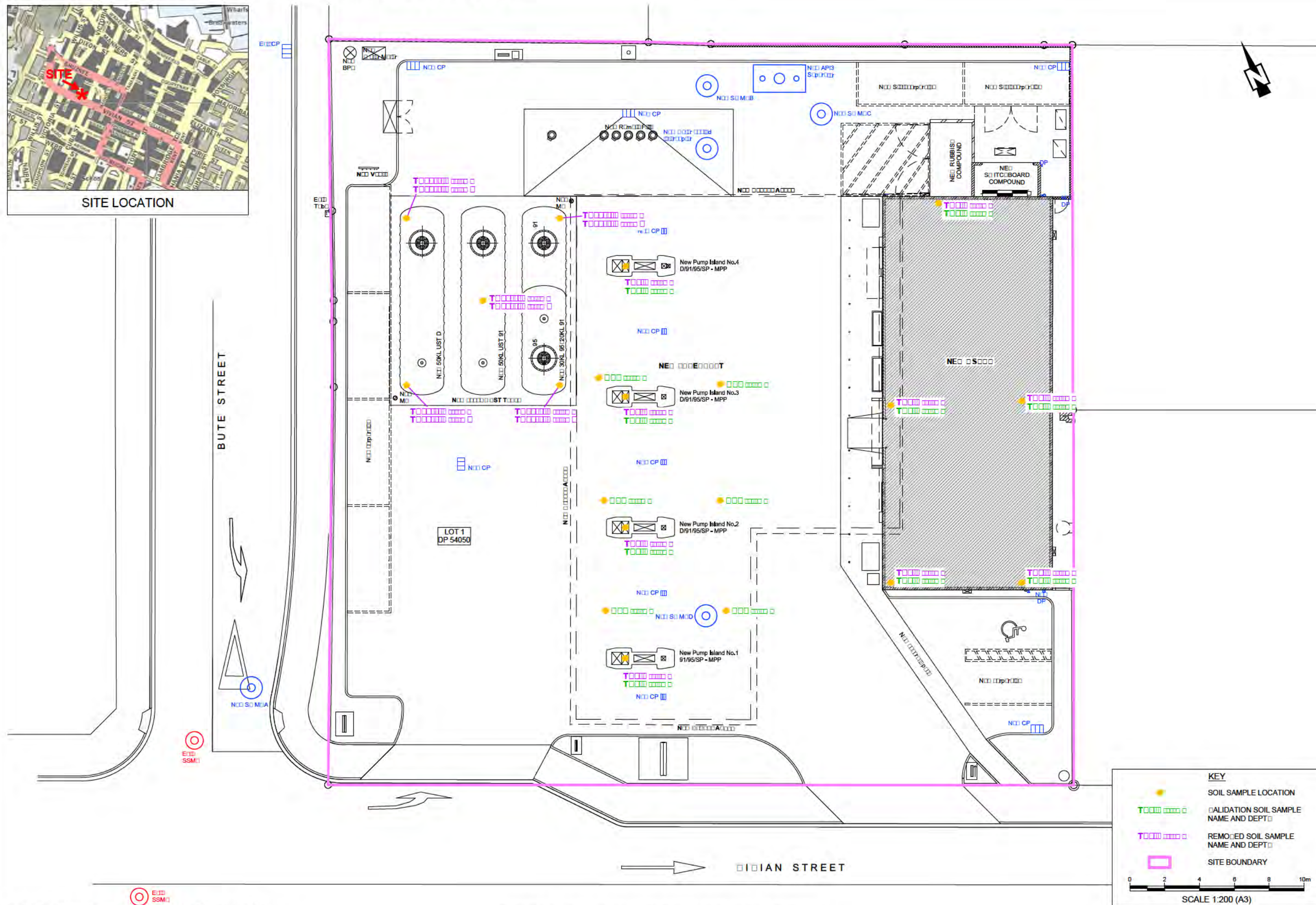
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Figures



SOURCE: BASE DRAWING: Z Vivian St A03ProposedSitePlan Rev J.dwg BY SHA ARCHITECTURE LTD., SUPPLIED BY Z ENERGY LTD.
CADASTRAL INFORMATION AND INSET DERIVED FROM LINZ DATA.

FIGURE 1 : SITE PLAN AND SOIL SAMPLING LOCATIONS

Tables

Table 1: Soil Sample Results - Vivian Street - Site Redevelopment

Removed soil samples															
Sample Name	TP1/1	TP2/1	TP3/1	TP4/1	TP5/1	TP6/1	TP6-2	TP7/1	TP8/1	TP9/1	CP1	SP2-1	SP1-1/SP1-2	SP2-2/SP2-3	SP1
Laboratory Reference	1051921.1	1051921.3	1051921.5	1051921.7	1051921.9	1051921.11	1051921.12	1051921.14	1051921.16	1055422.6	1059731.1	1055422.3	1055422.8	1055422.9	1060947.1
Sample Location	Shop Excavation	Shop Excavation	Shop Excavation	Shop Excavation	Shop Excavation	Canopy Excavation	Canopy Excavation	Canopy Excavation	Canopy Excavation	Canopy Excavation	Canopy Excavation	Shop Excavation	Shop Excavation	Shop Excavation	Canopy Stockpile
Soil Fate	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed
Soil Type - Field	Sandy Gravel	Sandy Gravel	Sandy Gravel	Sandy Gravel	Sandy Gravel	Sandy Gravel	Sandy Gravel	Sandy Gravel	Sandy Gravel	Silty Clay	Sandy Gravel	Sandy Gravel	Sandy Gravel	Sandy Gravel	Sandy Gravel
Soil Type - MfE (2011)	Sand	Sand	Sand	Sand	Sand	Sand	Sand	Sand	Sand	Silty Clay	Sand	Sand	Sand	Sand	Sand
Sample Depth (m bgl)	0.5	0.5	0.5	0.1	1.6	0.5	1.0	0.5	0.5	0.5	1.2	-	-	-	-
PID Reading (ppmv)	0.2	0.3	0.3	2.2	0.2	1600	850	0.5	0.3	-	0.2	1.2	0.4	2.0	-
C ₇ -C ₉ hydrocarbons	< 9	< 8	< 9	< 9	9	< 8	20	< 9	< 9	< 9	< 8	< 8	< 9	< 8	< 8
C ₁₀ -C ₁₄ hydrocarbons	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20
C ₁₅ -C ₃₆ hydrocarbons	< 40	< 40	91	< 40	160	< 40	< 40	2800	< 40	< 40	71	58	< 40	< 40	< 40
TPH	< 70	< 70	91	< 70	169	< 70	< 70	2800	< 70	< 70	71	< 70	< 70	< 70	< 70
Benzene	< 0.05	< 0.05	< 0.05	< 0.05	< 0.06	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	-	< 0.05	-	-	< 0.05
Toluene	< 0.05	< 0.05	< 0.05	< 0.05	< 0.06	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	-	< 0.05	-	-	< 0.05
Ethylbenzene	< 0.05	< 0.05	< 0.05	< 0.05	< 0.06	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	-	< 0.05	-	-	< 0.05
Total xylenes ⁷	< 0.15	< 0.15	< 0.15	< 0.15	< 0.17	< 0.15	< 0.15	< 0.15	< 0.15	< 0.15	-	< 0.15	-	-	< 0.15
Removed soil samples															
Sample Name	SP2	SP3	SP4	SP5	TP10-0.5	TP10-3.5	TP11-0.5	TP11-3.1	TP12-0.5	TP12-3.2	TP13-0.5	TP13-3.8	TP14-0.5	TP14-3.3	
Laboratory Reference	1060947.2	1060947.3	1060947.4	1060947.5	1079063.1	1079063.2	1079063.3	1079063.4	1079063.5	1079063.6	1079063.7	1079063.8	1079063.9	1079063.10	
Sample Location	Canopy Stockpile	Canopy Stockpile	Canopy Stockpile	Canopy Stockpile	Tankpit Excavation	Tankpit Excavation	Tankpit Excavation	Tankpit Excavation	Tankpit Excavation	Tankpit Excavation	Tankpit Excavation	Tankpit Excavation	Tankpit Excavation	Tankpit Excavation	
Soil Fate	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	Removed	
Soil Type - Field	Sandy Gravel	Sandy Gravel	Sandy Gravel	Sandy Gravel	Sandy Gravel	Silty Clay	Sandy Gravel	Silty Clay	Sandy Gravel	Sandy Gravel	Sandy Gravel	Silty Clay	Sandy Gravel	Silty Clay	
Soil Type - MfE (2011)	Sand	Sand	Sand	Sand	Sand	Silty Clay	Sand	Silty Clay	Sand	Sand	Sand	Silty Clay	Sand	Silty Clay	
Sample Depth (m bgl)	-	-	-	-	0.5	3.5	0.5	3.1	0.5	3.2	0.5	3.8	0.5	3.3	
PID Reading (ppmv)	-	-	-	-	4.6	22.8	1.4	24.7	47.2	1786	11.0	1.1	1.8	28.8	
C ₇ -C ₉ hydrocarbons	< 8	< 8	< 8	< 8	< 8	< 9	< 8	< 9	< 8	35	< 8	< 9	< 8	< 9	
C ₁₀ -C ₁₄ hydrocarbons	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	89	< 20	< 20	< 20	< 20	
C ₁₅ -C ₃₆ hydrocarbons	< 40	< 40	< 40	< 40	< 40	< 40	< 40	< 40	< 40	63	< 40	< 40	< 40	< 40	
TPH	< 70	< 70	< 70	< 70	< 70	< 70	< 70	< 70	< 70	187	< 70	< 70	< 70	< 70	
Benzene	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.06	< 0.05	< 0.06	< 0.05	< 0.05	< 0.05	< 0.06	< 0.05	< 0.06	
Toluene	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.06	< 0.05	< 0.06	< 0.05	< 0.05	< 0.05	< 0.06	< 0.05	< 0.06	
Ethylbenzene	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.06	< 0.05	< 0.06	< 0.05	0.11	< 0.05	< 0.06	< 0.05	< 0.06	
Total xylenes ⁷	< 0.15	< 0.15	< 0.15	< 0.15	< 0.15	< 0.18	< 0.15	< 0.17	< 0.15	1.78	< 0.15	< 0.17	< 0.15	< 0.17	

Note:

1. All results in mg/kg.

2. Total xylenes was calculated by adding the laboratory results of the individual xylene isomers with the sum rounded to the least number of significant figures of the two results. Where one of the xylene isomers was below the detection limit, a value of half the detection limit was used in the sum. Where all compounds in the sum are non-detects, the overall detection limit is the sum of the detection limits.

Table 2: Soil Sample Results - Validation Sampling

Soil Samples Collected at a Depth of 1 - 4 m Below Ground Level ¹																	
Sample Name	TP1/2	TP2/2	TP3/2	TP4/2	TP5/2	TP6/3	TP7/2	TP8/2	TP9-2	CP2	CP3	CP4	CP5	CP6	CP7	Tier 1 Soil Acceptance Criteria ^{2,3} Commercial/ Industrial Land Use ALL PATHWAYS	Tier 1 Soil Acceptance Criteria ^{2,3} Commercial/ Industrial Land Use ALL PATHWAYS
Laboratory Reference	1051921.2	1051921.4	1051921.6	1051921.8	1051921.10	1051921.13	1051921.15	1051921.17	1055422.7	1059731.2	1059731.3	1060018.1	1060018.2	1060018.3	1060018.4		
Sample Location	Shop Excavation	Shop Excavation	Shop Excavation	Shop Excavation	Shop Excavation	Canopy Excavation	Canopy Excavation	Canopy Excavation	Canopy Excavation	Canopy Excavation	Canopy Excavation	Canopy Excavation	Canopy Excavation	Canopy Excavation	Canopy Excavation		
Soil Fate	Remaining	Remaining	Remaining	Remaining	Remaining	Remaining	Remaining	Remaining	Remaining	Remaining	Remaining	Remaining	Remaining	Remaining	Remaining	Sand	Silty Clay
Soil Type - Field	Sandy Gravel	Sandy Gravel	Silty Clay	Sandy Gravel	Sandy Gravel	Sandy Gravel	Silty Clay	Silty Clay	Silty Clay	Sandy Gravel	Sandy Gravel	Silty Clay	Silty Clay	Silty Clay	Silty Clay		
Soil Type - MfE (2011)	Sand	Sand	Silty Clay	Sand	Sand	Sand	Silty Clay	Silty Clay	Silty Clay	Sand	Sand	Silty Clay	Silty Clay	Silty Clay	Silty Clay		
Sample Depth (m bgl)	2.5	2.5	2.5	2.5	2.5	3.5	3.5	3.5	3.5	3.4	3.4	3.4	3.4	3.4	3.4	1 - 4 m	1 - 4 m
PID Reading (ppmv)	0.3	0.2	0.1	0.3	5.2	1.3	0.1	134	-	0.4	1.1	-	-	-	-		
C ₇ -C ₉ hydrocarbons	< 8	< 8	< 9	< 8	< 8	< 8	< 9	< 8	< 11	25	< 8	< 8	< 8	< 8	< 9	120 ^{5m}	(20,000) ^{6,5m}
C ₁₀ -C ₁₄ hydrocarbons	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 30	52	< 20	< 20	< 20	< 20	< 20	(1,900) ^{6,5x}	(8,900) ^{6,5x}
C ₁₅ -C ₃₆ hydrocarbons	< 40	< 40	< 40	< 40	< 40	< 40	< 40	< 40	< 50	< 40	< 40	< 40	< 40	< 40	< 40	NA ⁴	NA ⁴
TPH	< 70	< 70	< 70	< 70	< 70	< 70	< 70	< 70	< 80	77	< 70	< 70	< 70	< 70	< 70	-	-
Benzene	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.07	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	3.0 ^{5m}	(20) ^{6,5v}
Toluene	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.07	0.72	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	(94) ^{6,5m}	(3,100) ^{6,5v}
Ethylbenzene	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.06	< 0.07	1.02	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	(300) ^{6,8,5v}	(2,600) ^{6,5v}
Total xylenes ⁷	< 0.15	< 0.15	< 0.15	< 0.15	< 0.15	< 0.15	< 0.15	0.63	< 0.21	7.69	< 0.15	< 0.15	< 0.15	< 0.15	< 0.15	(150) ^{6,5m}	(2,300) ^{6,5v}

Note:

- All results in mg/kg.
- Criteria from Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand, Revised 2011 (MfE 2011).
- Criteria assume commercial/industrial land use, 'silty clay', 'clay' and 'sand' soil types and contamination depths of <1 m and 1 - 4 m below ground level.
- NA indicates contaminant is not limiting as health based criterion is significantly higher than may be encountered on site (i.e. 20,000 mg/kg for TPH, 10,000 mg/kg for other contaminants).
- The following notes indicate the limiting pathway for each criterion: d - dermal, m - maintenance/excavation, p - produce, s - soil ingestion, v - volatilisation, x - PAH surrogate.
- Brackets denote values exceed threshold likely to correspond to formation of residual separate phase hydrocarbons.
- Total xylenes was calculated by adding the laboratory results of the individual xylene isomers with the sum rounded to the least number of significant figures of the two results. Where one of the xylene isomers was below the detection limit, a value of half the detection limit was used in the sum. Where all compounds in the sum are non-detects, the overall detection limit is the sum of the detection limits.
- Due to the boundary conditions in volatilisation model, calculated criteria for sandy soils are higher than that for the sandy silt soil type. Therefore, the criteria for sand are set equal to the criteria for sandy silt.

a. Contaminated soil layer is in direct contact with groundwater and hence no attenuation associated with vertical migration through the soil column occurs.

 Concentration above MfE (2011) Tier 1 soil acceptance criteria - ALL PATHWAYS

Site Photographs



Photograph 1: Looking northwest towards area of canopy excavation. Shop excavation area visible to the right of shot.



Photograph 2: Looking north, area of shop excavation.



Photograph 3: Test pit 2. Shop excavation. Sandy gravel to 2.5 m bgl.



Photograph 4: Spoil from test pit 6, showing blue-grey silty clay from 3.5 m bgl.



Photograph 5: Looking north, area of canopy excavation.



Photograph 6: Looking south, canopy excavation (centre).



Photograph 7: Material from canopy excavation with dark staining. Excavated from near historic UST bund.



Photograph 8: Looking north, canopy excavation (centre). Historic UST bund visible in right of shot.



Photograph 9: Looking northeast, canopy excavation (south). Silty clay visible at base of excavation (3.4m).



Photograph 10: Looking southeast, canopy excavation (south).



Photograph 11: Material from canopy excavation (south). Predominantly sandy gravel.



Photograph 12: Looking southeast, canopy excavation (north). Groundwater visible at 3.5 m bgl. Historic UST bund visible in left of shot.

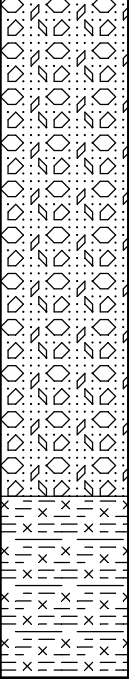


Photograph 13: Test pit 13. Tank pit excavation. Silty clay visible.



Photograph 14: Spoil from Test pit 14, blue-grey silty clay evident.

Logs

  PATTLE DELAMORE PARTNERS LTD		LOG OF TANK PIT Z Vivian St Site Redevelopment			PIT NO. General JOB NO: W01872101	
CLIENT: Z Energy			LOCATION: 166-180 Vivian Street, Wellington			
DATE:	DATE BACKFILLED:	LOGGED BY: BR		SHEET 1 OF 1		
DESCRIPTION OF SOIL		GRAPHIC LOG	DEPTH (m)	SAMPLE DETAILS	PID TESTS	WATER OBSERVATIONS
Sandy GRAVEL, brown, loose. No staining or odour			0.0			
Silty CLAY, bluish grey, damp-wet. Moderate hydrocarbon odours, occasional staining.			0.5			
			1.0			
			1.5			
			2.0			
			2.5			
			3.0			
			3.5			
			4.0			
			4.5			
END OF TANK PIT AT 4.5m						
Notes: General lithology log from a combination of testpits.		KEY  Groundwater level  Seepage inflow  Grab sample  PID Reading (ppm)		Method: Filename: W01872101B001_General		

Laboratory Reports



ANALYSIS REPORT

Page 1 of 2

Client:	Pattle Delamore Partners Ltd	Lab No:	1051921	SPV1
Contact:	Ben Riley C/- Pattle Delamore Partners Ltd PO Box 6136 WELLINGTON 6141	Date Registered:	27-Sep-2012	
		Date Reported:	02-Oct-2012	
		Quote No:		
		Order No:		
		Client Reference:	W01872101	
		Submitted By:	Stacey Marquardt	

Sample Type: Soil						
Sample Name:		TP1-1	TP1-2	TP2-1	TP2-2	TP3-1
Lab Number:		1051921.1	1051921.2	1051921.3	1051921.4	1051921.5
Individual Tests						
Dry Matter	g/100g as rcvd	85	90	85	91	89
BTEX in Soil by Headspace GC-MS						
Benzene	mg/kg dry wt	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Toluene	mg/kg dry wt	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Ethylbenzene	mg/kg dry wt	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
m&p-Xylene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
o-Xylene	mg/kg dry wt	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	< 9	< 8	< 8	< 8	< 9
C10 - C14	mg/kg dry wt	< 20	< 20	< 20	< 20	< 20
C15 - C36	mg/kg dry wt	< 40	< 40	< 40	< 40	91
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 70	< 70	< 70	< 70	91

Sample Name:		TP3-2	TP4-1	TP4-2	TP5-1	TP5-2
Lab Number:		1051921.6	1051921.7	1051921.8	1051921.9	1051921.10
Individual Tests						
Dry Matter	g/100g as rcvd	85	88	90	79	91
BTEX in Soil by Headspace GC-MS						
Benzene	mg/kg dry wt	< 0.05	< 0.05	< 0.05	< 0.06	< 0.05
Toluene	mg/kg dry wt	< 0.05	< 0.05	< 0.05	< 0.06	< 0.05
Ethylbenzene	mg/kg dry wt	< 0.05	< 0.05	< 0.05	< 0.06	< 0.05
m&p-Xylene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.11	< 0.10
o-Xylene	mg/kg dry wt	< 0.05	< 0.05	< 0.05	< 0.06	< 0.05
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	< 9	< 9	< 8	9	< 8
C10 - C14	mg/kg dry wt	< 20	< 20	< 20	< 20	< 20
C15 - C36	mg/kg dry wt	< 40	< 40	< 40	160	< 40
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 70	< 70	< 70	169	< 70

Sample Name:		TP6-1	TP6-2	TP6-3	TP7-1	TP7-2
Lab Number:		1051921.11	1051921.12	1051921.13	1051921.14	1051921.15
Individual Tests						
Dry Matter	g/100g as rcvd	94	88	90	88	82
BTEX in Soil by Headspace GC-MS						
Benzene	mg/kg dry wt	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Toluene	mg/kg dry wt	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Ethylbenzene	mg/kg dry wt	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
m&p-Xylene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10



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Sample Type: Soil						
Sample Name:		TP6-1	TP6-2	TP6-3	TP7-1	TP7-2
Lab Number:		1051921.11	1051921.12	1051921.13	1051921.14	1051921.15
BTEX in Soil by Headspace GC-MS						
o-Xylene	mg/kg dry wt	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	< 8	20	< 8	< 9	< 9
C10 - C14	mg/kg dry wt	< 20	< 20	< 20	< 20	< 20
C15 - C36	mg/kg dry wt	< 40	< 40	< 40	2,800	< 40
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 70	< 70	< 70	2,800	< 70
Sample Name:		TP8-1	TP8-2			
Lab Number:		1051921.16	1051921.17			
Individual Tests						
Dry Matter	g/100g as rcvd	88	87	-	-	-
BTEX in Soil by Headspace GC-MS						
Benzene	mg/kg dry wt	< 0.05	< 0.05	-	-	-
Toluene	mg/kg dry wt	< 0.05	< 0.05	-	-	-
Ethylbenzene	mg/kg dry wt	< 0.05	0.06	-	-	-
m&p-Xylene	mg/kg dry wt	< 0.10	0.51	-	-	-
o-Xylene	mg/kg dry wt	< 0.05	0.12	-	-	-
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	< 8	28	-	-	-
C10 - C14	mg/kg dry wt	< 20	39	-	-	-
C15 - C36	mg/kg dry wt	< 40	< 40	-	-	-
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 70	< 70	-	-	-
Analyst's Comments						
Appendix No.1 - Total Petroleum Hydrocarbon Chromatograms						
Appendix No.2 - Total Petroleum Hydrocarbon Chromatograms						

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	Samples
BTEX in Soil by Headspace GC-MS	Solvent extraction, Headspace GC-MS analysis US EPA 8260B. Tested on as received sample	-	1-17
Total Petroleum Hydrocarbons in Soil	Sonication extraction in DCM, Silica cleanup, GC-FID analysis US EPA 8015B/MfE Petroleum Industry Guidelines. Tested on as received sample	-	1-17
Dry Matter (Env)	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. US EPA 3550. (Free water removed before analysis).	0.10 g/100g as rcvd	1-17

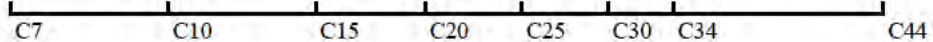
These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

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.

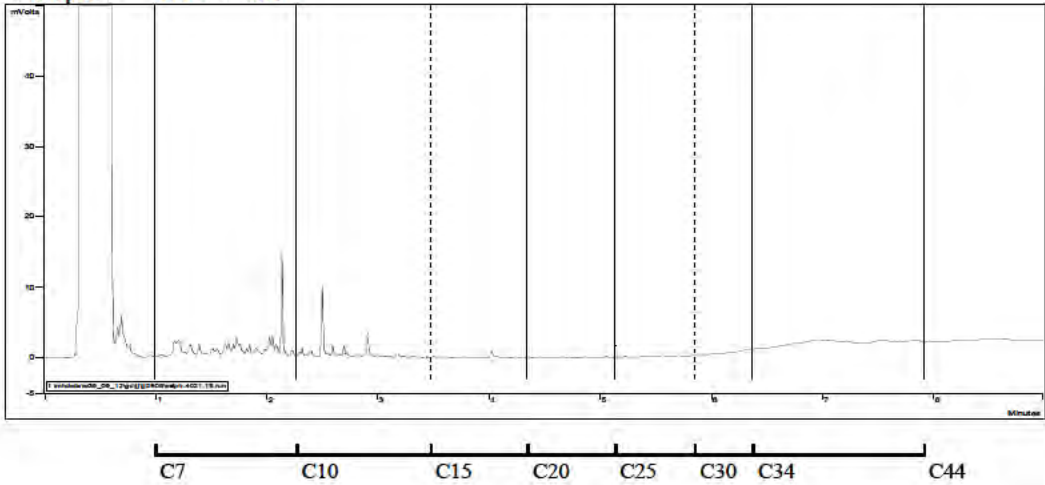
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Ara Heron BSc (Tech)
Client Services Manager - Environmental Division



Sample : 1051921.17





ANALYSIS REPORT

Page 1 of 2

Client:	Pattle Delamore Partners Ltd	Lab No:	1055422	SPv1
Contact:	Ben Riley	Date Registered:	05-Oct-2012	
	C/- Pattle Delamore Partners Ltd	Date Reported:	09-Oct-2012	
	PO Box 6136	Quote No:	51602	
	WELLINGTON 6141	Order No:		
		Client Reference:	W01872101	
		Submitted By:	Ben Riley	

Sample Type: Soil						
Sample Name:	SP2-1	TP9-1	TP9-2	Composite of	Composite of	
	04-Oct-2012	04-Oct-2012	04-Oct-2012	SP1-1 + SP1-2	SP2-2 + SP2-3	
Lab Number:	1055422.3	1055422.6	1055422.7	1055422.8	1055422.9	
Individual Tests						
Dry Matter	g/100g as rcvd	84	86	65	89	86
BTEX in Soil by Headspace GC-MS						
Benzene	mg/kg dry wt	< 0.05	< 0.05	< 0.07	-	-
Toluene	mg/kg dry wt	< 0.05	< 0.05	< 0.07	-	-
Ethylbenzene	mg/kg dry wt	< 0.05	< 0.05	< 0.07	-	-
m&p-Xylene	mg/kg dry wt	< 0.10	< 0.10	< 0.14	-	-
o-Xylene	mg/kg dry wt	< 0.05	< 0.05	< 0.07	-	-
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	< 8	< 9	< 11	< 9	< 8
C10 - C14	mg/kg dry wt	< 20	< 20	< 30	< 20	< 20
C15 - C36	mg/kg dry wt	58	< 40	< 50	< 40	< 40
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 70	< 70	< 80	< 70	< 70

Analyst's Comments

Appendix No.1 - Total Petroleum Hydrocarbon Chromatograms

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	Samples
BTEX in Soil by Headspace GC-MS	Solvent extraction, Headspace GC-MS analysis US EPA 8260B. Tested on as received sample	-	3, 6-7
Total Petroleum Hydrocarbons in Soil	Sonication extraction in DCM, Silica cleanup, GC-FID analysis US EPA 8015B/MfE Petroleum Industry Guidelines. Tested on as received sample	-	3, 6-9
Dry Matter (Env)	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. US EPA 3550. (Free water removed before analysis).	0.10 g/100g as rcvd	3, 6-9
Composite Environmental Solid Samples*	Individual sample fractions mixed together to form a composite fraction.	-	1-2, 4-5



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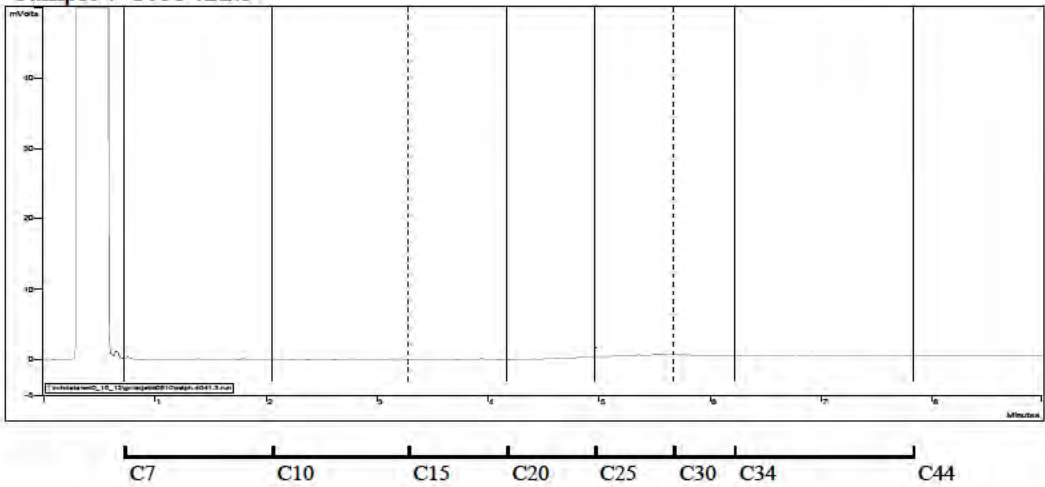
Samples are held at the laboratory after reporting for a length of time depending on the preservation used and the stability of the analytes being tested. Once the storage period is completed the samples are discarded unless otherwise advised by the client.

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Ara Heron BSc (Tech)
Client Services Manager - Environmental Division

Sample : 1055422.3





ANALYSIS REPORT

Page 1 of 2

Client:	Pattle Delamore Partners Ltd	Lab No:	1059731	SPv1
Contact:	Ben Riley	Date Registered:	17-Oct-2012	
	C/- Pattle Delamore Partners Ltd	Date Reported:	24-Oct-2012	
	PO Box 6136	Quote No:		
	WELLINGTON 6141	Order No:		
		Client Reference:	W01872101	
		Submitted By:	Ben Riley	

Sample Type: Soil						
Sample Name:	CP1 16-Oct-2012	CP2 16-Oct-2012	CP3 16-Oct-2012			
Lab Number:	1059731.1	1059731.2	1059731.3			
Individual Tests						
Dry Matter	g/100g as rcvd	82	82	86	-	-
BTEX in Soil by Headspace GC-MS						
Benzene	mg/kg dry wt	-	< 0.05	< 0.05	-	-
Toluene	mg/kg dry wt	-	0.72	< 0.05	-	-
Ethylbenzene	mg/kg dry wt	-	1.02	< 0.05	-	-
m&p-Xylene	mg/kg dry wt	-	5.9	< 0.10	-	-
o-Xylene	mg/kg dry wt	-	1.79	< 0.05	-	-
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	< 8	25	< 8	-	-
C10 - C14	mg/kg dry wt	< 20	52	< 20	-	-
C15 - C36	mg/kg dry wt	71	< 40	< 40	-	-
Total hydrocarbons (C7 - C36)	mg/kg dry wt	71	77	< 70	-	-

Analyst's Comments

Appendix No.1 - Total Petroleum Hydrocarbon Chromatograms

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	Samples
BTEX in Soil by Headspace GC-MS	Solvent extraction, Headspace GC-MS analysis US EPA 8260B. Tested on as received sample	-	2-3
Total Petroleum Hydrocarbons in Soil	Sonication extraction in DCM, Silica cleanup, GC-FID analysis US EPA 8015B/MfE Petroleum Industry Guidelines. Tested on as received sample	-	1-3
Dry Matter (Env)	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry), gravimetry. US EPA 3550. (Free water removed before analysis).	0.10 g/100g as rcvd	1-3



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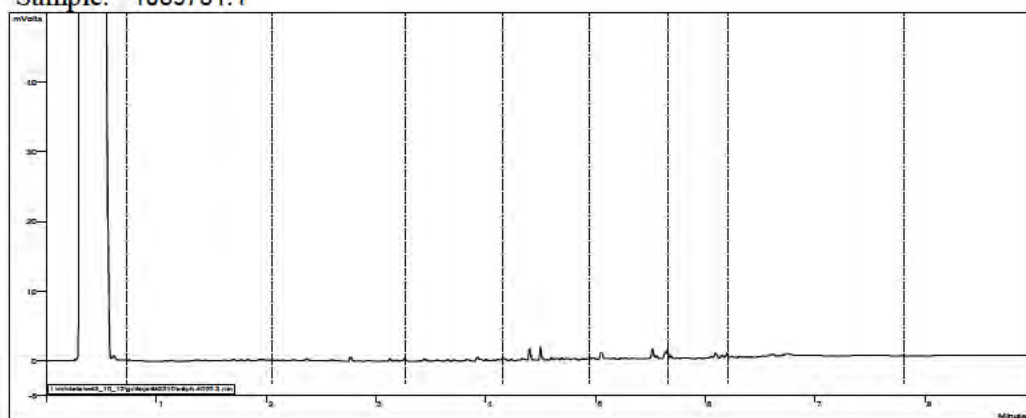
Samples are held at the laboratory after reporting for a length of time depending on the preservation used and the stability of the analytes being tested. Once the storage period is completed the samples are discarded unless otherwise advised by the client.

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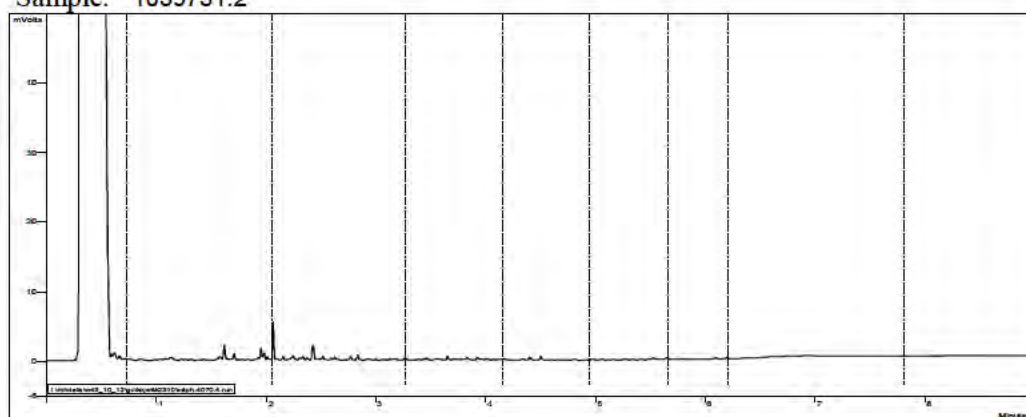
A handwritten signature in blue ink, appearing to read 'Peter Robinson', with a long horizontal flourish extending to the right.

Peter Robinson MSc (Hons), PhD, FNZIC
Client Services Manager - Environmental Division

Sample: 1059731.1



Sample: 1059731.2



C7 C10 C15 C20 C25 C30 C34 C44



ANALYSIS REPORT

Page 1 of 1

Client:	Pattle Delamore Partners Ltd	Lab No:	1060018	SPv1
Contact:	Ben Riley	Date Registered:	18-Oct-2012	
	C/- Pattle Delamore Partners Ltd	Date Reported:	23-Oct-2012	
	PO Box 6136	Quote No:		
	WELLINGTON 6141	Order No:		
		Client Reference:	W01872101	
		Submitted By:	Ben Riley	

Sample Type: Soil						
Sample Name:		CP4 17-Oct-2012	CP5 17-Oct-2012	CP6 17-Oct-2012	CP7 17-Oct-2012	
Lab Number:		1060018.1	1060018.2	1060018.3	1060018.4	
Individual Tests						
Dry Matter	g/100g as rcvd	84	86	88	84	-
BTEX in Soil by Headspace GC-MS						
Benzene	mg/kg dry wt	< 0.05	< 0.05	< 0.05	< 0.05	-
Toluene	mg/kg dry wt	< 0.05	< 0.05	< 0.05	< 0.05	-
Ethylbenzene	mg/kg dry wt	< 0.05	< 0.05	< 0.05	< 0.05	-
m&p-Xylene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	-
o-Xylene	mg/kg dry wt	< 0.05	< 0.05	< 0.05	< 0.05	-
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	< 8	< 8	< 8	< 9	-
C10 - C14	mg/kg dry wt	< 20	< 20	< 20	< 20	-
C15 - C36	mg/kg dry wt	< 40	< 40	< 40	< 40	-
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 70	< 70	< 70	< 70	-

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	Samples
BTEX in Soil by Headspace GC-MS	Solvent extraction, Headspace GC-MS analysis US EPA 8260B. Tested on as received sample	-	1-4
Total Petroleum Hydrocarbons in Soil	Sonication extraction in DCM, Silica cleanup, GC-FID analysis US EPA 8015B/MfE Petroleum Industry Guidelines. Tested on as received sample	-	1-4
Dry Matter (Env)	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. US EPA 3550. (Free water removed before analysis).	0.10 g/100g as rcvd	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.

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Graham Corban MSc Tech (Hons)
Client Services Manager - Environmental Division





ANALYSIS REPORT

Page 1 of 1

Client:	Pattle Delamore Partners Ltd	Lab No:	1060947	SPv1
Contact:	Ben Riley	Date Registered:	20-Oct-2012	
	C/- Pattle Delamore Partners Ltd	Date Reported:	24-Oct-2012	
	PO Box 6136	Quote No:	51811	
	WELLINGTON 6141	Order No:		
		Client Reference:	W01872101	
		Submitted By:	Ben Riley	

Sample Type: Soil						
Sample Name:		SP1 19-Oct-2012	SP2 19-Oct-2012	SP3 19-Oct-2012	SP4 19-Oct-2012	SP5 19-Oct-2012
Lab Number:		1060947.1	1060947.2	1060947.3	1060947.4	1060947.5
Individual Tests						
Dry Matter	g/100g as rcvd	89	90	86	89	88
BTEX in Soil by Headspace GC-MS						
Benzene	mg/kg dry wt	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Toluene	mg/kg dry wt	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Ethylbenzene	mg/kg dry wt	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
m&p-Xylene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
o-Xylene	mg/kg dry wt	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	< 8	< 8	< 8	< 8	< 8
C10 - C14	mg/kg dry wt	< 20	< 20	< 20	< 20	< 20
C15 - C36	mg/kg dry wt	< 40	< 40	< 40	< 40	< 40
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 70	< 70	< 70	< 70	< 70

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	Samples
BTEX in Soil by Headspace GC-MS	Solvent extraction, Headspace GC-MS analysis US EPA 8260B. Tested on as received sample	-	1-5
Total Petroleum Hydrocarbons in Soil	Sonication extraction in DCM, Silica cleanup, GC-FID analysis US EPA 8015B/MfE Petroleum Industry Guidelines. Tested on as received sample	-	1-5
Dry Matter (Env)	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. US EPA 3550. (Free water removed before analysis).	0.10 g/100g as rcvd	1-5

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.

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

Martin Cowell - BSc (Chem)
Client Services Manager - Environmental Division





ANALYSIS REPORT

Page 1 of 2

Client:	Pattle Delamore Partners Ltd	Lab No:	1079063	SPV1
Contact:	Stacey Marquardt	Date Registered:	08-Dec-2012	
	C/- Pattle Delamore Partners Ltd	Date Reported:	13-Dec-2012	
	PO Box 6136	Quote No:	52671	
	WELLINGTON 6141	Order No:		
		Client Reference:	W01872101	
		Submitted By:	Ben Riley	

Sample Type: Soil						
Sample Name:	TP10-0.5	TP10-3.5	TP11-0.5	TP11-3.1	TP12-0.5	
	07-Dec-2012	07-Dec-2012	07-Dec-2012	07-Dec-2012	07-Dec-2012	
Lab Number:	1079063.1	1079063.2	1079063.3	1079063.4	1079063.5	
Individual Tests						
Dry Matter	g/100g as rcvd	91	76	85	77	86
BTEX in Soil by Headspace GC-MS						
Benzene	mg/kg dry wt	< 0.05	< 0.06	< 0.05	< 0.06	< 0.05
Toluene	mg/kg dry wt	< 0.05	< 0.06	< 0.05	< 0.06	< 0.05
Ethylbenzene	mg/kg dry wt	< 0.05	< 0.06	< 0.05	< 0.06	< 0.05
m&p-Xylene	mg/kg dry wt	< 0.10	< 0.12	< 0.10	< 0.11	< 0.10
o-Xylene	mg/kg dry wt	< 0.05	< 0.06	< 0.05	< 0.06	< 0.05
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	< 8	< 9	< 8	< 9	< 8
C10 - C14	mg/kg dry wt	< 20	< 20	< 20	< 20	< 20
C15 - C36	mg/kg dry wt	< 40	< 40	< 40	< 40	< 40
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 70	< 70	< 70	< 70	< 70
Sample Name:	TP12-3.2	TP13-0.5	TP13-3.8	TP14-0.5	TP14-3.3	
	07-Dec-2012	07-Dec-2012	07-Dec-2012	07-Dec-2012	07-Dec-2012	
Lab Number:	1079063.6	1079063.7	1079063.8	1079063.9	1079063.10	
Individual Tests						
Dry Matter	g/100g as rcvd	88	87	80	87	78
BTEX in Soil by Headspace GC-MS						
Benzene	mg/kg dry wt	< 0.05	< 0.05	< 0.06	< 0.05	< 0.06
Toluene	mg/kg dry wt	< 0.05	< 0.05	< 0.06	< 0.05	< 0.06
Ethylbenzene	mg/kg dry wt	0.11	< 0.05	< 0.06	< 0.05	< 0.06
m&p-Xylene	mg/kg dry wt	1.46	< 0.10	< 0.11	< 0.10	< 0.11
o-Xylene	mg/kg dry wt	0.32	< 0.05	< 0.06	< 0.05	< 0.06
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	35	< 8	< 9	< 8	< 9
C10 - C14	mg/kg dry wt	89	< 20	< 20	< 20	< 20
C15 - C36	mg/kg dry wt	63	< 40	< 40	< 40	< 40
Total hydrocarbons (C7 - C36)	mg/kg dry wt	187	< 70	< 70	< 70	< 70

Analyst's Comments

Appendix No.1 - Total Petroleum Hydrocarbon Chromatograms

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	Samples



This Laboratory is accredited by International Accreditation New Zealand (IANZ), which represents New Zealand in the International Laboratory Accreditation Cooperation (ILAC). Through the ILAC Mutual Recognition Arrangement (ILAC-MRA) this accreditation is internationally recognised. The tests reported herein have been performed in accordance with the terms of accreditation, with the exception of tests marked *, which are not accredited.

Sample Type: Soil			
Test	Method Description	Default Detection Limit	Samples
BTEX in Soil by Headspace GC-MS	Solvent extraction, Headspace GC-MS analysis US EPA 8260B. Tested on as received sample	-	1-10
Total Petroleum Hydrocarbons in Soil	Sonication extraction in DCM, Silica cleanup, GC-FID analysis US EPA 8015B/MfE Petroleum Industry Guidelines. Tested on as received sample	-	1-10
Dry Matter (Env)	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. US EPA 3550. (Free water removed before analysis).	0.10 g/100g as rcvd	1-10

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.

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Peter Robinson MSc (Hons), PhD, FNZIC
Client Services Manager - Environmental Division

Sample : 1079063.6

ATTLE DELAMORE PARTNERS LTD

No of samples: 17 No of Fractions: 85

From: Pattle Delamore Partners Ltd

Address (Refer to base of sheet):

☐ PDP Auckland☒ PDP Wellington

3110519214

Submitted by:

Ph No.: 044714153

PDP Job No.: W01812101

Chain of Custody Record

Sent:

Name: J. Maxquardt

Signature: L. J. Hargrave

Date and time: 26. 9. 11

Received: ☐ Room temp. ☒ Chilled Temp.: 0-6°C

Name: Kathryn H

Signature: [Signature]

Date and time: _____

Notes:

Notes: Samples on urgent
t.a.t please.

123 220 220 220

Results by: ☒ Email submitter:

☒ Email submitter:

☐ Mail (address below)

Priority: ☐ Normal ☐ High ☒ Urgent

☒ Email other:

☐ Fax (number below)

Results required by: *ASAP*

Invoice to:☒ PDP☐ Other:

Sample ID	Sample type	No. bottles	Analyses Requested	Notes
TP 1-1	Soil	1	TPH/BTEX	Screen
TP 1-2	"	"	"	"
TP 2-1	"	"	"	"
TP 2-2	"	"	"	"
TP 3-1	"	"	"	"
TP 3-2	"	"	"	"
TP 4-1	"	"	"	"
TP 4-2	"	"	"	"
TP 5-1	"	"	"	"
TP 5-2	"	"	"	"
TP 6-1	"	"	"	"
TP 6-2	"	"	"	"
TP 6-3	"	"	"	"
TP 7-1	"	"	"	"
TP 7-2	"	"	"	"
TP 8-1	"	"	"	"
TP 8-2	"	"	"	"

Sample type:	<u>S Soil</u>	GW Groundwater	SAL Seawater/saline	FW Freshwater	LEACH Leachate	GEO Geothermal
	SED Sediment	BIO Biota	TW Tradewaste	WW Wastewater	P Potable	Other:

Note: Samples may contain dangerous or hazardous substances

Page 1 of 1

PDP Auckland
PDP House, 235 Broadway, Newmarket, Auckland
PO Box 9528, Newmarket, Auckland 1149

PDP Wellington
iSOFT House, Level 1, 111 Customhouse Quay, Wellington
PO Box 6136, Wellington 6141

PDP Christchurch
PO Box 389, Christchurch 8140
Tel: +64 3 363 3100 | Fax: +64 3 363 3101



Job Information Summary

Page 1 of 1

Client:	Pattle Delamore Partners Ltd	Lab No:	1051921
Contact:	Ben Riley	Date Registered:	27-Sep-2012 7:56:18 am
	C/- Pattle Delamore Partners Ltd	Priority:	Urgent
	PO Box 6136	Quote No:	
	WELLINGTON 6141	Order No:	
		Client Reference:	W01872101
		Add. Client Ref:	
		Submitted By:	Stacey Marquardt
		Charge To:	Pattle Delamore Partners Ltd

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	TP1-1	Soil	GSoil300	TPH + BTEX profile, Soil
2	TP1-2	Soil	GSoil300	TPH + BTEX profile, Soil
3	TP2-1	Soil	GSoil300	TPH + BTEX profile, Soil
4	TP2-2	Soil	GSoil300	TPH + BTEX profile, Soil
5	TP3-1	Soil	GSoil300	TPH + BTEX profile, Soil
6	TP3-2	Soil	GSoil300	TPH + BTEX profile, Soil
7	TP4-1	Soil	GSoil300	TPH + BTEX profile, Soil
8	TP4-2	Soil	GSoil300	TPH + BTEX profile, Soil
9	TP5-1	Soil	GSoil300	TPH + BTEX profile, Soil
10	TP5-2	Soil	GSoil300	TPH + BTEX profile, Soil
11	TP6-1	Soil	GSoil300	TPH + BTEX profile, Soil
12	TP6-2	Soil	GSoil300	TPH + BTEX profile, Soil
13	TP6-3	Soil	GSoil300	TPH + BTEX profile, Soil
14	TP7-1	Soil	GSoil300	TPH + BTEX profile, Soil
15	TP7-2	Soil	GSoil300	TPH + BTEX profile, Soil
16	TP8-1	Soil	GSoil300	TPH + BTEX profile, Soil
17	TP8-2	Soil	GSoil300	TPH + BTEX profile, Soil

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	Samples
BTEX in Soil by Headspace GC-MS	Solvent extraction, Headspace GC-MS analysis US EPA 8260B. Tested on as received sample	-	1-17
Total Petroleum Hydrocarbons in Soil	Sonication extraction in DCM, Silica cleanup, GC-FID analysis US EPA 8015B/MfE Petroleum Industry Guidelines. Tested on as received sample	-	1-17
Dry Matter (Env)	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry), gravimetry. US EPA 3550. (Free water removed before analysis).	0.10 g/100g as rcvd	1-17



Job Information Summary

Page 1 of 1

Client:	Pattle Delamore Partners Ltd	Lab No:	1055422
Contact:	Ben Riley	Date Registered:	05-Oct-2012 6:42:01 am
	C/- Pattle Delamore Partners Ltd	Priority:	Urgent
	PO Box 6136	Quote No:	51602
	WELLINGTON 6141	Order No:	
		Client Reference:	W01872101
		Add. Client Ref:	
		Submitted By:	Ben Riley
		Charge To:	Pattle Delamore Partners Ltd

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	SP1-1 04-Oct-2012	Soil	GSoil300	Composite Environmental Solid Samples
2	SP1-2 04-Oct-2012	Soil	GSoil300	Composite Environmental Solid Samples
3	SP2-1 04-Oct-2012	Soil	GSoil300	TPH + BTEX profile, Soil
4	SP2-2 04-Oct-2012	Soil	GSoil300	Composite Environmental Solid Samples
5	SP2-3 04-Oct-2012	Soil	GSoil300	Composite Environmental Solid Samples
6	TP9-1 04-Oct-2012	Soil	GSoil300	TPH + BTEX profile, Soil
7	TP9-2 04-Oct-2012	Soil	GSoil300	TPH + BTEX profile, Soil
8	Composite of SP1-1 + SP1-2	Soil	GSoil300	TPH + BTEX profile, Soil
9	Composite of SP2-2 + SP2-3	Soil	GSoil300	TPH + BTEX profile, Soil

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	Samples
BTEX in Soil by Headspace GC-MS	Solvent extraction, Headspace GC-MS analysis US EPA 8260B. Tested on as received sample	-	3, 6-9
Total Petroleum Hydrocarbons in Soil	Sonication extraction in DCM, Silica cleanup, GC-FID analysis US EPA 8015B/MfE Petroleum Industry Guidelines. Tested on as received sample	-	3, 6-9
Dry Matter (Env)	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. US EPA 3550. (Free water removed before analysis).	0.10 g/100g as rcvd	3, 6-9
Composite Environmental Solid Samples	Individual sample fractions mixed together to form a composite fraction.	-	1-2, 4-5

To: Hills Labs

Quote No.:

PDP Job No.: W01872101

Job No: Date Recv 17-Oct-12 11:16

Received: ☐ Room temp. ☐ Chilled Temp.: 13 °C

Name: Walter Veeber

Signature: [Signature]

Date and time: _____

105 9731

No of samples: 3 No of Fractions: 13



Priority: ☒ Normal ☐ High ☐ Urgent

Results required by: 29/10/12

☒ PDP

sample type:	S Soil	GW Groundwater	SAL Seawater/saline	FW Freshwater	LEACH Leachate	GEO Geothermal
	SED Sediment	BIO Biota	TW Tradewaste	WW Wastewater	P Potable	Other:

Page of

PDP Christchurch
Radio NZ House, 51 Chester St West, Christchurch
PO Box 389, Christchurch 8140
Tel: +64 3 363 3100 | Fax: +64 3 363 3101
christchurch@pdp.co.nz



Job Information Summary

Page 1 of 1

Client:	Pattle Delamore Partners Ltd	Lab No:	1059731
Contact:	Ben Riley	Date Registered:	17-Oct-2012 11:20:02 am
	C/- Pattle Delamore Partners Ltd	Priority:	High
	PO Box 6136	Quote No:	
	WELLINGTON 6141	Order No:	
		Client Reference:	W01872101
		Add. Client Ref:	
		Submitted By:	Ben Riley
		Charge To:	Pattle Delamore Partners Ltd

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	CP1 16-Oct-2012	Soil	GSoil300	Total Petroleum Hydrocarbons in Soil
2	CP2 16-Oct-2012	Soil	GSoil300	TPH + BTEX profile, Soil
3	CP3 16-Oct-2012	Soil	GSoil300	TPH + BTEX profile, Soil

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	Samples
BTEX in Soil by Headspace GC-MS	Solvent extraction, Headspace GC-MS analysis US EPA 8260B. Tested on as received sample	-	2-3
Total Petroleum Hydrocarbons in Soil	Sonication extraction in DCM, Silica cleanup, GC-FID analysis US EPA 8015B/MfE Petroleum Industry Guidelines. Tested on as received sample	-	1-3
Dry Matter (Env)	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. US EPA 3550. (Free water removed before analysis).	0.10 g/100g as rcvd	1-3

Requ Job No:

Date Rec'd: 18-Oct-12 07:25

NOTE: Please acknowledge receipt of these samples by signing this form and emailing to submitter.

From: Pattle Delamore Partners Ltd

Address (Refer to base of sheet):

☐ PDP Auckland☒ PDP W

Submitted by: Ken Liley

Ph No.: (

No of samples: 4

No of Fractions: 20

Hills Labs

3 No.:

Job No.: W01872101

Chain of Custody Record

Sent:

Name: Ben Kelly

Signature: 

Date and time: 17/10/12

Received: ☐ Room temp. ☐ Chilled Temp.: 6.1 °C

Name: Lisa Bailey

Signature: L. Bailey

Date and time: / 2007.12.25

Notes:

Results by: ☒ Email submitter: ben.filey @pdp.co.nz ☐ Mail (address below)

☒ Email submitter: ben.filey @pdp.co.nz

☐ Mail (address below)

Priority: ☒ Normal ☐ High ☐ Urgent

☐ Email other: _____ @pdp.co.nz

☐ Fax (number below)

Results required by: 28/10/17

Invoice to: ☒ PDP ☐ Other:

☒ PDP☐ Other:[illegible]

Sample type:	S Soil	GW Groundwater	SAL Seawater/saline	FW Freshwater	LEACH Leachate	GEO Geothermal
	SED Sediment	BIO Biota	TW Tradewaste	WW Wastewater	P Potable	Other:

Note: Samples may contain dangerous or hazardous substances

Page 1 of 1



Job Information Summary

Page 1 of 1

Client:	Pattle Delamore Partners Ltd	Lab No:	1060018
Contact:	Ben Riley	Date Registered:	18-Oct-2012 7:26:44 am
	C/- Pattle Delamore Partners Ltd	Priority:	High
	PO Box 6136	Quote No:	
	WELLINGTON 6141	Order No:	
		Client Reference:	W01872101
		Add. Client Ref:	
		Submitted By:	Ben Riley
		Charge To:	Pattle Delamore Partners Ltd

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	CP4 17-Oct-2012	Soil	GSoil300	TPH + BTEX profile, Soil
2	CP5 17-Oct-2012	Soil	GSoil300	TPH + BTEX profile, Soil
3	CP6 17-Oct-2012	Soil	GSoil300	TPH + BTEX profile, Soil
4	CP7 17-Oct-2012	Soil	GSoil300	TPH + BTEX profile, Soil

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	Samples
BTEX in Soil by Headspace GC-MS	Solvent extraction, Headspace GC-MS analysis US EPA 8260B. Tested on as received sample	-	1-4
Total Petroleum Hydrocarbons in Soil	Sonication extraction in DCM, Silica cleanup, GC-FID analysis US EPA 8015B/MfE Petroleum Industry Guidelines. Tested on as received sample	-	1-4
Dry Matter (Env)	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. US EPA 3550. (Free water removed before analysis).	0.10 g/100g as rcvd	1-4





Job Information Summary

Page 1 of 1

Client:	Pattle Delamore Partners Ltd	Lab No:	1060947
Contact:	Ben Riley	Date Registered:	20-Oct-2012 7:42:46 am
	C/- Pattle Delamore Partners Ltd	Priority:	Urgent
	PO Box 6136	Quote No:	51811
	WELLINGTON 6141	Order No:	
		Client Reference:	W01872101
		Add. Client Ref:	
		Submitted By:	Ben Riley
		Charge To:	Pattle Delamore Partners Ltd

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	SP1 19-Oct-2012	Soil	GSoil300	TPH + BTEX profile, Soil
2	SP2 19-Oct-2012	Soil	GSoil300	TPH + BTEX profile, Soil
3	SP3 19-Oct-2012	Soil	GSoil300	TPH + BTEX profile, Soil
4	SP4 19-Oct-2012	Soil	GSoil300	TPH + BTEX profile, Soil
5	SP5 19-Oct-2012	Soil	GSoil300	TPH + BTEX profile, Soil

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	Samples
BTEX in Soil by Headspace GC-MS	Solvent extraction, Headspace GC-MS analysis US EPA 8260B. Tested on as received sample	-	1-5
Total Petroleum Hydrocarbons in Soil	Sonication extraction in DCM, Silica cleanup, GC-FID analysis US EPA 8015B/MfE Petroleum Industry Guidelines. Tested on as received sample	-	1-5
Dry Matter (Env)	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. US EPA 3550. (Free water removed before analysis).	0.10 g/100g as rcvd	1-5

PDP Job No.: W01872101

Results required by: 4/12/22

Sample type:	S Soil	GW Groundwater	SAL Seawater/saline	FW Freshwater	LEACH Leachate	GEO Geothermal
	SED Sediment	BIO Biota	TW Tradewaste	WW Wastewater	P Potable	Other:

Page 1 of 1



Job Information Summary

Page 1 of 1

Client:	Pattle Delamore Partners Ltd	Lab No:	1079063
Contact:	Stacey Marquardt	Date Registered:	08-Dec-2012 11:32:22 am
	C/- Pattle Delamore Partners Ltd	Priority:	High
	PO Box 6136	Quote No:	52671
	WELLINGTON 6141	Order No:	
		Client Reference:	W01872101
		Add. Client Ref:	
		Submitted By:	Ben Riley
		Charge To:	Pattle Delamore Partners Ltd

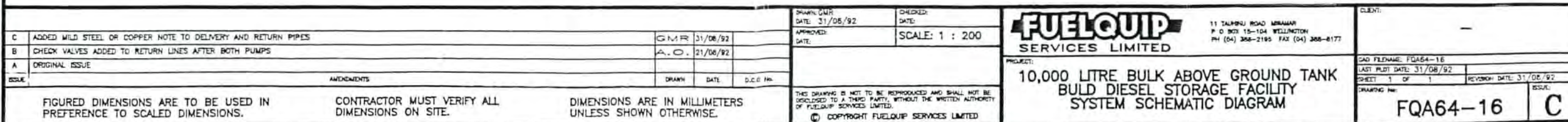
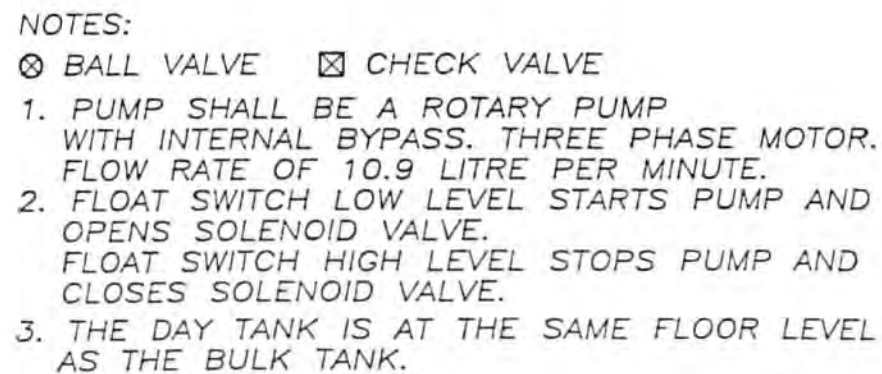
Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	TP10-0.5 07-Dec-2012	Soil	GSoil300	TPH + BTEX profile, Soil
2	TP10-3.5 07-Dec-2012	Soil	GSoil300	TPH + BTEX profile, Soil
3	TP11-0.5 07-Dec-2012	Soil	GSoil300	TPH + BTEX profile, Soil
4	TP11-3.1 07-Dec-2012	Soil	GSoil300	TPH + BTEX profile, Soil
5	TP12-0.5 07-Dec-2012	Soil	GSoil300	TPH + BTEX profile, Soil
6	TP12-3.2 07-Dec-2012	Soil	GSoil300	TPH + BTEX profile, Soil
7	TP13-0.5 07-Dec-2012	Soil	GSoil300	TPH + BTEX profile, Soil
8	TP13-3.8 07-Dec-2012	Soil	GSoil300	TPH + BTEX profile, Soil
9	TP14-0.5 07-Dec-2012	Soil	GSoil300	TPH + BTEX profile, Soil
10	TP14-3.3 07-Dec-2012	Soil	GSoil300	TPH + BTEX profile, Soil

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	Samples
BTEX in Soil by Headspace GC-MS	Solvent extraction, Headspace GC-MS analysis US EPA 8260B. Tested on as received sample	-	1-10
Total Petroleum Hydrocarbons in Soil	Sonication extraction in DCM, Silica cleanup, GC-FID analysis US EPA 8015B/MfE Petroleum Industry Guidelines. Tested on as received sample	-	1-10
Dry Matter (Env)	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. US EPA 3550. (Free water removed before analysis).	0.10 g/100g as rcvd	1-10





COPY



Tse Group Limited

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Architects - Engineers
Interior Designers - Land Surveyors
Resource Planners - Valuers

13 October 2006



Planning and Urban Design Directorate
Wellington City Council
PO Box 2199
WELLINGTON 6140

Attention: Laura Willoughby

FILE REF	
SN 105/599/02	
Doc. No	
Referred to	Date/Int
T. Taylor	
A. Crocker	

603/43/500
L0056CAM

Dear Laura

COMPLIANCE WITH LAND USE CONSENT 146666 PRIVATE CARPARK CONSTRUCTION, 96 VIVIAN STREET

Thank you for your letter dated 2 October 2006 approving the Excavation Protocol and Management Plan we submitted 28 September 2006.

As we discussed earlier this week, due to the relative cost and complexity of excavating all of the metal-contaminated soil from the site and undertaking validation testing at this stage, as requested by Greater Wellington's Contamination Scientist (GWCS), our client has opted to defer much of the excavation of contaminated soil until a later stage of development.

Our environmental consultants, MWH, have confirmed to the GWCS that additional soil tests undertaken recently confirm that metal contamination in the soil is restricted to the near surface of the site and that the levels of contamination found do not warrant remediation for an industrial/commercial end use (supplementary soils testing data enclosed for your reference). The GWCS agreed, and does not have an objection to capping the site and leaving the contaminated soils in situ. Consequently, we proposed to remove only the amount of contaminated soil necessary to form the parking lot subgrade, including removal of any soft spots, and to cover it with a non-woven geotextile fabric (Maccaferri's Bidim A14 or approved equivalent). The granular fill required to construct the parking surface will then be placed and compacted onto the fabric. The fabric will serve to clearly delineate the extent of excavation and facilitate disposal or reuse of the clean engineered fill when the site is redeveloped. The contaminated soil excavated from the site will be removed from site in accordance with the approved EPMP.

With regard to the comments in your email dated 11 October 2006, I can confirm that the first and third bullets in the Vehicle Access Engineer's memo were indeed correct and these details on the plans have been corrected. A copy of the revised details are enclosed for your review.

I trust this provides the information you currently require. Please confirm at your earliest convenience excavation can begin as planned on 16 October 2006 and, following that, that the revised carpark details are acceptable. We also await confirmation that the lighting proposal submitted is acceptable to Council.

Yours faithfully
TSE GROUP LIMITED



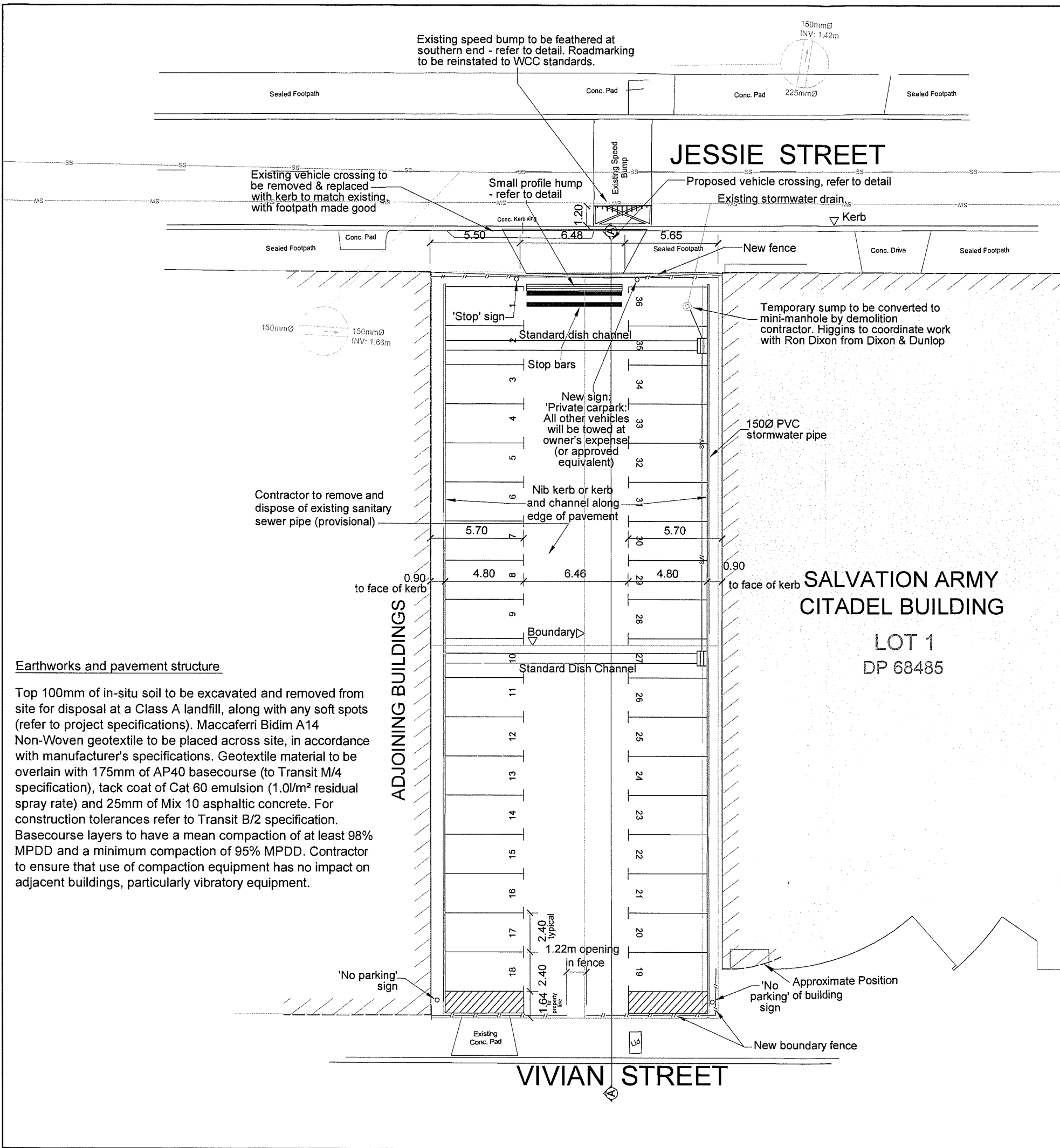
Chris Markell

Encl.

Cc: Greater Wellington Regional Council
PO Box 11646
Manners Street
WELLINGTON 6142
Attn: Bruce Croucher

The Salvation Army
PO Box 6015
Marion Square
WELLINGTON 6141
Attn: Ian McLaren

Higgins Contractors Ltd
PO Box 13434
Johnsonville
WELLINGTON 6440
Attn: Jonathan Kibblewhite



Earthworks and pavement structure

Top 100mm of in-situ soil to be excavated and removed from site for disposal at a Class A landfill, along with any soft spots (refer to project specifications). Maccaferri Bidim A14 Non-Woven geotextile to be placed across site, in accordance with manufacturer's specifications. Geotextile material to be overlain with 175mm of AP40 basecourse (to Transit M/4 specification), tack coat of Cat 60 emulsion (1.0l/m² residual spray rate) and 25mm of Mix 10 asphaltic concrete. For construction tolerances refer to Transit B/2 specification. Basecourse layers to have a mean compaction of at least 98% MPDD and a minimum compaction of 95% MPDD. Contractor to ensure that use of compaction equipment has no impact on adjacent buildings, particularly vibratory equipment.

EARTHWORKS NOTES

- All earthworks shall be completed in accordance with the project specifications and the Local Territorial Authorities' codes of practice for land development.
- These drawings do not necessarily show all existing services. It is the responsibility of the Contractor to accurately locate and protect existing services before excavation and take all care to protect them during construction. The Contractor shall liaise with the applicable service providers before commencing any work.
- The Contractor shall provide erosion and sediment control (ESC) measures in accordance with the project drawings specifications, and regional guidelines. All ESC measures must be operational prior to any other works commencing on site. The Contractor has sole responsibility for ensuring that ESC measures are maintained and effective at all times.
- The Contractor shall grade earthworks to the contours shown, however, final marrying in and shaping of earthworks is subject to the Engineer's approval. This approval must be given before topsoil is respread.
- Earthworks are to be undertaken and completed within the minimum possible time frame. Once earthworks are completed in an area and final levels are reached, the area shall be stabilised by an approved method as soon as practicable.
- All excavations of unsuitable or saturated materials are to be inspected by the Engineer prior to filling.
- Stockpiles of topsoil or unsuitable material shall be located in accordance with the Engineer's instructions.

Coordinate Datum
GEODETIC 1949
WELLINGTON CIRCUIT
Origin of Coordinates
ORM 5 SO 36161 700511.40mN
300062.83mE

Vertical Datum
WELLINGTON DATUM 1953
Origin of Levels
ORM 5 SO 36161
R.L. 7.86m

SITE-SPECIFIC EARTHWORKS NOTES

1

APPROVED FOR
CONSTRUCTION

C	PER WCC COMMENTS	CAM	12-10-06
B	CONSTRUCTION	CAM	26-09-06
A	PER WCC COMMENTS	CAM	25-07-06
-	TENDER / CONSENT	CAM	08-06-06
Revision		Name	Date

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Contractors To:
Read drawings in conjunction with all contract documents and specifications. All dimensions to be verified on site prior to commencing work. Any conflicts, ambiguities or omissions in any of the drawings or specifications shall be reported to Tse Group Ltd. upon discovery for clarification prior to commencement of works.

	Name	Date
Surveyed	C. Love, R. Collins	29-05-06
Designed	C. Markell, N. Bartholomew	26-09-06
Drawn	I. Chua, N. Bartholomew	26-09-06
Reviewed	C. Markell	26-09-06
Approved	J. Needham	26-09-06

Tse

Tse Group Limited

from concept to reality

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Land Surveyors - Resource Planners - Valuers
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Wairarapa

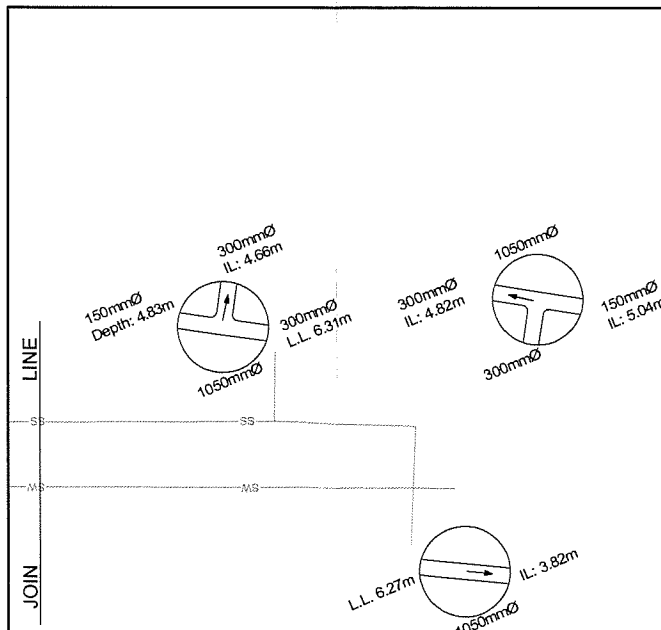
25 Fitzherbert Street, Featherston

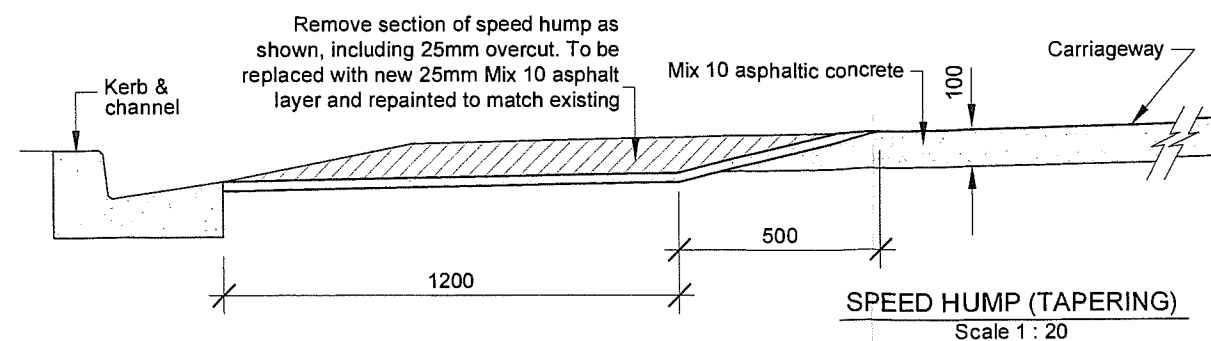
Phone: (06) 308-9200

**SALVATION ARMY
PRIVATE CARPARK
96 VIVIAN STREET**

SITE PLAN

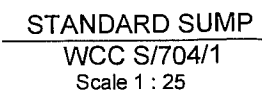
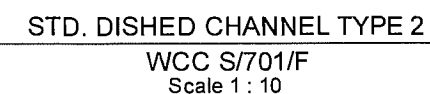
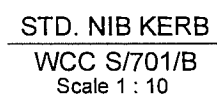
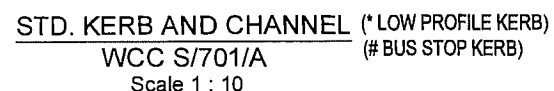
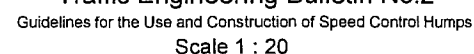
Project	603-43	Drawing	170
Scale	1:250 (A3)	Revision	C



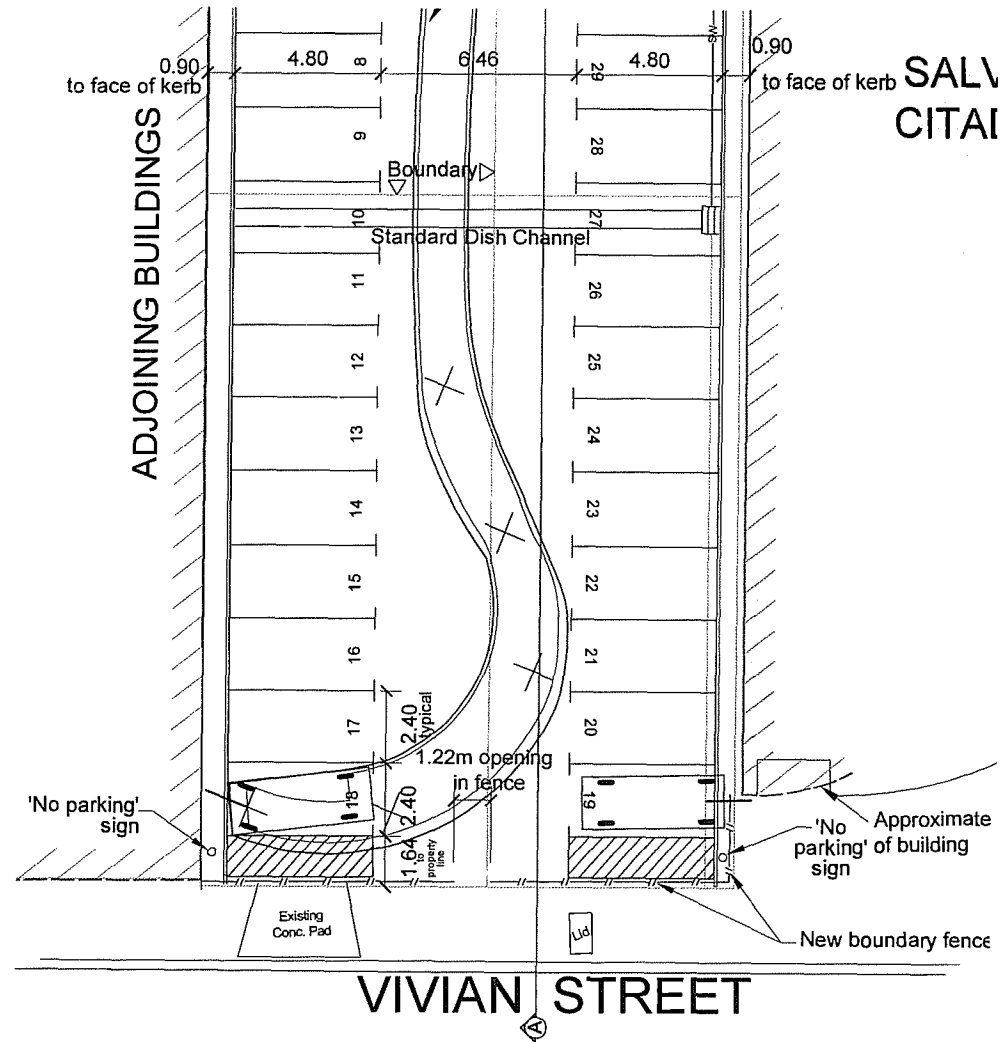


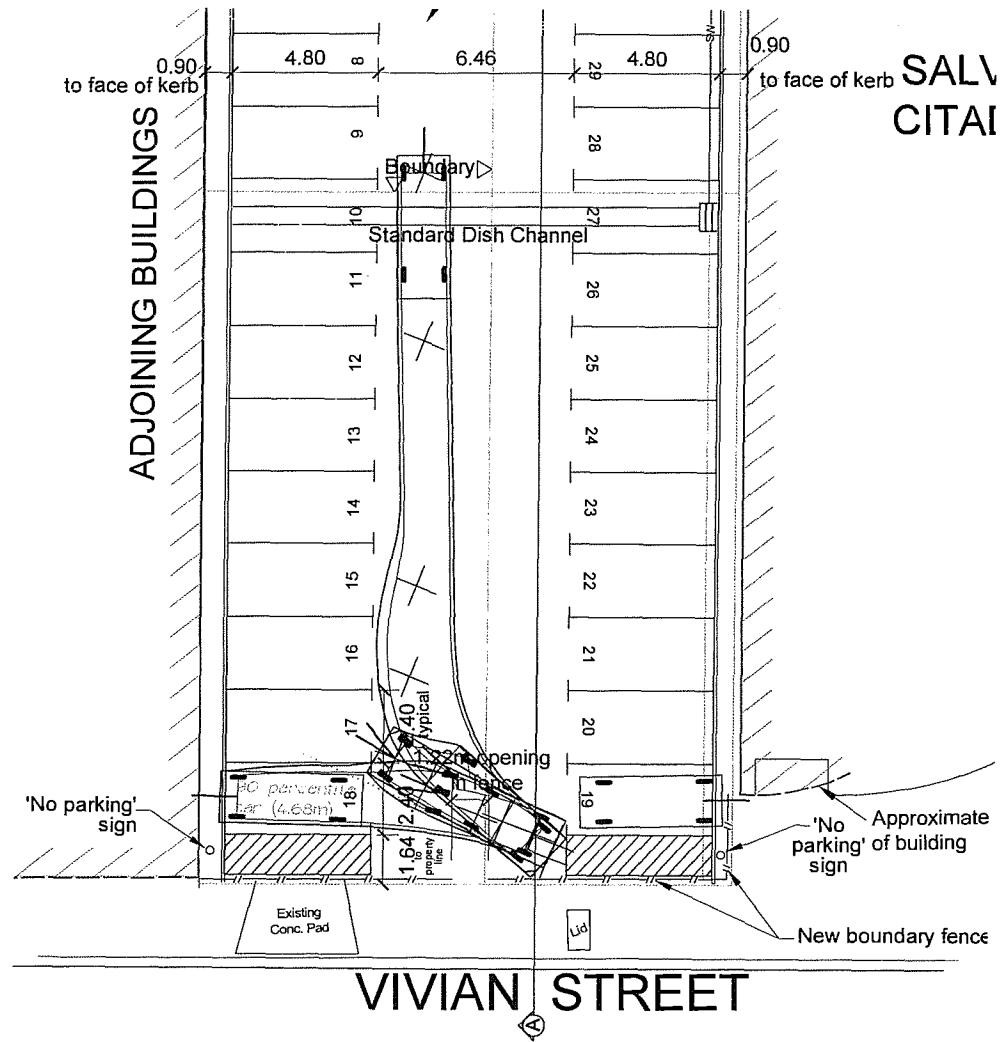
NOTES:

- 1) 20 MPa (80 -120 SLUMP) CONCRETE WITH LIGHTLY BROOMED FINISHED.
- 2) SOFT SUBSOILS TO BE BROUGHT TO THE ATTENTION OF THE ENGINEER.



Project	603-43	Drawing	172
Scale	1:As Shown (A3)	Revision	B





96 Vivian St, Wellington – Environmental Site Investigation Job No Z1252100

Supplementary soil test results: PRELIMINARY 5-10-06

Test Pit	Depth (m)	Lead (ppm)	Zinc (ppm)
TP1	0.25	742	2300
TP1	0.5	40.4	257
TP1	1.0	13.6	42
TP2	0.25	86.6	473
TP2	0.5	30.1	133
TP2	1.0	23.2	92
TP3	0.25	464	501
TP3	0.5	54.8	66
TP3	1.0	13	44
TP4	0.25	1170	1830
TP4	0.5	48.9	563
TP4	1.0	56.2	319
TP5	0.25	37.1	61
TP5	0.5	26.1	75
TP5	1.0	20.4	57



15 June 2012

Jeff Kennedy
Geppetto Properties Limited
12 McFarlane Street
Mount Victoria
WELLINGTON 6011

Dear Jeff

14 Jessie Street – Environmental Site Investigation – DRAFT

1.0 Introduction

Geppetto Properties Limited is converting 14 Jessie Street from its present storage, engine reconditioning and vehicle maintenance use, to a café and storage. The Wellington City Council has raised concerns regarding possible site contamination from the engine reconditioning and car maintenance uses and the consequent need for consent under the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (the NES).

This letter sets out the results of an environmental investigation carried out by Pattle Delamore Partners Limited (PDP).

2.0 Site description and history

The site at 14 Jessie Street, legal description Lot 1, DP 40157, is occupied by a single-storey warehouse-type building that runs between Jessie Street and Vivian Street. The building occupies the majority of the site. There are lanes both sides of the building with commercial buildings on either side beyond these lanes.

The southern approximately 60% of the building is constructed on a 175 mm thick reinforced concrete slab-on-grade, with the northern 40% predominantly on a 175 mm thick reinforced concrete suspended slab with void under. A concrete-paved drive-through lane with a verandah over it exists on the western side of the building and a sealed lane provides access on the eastern side.

The building was constructed in the mid-1970s as a drive-in liquor store for Burns Philp & Co. Ltd. The building had bulk storage of alcoholic products occupying the southern approximately 40% of the building, a chiller and drive-through service counters in the central part of the building, with a retail store and showroom in the northern 40% of the building.

It is uncertain how long the liquor store operated, but according to Companies Office records Burns Philp & Co ceased trading in 1986. It is apparent from partitioning in the building that at least part of the building was converted to office use. At some point the northern section of the building became a lighting retailer (Patrick Thompson, pers. comm.), with this part now used as warehouse space for restaurant ware and the like (Photograph 1).

The southern end of the building has an engine reconditioning business, Headmaster Engine Reconditioners (1994) Limited, on the eastern side and, until very recently, a vehicle maintenance business, Central City Auto Repairs Limited on the western side. Companies Office records indicate Headmaster Engine Reconditioners have been at 70 Vivian Street (the address of the southern end of the building) since at least 1994 and possibly earlier, while Central City Auto Repairs have been at the same address since at least 1998 (Photograph 2).

The engine reconditioning business has one main space, equipped as a machine shop (Photograph 3), with an office, and entrance lobby and, at the northern of the business, a bunded degreasing bay for cleaning engine parts (Photograph 4). During the site investigation the machine shop was reasonably tidy, although there is some staining on the floor under machinery. The degreasing bay was built up above the floor slab, with a metal tray below a grating to catch dirt and degreasing solvents and wall linings draining into the tray to contain splashes. There were two covered tanks containing degreasing solvents. It is thought that components are soaked in the tanks and then cleaned using high pressure air guns over the grating. There were drums of degreaser (containing methyl chloride) stored in the degreasing bay and nearby.

The vehicle repair workshop tenant no longer occupies the former workshop area and all equipment and tools have been removed. Before vacating, the area consisted of one main area with two vehicle lifts surrounded by benches against the walls, tool boxes, vehicle parts and miscellaneous oil containers. Notably there was new and waste oil storage on the western wall (Photograph 5) and a concentration of oil drums south of the vehicle lifts. During the site investigation the floor had some staining and oil containers and tools were placed throughout the workshop.

The painted floor of both workshops was in good condition with few joints or cracks. The original construction joints, spaced at 3.7 m in one direction and 5.8 m in the other are visible, but appear quite tight. There will be some potential for spilled fluids to penetrate the cracks but penetration to the ground will be severely limited by the presence of a damp-proof membrane encountered under the slab-on-grade when drilling holes for geotechnical investigations (Patrick Thompson, pers. comm.).

3.0 Proposed Development

The proposed development involves stripping out the existing partitioning and ceilings and converting the southern end of the building where the engine reconditioning and vehicle workshop activities took place to a multi-function space and a storage space, installing a kitchen, bathrooms, an office and staff room in the central part of the building with a café occupying the northern third of the building.

There will be minor trenching through the existing floor slab associated with installing services to the kitchen and bathroom, but the excavation thresholds associated with the NES will not be exceeded, with this excavation being a permitted activity.

4.0 Application of the NES

The recently implemented NES seeks to control activities on contaminated land so as to protect human health. The regulations apply to land which is described by one of the following (regulation 5(7)):

- (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.*

AND one or more of various activities as described in sub-clauses (2) – (6) of regulation 5 are being carried out. Otherwise the NES does not apply. The only activity described in the NES that could apply is sub-clause (6):

- (6) *An activity is changing the use of the piece of land, which means changing it to a use that, because the land is as described in subclause (7), is reasonably likely to harm human health.*

The HAIL, or Hazardous Activities and Industries List¹, was developed by the Ministry for the Environment to categorise sites that have a greater potential for soil contamination as a result of their past use. While Greater Wellington Regional Council (GWRC) has not listed the Jessie Street site on its selected Land User register (SLUR) as having potential or actual contamination, the site's current and past use falls within one of the definitions on the HAIL, specifically Motor Vehicle Workshop, which is category F-5 in the HAIL.

It is therefore necessary to carry out an investigation to determine whether harm to human health is likely to arise under regulation 5(6).

5.0 Conceptual site model

For a risk of harm to human health to exist there must be a hazard, a receptor and an exposure mechanism or pathway between the hazard and a receptor. If any of these three components is missing there cannot be a risk of harm.

The possible hazard is petroleum hydrocarbons or solvents in the ground from past spills or leaks from workshop activities in the southern 40% of the building. There is no reason to suspect past use will have caused soil contamination under the northern 60% of the building.

Potential receptors are future workers in the remodelled building and customers of the café. Given the likely short exposure duration for customers, the critical receptors will be workers.

Post-development there is no possibility of direct contact with soil therefore the only exposure mechanism is inhalation of vapours migrating into indoor spaces from possible contamination in the ground.

Direct contact with potentially contaminated soil is possible over very small areas during trenching activities during the redevelopment. However, the opportunity for exposure is minimal given the short length of time soil will be exposed. In any event, potential risk is properly taken care of as a work place issue under the Health and Safety in Employment Act 1991, by workers wearing personal protective equipment and minimising contact with soil.

6.0 Investigation

The investigation measured sub-slab vapours and compared the concentrations with appropriate indoor air guidelines after calculating predicted indoor air concentrations based on the sub-slab measurements. Such an approach is a more direct method than taking soil samples and using soil concentrations to predict indoor air concentrations.

The investigation consisted of drilling holes through the floor and installing ports to sample sub-slab soil gas at selected locations and then using a highly accurate photo-ionisation detector (PID) to measure the presence or absence of volatile organic compounds down to ppb² concentrations. A PID is not specific as to which volatile organic compounds are detected. However, if it is assumed that all that is detected is the most toxic of the compounds likely to be present (benzene) then if the measured concentrations are below the allowable concentration for benzene then the risk to human health is acceptable.

If unacceptable total volatile compounds were detected then air samples would then need to be collected and submitted to a laboratory to determine the detail of the vapours. However, this proved not to be necessary in this case.

¹ See <http://www.mfe.govt.nz/issues/hazardous/contaminated/hazardous-activities-industries-list.html>

² ppb = parts per billion

The measurement locations were selected based on the layout of the two workshops, and included close to where oil was stored in the vehicle repair workshop (Photographs 5 and 6), where engine parts were cleaned with degreasers in the engine reconditioner's (Photograph 4) and under a lathe (Photograph 7). In addition, holes were drilled through the suspended slab in the northern part of the building and the PID used to measure any vapours in the void below the floor. This included on the other side of the partition wall close to the location of the engine reconditioner's degreasing bay (Photograph 8). The measurement locations are shown in Figure 1.

The holes were drilled using 20 mm tungsten carbide bit. A Tygon™ tube was then sealed in each hole using bentonite clay to prevent atmospheric air entering during monitoring with the PID. Monitoring was carried out on 6 June 2012 by connecting the PID inlet to the tube and drawing air through the PID until a stable reading was obtained. This typically took 1 - 3 minutes. Readings of ambient air concentrations of volatile organic compounds were also taken at floor level and head level at the same locations. The ambient air readings provide an indication of what the atmosphere is like from normal activities within the workshops and storage space, for example effects from running car engines in the vehicle workshop, from hydrocarbon-containing cutting fluids in the machine shop and from solvents in the cleaning bay.

7.0 Results

The results of the PID monitoring are shown in Table 1, below.

Table 1: Vapour measurement results					
Sample Number	Location	Vapour Concentrations (ppb)			Comments
		Sub-slab	Head height	Floor level	
SP1	Northern wall	0	0	0	
SP2	Northern, near office	8	0	0	
SP3	Northern, near delivery door	0	0	0	
SP4	Near cleaning bay	30	474	498	Measurement slowly decreased
SP5	Workshop – centre back wall	941	151	129	
SP6	Workshop – oil storage	184	92	14	Void under slab
SP7	Machine shop - small lathe	150	1212	329	

It is notable that very low vapour concentrations, generally zero but not greater than 8 ppb, were measured within and under the northern part of the building. This is as expected as there have been no known activities that might have been contaminating. Even the sample from below the slab immediately north of the degreasing bay in the workshop (sample SP3) had a zero reading.

Samples from the two workshops were all elevated, with the highest sub-slab measurement being 941 ppb near the back (southern) wall of the vehicle workshop. It is notable that at two of the workshop locations the ambient air concentrations were higher than the sub-slab concentrations, indicating effects were related to activities within the workshop. In fact the highest measured concentration was in the machine shop at head height near a lathe, probably a consequence of volatile hydrocarbon-containing fluids in and around the lathe.

It should be noted that the measured ambient air concentrations are not indicative of future conditions as, post-redevelopment, the workshop activities will no longer exist and any volatile organic compound vapours will be related to the future activities in the building (not expected to involve hazardous substances) and any vapours that might be migrating from below the slab.

It is necessary to separate effects on the workshop atmosphere from normal activities within the workshops from possible effects on the workshop atmosphere from soil contamination under the floor slab. The former is an occupational health issue under the Health and Safety in Employment Act 1989, and outside the scope of this investigation, while the latter is a potential issue for the NES.

To separate out the effects some assumptions need to be made:

1. That the measured sub-slab vapours are a result of sub-slab soil contamination. In fact it is quite possible that the sub-slab vapours are a result, or at least partially a result, of contaminated workshop air being forced into the ground by changes in atmospheric pressure. If the indoor air pressure is greater than the subfloor air pressure, a common phenomenon when a high pressure weather system replaces a low pressure system, then indoor air can enter the ground through cracks and holes in the floor.
2. That sub-slab vapour will migrate into the workshops and contribute to the ambient air contamination in the building.
3. That, as a worst case, all the vapour is benzene, the likely worst case vapour. In fact the vapours will be a mixture of a variety of volatile organic compounds, with benzene probably being only a small component, if present at all, because benzene is not a component of most commonly available lubricants and solvents, although it is present in relatively small amounts in automotive fuels. Pure benzene is not generally commercially available.

Using these assumptions it is possible to calculate the concentration of benzene that would exist in the above floor spaces post-redevelopment for a given sub-slab vapour concentration. These vapour intrusion calculations have been carried out using industry standard modelling software; BP RISC version 5.0³. The modelling requires as input the floor thickness (175 mm), a typical density of cracks in the floor through which vapour can pass, the dimensions of individual indoor spaces that the vapour migrates to, and a ventilation rate (in air exchanges per hour) within each space.

The modelling was carried out for four proposed spaces in the re-configured building; the kitchen, the office, the multifunction space and a storage space. All these spaces are entirely or mostly over the slab-on-grade part of the building. The dimensions of these spaces are shown in Table 2, scaled from the architect's concept drawings. There was no need to carry out calculations for the proposed café at the northern end of the building as the vapour measurements in the air space below the floor were too low to be of concern. The bathrooms and staff room were also not modelled as they are not occupied for sufficient time each day to be the critical spaces.

While the sub-slab vapour concentrations varied from place to place, it was assumed for the purposes of the calculation that the highest measured sub-slab vapour concentration occurred over the complete slab-on-grade area. This introduces a further element of conservatism as the measurements show this not to be the case. Also, biodegradation of the vapours as they migrate is assumed not to occur and the damp-proof membrane was ignored.

Vapour intrusion modelling detailed in MfE (2011) to obtain soil guideline values for petroleum storage sites assumed a crack area to floor area ratio of 1%, or in other words, 10 mm of crack width for every lineal metre of slab. This is very conservative and is indicative of a floor in a very distressed state. As noted earlier, the floor at 14 Jessie Street is in good condition, with perhaps 2 mm cracks on a 3.7 x 5.8 m grid. This is the equivalent of a crack area to floor area ratio of 0.08 %. A value of 0.1 % was used in the modelling.

³ See <http://www.bprisc.com/>

Different air exchange rates were chosen for the different spaces. A commercial kitchen is normally very well ventilated, with air exchange rates of at least 20 to 40 exchanges per hour, and often higher, employed. An exchange rate of 20/hr was used for the calculations. Storage spaces have much lower ventilation rates. MfE (2011) uses a default rate of 2/hr, but for these calculations a more conservative exchange rate of 1/hr was used. This is the default rate recommended for warehouses by the United States Environmental Protection Agency. For the office the MfE (2011) default air exchange rate was used as the space will have forced ventilation and is on an outside wall with windows.

The results of the calculations are summarised in Table 2.

Table 2: Calculated indoor air benzene concentrations for sub-slab concentration of 941 ppb				
Building space	Building space dimensions (m)	Air exchange rate (per hr)	Calculated attenuation factor	Calculated indoor air vapour concentration (ppb)
Kitchen	11.5 x 6.5 x 2.7 high	20	7.6×10^{-5}	0.07
Office (external wall)	6.8 x 3.5 x 2.7 high	2	1.3×10^{-3}	1.22
Storage Area	26 x 4.5 x 6 high	1	7.5×10^{-4}	0.71
Multifunction Room	15 x 13 x 6 high	1	4.6×10^{-4}	0.43

8.0 Environmental Assessment

As noted above, in the first instance the PID results have been assumed to be all benzene. The Department of Labour (DoL) Workplace Exposure Standard (WES) for benzene is 1 ppm, which is the equivalent of 1000 ppb (DoL, 2010). In all cases the sub-slab measurements were smaller than this. Given the slab presents a considerable barrier to migration from sub-slab to indoor air, it can be concluded that indoor air concentrations from sub-slab migration will be less than the Workplace Exposure.

The Ministry for the Environment (MfE, 2011) has developed a more stringent target guideline for benzene, based on long-term exposure from contaminated ground. The indoor air guideline for benzene for a commercial/industrial situation is $13 \mu\text{g}/\text{m}^3$ (units of mass of contaminant per volume of air). Converted to the same basis as the vapour measurements (volume of vapour per volume of air), this is 4.1 ppb (or 0.0041 ppm), about 250 times lower than the WES. All the sub-slab measurements were greater than this value, where vapours were detected, making it necessary to calculate predicted indoor air concentrations as detailed in the previous section.

When these predicted values (last columns in Table 2) are compared with the MfE target concentration, it can be seen that all the predicted values are lower than the target by a considerable margin. The worst case is the office, with a margin of 3.4 times. In fact the margin is likely to be much larger than that, as sub-slab vapour concentrations will not be consistently high across the complete area. On that basis there is an acceptable risk from sub-slab vapours.

9.0 Conclusions

The southern part of the building at 14 Jessie Street has been used for motor vehicle maintenance and repair activities that have the potential to cause soil contamination if fuels or solvents were spilled and penetrated the concrete floor slab.

Measurement of sub-slab organic vapours at locations where soil contamination is most likely has confirmed the possibility that soil contamination has in fact occurred. However, the sub-slab vapour may also be a result of vapours having been drawn from the workshop areas by differences in atmospheric pressure, as ambient air concentrations within the workshops were also elevated.

If it is assumed, as a highly conservative worst case, that the vapours are from soil contamination and that the vapours are entirely benzene, and if it is further conservatively assumed that the worst case measurement (941 ppm) occurs across the entire slab-on-grade area, calculated indoor air concentrations from the migration of sub-slab vapours into the proposed building spaces are a substantial margin below the MfE target concentration for benzene to protect human health.

Accordingly, it is concluded that sub-slab soil contamination does not present an unacceptable human health risk for the proposed use of the building. In terms of the NES, the test in regulation 5(6) is not met for the regulations to apply.

10.0 Limitations

This report has been prepared based on publically available information, discussions with site occupants, visual observations of the site, the measurement of sub-slab vapour at seven locations and predictive calculations. The site conditions as described in this report have been interpreted from, and are subject to, this information and its limitations and accordingly PDP does not represent that its interpretation accurately represents the full site conditions.

The information contained within this report applies to the sampling undertaken on the dates stated in this report. With time, the site conditions could change so that the reported assessment and conclusions are no longer valid. Accordingly, the report should not be used to refer to site conditions and environmental standards applying at a later date without first confirming the validity of the report's information at that time.

This report has been prepared by PDP on the specific instructions of Geppetto Properties Limited for the limited purposes described in the report. PDP 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.

We trust this report provides the information you were seeking. If you have any queries please do not hesitate to call.

Yours sincerely

PATTLE DELAMORE PARTNERS LIMITED

Prepared by:



Dan Ferg
Environmental Engineer

Directed, reviewed and approved by:



Graeme Proffitt
Director

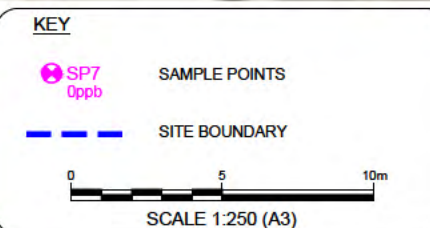
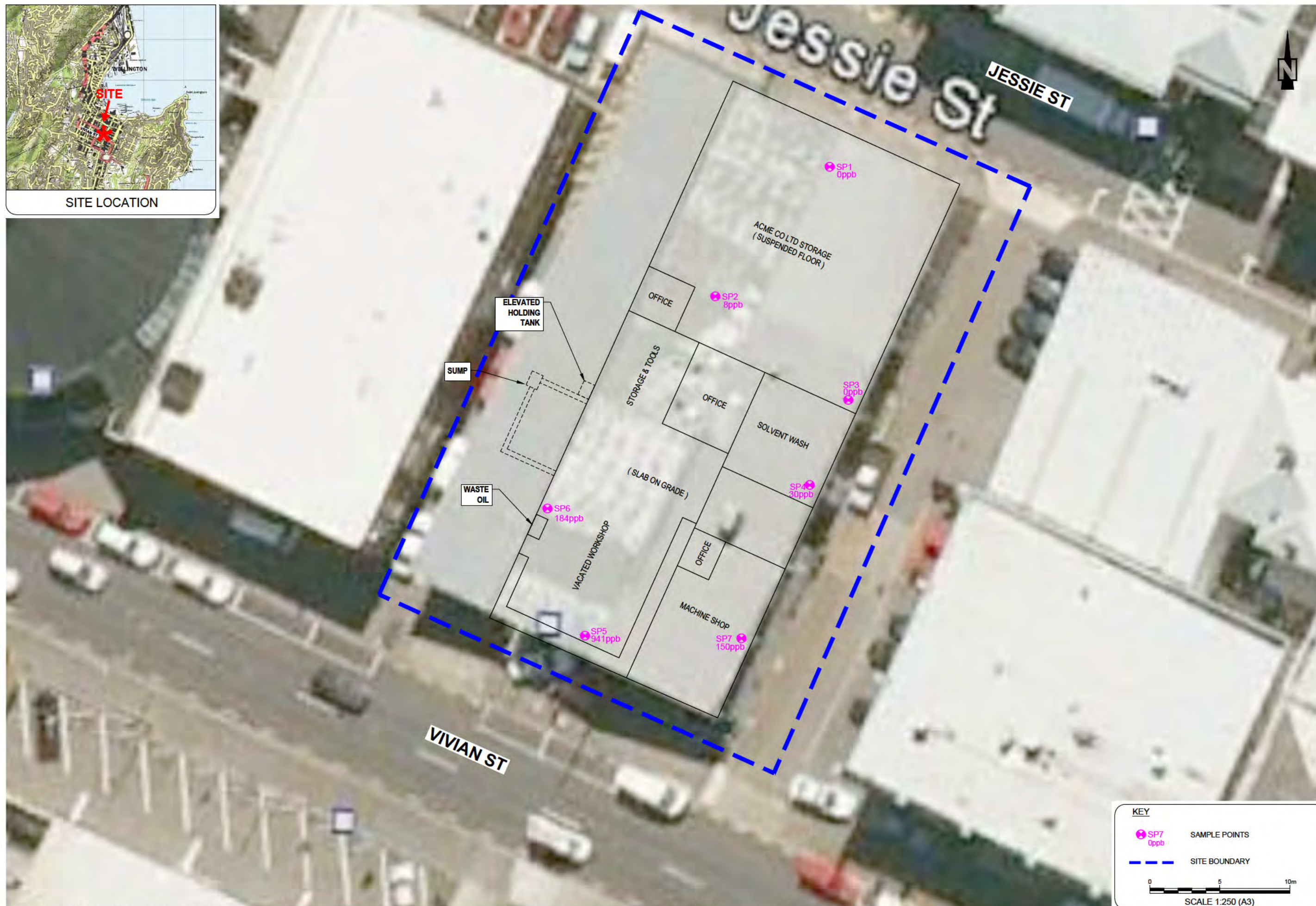
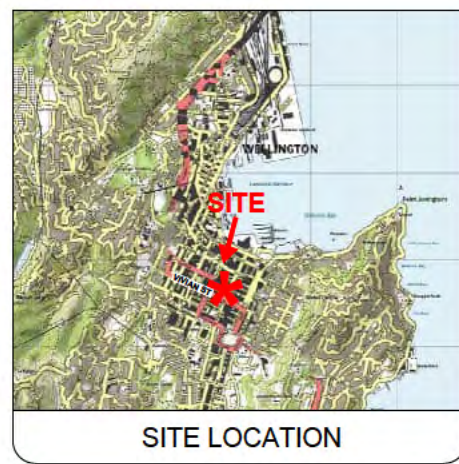
Encl:

Copy to: Patrick Thompson
Studio of Pacific Architecture Ltd

References

DoL (2010) *Workplace Exposure Standards and Biological Exposure Indices*, 4th edition, Department of Labour, Wellington

MfE (2011) *Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand* (updated 2011), Ministry for the Environment, Wellington.

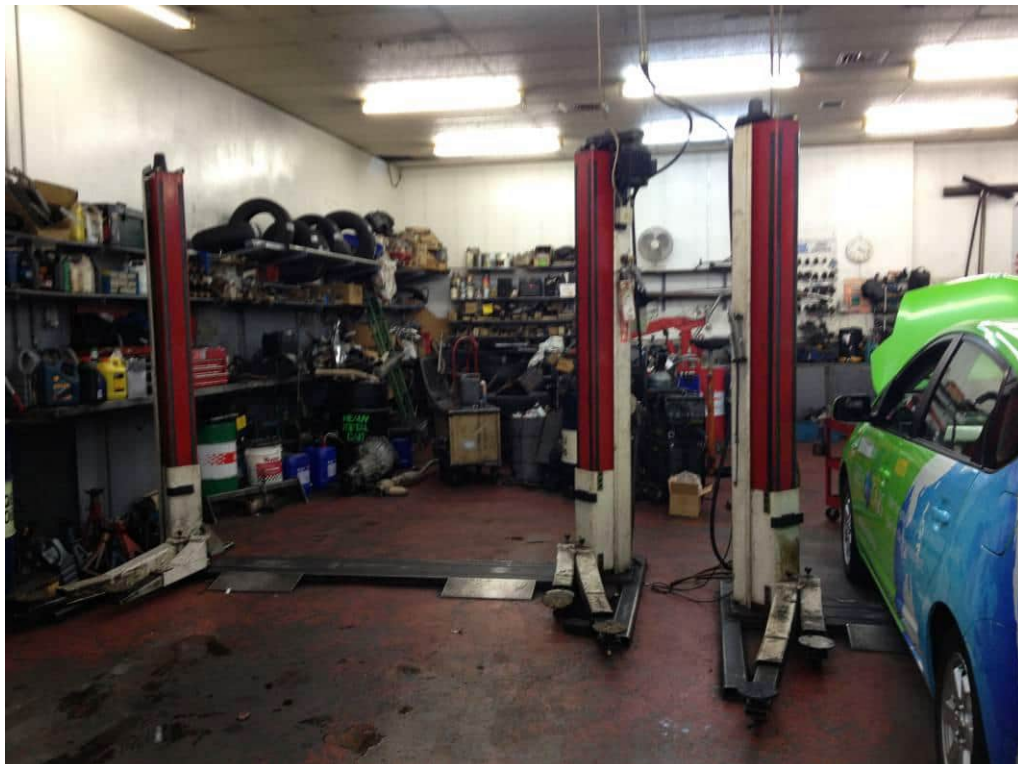


SOURCE: AERIAL IMAGERY DERIVED FROM GOOGLE EARTH PRO (MAY NOT BE SPATIALLY ACCURATE).
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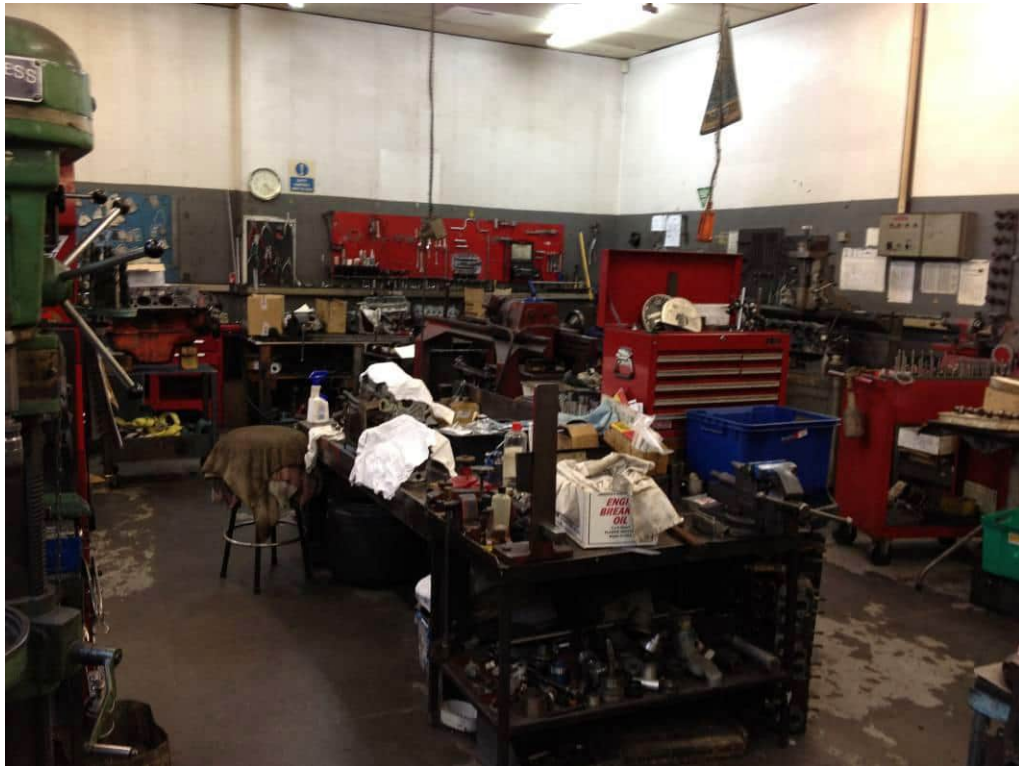
FIGURE 1 : SITE PLAN AND SAMPLING PORT LOCATIONS



Photograph 1: Northern (storage) end of building.



Photograph 2: Central City Auto Repairs workshop, looking south.



Photograph 3: Headmasters Engine Reconditioners machine shop, looking south west.



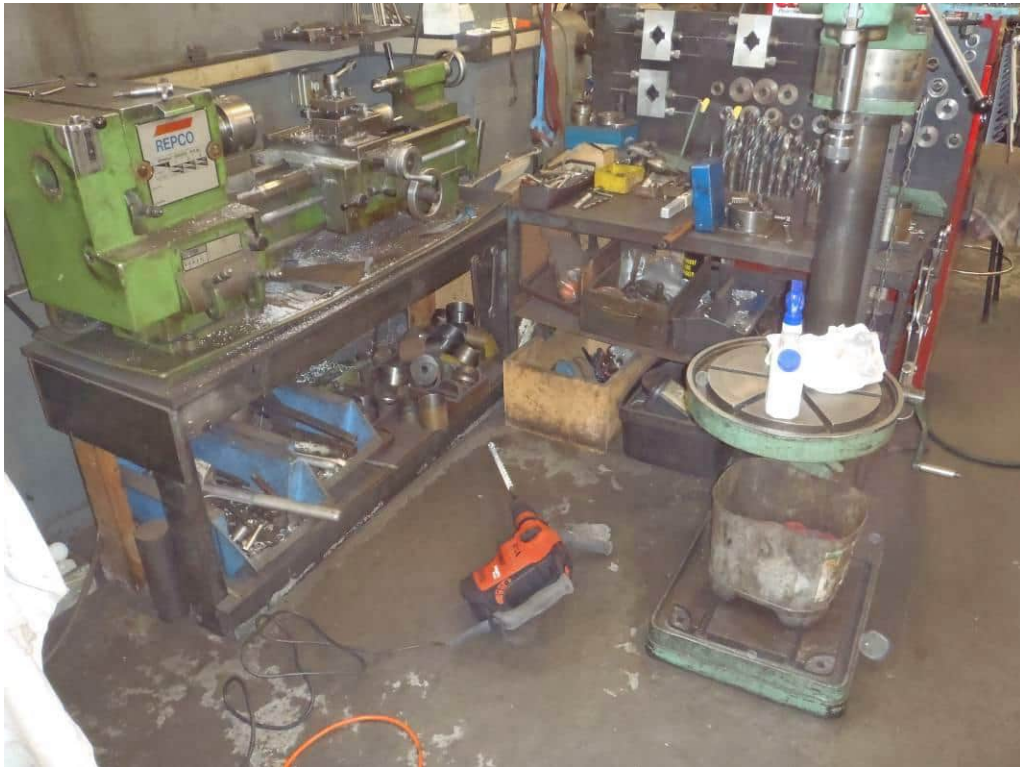
Photograph 4: Wash bay in Headmasters Engine Reconditioners, looking northeast



Photograph 5: Central City Auto oil storage (sampling point SP6).



Photograph 6: Oil drums, Central City Auto (sampling point SP5).



Photograph 7: Machine shop, sampling point SP7.



Photograph 8: Sampling point location SP3, looking south.

IDENTIFY

CLASSIFY

RECTIFY

Contaminated Site Management Plan (interim)

188-208 Victoria Street and 263-
269 Willis Street, Wellington

Miro Street Limited

THE CONTAMINATED SITE CONSULTANCY

Record of review

<i>Roles</i>	<i>Person responsible</i>	<i>Position</i>	<i>Relevant experience</i>	<i>Signature</i>
Report preparation	Jimmy Huang	Senior Environmental Consultant	10 years	
Report review	Dr Dave Bull	Contaminated Site Specialist	15 years	  

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1. Introduction

1.1 Purpose

Miro Street Limited (Miro) proposes to develop 188-208 Victoria Street and 263-269 Willis Street, Wellington ('the site') for a high-density residential use project called "Aro Living". The site currently comprises a commercial carpark and a motor vehicle workshop, both of which have had a variety of historic uses.

Previous detailed site investigation (DSI, Ref: HAIL) had identified historic land uses at the site that appear on the Ministry for the Environment's Hazardous Activities and Industries List (HAIL):

- Waste disposal to land (HAIL category G5)
- Motor vehicle workshop (category F4).

In accordance with condition 15 of resource consent SR454460 issued by Wellington City Council (WCC), Miro commissioned HAIL Environmental Limited (HAIL Environmental) to prepare this Contaminated Site Management Plan (CSMP) in support of the development works.

The purpose of this CSMP is to document procedures that will be undertaken during development works to minimise potential discharges to the environment, minimise risks to human health and to advise on soil and stormwater management and disposal options.

This plan has been prepared as a variation to our contract dated 11 October 2020 and is subject to the limitations set out in Section 10 below.

This CSMP may need to be updated to include any contamination associated with the vehicle workshop. Investigation will be undertaken in the area once the workshop building has been demolished.

1.2 Objectives and plan content

Miro and its relevant contractors should use this CSMP to supplement their own health and safety and environmental procedures as per the requirements of WorkSafe New Zealand and the Health and Safety at Work Act 2015 (and other applicable legislation, regulations, codes and guidelines).

This CSMP includes the following sections:

- A background section summarising the site, proposed development works and soil contamination.
- Health and safety procedures to deal with contaminated soil.
- Erosion and sediment control including soil handling procedures, storm water control, and soil disposal requirements.
- Contingency measures for dealing with unexpected contamination.
- Complaints procedure.

This CSMP **does not** address the demolition of existing on-site structures/buildings and associated requirements under The Health and Safety (Asbestos) at Work Regulations (2016) and the WorkSafe New Zealand Approved Code of Practice – Management and Removal of Asbestos (2016).

This CSMP has been certified by a suitably qualified and experienced practitioner (SQEP, refer Certification, page 2).

1.3 Roles and responsibilities

The following section outlines the various roles and responsibilities during the site preparation and civil works phases:

Table 1: Key Personnel

Role	Responsible person	Tasks	Contact details
Project Manager	Jesse Hing-Mather and Ben van Arts, Egmont Dixon	Responsible for site management and implementation of CSMP and compliance with consent conditions	021 050 1814 021 524 788
Site Manager	Kirk Sutton, Aoraki Construction	- Preparing for and supervising works. - Liaising and management of works contractors	027 527 1350
Contaminated Site Specialist	Dr Dave Bull, HAIL Environmental	- Preparing CSMP (this plan) - Review of soil data and provide advice with respect to appropriate management and/or off-site soil disposal - Provide on-going advice and support on contaminated land issues	021 036 7764
Works Contractor	Aaron Worthy, Aoraki Construction	- Site establishment and access - Set up relevant control measures - Supply of heavy equipment and materials - Undertake civil works	021 680 389
Compliance Enforcement Officer	Narendra Kumar, Wellington City Council	Regulator responsible for land use consent compliance	021 227 8638

2. Background

2.1 Site identification and layout

Table 2: Site details

Postal address	188-208 Victoria Street & 263-269A Willis Street, Te Aro, Wellington 6011
Relevant authority	WCC
Legal description	Lot 2 DP 433344, Part Town Section 143 City of Wellington, Lot 5 DP686 and Section 2 SO Plan 472109
Area	0.39 ha
Zoning	Central Area under the Wellington City District Plan

The general location and layout of the site is depicted in Figure 1.

2.2 Proposed development

The site will be completely redeveloped into a “premium low-rise residential development... comprising 61 architectural terraces and 48 minimalist apartments” over four stages of work. Staging plans are included in Appendix A.

Existing buildings will be demolished, and HAIL Environmental understands all surfacing and any unsuitable soil or fill will be removed. Minor recontouring will be undertaken, with cut of up to 1.2 m and fill of up to 2.3 m. A cut and fill plan is included in Appendix A.

2.3 Geology and hydrogeology

Geology

The site is mapped across two geological units. The majority of the site is shown underlain by undifferentiated Pleistocene-Holocene river deposits, being poorly sorted loess-covered alluvial gravel deposits. The southwest corner is shown as Holocene river deposits of well-sorted floodplain gravel. However, the national geological mapping scale is imprecise and the boundary between these two units may not be exactly as shown. (Ref: GNS).

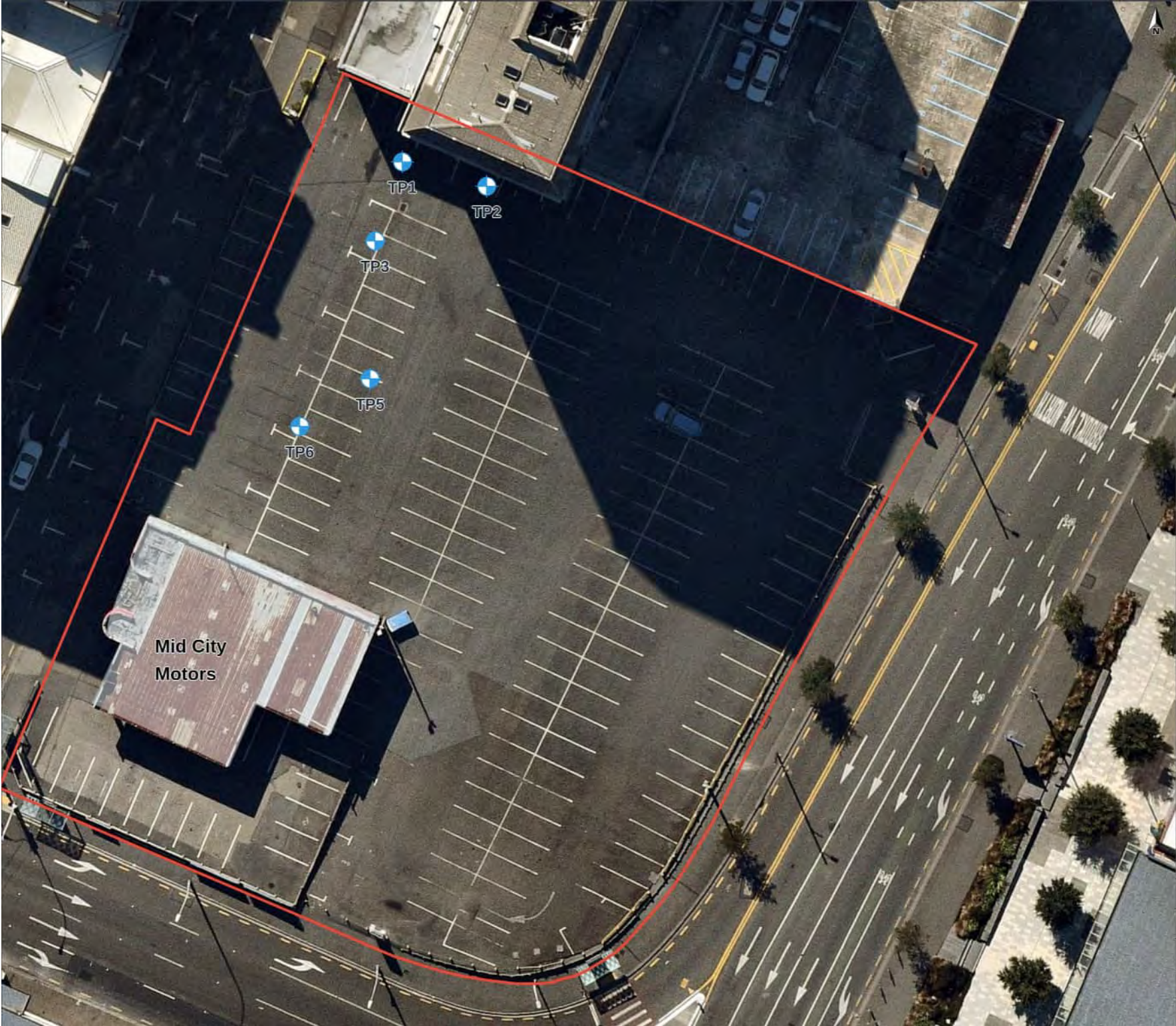
Several north-south and northeast-southwest-aligned faults are mapped in the site vicinity; exact positions are not certain but one at least is likely to follow the Urban Motorway alignment approximately 50 m to the west (Ref: GNS).

Hydrogeology

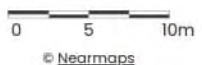
GWRC’s proposed Natural Resources Plan (pNRP) does not identify any regionally significant aquifers in the area, and its online geographic information system shows no wells or water takes in the area, other than for monitoring and dewatering purposes.

Hydrology

According to GWRC online mapping, the site is within the ‘Wellington’ catchment. There are no recognised waterways in the area, which is served solely by urban stormwater drainage.



- Legend**
- Site Boundary
 - Test Pit Locations



Produced by **Evalus.earth**

Title: Untitled Figure			
Client: Miro St		Figure No: 1 Size: A4	
Project: Victoria Quarter	Drawn:		
Date: Invalid date	Checked:	Version:	
Proj No: 1088			

2.4 Contamination status

HAIL Environmental undertook an interim DSI (Ref: HAIL) for the site in December 2020. The purpose of the DSI was to characterise potential contaminants in the site soils as a results of historical HAIL activities. A vehicle workshop (and possible service station) in the southwest of the site could not be accessed and remains to be assessed.

While a coal yard is thought to have existed in the northwest of the site, no evidence for any significant residual soil contamination was found. Instead, gasworks waste (spent oxide and ash) containing was encountered unexpectedly in test pit TP5 between 0.2 and 0.6 m below ground level (bgl). Gasworks waste included bright green stained material and dark ashy material, and had an unpleasant odour; it was highly acidic and contained complex cyanides, polycyclic aromatic hydrocarbons (PAH) and (in one sample) lead and other heavy metals. While gasworks waste was not found at other locations during the DSI, the actual extent remains to be proven. If systematic waste disposal is evident, the affected 'piece of land' would be HAIL category G5, waste disposal to land (Ref: HAIL).

When asphalt surfacing is removed for maintenance or development, direct exposure to soil, dust and odour will be possible from gasworks waste. Further, in a significant rainfall event, stormwater and entrained contaminants leaving the site would immediately enter the WCC stormwater system and be transported toward Wellington Harbour; however substantial dilution would also occur.

3. Earthworks

3.1 Overview

This section provides procedures for personnel working in and around contaminated soil during the earthworks programme. This plan should supplement Miro and its subcontractors' own health and safety procedures.

Potential risks associated with ground-breaking activities at the site relate to contaminants derived from buried gasworks waste (especially cyanides and lead). Potential risks relate to

- Dermal contact by workers.
- Ingestion and inhalation of contaminated soil particles by workers.
- Potential discharge of leachate containing acid, cyanide complexes and heavy metals.

Most of this section provides general site contamination controls. Additionally, whenever gasworks or hydrocarbon waste (green/blue stained soils, ash, oily material) are observed, the plan in Section 3.5 shall be immediately implemented. For any other form of gross contamination, the unexpected contamination contingency plan in Section 5 shall be implemented.

3.2 General requirements

A copy of this CSMP shall be available on site at all times. In case of any doubt or uncertainty as to what controls are required, the site manager shall consult the SQEP.

Setting up

Site establishment works shall include:

- Hazard identification signage to warn workers that buried gasworks waste may be hazardous.
- Induction for workers working at the site, which shall include training on indicators of contamination, protocols for discovery of unexpected contamination, and personal protective equipment (PPE) requirements.
- A change and wash facility and a personal protective store for workers (located outside of the earthworks area) who come in contact with contaminated material.
- Impermeable gloves, impermeable work clothing, and organic vapour respirators in case they are required. This PPE should supplement the contractor's own safety equipment which may include hard hat, high visibility vest, steel-cap boots etc.
- Equipment washdown facility for plant that has come in contact with gasworks waste.
- Chemical spill kits to contain/clean up any contaminated liquid, and oil spill kits for tar and fuels. For large amounts of liquid contamination, clean naturally absorbent materials such as untreated sawdust may be used to improve handling characteristics as required.

During earthworks

Daily health and safety toolbox meetings should be undertaken and documented.

As general good practice, workers shall maintain good personal hygiene:

- Avoid hand to mouth/face contact during work.
- Wash hands before eating, drinking, applying sunscreen and/or cosmetics, smoking, which should be done only in designated area.

Where necessary this plan shall be updated to reflect changing site conditions. Copies of the updated plan

3.3 Dust mitigation

Dust at the site shall be controlled in accordance with the *Good practice guide for assessing and managing the environmental effects of dust emissions* (Ref: MfE5) and include the following:

- Establish stabilised vehicle paths per the approved erosion and sediment control plan (ESCP, ref: Aurecon).
- Load soil directly into truck and trailer units by placing the material or limiting drop heights. Limit load sizes to avoid spillages. Cover truck and trailer units with tarpaulins on route to disposal facility.
- Regularly clean up spillages of soil on paved surfaces.
- Limit vehicle speeds to between 10 and 15 km/hour within the site.
- Visually monitor dust during dry conditions and if required by the Site Manager keep active earth working areas damp using water. The contractor shall ensure that the water application does not cause surface runoff that would discharge into the environment.

3.4 Stormwater control

The general topography of the site and surrounding land is gently sloping and discharges to a number of stormwater catchpits on the Vivian and Victoria Street sides of the site.

To mitigate potential offsite discharges, sediment and stormwater controls shall be implemented as per the approved ESCP (Ref: Aurecon).

Some of the contaminants of concern, especially acid and cyanides, are readily mobilised in stormwater, either dissolved or in colloidal forms. Sediment control measures cannot prevent these contaminants being transported in runoff. Any spilt fuel or oil might also be able to pass the specified erosion and sediment control devices. Accordingly the following controls must also be implemented:

- Minimise stormwater contact with gasworks waste – bund and cover any identified areas, avoid disturbing waste in wet conditions.
- Use absorbents to stabilise and remove any spills or drips of gasworks waste, tar, oil, fuel, hydraulic fluids etc.
- Consider placing haybales or similar in flowpaths to absorb materials that evade the above controls.

3.5 Solid waste handling and disposal

As noted in Section 2.4, while gasworks waste was not found within the other excavated test pits during the DSI (Ref: HAIL), the actual extent remains to be proven. The gasworks waste (spend oxide and ash) was encountered between 0.2 and 0.6 m bgl within test pit TP5 where bright green staining and an unpleasant odour was noted. The earthworks contractor should use these indicators to identify buried gasworks waste, and seek assistance from the SQEP in case of any doubt.

In order to avoid handling excavated material, and issues associated with stockpiling contaminated material, arisings should be placed directly into a truck located outside of the earthworks area – do not stockpile. Small amounts may be placed into plastic 200 L drums and sealed awaiting removal. The truck must have a sealed bed in order to prevent any drip or spillage from the material during transport. Limit load sizes to avoid any spillages from overfilling. All loads of contaminated soil shall be covered while in transit to disposal facility to minimise dust and odour.

Removed soil and waste shall generally be disposed of to Wellington City Council's Southern Landfill, a Class 1 facility that is consented to accept such material. Landfill acceptance of excavated materials to be disposed offsite must be obtained before soil is removed. An application to dispose of gasworks wastes has already been made. The material shall be tracked using a waste transfer form (Appendix B). Soil will only be disposed to alternative route where testing confirms that it is suitable to do so and subject to facility resource consent and operator approval.

Landfill disposal dockets and haulage details shall be retained to document the weight/volume of soil disposed.

3.6 Imported fill

Fill material being imported to the site shall be acceptable to Wellington City Council and at minimum meet the acceptance criteria in Section 4, Table 3. Any material meeting the MfE (2002) definition of cleanfill shall be deemed acceptable, that is:

'Material that when buried will have no adverse effect on people or the environment. Cleanfill material includes virgin natural materials such as clay, soil and rock, and other inert materials such as concrete or brick that are free of:

- *Combustible, putrescible, degradable or leachable components.*
- *Hazardous substances.*
- *Products or materials derived from hazardous waste treatment, hazardous waste stabilisation or hazardous waste disposal practices.*
- *Materials that may present a risk to human or animal health such as medical and veterinary waste, asbestos or radioactive substances.*
- *Liquid waste.'*

3.7 Groundwater procedures

It is not expected the proposed earthworks will encounter groundwater. If dewatering is required, the groundwater should be diverted to a retention system for testing. No groundwater should be discharged to the stormwater network until the laboratory testing shows it is appropriate to do so.

4. Validation and Reporting

Following the removal of contaminated soil from the excavation area, site validation is required to ensure the remediation works have been successful and remaining soil meet the remediation criteria. Validation sampling will be conducted in accordance with relevant guidance (Refs: MfE1, MfE2). The validation samples should be analysed for cyanide, sulphate, pH, heavy metals, polycyclic aromatic hydrocarbons (PAH) and/or petroleum hydrocarbons as the SQEP may determine.

If the validation results show that the remnant soil does not meet the remediation criteria. In this instance further excavation will be required in areas where exceedances occurred, followed by another round of validation sampling until the remediation criteria is met.

At the completion of the validation works, a site validation report (SVR) will be prepared outlining the remediation works undertaken, deviations from the methodology outlined in this plan and the results of remnant soil quality at the site. The SVR shall be prepared in accordance with the requirements of contaminated land management guideline No.1.

The proposed soil acceptance criteria are the assessment criteria used in the DSI (Ref: HAIL) and is summarised in Table 3:

Table 3: Summary of acceptance criteria

Contaminant	Acceptance criteria (mg/kg)	Source
Arsenic	45	SCS for high density residential use (Ref: NES:CS)
Cadmium	230	
Chromium	1500	
Copper	10,000	
Lead	500	
Free cyanide	1,600	MfE3
Total cyanide	3,900	
Naphthalene	58 (sand) / 71 (clay)	MfE4
Pyrene	10,000	
Benzo[a]pyrene equivalent	24	

Notwithstanding Table 3, the SQEP may elect to develop site-specific acceptance criteria to the satisfaction of Wellington City Council.

5. Contingency Plan

Given the unexpected gasworks waste encountered during the DSI (Ref: HAIL), it is possible that other unexpected materials may be discovered. Warning signs may include petroleum hydrocarbon stained or odorous soil, unusually coloured soil, smoke or flame when disturbed, anthropogenic material such as refuse, intact or broken drums and containers, potential asbestos-containing materials. Any of these may pose health and safety hazards, and are unlikely to be suitable for reuse.

In the first instance, the material should be photographed and then re-covered. The SQEP will assess the material and advise on its management. A site contamination report shall be prepared. Where relevant the report shall document: the nature and extent of the material; its suitability to remain on site (from an environmental impact and human health perspective); proposed disposal location and estimated volumes.

The SQEP must immediately contact WCC in the event that further contamination is discovered and seek approval for these proposed Contingency Plan measures prior to them being implemented.

In the event that significant waste burial pits are uncovered during earthworks the following shall be implemented:

- Earthworks should cease in the area. The area should be cordoned off from worker access.
- The SQEP shall attend the site and shall investigate the area.
- Works may commence when investigations are completed and following approval from the Site Manager.
- Areas of exposed impacted soil shall be limited.
- If odours are observed, the downwind perimeter of the site shall be monitored for objectionable or offensive levels. If objectionable or offensive odours are observed, works shall cease, and tarpaulins or a cover of soil applied to the source area. Works may commence when there is no longer objectionable or offensive odour at or beyond the downwind site boundary.

The above is an initial outline of what is being proposed. Actual measures to be implemented will be those recommended by the SQEP and approved by WCC.

6. Complaints Procedure

Site works will be undertaken in accordance with this CSMP.

The Site Manager will ensure works are undertaken in accordance with this CSMP and this role will extend to one of Complaints Manager. Complaints will be managed according to the following:

- The Complaints register (Appendix C) will be held on site.
- The Complaints Manager will form the primary contact for complaints and will complete the complaints register.
- Potential conflicts or disputes will be referred to the Project Manager.
- WCC shall be notified of received complaints on the same day.

7. Limitations

This report has been prepared by HAIL Environmental for Miro Street Limited in accordance with the purpose and scope set out above, and the usual care and thoroughness of the consulting profession. Any use of any part of this report by any other party, or in any other context, is the responsibility of the user. Information from cited sources has not been independently verified unless specifically stated, and HAIL Environmental assumes no responsibility for any inaccuracy or omission therein. This report does not purport to give legal or financial advice.

8. References

Aurecon: Project Aro erosion and sediment control plan. Document 507237-000-REP-CC-0001. Report for Miro Street Limited. Aurecon New Zealand Limited. Wellington. October 2019.

GNS: Geology of the Wellington area: scale 1:250,000. JG Begg, MR Johnston, compilers. 1:250,000 geological map 10. Institute of Geological and Nuclear Sciences, Lower Hutt. 2000.

HAIL: Detailed Site Investigation, Error! Reference source not found.. Report prepared for Miro Street Limited by HAIL Environmental Limited. Wellington. December 2020.

MfE1: Contaminated land management guideline No. 1: Reporting on contaminated sites in New Zealand. Revised edition. Ministry for the Environment. Wellington. 2011.

MfE2: Contaminated land management guideline No. 5: Site investigation and analysis of soils. Revised edition. Ministry for the Environment. Wellington. 2011.

MfE3: Guidelines for assessing and managing gasworks sites in New Zealand. Ministry for the Environment, Wellington. 1997.

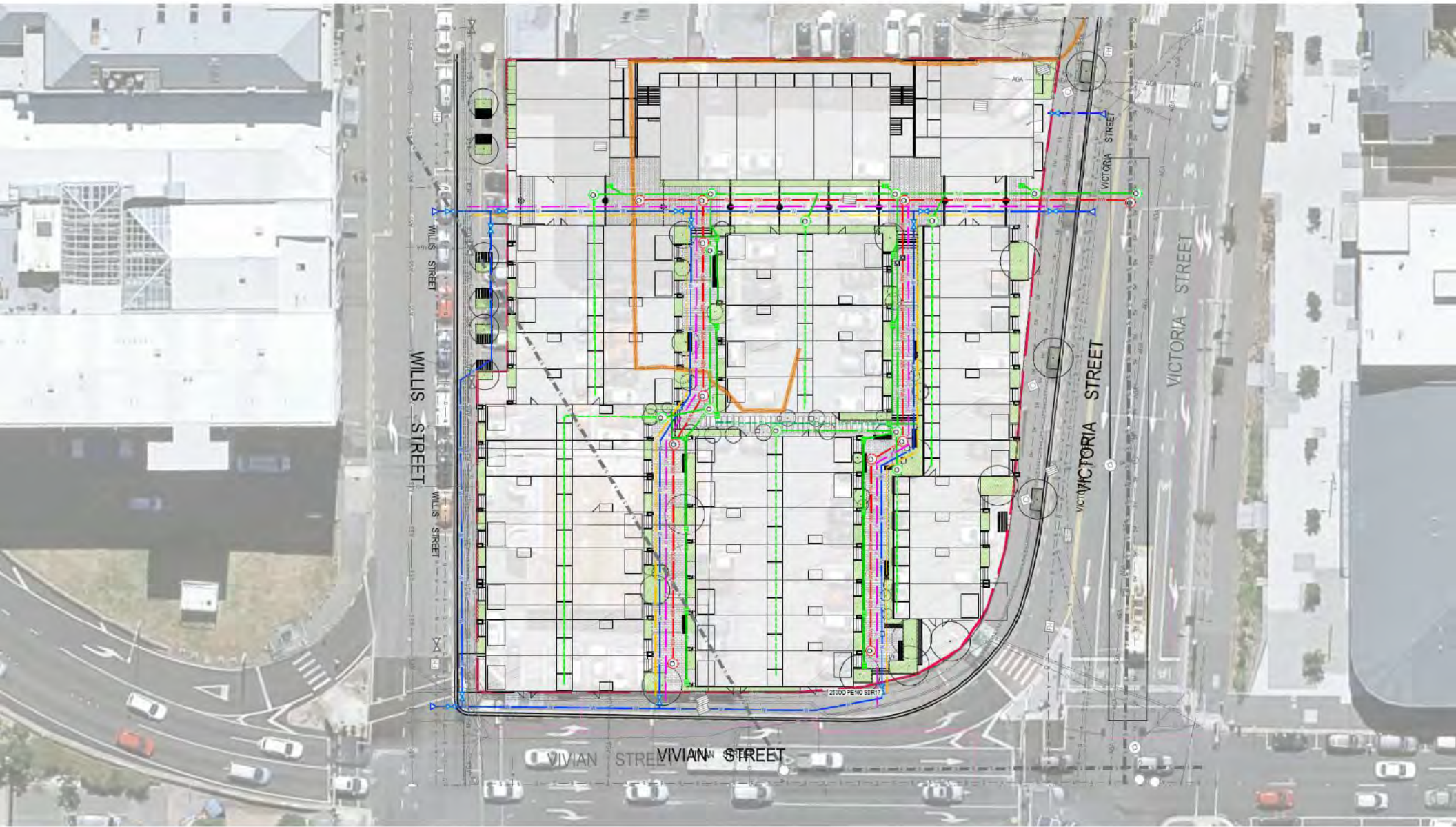
MfE4: Guidelines for assessing and managing petroleum hydrocarbon contaminated sites in New Zealand. Revised version. Ministry for the Environment, Wellington. 2011.

MfE5: Good practice guide for assessing and managing the environmental effects of dust emissions. Ministry for the Environment. Wellington. 2001.

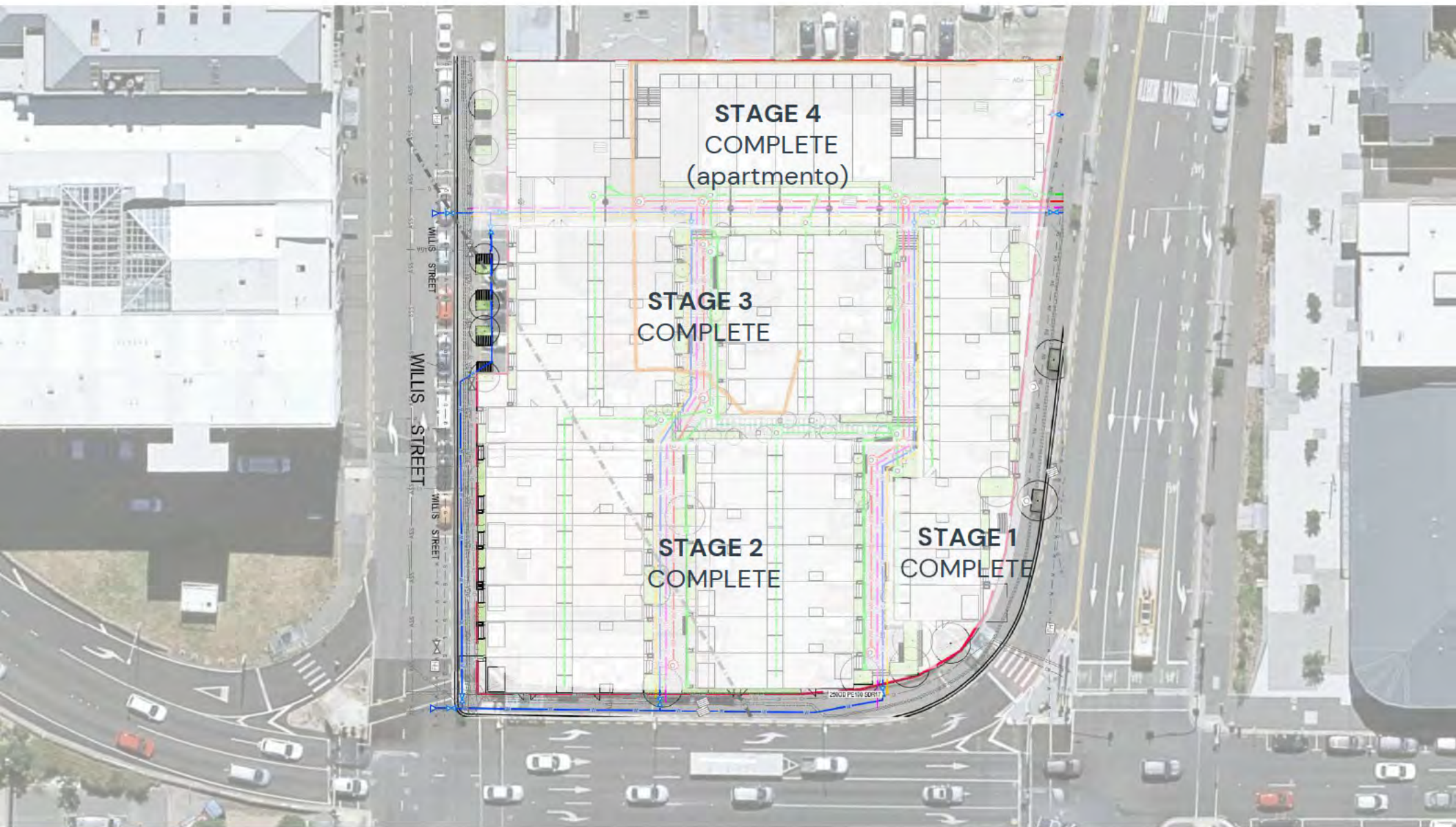
NES-CS: Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations. 2011.

Appendix A: Development Plan

PLAN | in-ground services infrastructure overlay



PLAN | Aro Living Complete



aro

AroLiving | Rev A | July 2020



AORAKI
construction

Appendix B: Waste Transfer Form

Application for disposal of contaminated soil

Absolutely Positively
Wellington City Council

Me Heke Ki Pōneke

Please complete this form in full at least 48 hours prior to delivery, supplying appropriate details so that there is no delay in processing this application. A permit number must be issued before contaminated soil will be accepted at the Southern Landfill. Approved applications will be notified by fax or email to confirm acceptance.

Send your completed form to

Fax to: Southern Landfill Kiosk
Fax: 04 383 6631

Emailed to: landfillin@wcc.govt.nz

Hours: Contaminated soil, once issued with a permit number, will only be accepted:
Monday to Friday, 8am–4pm at the Southern Landfill.

Fee: Contaminated soil is charged at \$87 including GST per tonne.

Application for disposal of contaminated soil

Address: 188-208 Victoria Street and 263-269 Willis Street, Wellington

Description: Gasworks waste unexpectedly encountered as shallow fill material underlying carparking area of site. No gasworks in site vicinity, no official record of waste disposal to site, therefore expected to be illicit and small-scale waste disposal.

Test results: A laboratory report containing TCLP test results for contaminants of concern is attached.

Waste generator: Aoraki Construction, PO Box 11012, Manners St 6142

Contacts: Aaron Worthy [REDACTED]

SQEP: Dr. Dave Bull CEnvP-SC CChem, Site Contamination Specialist, HAIL Environmental, [REDACTED]

Phone/mobile

Email

How would you like to be notified
to confirm acceptance: *(please tick)*

Fax

Fax

~~Fax~~

Email ✓ (to both)

Delivery

Requested date of delivery From 1 February (tbc)

Quantity Still to be determined – known extent less than 5 m³ but not known if more could be discovered

☐☐

Odorous: Yes ~~No~~ (delete one)

If "Yes" please describe odour Moderate phenolic odour

Storage site prior to transport Direct from site

Name of transporter TBC

Name of driver

Declaration by generator

I declare that the above waste application form is accurately described and in proper condition for transport in accordance with the Transport Act.

I hereby accept full liability for any loss or damage, of whatsoever kind including direct or indirect, special or consequential loss arising as a result of any inaccuracy in or omission from the information provided by me and agree to fully indemnify The Wellington City Council for any claims which may be made against The Wellington City Council arising from such inaccuracies or omissions.

Full name: Dr. Dave Bull

Date 21 / 1 / 21



Signature: _____



Certificate of Analysis

Hail Environmental Ltd
16D Hobson St
Wellington 6011

Attention: Dave Bull

Phone: [REDACTED]

Email: [REDACTED]

Lab Reference: 20-45621
Submitted by: Dave
Date Received: 27/11/2020
Testing Initiated: 28/11/2020
Date Completed: 10/12/2020
Order Number:
Reference: 1088

Sampling Site:

Report Comments

Samples were collected by yourselves (or your agent) and analysed as received at Analytica Laboratories. Samples were in acceptable condition unless otherwise noted on this report.
Specific testing dates are available on request.

Soil Aggregate Properties and Nutrients

Client Sample ID			TP3 0.2-0.3	TP3 0.5-0.6	TP5 0.2-0.3	TP5 0.6	TP5 Dup
Date Sampled							
Analyte	Unit	Reporting Limit	20-45621-1	20-45621-2	20-45621-3	20-45621-4	20-45621-5
Free Cyanide*	mg/kg dry wt	0.2	<0.20	<0.20	<0.20	<0.20	<0.20

Soil Aggregate Properties and Nutrients

Client Sample ID			TP6 0.3-0.4
Date Sampled			
Analyte	Unit	Reporting Limit	20-45621-6
Free Cyanide*	mg/kg dry wt	0.2	<0.20

Moisture Content

Client Sample ID			TP3 0.2-0.3	TP3 0.5-0.6	TP5 0.2-0.3	TP5 0.6	TP5 Dup
Date Sampled							
Analyte	Unit	Reporting Limit	20-45621-1	20-45621-2	20-45621-3	20-45621-4	20-45621-5
Moisture Content	%	1	16	21	26	20	34

Moisture Content

Client Sample ID			TP6 0.3-0.4
Date Sampled			
Analyte	Unit	Reporting Limit	20-45621-6
Moisture Content	%	1	22

Heavy Metals by TCLP

Client Sample ID			TP5 0.2-0.3
Date Sampled			
Analyte	Unit	Reporting Limit	20-45621-3
Arsenic	g/m ³	0.005	<0.005
Cadmium	g/m ³	0.0005	<0.0005
Chromium	g/m ³	0.005	0.011
Copper	g/m ³	0.05	<0.05
Lead	g/m ³	0.01	<0.010
Zinc	g/m ³	0.4	<0.4

Aggregates and Nutrients (TCLP)

Client Sample ID			TP5 0.2-0.3
Date Sampled			
Analyte	Unit	Reporting Limit	20-45621-3
Total Cyanide by TCLP	g/m ³	0.05	0.131

Polycyclic Aromatic Hydrocarbons - TCLP

Client Sample ID			TP5 0.2-0.3
Date Sampled			
Analyte	Unit	Reporting Limit	20-45621-3
1-Methylnaphthalene	g/m ³	0.00024	0.02207
2-Methylnaphthalene	g/m ³	0.00024	0.01753
Acenaphthene	g/m ³	0.00008	0.00043
Acenaphthylene	g/m ³	0.00008	0.00035
Anthracene	g/m ³	0.00008	0.00159
Benz[a]anthracene	g/m ³	0.00012	<0.00013
Benzo[a]pyrene	g/m ³	0.00008	<0.000081
Benzo[b]fluoranthene	g/m ³	0.00008	<0.000081
Benzo[g,h,i]perylene	g/m ³	0.00008	0.00018
Benzo[k]fluoranthene	g/m ³	0.00008	0.00010
Chrysene	g/m ³	0.00008	<0.000081
Dibenz[a,h]anthracene	g/m ³	0.00008	<0.000081
Fluoranthene	g/m ³	0.00008	0.00034
Fluorene	g/m ³	0.00008	0.00047
Indeno[1,2,3-cd]pyrene	g/m ³	0.00012	0.00014
Naphthalene	g/m ³	0.00024	0.04123
Phenanthrene	g/m ³	0.00012	0.00171
Pyrene	g/m ³	0.00008	0.00019
Benzo[a]pyrene TEQ (LOR)	g/m ³	0.0002	0.00021
Benzo[a]pyrene TEQ (Zero)	g/m ³	0.00008	<0.00008

Polycyclic Aromatic Hydrocarbons - TCLP

Client Sample ID		TP5 0.2-0.3
Date Sampled		
Anthracene-d10 (Surrogate)	% 4	98.0

TCLP Extraction

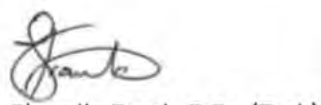
Client Sample ID		TP5 0.2-0.3
Date Sampled		
Analyte	Unit	Reporting Limit
Extractant Used		# 1
Initial pH	pH	1 5.0
Final pH	pH	1 4.6

Method Summary

Free Cyanide	1:5 water extraction (NEPM, Schedule B3, Laboratory Analysis of Potentially Contaminated Soil, 2011) followed by acid distillation, distillate measured by colourmetric analysis. (APHA 4500-CN C-Modified- Discrete Analyser - Online edition).
Moisture	Moisture content is determined gravimetrically by drying at 103 °C.
TCLP Elements	TCLP extraction of soils followed by acid digestion and analysis of TCLP extracts by ICP-MS (In house procedure based on US EPA method 200.8).
Cyanide_TCLP	Acid distillation of TCLP extract, distillate measured by colourmetric analysis. (APHA 4500-CN C - Modified - discrete Analyser - Online edition).
TCLP PAH	Liquid-liquid extraction with hexane, florisil cleanup with analysis by GC-MS. Benzo[a]pyrene TEQ (LOR): The most conservative TEQ estimate, where a result is reported as less than the limit of reporting (LOR) the LOR value is used to calculate the TEQ for that PAH. Benzo[a]pyrene TEQ (Zero): The least conservative TEQ estimate, PAHs reported as less than the limit of reporting (LOR) are not included in the TEQ calculation. Benzo[a]pyrene toxic equivalence (TEQ) is calculated according to 'Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health'. Ministry for the Environment. 2011. In accordance with in-house procedure.
PAH in Water	Liquid-liquid extraction with hexane, florisil cleanup with analysis by GC-MS. Benzo[a]pyrene TEQ (LOR): The most conservative TEQ estimate, where a result is reported as less than the limit of reporting (LOR) the LOR value is used to calculate the TEQ for that PAH. Benzo[a]pyrene TEQ (Zero): The least conservative TEQ estimate, PAHs reported as less than the limit of reporting (LOR) are not included in the TEQ calculation. Benzo[a]pyrene toxic equivalence (TEQ) is calculated according to 'Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health'. Ministry for the Environment. 2011. In accordance with in-house procedure.
TCLP Extraction	TCLP was performed according to US-EPA method 1311.


Matthew Counsell, B.Sc.
Inorganics Team Leader


Emily Hanna, B.Sc.
Trace Elements Team Leader


Sharelle Frank, B.Sc. (Tech)
Technologist


Rong Zhang
Technician

Application for disposal of contaminated soil

**Absolutely Positively
Wellington City Council**
Mā Heke Ki Pūneco

Please complete this form in full at least 48 hours prior to delivery, supplying appropriate details so that there is no delay in processing this application. A permit number must be issued before contaminated soil will be accepted at the Southern Landfill. Approved applications will be notified by fax or email to confirm acceptance.

Send your completed form to

Fax to: Southern Landfill Kiosk
Fax: 04 383 6631

Emailed to: landfillin@wcc.govt.nz

Hours: Contaminated soil, once issued with a permit number, will only be accepted:
Monday to Friday, 8am–4pm at the Southern Landfill.

Fee: Contaminated soil is charged at \$87 including GST per tonne.

Application for disposal of contaminated soil

Site where the contaminated soil is currently located

Brief history of site/description of nature of contamination

Please attach results of Total Concentration and/or TCLP tests (as described in MfE guidelines) undertaken at site

Business address

Contact person

Phone/mobile

Email

How would you like to be notified
to confirm acceptance: *(please tick)*

Fax

Fax

☐ Fax ☐ Email

Delivery

Requested date of delivery

Quantity

Odorous: Yes / No *(delete one)*

If "Yes" please describe odour

Storage site prior to transport

Name of transporter

Name of driver

Declaration by generator

I declare that the above waste application form is accurately described and in proper condition for transport in accordance with the Transport Act.

I hereby accept full liability for any loss or damage, of whatsoever kind including direct or indirect, special or consequential loss arising as a result of any inaccuracy in or omission from the information provided by me and agree to fully indemnify The Wellington City Council for any claims which may be made against The Wellington City Council arising from such inaccuracies or omissions.

Full name: _____

Signature: _____

Date ____/____/____

Application for disposal of Asbestos

**Absolutely Positively
Wellington City Council**
Me Heke Ki Pōneke

Please complete this form in full 48 hours prior to delivery, supplying appropriate details so that there is no delay in processing this application. A permit number must be issued before special waste can be accepted at the Southern Landfill. Approved applications will be notified by fax or email to confirm acceptance.

Send your completed form to

Email to: landfillin@wcc.govt.nz Attn: Peter Gordon

Hours: Special waste, once issued with a permit number, will only be accepted:
Monday to Friday, 8am–3pm at the Southern Landfill.

Please note: Some hazardous waste may take longer than 48 hours to be approved.

Acceptance of asbestos contaminated soil or asbestos containing material (ACM) must comply with the following:

- ☐ Domestic (Unlicensed) parcels will be double wrapped/ bagged with no less than 200 µm Polythene wrap/bag, parcel sizes will not exceed 1200mm x 900mm in size and weigh no more than 25Kg. Combined weight of all parcels must not exceed 160kg to qualify as domestic amounts.
- ☐ Commercial (Licensed) parcels will be double wrapped/ bagged with no less than 200 µm Polythene wrap/bag, parcel size will not exceed 2500mm x 2000mm x 500mm in size and not exceeding 1000Kg (1 tonne).
- ☐ All asbestos containing material (ACM) transported securely and presented in such a manner that it can be manually and or mechanically unloaded off the transporting vehicle and placed into the required area, tipping of ACM is not permitted.
- ☐ Transporter will be required to assist with the unloading of ACM at the disposal area. Appropriate PPE must be worn by this person(s). Please visit: [//worksafe.govt.nz/topic-and-industry/asbestos/ppe-when-working-with-asbestos/](https://www.worksafe.govt.nz/topic-and-industry/asbestos/ppe-when-working-with-asbestos/) for further advice.
- ☐ Asbestos contaminated soil will need to be double wrapped, with seams in wrapping offset from each other. The entire load will need to be on a sacrificial slip sheet, therefore should reduce the possibility of rupture during tipping.
- ☐ All asbestos waste needs to be moist prior to closure or sealing of parcels.
- ☐ Approved permit to accompany all asbestos volumes to site for disposal.
- ☐ All vehicles must go through the wheel wash facility upon completion of disposal.

The landfill management retain the right to refuse entry to any vehicle should they believe that safe practices are not being complied with.

Application for disposal of special waste ☐ please print clearly

Waste generator:

Customer number:

License No:

Location where the waste was generated:

Business address

Contact person:

Phone/mobile:

Email:

Name of driver:

Waste description:

Delivery

Requested date of delivery:	HAZCHEM code:
Quantity:	Packaging method:
Odorous: Yes / No (<i>delete one</i>) If ☐ Yes ☐ please describe odour	
Storage site prior to transport:	
Name of transporter:	Name of driver:

Declaration by generator

I declare that the above waste application form is accurately described and in proper condition for transport in accordance with the Transport Act.

I hereby accept full liability for any loss or damage, of whatsoever kind including direct or indirect, special or consequential loss arising as a result of any inaccuracy in or omission from the information provided by me and agree to fully indemnify The Wellington City Council for any claims which may be made against The Wellington City Council arising from such inaccuracies or omissions.

Full Name: _____

Signature: _____ Date ____ / ____ / ____

Declaration by the transport operator

I acknowledge the receipt of the waste consignment as describe above:

Full Name: _____

Signature: _____

Special disposal instruction where applicable

Disposal charges

Type	Rate Per Tonne (incl. GST)	Minimum Charge (incl. GST)
Asbestos	☐ 208.50	☐ 104.25

Appendix C: Complaints Register

<i>Date:</i>	
<i>Time:</i>	
<i>Complainant Details:</i>	
<i>Weather at time of complaint:</i>	
<i>Complaint description</i>	
<i>Investigation of complaint (provide details of what was assessed in relation to the complaint):</i>	
<i>Investigation date:</i>	
<i>Findings of investigation:</i>	
<i>Remedial measures undertaken:</i>	
<i>Was Hutt City Council notified?</i>	
<i>Any further actions required by Hutt City Council? If so, provide details.</i>	
<i>Update provided to complainant? Date?</i>	



RECORD OF TITLE
UNDER LAND TRANSFER ACT 2017
FREEHOLD
Search Copy




R.W. Muir
Registrar-General
of Land

Identifier **1093545**
Land Registration District **Wellington**
Date Issued 04 August 2023

Prior References
1045553

Estate Fee Simple
Area 39 square metres more or less
Legal Description Lot 10 Deposited Plan 583151

Registered Owners

Eric Timothy Heycoop, Miriam Elizabeth Heycoop and GS Independent Trustee Services (2008) Limited

Interests

Land Covenant in Covenant Instrument 12546093.1 - 12.9.2022 at 9:06 am

12546093.2 Encumbrance to Victoria Quarter Development Limited Partnership - 12.9.2022 at 9:06 am

12546093.3 Encumbrance to Aro Residents' Society Incorporated - 12.9.2022 at 9:06 am

12657903.3 Consent Notice pursuant to Section 221 Resource Management Act 1991 - 4.8.2023 at 2:58 pm

Subject to a right (in gross) to convey telecommunications over part marked VD, JA and JJ on DP 583151 in favour of Chorus New Zealand Limited created by Easement Instrument 12657903.7 - 4.8.2023 at 2:58 pm

Subject to a right (in gross) to convey electricity over part marked VD, JA and JJ on DP 583151 in favour of Aro Residents' Society Incorporated created by Easement Instrument 12657903.8 - 4.8.2023 at 2:58 pm

The easements created by Easement Instrument 12657903.8 are subject to Section 243 (a) Resource Management Act 1991

Subject to a party wall right over part marked JA, JB, JC, JH, JN, JM, JL, JK and JJ on DP 583151 created by Easement Instrument 12657903.10 - 4.8.2023 at 2:58 pm

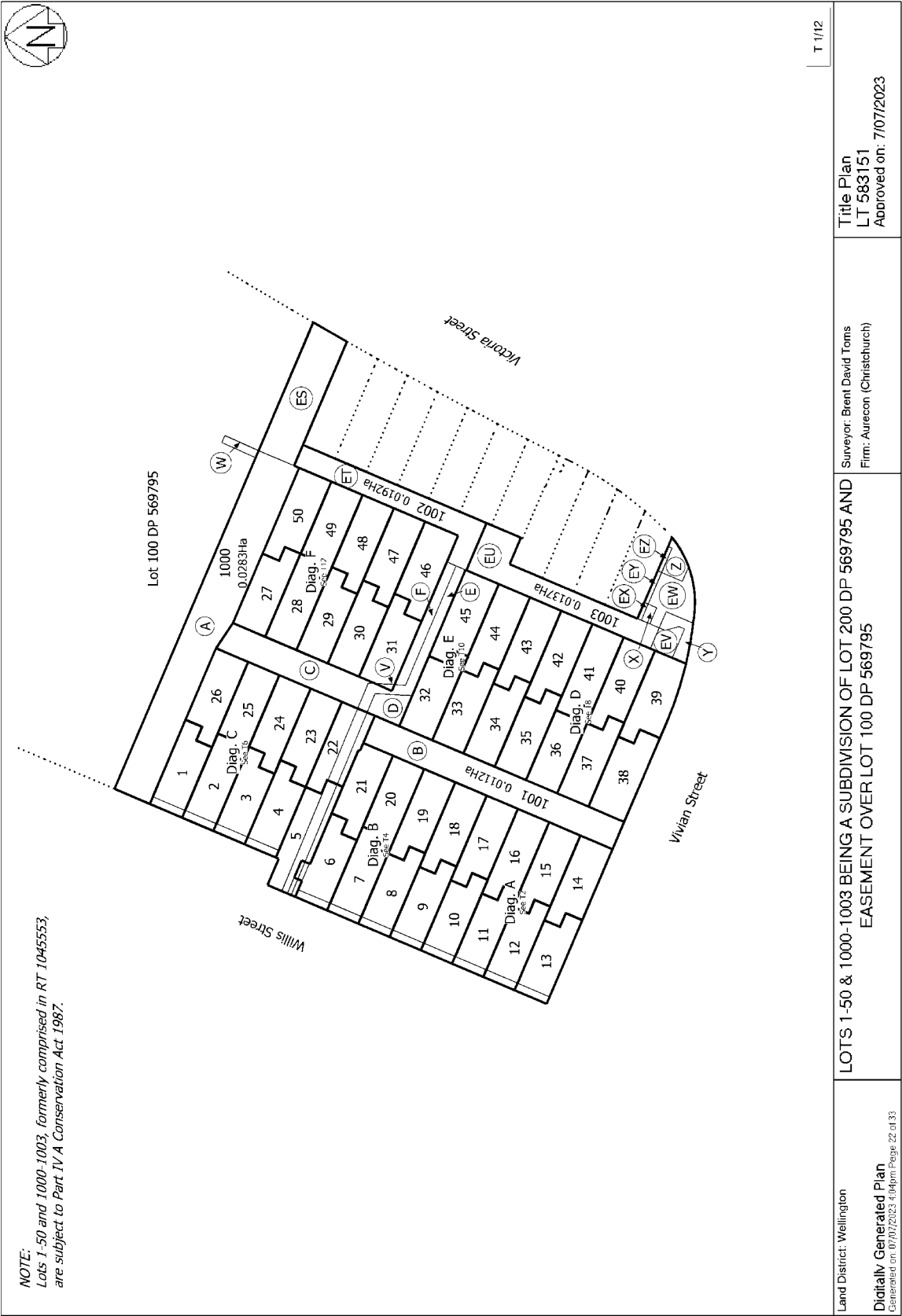
Appurtenant hereto is a right of way and party wall right and right to drain water and sewage created by Easement Instrument 12657903.10 - 4.8.2023 at 2:58 pm

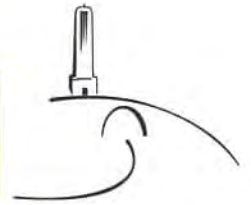
Some of the easements created by Easement Instrument 12657903.10 are subject to Section 243 (a) Resource Management Act 1991 (see DP 583151)

Subject to Part IVA Conservation Act 1987

Subject to Section 11 Crown Minerals Act 1991

13235830.3 Mortgage to ASB Bank Limited - 28.2.2025 at 1:56 pm





24 February 2014

CONTAMINATED LAND MANAGEMENT PLAN

Enabling Works, Underpass, and Park

PW-15-ENV-MP

Rev.	Status	Prepared by	Checked by	Date
v1	Final	Penny Kneebone	Ed Breese	October 2012
v2	Final	Penny Kneebone	Ed Breese	December 2012
v3	Final	Penny Kneebone	Ed Breese	February 2014

Name	Position	Date	Signature
Ed Breese	Environmental Compliance Manager	24/2/14	
Duncan Kenderdine	Alliance Manager	24.2.2014	

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1 INTRODUCTION

This is the third revision of this Contaminated Land Management Plan. The third revision has been completed to allow for the Park development and construction of the Australian War Memorial. The earthwork activities for the Australian War Memorial are being undertaken by the Memorial Park Alliance (MPA).

1.1 Objective

The objective of this Contaminated Land Management Plan (CLMP) is to ensure contaminated soil excavated during enabling works, underpass construction, and park development is handled and disposed of in an appropriate manner, including:

- Protecting on-site workers and off-site neighbours during earthworks.
- Preventing discharge of contaminated material from the site.
- Ensuring that if contaminated soil is reused on site, it is managed appropriately.
- Ensuring any contaminated soil disposed offsite goes to an appropriately consented facility.

1.2 Roles and responsibilities

Table 1: roles and responsibilities

Company	Position	Responsibilities
NZTA	Owner	Overall responsibility for the Project
MPA	Construction Manager (Steve Croft)	Supervision of construction activities Authorises all design and contractual changes Inspections of works to ensure compliance with CLMP
MPA	Site supervisor (Scott Hockly)	Ensuring CLMP is implemented during works Ensuring any sub-contractors are aware of and comply with the requirements of the CLMP Contact Environmental Scientist when unexpected contamination encountered. Ensure relevant staff are trained in the requirements of this CLMP Maintain records of contaminated soil transport and disposal Daily inspections and reporting
MPA	Environmental Scientist	Provide advice if unexpected contamination encountered on site. Review laboratory test results and advise appropriate on-site management methods and disposal locations

1.3 Training

The contractor shall ensure relevant staff are trained in this CLMP. The requirements of the CLMP shall be an agenda item at the toolbox meeting held by the Contractors. The meeting will be used to stress the importance of appropriate measures to manage contaminated soil.

1.4 Procedure for amendment of plan

This plan may require amendment as works proceed. Any revisions to this plan shall be approved by the Engineer and Environmental Scientist.

1.5 Statutory requirements

Special legislation for the project includes requirement for a contamination management plan.

1.6 Distribution of plan

Copies of this plan shall be held in the MPA office (175 Taranaki Street).

2 SITE DESCRIPTION

2.1 Location

The site is located on and north of Buckle Street, Wellington. The approximate areas of the proposed enabling works, interim road, haul road, laydown area, and underpass are shown on Figure 1 below, and the overlying park is shown on Drawing MP-11-90100 overleaf. The surrounding environment comprises:

- North: commercial buildings, school, Te Papa collections building.
- South: roadway, beyond which lie war memorial and residential buildings.
- East and west: roadways and commercial buildings.

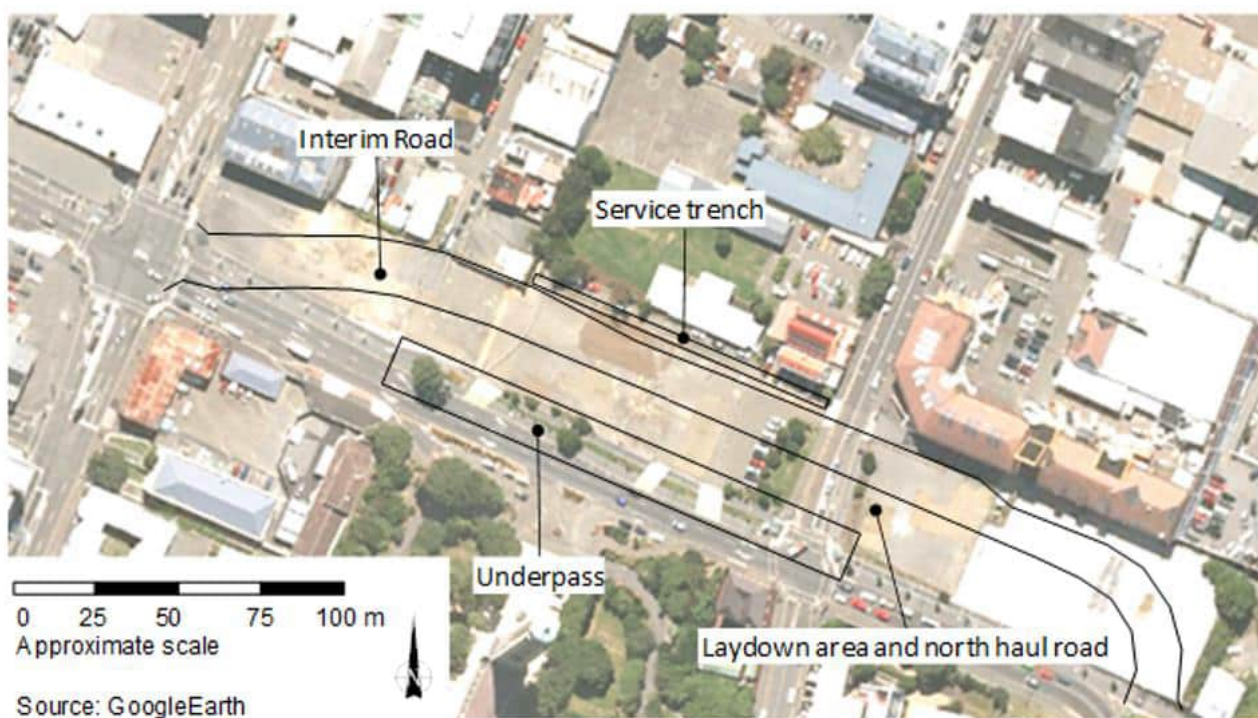


Figure 1: Location of works area (source: MP-11-90100)

2.2 Geology and hydrology

Based on geotechnical investigations carried out at the site July – August 2012, a greywacke rock ridge runs across the middle of the site trending to the northeast. The top of the ridge is mangled with residual soil. Valleys either side comprise silt and sand alluvial deposits with minor gravel. Test pits in October 2012 indicate imported fill in some locations, ranging up to 2 m deep.

The nearest surface water to the site is Wellington Harbour, approximately 1 km north of the site. Stormwater at and around the site discharges to the harbour via the WCC stormwater network.

The topography of the site slopes downward to the northwest and southeast. Based on local topography and surface water features, groundwater flow direction is expected to be toward the north-northeast.

Depth to ground water measured in geotechnical investigations varies from 2.4 to 4.5 m below ground level.

2.3 Site history

The history of the site is summarised in a report prepared by SKM, titled *Transport Improvements Around the Basin Reserve, Technical Report – Contaminated Land Investigations*. This report provides a partial site history for 50 Buckle Street, 60 Buckle Street, and the northeast corner of Buckle and Tory Streets. The site histories are not complete for these sites, and no histories are provided for other sites.

In 2 locations, hydrocarbon contaminated soil is likely present:

- 50 Buckle Street (former Mobil): underground fuel storage tanks removed in 2007. Petroleum hydrocarbons including BTEX (benzene, toluene, ethylbenzene, and xylenes) detected in soil beneath dispenser. This soil was left in place, because concentrations were below residential guidelines. While some BTEX will have degraded since 2007, residual contamination above background is likely still present. Based on the depth of the former tanks, this soil is not likely to be encountered during enabling works.
- Corner Buckle and Tory (former Hertz): underground 10,000-L petrol tank removed 2008. Trace toluene detected beneath dispenser in soil that was left in place.

There is no comment in desk study report on placement of fill material. Fill material is known to be present. The source of the fill is unknown. Contaminants commonly encountered in fill materials in Wellington include metals, polycyclic aromatic hydrocarbons (PAH), and if construction debris is present, asbestos.

3 DESCRIPTION OF PROPOSED WORKS

3.1 Enabling works – interim road

- Remove existing concrete and foundation debris.
- Excavate to finished level. Maximum depth from existing ground surface to proposed finished level approximately 1.6 m.
- Excavate a further 590 mm below finished level for subgrade preparation. In localised areas of weak material (if any), undercut a further 500 mm below subgrade preparation level.
- Import material to form subgrade and construct temporary road.

Groundwater is not expected to be encountered during the enabling works.

Approximate volume to be excavated: 7,700 m³.

3.2 Enabling works - service trench south of school

Soil to be excavated to install underground services. Groundwater is not expected to be encountered. Approximate volume to be excavated: 120 m³.

3.3 Enabling works – laydown area and haul road

Prepare laydown area and north haul road when interim road open. Assume excavation to 1 m depth.

3.4 Underpass

Method for earthworks to be confirmed. Key elements affecting CLMP comprise removal of existing road and structures, excavation up to approximately 10 m below existing ground level, and dewatering. Approximate volume to be excavated: 55,000 m³.

3.5 Park

Method for earthworks to be confirmed. Levels have been built up as part of the underpass works, then the work transitions into constructing pavements and finished surfaces. Key elements affecting CLMP comprise:

- Finished surfaces with potentially exposed soil, including grassed lawns, garden beds, and rain gardens. These are to be constructed with imported clean materials, comprising 4,000-5,000 m³ of imported hard fill and 3,800 m³ of imported topsoil for raingardens and turf areas.
- Cut to waste 1,450 m³ from the area of the Australian Memorial, interim road, and laydown area.
- Excavation and removal of surplus material in localised areas for pavement construction (e.g., cut to 400 mm depth), tree pits, and foundations for the Australian Memorial. Estimated excavation volumes

Groundwater is not expected to be encountered during the park works.

4 BASIS FOR GUIDELINE VALUES

Guideline values for soil and groundwater are summarised in Tables 2A and 2B.

4.1 Offsite disposal

4.1.1 Soil

For soil being disposed offsite, the following guidelines must be considered to ensure the appropriate disposal location is selected.

- **Cleanfill:** Wellington Regional Council follows the Ministry for the Environment's (MfE) definition of cleanfill. Material with concentrations of contaminants in excess of background cannot be disposed of as cleanfill. Background concentrations are provided in GWRC/URS, 2003, Determination of common pollutant background soil concentrations for the Wellington region; greywacke soil.
- **Landfill:** Material which cannot be disposed of as cleanfill must be disposed of at a consented landfill facility (e.g. Southern Landfill) provided landfill acceptance criteria can be met. The acceptance criteria for Southern Landfill generally follow MfE's *Waste Acceptance Criteria for Class A Landfills* (2003).

- **Pre-treatment:** If the landfill acceptance criteria are exceeded, material may require pre-treatment, either onsite or at a specialist waste treatment facility (e.g. Transpacific, Seaview) prior to being accepted at landfill.
- **Asbestos:** Asbestos-containing material is likely suitable for disposal at landfill, but will require special handling at the landfill (i.e. additional cost).

4.1.2 Groundwater

For groundwater being disposed offsite (e.g. dewatering) the following guidelines should be considered to ensure appropriate management.

- If groundwater is to be discharged to the sewer, contaminant concentrations are compared to guidelines provided in Wellington City Council (WCC)'s Trade Waste Bylaw (2004). The bylaw provides maximum concentrations permissible for an acceptable discharge to trade waste. If water contains concentrations above these guidelines, discharge to trade waste is prohibited. A permit would be required from WCC for any discharge to trade waste.
- If groundwater is to be discharged to Stormwater, contaminant concentrations are compared to the marine trigger values provided in the Australian and New Zealand Environment Conservation Council's Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC, 2000). Due to significant attenuation and dilution likely to occur between the site and the harbour, the trigger values for protection of 80% of species are used for the initial comparison.

4.2 Reuse on site

MfE's '*National Environmental Standards for Assessing and Managing Contaminants in Soil to Protect Human Health*' (NES (Soil)) provide soil contaminant standards (SCS) that define an adequate level of protection for human health for a range of land-uses.

- Soil to be placed in unpaved park areas shall be assessed against the SCS for recreational land use. Where SCS are not available, residential guidelines from New Zealand and international guideline documents shall be used, in accordance with MfE's recommended hierarchy of guidelines.
- Soil beneath paved areas: future site users will not be directly exposed to soil beneath the roadway and other paved areas. The accompanying document to the NES, '*Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health*' (the Methodology, MfE, 2011) notes that where there is no direct contact with soil there is no risk of exposure of future site users to non-volatile (e.g., metals, asbestos) and therefore no SCS for non-volatiles. Inhalation of volatile contaminants (e.g. PAH, which are semi-volatile) is a potential exposure pathway for future site users only if there are enclosed building spaces overlying contaminated ground, in which vapours could accumulate. Therefore, for soil to be placed beneath paved surfaces or beneath >0.6 m clean cover, PAH shall be compared to the guidelines for the inhalation only exposure pathway in '*Guidelines for Assessing and Managing Petroleum Hydrocarbon-Contaminated Sites in New Zealand*' (MfE, 1997).

4.3 Excavation worker protection

4.3.1 Soil

The NES does not contain guidelines for protection of excavation workers. The Methodology states that the worker protection guidelines (e.g. MfE and Ministry of Health's (MoH) '*Health and Environmental Guidelines for Selected Timber Treatment Chemicals*' (1997) and MfE's '*Guidelines for Assessing and Managing Petroleum Hydrocarbon-Contaminated Sites in New Zealand*' (1999)) are at least 10 times too conservative. To provide some assessment of contaminant concentrations in terms of worker exposure, results shall be compared with 10 times the worker protection guideline values.



Asbestos is assessed using guidance from the UK Interdepartmental Committee on the Redevelopment of Contaminated Land (*'Asbestos on Contaminated Sites, ICRL Guidance Note 64/85'*, second edition, October 1990). The action level is 0.001% asbestos by weight in soil.

4.3.2 Groundwater

Site workers may come into contact with groundwater at the site during dewatering. The MoH's *'Drinking-water Standards for New Zealand'* (NZDWS, 2005, revised 2008) is used as a conservative guideline for the protection of workers in relation to contact with groundwater.

Table 2A: Soil guideline values (mg/kg)

	Offsite disposal		Reuse on site		Excavation worker protection
	Expected background ¹	Landfill screening ²	Unpaved areas	Beneath paving or >0.6 m clean cap	
Arsenic	<2 - 7	100	80 ³	No limit	6,500 ⁵
Cadmium	<0.1 - 0.1	20	400 ³	No limit	-
Chromium	6 - 16	100 ⁴	2,700 ³	No limit	5,100 ⁵
Copper	3 - 25	100	>10,000 ³	No limit	2,600,000 ⁵
Lead	6 - 79	100	880 ³	No limit	-
Nickel	4 - 13	200	50 ⁶	No limit	-
Zinc	24 - 105	200	200 ⁶	No limit	-
TPH (C ₇ -C ₃₆)	<30 - 190	-	>20,000 ⁷	>20,000 ^{7a}	>20,000 ⁸
Anthracene	<0.002 - 0.05	-	>10,000 ⁹	>10,000 ^{9a}	-
Benzo(a)pyrene	<0.002 - 0.27	300	40 ^{3a}	>10,000 ^{7a}	250 ^{8a}
Fluoranthene	<0.002 - 0.55	-	>10,000 ⁹	>10,000 ^{9a}	-
Naphthalene	<0.002 - 0.01	200	63 ⁷	63 ^{7a}	>10,000 ⁸
Phenanthrene	<0.002 - 0.26	-	>10,000 ⁹	>10,000 ^{9a}	-
Pyrene	<0.002 - 0.57	-	1,600 ⁷	>10,000 ^{7a}	>10,000 ⁸

¹ GWRC. 2003. Determination of Common Pollutant Background Soil Concentrations for the Wellington Region, greywacke

² MfE. 2003. Waste Acceptance Criteria for Class A Landfills; screening criteria

³ NES (Soil). SCS for recreational pathway. 3a guideline is for BaP eq

⁴ Landfill acceptance value is for Cr(VI), test result is for total Cr

⁵ MfE and MoH. 1997. Health and Environmental Guidelines for Selected Timber Treatment Chemicals. Industrial, unpaved, maintenance, x10

⁶ Canadian Environmental Quality Guidelines. 2003. Residential/Parkland

⁷ MfE. 1999. *Guidelines for Assessing and Managing Petroleum Hydrocarbon-Contaminated Sites in New Zealand*. Residential use, sandy silt, surface soil, all pathways. 7a Residential use, inhalation only, sandy silt, surface soil.

⁸ MfE. 1999. *Guidelines for Assessing and Managing Petroleum Hydrocarbon-Contaminated Sites in New Zealand*. Maintenance/ excavation workers, sandy silt, x10. 8a guideline is for BaPeq

⁹ MfE. 1997. *Guidelines for Assessing and Managing Contaminated Gasworks Sites in New Zealand*. Parkland / recreational, adopted values. 9a inhalation only.

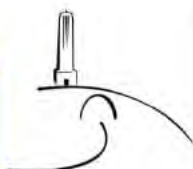


Table 2B: Groundwater guidelines (mg/L, dissolved)

	Worker protection	Off-site discharge	
	NZDWS ¹	ANZECC 80% ²	Trade waste ³
Arsenic	10	4.5 ⁴	5,000
Cadmium	4	36	500
Chromium	50	85 ⁵	5,000
Copper	2000	8	10,000
Lead	10	12	10,000
Nickel	20	560	10,000
Zinc	-	43	10,000
Anthracene	-	7	-
Benzo(a)pyrene	0.7	0.7	-
Fluoranthene	-	2	-
Naphthalene	-	120	-
Phenanthrene	-	8	-
Total PAH	-	-	50

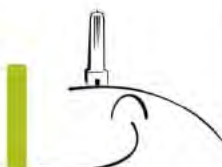
¹ Ministry of Health. 2005. *Drinking-Water Standards for New Zealand*, maximum acceptable values

² ANZECC. 2000. *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, guidelines for the protection of 80% of marine species

³ WCC Trade Waste Bylaw. 2004. Maximum concentrations for conditional trade waste discharges

⁴ ANZECC guideline is for As(V), test result is for total As. It is assumed all As in shallow groundwater is found as As(V).

⁵ ANZECC guideline value is for Cr(VI), test results are for total Cr



5 SITE CONDITION: GROUND CONTAMINATION

Historical activities have been identified that have potential to cause ground contamination, including placement of fill, underground fuel storage tanks, and use of fuels and oils.

5.1 Soil

All soil sample locations and soil profiles for each area are shown on figures in Appendix A.

Test pit depths and descriptions are summarised in Table 3.

Based on the site history and observations of fill material, selected samples were tested for metals and polycyclic aromatic hydrocarbons (PAH). Results and relevant guidelines are summarised in Tables 4A-4C.

Table 3: Test pit summary

Area	Test pits and dates of investigation	Target depth	Depth of fill (m)	Comment	Results table
Interim Road	29 August 2012 (VP16, VP17-18), 5 October 2012 (VP04), and 4 October 2012 (VP03, VP05, VP07-15)	the shallower of natural ground or the depth of proposed subgrade preparation	1 m to 2.4 m	deepest fill at the western end	5
Underpass	15 October 2012 (MR01-05), 17 October 2012 (MR06-09), and 30 November (MR10-11)	Natural ground	0.5 m to 1 m	deepest fill at the eastern end	6
Laydown area and North Haul Road	29 August 2012 (VP17-18), 15 October 2012 (MR01), and 30 November (HR01-03)	natural ground	0.5 m to 1 m	deepest fill at the eastern end	7
Service trench south of school	3 December 2012 (SL01-04).	1 m (proposed depth of service trench)	1 m	-	7

5.2 Groundwater

Samples of groundwater were collected from VP16 and VP18 on 31 August 2012. Due to the method of sample collection (i.e., grab sample from test pit), only non-volatile contaminants were tested. A ground water sample was collected using low-flow techniques from standpipe TT1 on 4 October 2012. The sample was tested for metals, semi-volatile organic compounds (SVOC) and volatile organic compounds (VOC). Results and guidelines are provided in Table 4.

No SVOC or VOC were detected. Lead and zinc concentrations were slightly higher than the ANZECC guidelines for protection of 80% of marine species. All other metals were lower than these guidelines. Based on the significant dilution occurring when stormwater enters the harbour, and assuming sediment is removed before discharge, it is likely that

discharge of this groundwater to stormwater would have no adverse effect on water quality in the harbour.

No special groundwater controls (other than sediment removal) would be needed on account of metal contamination.

Table 4: Preliminary groundwater testing results (mg/L)

	Arsenic	Cadmium	Chromium	Copper	Lead	Nickel	Zinc
VP16	0.0053	0.000073	0.0071	0.0118	0.036	0.0101	0.063
VP17	0.0029	0.000059	0.0167	0.013	0.027	0.01	0.062
TT01	<0.02	<0.001	<0.01	<0.01	<0.002	<0.01	<0.02
NZ DWS	0.01	0.004	0.006	2	0.01	0.08	-
WCC Trade waste	5,000	500	5,000	10,000	10,000	10,000	10,000
ANZECC 2000 (80%)	0.36	0.0008	0.040	0.0025	0.0094	0.017	0.031

Values in **bold** exceed NZ DWS



Table 5: Enabling works area: soil test results (mg/kg)

	VP01		VP02		VP03	VP04		VP05			VP07		TP704	VP08			VP09			VP10		TP703		VP11		VP12				VP13		VP14	VP15	TP701						Back-ground	
Depth (m)	0.3	0.6	0.3	0.45	0.5	0.3	0.7	0.2	0.4	0.9	0.1	0.5	0.4	0.1	0.4	0.6	0.1	0.5	0.9	0.2	1.5	0.5	0.9	0.7	1.3	0.05	0.3	0.6	1.5	0.1	1	0.3	0.1	0.3	0.6	1	1.75	2.1			
Arsenic	50	7	11	3	3	5	13	8	8	3	7	4	3	5	3	3	2	3	3	5	7	3	9	3	10	7	6	3	2	9	5	7	7	8	2	10	ND	ND	7		
Cadmium	0.59	0.19	0.34	0.12	ND	ND	ND	ND	0.12	ND	0.13	ND	0.10	0.13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.43	0.29	ND	ND	ND	0.11	0.17	0.14	0.12	ND	0.13	0.17	ND	0.2		
Chromium	44	17	26	12	18	20	18	19	19	25	20	21	21	19	19	20	3	20	22	19	15	15	16	17	15	19	18	18	18	21	15	16	17	16	12	16	12	8	16		
Copper	72	20	40	7	7	17	15	23	19	16	16	20	20	14	16	20	< 2	20	19	15	21	12	21	15	23	41	54	10	6	21	17	21	21	25	9	21	11	ND	25		
Lead	175	46	210	19.6	13	23	25	19.7	26	19.3	26	28	29	23	25	29	2.7	35	27	25	25	18.2	30	22	32	210	340	56	13.6	21	450	62	38	36	22	35	77	8.2	79		
Nickel	15	16	16	6	7	19	13	15	15	14	14	17	16	14	14	16	10	16	17	14	17	12	15	13	17	10	13	9	9	18	9	21	22	23	9	19	10	3	13		
Zinc	410	167	250	101	27	74	76	75	76	68	81	89	85	77	80	89	5	98	86	76	87	61	108	70	97	580	250	125	34	81	165	113	97	98	58	92	116	13	105		
Acenaphthene	0.03	0.12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	
Acenaphthylene	0.06	0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.26	0.05	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.11	0.04	ND	-
Anthracene	0.19	0.36	0.03	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.37	0.11	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.18	0.07	ND	0.05
Benzo[a]anthracene	1.29	0.76	0.19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.9	0.7	0.1	ND	ND	0.08	ND	ND	ND	ND	ND	0.74	0.39	ND	-	
Benzo[a]pyrene (BAP)	1.44	0.73	0.33	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	4	1.17	0.15	ND	ND	0.1	ND	ND	ND	ND	ND	1.04	0.42	ND	0.27	
Benzo[b]fluoranthene + Benzo[j]-fluoranthene	1.53	0.76	0.45	ND	ND	ND	ND	ND	ND	0.03	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.03	ND	ND	ND	ND	ND	4.4	1.56	0.19	ND	0.03	0.14	ND	ND	ND	ND	ND	0.91	0.41	ND	-	
Benzo[g,h,i]perylene	0.94	0.62	0.5	ND	ND	ND	ND	ND	ND	0.03	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.2	1.03	0.15	ND	0.03	0.11	ND	ND	ND	ND	ND	1.09	0.42	ND	-	
Benzo[k]fluoranthene	0.57	0.32	0.17	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2	0.67	0.09	ND	0.03	0.06	ND	ND	ND	ND	ND	0.42	0.19	ND	0.55	
Chrysene	0.91	0.74	0.2	ND	ND	ND	ND	ND	ND	0.03	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.4	0.76	0.13	ND	ND	0.09	ND	ND	ND	ND	ND	0.61	0.33	ND	-	
Dibenzo[a,h]anthracene	0.28	0.17	0.12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.74	0.23	0.03	ND	ND	ND	ND	ND	ND	ND	ND	0.13	0.05	ND	-	
Fluoranthene	1.78	1.55	0.29	ND	ND	ND	0.02	ND	ND	0.05	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.05	ND	ND	ND	ND	ND	3.7	1.23	0.22	ND	ND	0.15	0.03	ND	ND	ND	ND	ND	1.44	0.81	ND	-
Fluorene	0.06	0.26	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-		
Indeno(1,2,3-c,d)pyrene	0.85	0.58	0.37	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.7	0.77	0.11	ND	ND	0.08	ND	ND	ND	ND	ND	0.99	0.37	ND	-	
Naphthalene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.15	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01	
Phenanthrene	0.85	1.64	0.08	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.67	0.43	0.07	ND	ND	0.04	ND	ND	ND	ND	ND	0.24	0.18	ND	0.26	
Pyrene	1.94	1.64	0.36	ND	ND	ND	0.03	ND	ND	0.07	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.05	ND	ND	ND	ND	ND	4.2	1.33	0.26	ND	ND	0.16	0.03	ND	ND	ND	ND	ND	2.1	1.08	ND	0.57

Shaded: sample contains one or more contaminants above expected background concentrations. Background concentrations from GWRC 2003 Determination of common pollutant background soil concentrations for the Wellington region.
 ND = not detected.

Table 6: Underpass: soil test results (mg/kg)

Depth (m)	MR01					MR02		MR03		MR04			MR05			MR06	MR07		MR08	MR09	MR10	MR11		Background	ANZECC 1992 background
	0.2	0.35	0.6	0.75	1	0.35	0.5	0.4	0.7	0.2	0.4	0.7	0.2	0.4	0.6	0.7	0.5	0.8	0.4	0.3	0.7	0.3	0.6		
Arsenic	8	NA	6	5	4	8	7	6	8	7	8	3	6	4	12	4	13	5	4	5	4	8	7	7	0.2-30
Cadmium	0.16	NA	ND	0.9	ND	ND	0.2	ND	ND	ND	0.12	ND	0.11	0.1	ND	0.11	0.13	0.17	ND	0.46	ND	ND	0.21	0.2	0.04-2
Chromium	17	NA	15	18	22	17	14	21	22	25	15	15	21	18	21	19	18	18	21	15	19	23	13	16	0.5-110
Copper	23	NA	30	17	12	16	20	18	16	17	20	9	13	17	16	17	20	16	17	74	5	23	43	25	1-190
Lead	41	NA	39	970	26	20	164	30	23	24	26	21	32	34	18.6	34	61	43	25	360	15.9	48	185	79	2-200
Nickel	20	NA	15	10	9	14	15	14	15	15	16	5	14	12	15	14	14	9	14	14	4	17	6	13	2-400
Zinc	112	NA	82	530	49	69	190	84	72	70	84	26	81	89	68	100	115	149	82	340	27	105	123	105	2-180
Acenaphthene	ND	ND	ND	8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-
Acenaphthylene	ND	0.04	0.03	28	ND	0.04	0.27	0.05	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.08	ND	ND	0.06	-	-
Anthracene	ND	0.08	0.08	76	ND	0.06	0.36	0.12	ND	ND	ND	ND	ND	ND	ND	ND	0.03	ND	ND	0.13	ND	ND	0.11	0.05	-
Benzo[a]anthracene	0.02	0.28	0.27	103	0.03	0.39	4.8	0.18	ND	ND	ND	ND	ND	ND	ND	0.06	0.13	ND	ND	0.65	ND	0.04	0.99	-	-
Benzo[a]pyrene (BAP)	0.02	0.32	0.33	121	0.03	0.42	4.6	0.22	ND	ND	ND	ND	ND	0.02	ND	0.07	0.15	0.03	ND	0.84	ND	0.07	0.93	0.27	-
Benzo[b]fluoranthene + Benzo[j]fluoranthene	0.05	0.35	0.44	119	0.04	0.8	6.4	0.38	ND	ND	ND	ND	ND	0.03	ND	0.08	0.18	0.03	ND	1.15	ND	0.09	1.1	-	-
Benzo[g,h,i]perylene	ND	0.25	0.18	98	ND	0.26	3.8	0.13	ND	ND	ND	ND	ND	0.02	ND	0.06	0.15	0.04	ND	0.78	ND	0.09	0.86	-	-
Benzo[k]fluoranthene	ND	0.15	0.19	56	ND	0.36	3.2	0.16	ND	ND	ND	ND	ND	ND	ND	0.04	0.08	ND	ND	0.47	ND	0.05	0.48	-	-
Chrysene	0.02	0.26	0.31	100	ND	0.34	3.7	0.19	ND	ND	ND	ND	ND	ND	ND	0.06	0.13	ND	ND	0.67	ND	0.03	0.75	-	-
Dibenzo[a,h]anthracene	ND	0.04	0.03	15	ND	0.04	0.61	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.03	ND	ND	0.14	ND	ND	0.25	-	-
Fluoranthene	0.04	0.61	0.61	310	0.04	0.88	8.9	0.35	ND	ND	ND	ND	ND	0.03	ND	0.13	0.22	0.05	ND	1.27	ND	0.04	1.65	0.55	-
Fluorene	ND	ND	ND	25	ND	ND	ND	0.03	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-
Indeno(1,2,3-c,d)pyrene	ND	0.28	0.28	61	ND	0.37	4.9	0.2	ND	ND	ND	ND	ND	ND	ND	0.07	0.15	0.04	ND	0.81	ND	0.04	0.73	-	-
Naphthalene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01	-
Phenanthrene	ND	0.21	0.31	280	0.05	0.32	0.81	0.31	ND	ND	ND	ND	ND	ND	ND	0.04	0.08	ND	ND	0.54	ND	ND	0.73	0.26	-
Pyrene	0.05	0.64	0.72	350	0.04	0.88	10.1	0.4	ND	ND	ND	ND	ND	0.04	ND	0.14	0.24	0.07	ND	1.32	ND	0.08	2.2	0.57	-

Shaded: sample contains one or more contaminants above expected background concentrations. Background concentrations from GWRC 2003 Determination of common pollutant background soil concentrations for the Wellington region. ND = not detected. NA = not analysed.

Table 7: Laydown and North Haul Road, and service trench south of school: soil test results (mg/kg)

Depth (m)	Laydown area and North Haul Road				Service trench south of school								Expected background	ANZECC 1992 background
	HR01	HR02		HR03	SL01		SL02		SL03		SL04			
	0.1	0.3	0.95	0.6	0.3	1	0.4	0.9	0.1	0.4	0.6	1		
Arsenic	3	8	7	6	8	< 2	3	3	12	11	8	3	7	0.2-30
Cadmium	ND	ND	0.62	ND	0.11	ND	ND	ND	0.1	ND	ND	ND	0.2	0.04-2
Chromium	12	21	16	13	19	15	17	19	17	14	16	20	16	0.5-110
Copper	7	22	58	17	25	5	17	7	26	20	21	8	25	1-190
Lead	95	31	520	24	38	13.1	47	60	36	29	26	16	79	2-200
Nickel	5	14	9	13	17	6	9	6	18	15	15	7	13	2-400
Zinc	76	210	510	76	184	86	111	94	104	84	85	87	105	2-180
Acenaphthene	ND	ND	0.09	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-
Acenaphthylene	ND	ND	0.12	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-
Anthracene	ND	ND	0.41	ND	ND	ND	0.06	ND	ND	ND	ND	ND	0.05	-
Benzo[a]anthracene	0.03	0.04	1.97	ND	0.03	ND	0.29	0.03	ND	ND	ND	ND		
Benzo[a]pyrene (BAP)	0.06	0.05	1.93	ND	0.05	ND	0.31	0.05	ND	ND	ND	ND	0.27	-
Benzo[b]fluoranthene + Benzo[j]fluoranthene	0.06	0.05	2.3	ND	0.06	ND	0.35	0.04	ND	ND	ND	ND	-	-
Benzo[g,h,i]perylene	0.05	0.04	1.78	ND	0.06	ND	0.31	0.04	ND	ND	ND	ND	-	-
Benzo[k]fluoranthene	ND	0.03	0.94	ND	0.03	ND	0.16	ND	ND	ND	ND	ND	-	-
Chrysene	ND	0.03	1.49	ND	0.03	ND	0.19	ND	ND	ND	ND	ND	-	-
Dibenzo[a,h]anthracene	ND	ND	0.52	ND	ND	ND	0.1	ND	ND	ND	ND	ND	-	-
Fluoranthene	0.04	0.05	3.3	ND	0.04	ND	0.43	0.04	ND	ND	ND	ND	0.55	-
Fluorene	ND	ND	0.21	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-
Indeno(1,2,3-c,d)pyrene	0.04	ND	1.49	ND	0.05	ND	0.25	ND	ND	ND	ND	ND	-	-
Naphthalene	ND	ND	0.22	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01	-
Phenanthrene	ND	ND	1.95	ND	ND	ND	0.18	ND	ND	ND	ND	ND	0.26	-
Pyrene	0.05	0.06	4.3	ND	0.07	ND	0.57	0.05	ND	ND	ND	ND	0.57	-

Shaded: sample contains one or more contaminants above expected background concentrations. Background concentrations from GWRC 2003 Determination of common pollutant background soil concentrations for the Wellington region.
 ND = not detected.

6 CONTAMINATED SOIL MANAGEMENT

6.1 Overview of soil management

Management of soil is dependent on whether it is remaining in place, being excavated for reuse on site, or being excavated for off-site disposal.

Table 8: soil management overview

Material destination		Level of contamination	Management options
Remaining in place		Meets recreational guidelines	Can be used in paved or unpaved areas. Testing is needed to confirm soil meets guidelines.
		Exceeds recreational guidelines and/or contains asbestos	Can remain in place if it is to be paved. If surface is to be unpaved, must be covered with at least 0.6 m material that meets recreational guidelines. May require undercut to achieve final levels. Imported materials would need to be tested unless they are clean quarry fill.
To be excavated	Reuse on site	Meets recreational guidelines	Can be used anywhere on site. Need testing to confirm meets guidelines.
		Exceeds recreational guidelines and/or contains asbestos	Can be used under any paved surfaces. If unpaved, must be covered by at least 0.6 m thick cover of material that meets recreational guidelines
	Off-site disposal	Consistent with background	Can be disposed as clean fill. Need testing to confirm clean.
		Exceeds background but below landfill acceptance criteria	Must be disposed to landfill. Need testing to confirm meets landfill criteria, and need authorisation from landfill.
		Exceeds landfill acceptance criteria	Pre-treatment required before landfill disposal (either on-site for large quantities or for small quantities, hazardous waste contractor). Need testing to confirm pre-treatment successful.
		Contains asbestos	Must be disposed to landfill as asbestos waste.

6.2 Identification of contaminated soil

6.2.1 Enabling works (interim road)

The extent of contaminated fill in the enabling works area has been defined. No soil exceeds guidelines for recreational use. In terms of contamination, it may be used in any paved or unpaved areas. There may be geotechnical constraints on re-use.

Contaminated fill is present at:

- Fill east of VP03 – depth varies.
- Fill with brick fragments, down to 0.4 m depth at VP12 and below 0.6m depth at VP13.
- Fill below 0.6 m depth at VP701.

6.2.2 Service trench south of school.

No contaminated soil is present.



6.2.3 Laydown area and North Haul Road

The extent of contaminated fill has been defined. Contaminated fill is present east of VP03. At HR02 fill is clean to 0.9 m depth, but a black contaminated lens is present at 0.9 m depth.

No soil exceeds guidelines for recreational use. In terms of contamination, it may be used in any paved or unpaved areas. There may be geotechnical constraints on re-use.

If fill from the area east of VP03 is to be reused on site it must be placed above the water table.

6.2.4 Underpass

The extent of contaminated fill in the underpass area has been defined. Contaminated fill is present at and west of MR09 and at MR11. No soil exceeds guidelines for recreational use except for fill at 0.75 m depth at MR01.

Soil may be used above the groundwater table in any paved area (provided it is geotechnically suitable).

If excavated fill from around MR01, MR02, MR09, or MR11 is to be reused on site, it must be placed above the water table.

Fill from around MR01 cannot be reused in unpaved areas. All other soil excavated from the underpass could be reused in unpaved areas (pending geotechnical suitability).

6.2.5 Park

The Park overlies the areas described above, and soil management in each area is to be carried out in accordance with the requirements for these areas.

Where excavations for the park are into clean imported fill that has been placed as part of previous works, the clean fill can be placed in paved or unpaved areas, provided the source was clean quarried fill, and no contaminants have been allowed to contact the fill since placement, and provided it is geotechnically suitable.

6.3 Excavation procedures

6.3.1 Enabling works – Interim Road

Excavation areas are shown on Figure 2 in Appendix A. Chainage is taken from the Interim Road plans.

6.3.1.1 Interim Road from chainage 300 to 380

Contaminated fill in this area is characterised by gravel material:

- All fill is to be disposed to landfill. Once natural ground is exposed, remainder of excavation may be disposed as clean fill. Environmental scientist to observe excavations and confirm when natural ground has been reached.
- A clear procedure must be established on site to identify which trucks are transporting contaminated fill. This may comprise excavating all fill first, and noting the time period and the number of trucks leaving the site during this period. If fill is deeper in some area (e.g., eastern end) may have dedicated trucks transporting contaminated fill. Follow contaminated soil transport procedures at Section 6.8.

6.3.1.2 Interim Road from chainage 140 to 300

All material is clean and may be taken to clean fill.

If unexpected contamination is identified (e.g., odour, staining) follow procedures in Section 8.

6.3.1.3 Interim Road from chainage 100 to 140

Contaminated fill in this area is characterised by presence of red-brick fragments. It is present at different depths in this area (below 0.6 m at VP13; from surface to 0.4 m at VP12). Either:

- Manage all fill cut from this area as contaminated fill, OR
- Environmental scientist to be present on site to identify materials suitable for clean fill (based on observations in VP12 and VP13).

Contaminated fill must be transported following procedures at Section 6.8.

6.3.1.4 Interim Road from chainage 35 to 100

Fill to 0.6 m below finished level is clean and may be taken to clean fill.

If undercut is required (i.e., >0.6 m below finished level), the extra fill excavated must be taken to landfill. Follow contaminated soil transport procedures at Section 6.8.

6.3.2 Service trench south of school

All material to be excavated from the service trench is clean and may be taken to clean fill.

If unexpected contamination is identified (e.g., odour, staining) follow procedures in Section 8.

6.3.3 Laydown area and North Haul Road

Excavation areas discussed below are shown on Figure 2. Chainage is taken from the Underpass plans. For all areas:

- Contaminated fill must be transported following procedures at Section 6.8.
- If unexpected contamination is identified (e.g., odour, staining) follow procedures in Section 8.

6.3.3.1 Laydown area works from chainage 460 to 520

All fill is to be disposed to landfill.

Once natural ground is exposed, remainder of excavation may be disposed as clean fill.

6.3.3.2 Laydown area works from chainage 420 to 460

This area is mostly clean, with a thin lens of contaminated black clay at 0.9 m. The clay lens must be managed as contaminated.

Fill above the clay and natural ground underlying the clay can be managed as clean fill.

6.3.3.3 Laydown area works from chainage 300 to 420

All material is clean and may be taken to clean fill.

6.3.3.4 Laydown area works from chainage 240 to 300

All fill is to be disposed to landfill.

Once natural ground is exposed, remainder of excavation may be disposed as clean fill.

6.3.4 Underpass

Excavation areas discussed below are shown on Figure 2. Chainage is taken from the Underpass plans. For all areas:

- Contaminated fill must be transported following procedures at Section 6.8.
- If unexpected contamination is identified (e.g., odour, staining) follow procedures in Section 8.

6.3.4.1 Underpass from chainage 480 to 520

Fill in this area is contaminated. Once natural ground is exposed, remainder of excavation may be disposed as clean fill.

6.3.4.2 Underpass from chainage 300 to 480

All material is clean and may be taken to clean fill.

6.3.4.3 Underpass from chainage 200 to 300

Fill in this area is contaminated. Once natural ground is exposed, remainder of excavation may be disposed as clean fill.

Note: fill material from chainage 230 to 260 exceeds parkland guidelines and may not be reused on site in unpaved areas (see Figure 2).

6.3.5 Park

The Park overlies the areas described above, and soil management in each area is to be carried out in accordance with the requirements for the relevant underlying area.

Where excavations for the park are into clean imported fill that has been placed as part of previous works, the clean fill can be placed in paved or unpaved areas, provided the source was clean quarried fill, and no contaminants have been allowed to contact the fill since placement, and provided it is geotechnically suitable.

6.4 Stockpiling

Where possible, soil shall be loaded directly into trucks for transport. If stockpiling cannot be avoided:

- Stockpiles of contaminated soil shall be covered with tarpaulins to prevent contaminated stormwater runoff, or provided with separate bunding from clean soil stockpiles to prevent cross-contamination.
- If asbestos is known or potentially present, stockpiles shall be covered with tarpaulins or kept damp using a water spray to prevent generation of dust.

6.5 Odour control

No odorous soil has been identified in the area of enabling works, so no routine odour controls for contaminated soil are required. See Section 5.3 for contingency actions in the event unexpected odorous material is encountered.

6.6 Dust control

Dust shall be controlled as necessary through use of water spray via a hose and water truck or onsite water tap.

Excessive water spraying shall be avoided to prevent generation of runoff water or leachate.

6.7 Asbestos containing material

If asbestos containing fill is identified, the following procedures shall be followed:

- The time that asbestos containing material is exposed shall be minimised.
- Asbestos material shall be kept damp at all times when it is exposed.
- If asbestos containing material is exposed, operators shall take appropriate precautions, as advised by the Occupational Health and Safety Adviser (e.g., dust masks, half-respirators).
- If asbestos containing fill is to be reused on site it must be placed beneath a minimum of 0.6 m clean material.
- If asbestos containing fill is to be disposed offsite:
 - It must not be disposed as clean fill.
- The landfill operator shall be advised of the presence of asbestos (special handling requirements).
- Asbestos containing material shall be kept separate from other fill material to minimise the amount of material that has to be disposed as asbestos waste (asbestos waste has a significantly higher landfill disposal cost).

6.8 Transport and disposal of contaminated soil

There must be no discharge of dust from trucks carrying contaminated soil. Trucks shall be managed to prevent discharge of dust. Depending on the soil/fill type being transported, this may include covering or dampening.

Where possible, truck wheels shall be kept away from areas of exposed contaminated soil on site.

If truck wheels contact exposed contaminated soil, wheels shall be brushed or washed if necessary before exiting the site, to prevent discharge of contaminated material.

All shipments of soil to landfill shall be tracked using a manifest procedure to ensure all soil shipped from the site is received at the landfill.

Landfill receipts shall be retained for inclusion in the Site Validation Report (see Section 7).

6.9 Imported material

Clean quarry sourced fill does not need to be tested, but documentation must be maintained to verify the source of the fill, to be included in the Site Validation Report.

Imported fill that is not clean quarried fill must be tested for metals and PAH at a rate of 1 sample per 100 m³. Imported fill must meet the guidelines for recreational site use if it is to be used in unpaved areas. The source of all non-quarried imported fill materials and records of test results and placement location must be documented for inclusion in the Site Validation Report.

7 WATER MANAGEMENT

7.1 Stormwater management

Stormwater shall be managed in accordance with the Erosion and Sediment Control Plan for the works.

During any periods when contaminated soil is exposed, any sediment collected in sediment control devices shall be managed as contaminated material, unless testing shows otherwise.

7.2 Groundwater management

The excavation for enabling works is not expected to extend below the groundwater table. Monitoring has shown that groundwater quality entering the excavation will meet surface water quality guidelines and drinking water standards. Therefore, no additional controls are proposed to manage groundwater due to contamination.

8 CONTINGENCY PLAN

8.1 Unexpected contamination encountered

If unexpected contamination is encountered, an Environmental Scientist shall inspect the potentially contaminated material.

If the material has to be excavated, it must be stockpiled separately from clean materials to prevent cross contamination. Potential to generate contaminated stormwater runoff and dust generation must be minimised.

Depending on the outcome of the Environmental Scientist's assessment, the material may need to be held on site pending the results of testing.

8.2 Unexpected structures encountered

No underground storage tanks are known to be present. However, based on the commercial history of the site, there is potential that unexpected structures may be encountered.

Note: the archaeology plan has specific requirements regarding artefacts encountered.

Underground storage tanks and associated pipework

If underground storage tanks or chemical transfer pipework is encountered:

- Check for presence of product. If product is present, it must be removed (e.g., vacuum truck, specialist waste disposal contractor). Keep records of disposal location (dated receipts).
- Environmental Scientist to observe structure before removal and base of excavation after structure is removed, and complete MfE tank removal form to document the process. This may require stockpiling of contaminated soil pending test results.
- Tank must be disposed to an appropriate facility, or via a specialist tank disposal company. Keep records of disposal location.

8.2.1 Historical foundations (concrete, brickwork)

In accordance with MfE guidelines, the following materials are acceptable as clean fill:

- Cured (weathered) asphalt.
- Bricks, glass, tiles, and ceramics.
- Unreinforced concrete. Reinforced concrete is acceptable provided reinforcing steel is cut off at the concrete face.
- Fibre cement building products, provided they do not contain asbestos. These materials must be tested for asbestos before disposal to clean fill. This may require stockpiling of these materials pending test results.

If asbestos containing building materials are encountered (e.g., Super 6 roofing materials, thermal pipe insulation), these must be removed by an authorised contractor and the works documented.

8.3 Odour

If odorous material is encountered:

- Stop the discharge of odour by covering the material.
- Environmental Scientist to inspect the material and advise on further actions. This may include testing or field screening.
- Minimise the time odorous excavations are exposed.

8.4 Extreme rainfall events

The potential outcome of an extreme rainfall event is a discharge of contaminated sediment to stormwater. The contingency actions provided in the Erosion & Sediment Control Plan, prepared under separate cover, are applicable to clean and contaminated soil. If contaminated material enters sediment control devices, then any sediment removed from the control devices must be managed as potentially contaminated material (i.e., dispose to consented landfill, or test to check whether material is clean).

8.5 Review

Immediately following an event where contingency action was required, a review of the circumstance leading to the event will be undertaken, along with the response and its effectiveness. Based upon the outcome of the review, the CLMP may be updated.

9 HEALTH AND SAFETY

Contaminated soil is known to be present on the site. Testing has not shown levels that exceed worker protection standards. As a precaution, measures shall be taken during earthworks when contaminated soil is present to reduce or eliminate potential human health effects arising from exposure to contaminated soil. This shall be achieved through adequate site establishment prior to the works, and the use of appropriate health and safety procedures and personal protective equipment (PPE).

9.1 Site establishment

The site is fenced and secure, preventing the general public entering the site.

Workers shall receive an induction outlining the nature of the potential contamination, possible exposure pathways, and PPE to prevent exposure.

9.2 General safety requirements

The contractor shall prepare and a site specific health and safety plan prior to commencement of remedial works. The plan should be based on the New Zealand Department of Labour publication Health and Safety Guidelines on the Cleanup of Contaminated Sites. This CLMP focuses on hazards associated with contamination only.

9.3 Hazard identification

The following potential hazards specific to contamination may be encountered:

- Exposure to contaminated fill by skin contact.
- Incidental ingestion by eating or drinking in unsafe areas, or inadequate hygiene.
- Inhalation of dust.

9.4 Hazard management

The following practices shall be followed to minimise hazards associated with contamination:

- All workers should minimise skin exposure to soil, including wearing disposable gloves if handling contaminated soil.
- No eating, drinking, or smoking shall be permitted in the excavation area if contaminated material is exposed. Eating, drinking, and smoking shall only be permitted offsite or well away from excavation areas.
- Hand to mouth and hand to face contact shall be avoided on site.
- All personnel are to remove protective clothing (e.g., gloves), and wash hands prior to eating, drinking, or smoking.
- Dust masks shall be available at all times. Dust is to be controlled using water spray, therefore the intention to provide dust masks is for workers to use masks as necessary while damping dust.
- If asbestos-containing material is identified, material shall be kept damp or covered to prevent generation of dust.
- If asbestos containing material is exposed, operators shall take appropriate precautions, as advised by the Occupational Health and Safety Adviser (e.g., dust masks, half-respirators)



10 VALIDATION

10.1 Monitoring

During the works, a daily inspection shall be made by the contractor of any areas of exposed contaminated soil including contaminated soil stockpiles. This includes areas pending testing to confirm whether contamination is present. Inspections shall check:

- No discharges of dust or odour.
- Contaminated soil stockpiles are covered to prevent stormwater contacting soil, or all stormwater runoff from contaminated or potentially contaminated areas is contained.

All contaminated material that is disposed off site shall be monitored by recording all truck movements carrying contaminated soil.

10.2 Recordkeeping

The following records will be maintained in the Site Office:

- Areas of known contamination.
- Daily inspections – the daily record shall identify the specific areas being excavated and whether material disposed off site is sent to clean fill or landfill.
- Weekly reports – prepared by the Engineer, including instructions to Contractor.
- Risk register records.
- During the period when contaminated soil is present on site the following additional records shall be maintained:
- Confirmation of set-out of excavation areas/delineation of contaminated soil, by survey and photographic records.
- Records of all deliveries of contaminated soil to landfill, including any sediment removed from stormwater treatment devices.
- If fill requiring pre-treatment is to be treated on site, records of the pre-treatment process employed, confirming that the process followed was the same process as used in trials (TCLP testing).
- Test results from any accumulated stormwater discharged from the site (if any).
- Records of volumes of contaminated water removed from the site by vacuum truck (if any) and disposal facility.

10.3 Reporting

On completion of the works, a site validation report compiling all records shall be prepared in accordance with MfE's *Contaminated Land Management Guidelines No. 1 - Reporting on Contaminated Sites in New Zealand* (MfE 2003).

11 APPLICABILITY

This report has been prepared for the benefit of MPA with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose without our prior review and agreement.



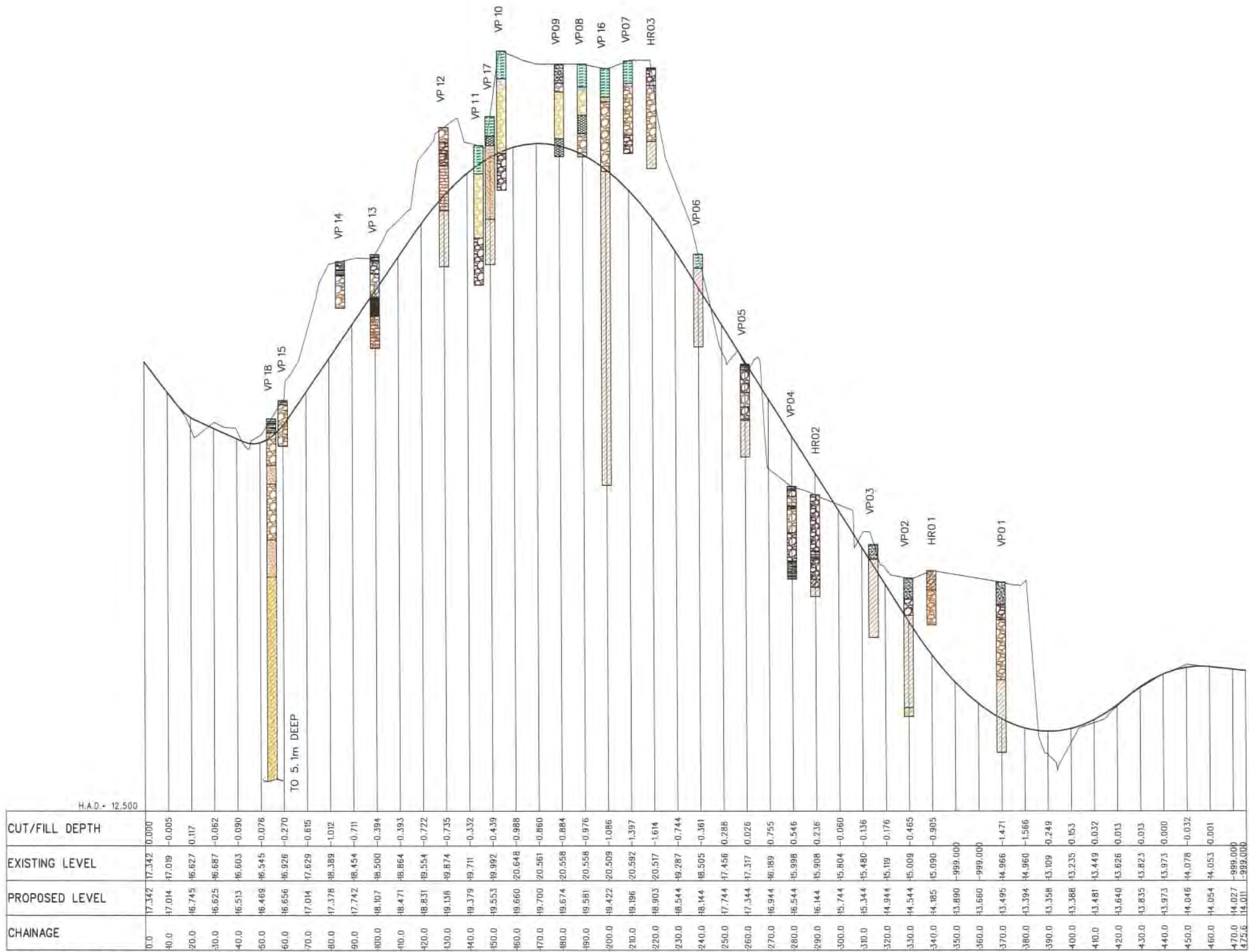
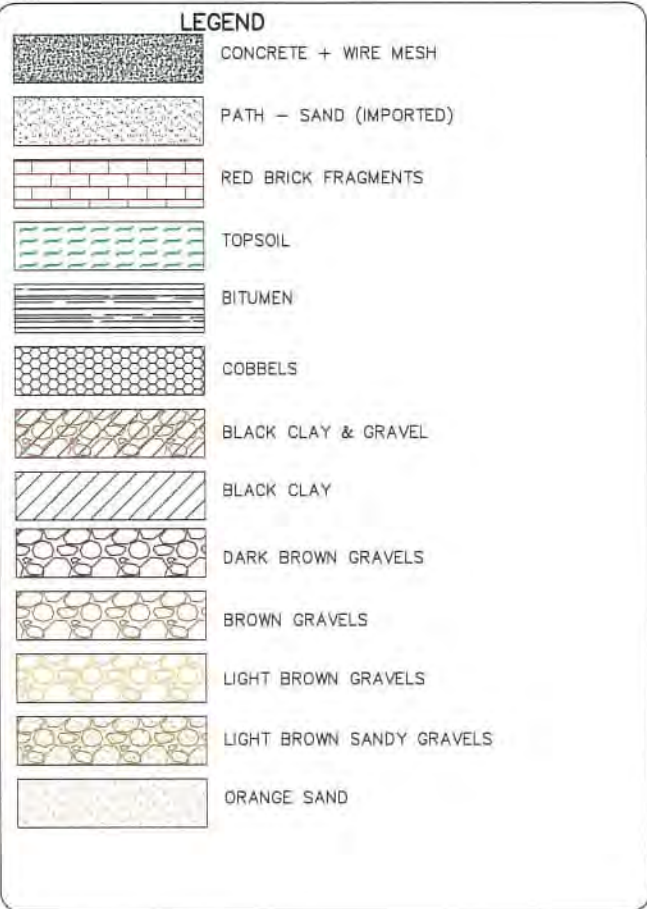
APPENDIX A: Figures

- Investigation locations
- Cross sections

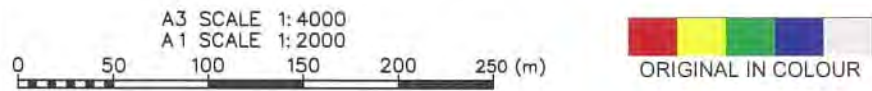




										Tab EW-14-900		 NZ TRANSPORT AGENCY WAKA Kaitiaki			NOTES: 1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.				WELLINGTON INNER CITY IMPROVEMENTS				Approved NOT FOR CONSTRUCTION		
										Scales 1:500 (A1) 1:1000 (A3)					ENABLING WORKS - 14 TEMPORARY WORKS MEMORIAL PARK UNDERPASS CONTAMINATED LAND MANAGMENT PLAN				Status FOR INFORMATION						
										Original Size A1					Document Controller Check: _____ Date: _____				Drawing Number EW-14-900		Revision A				
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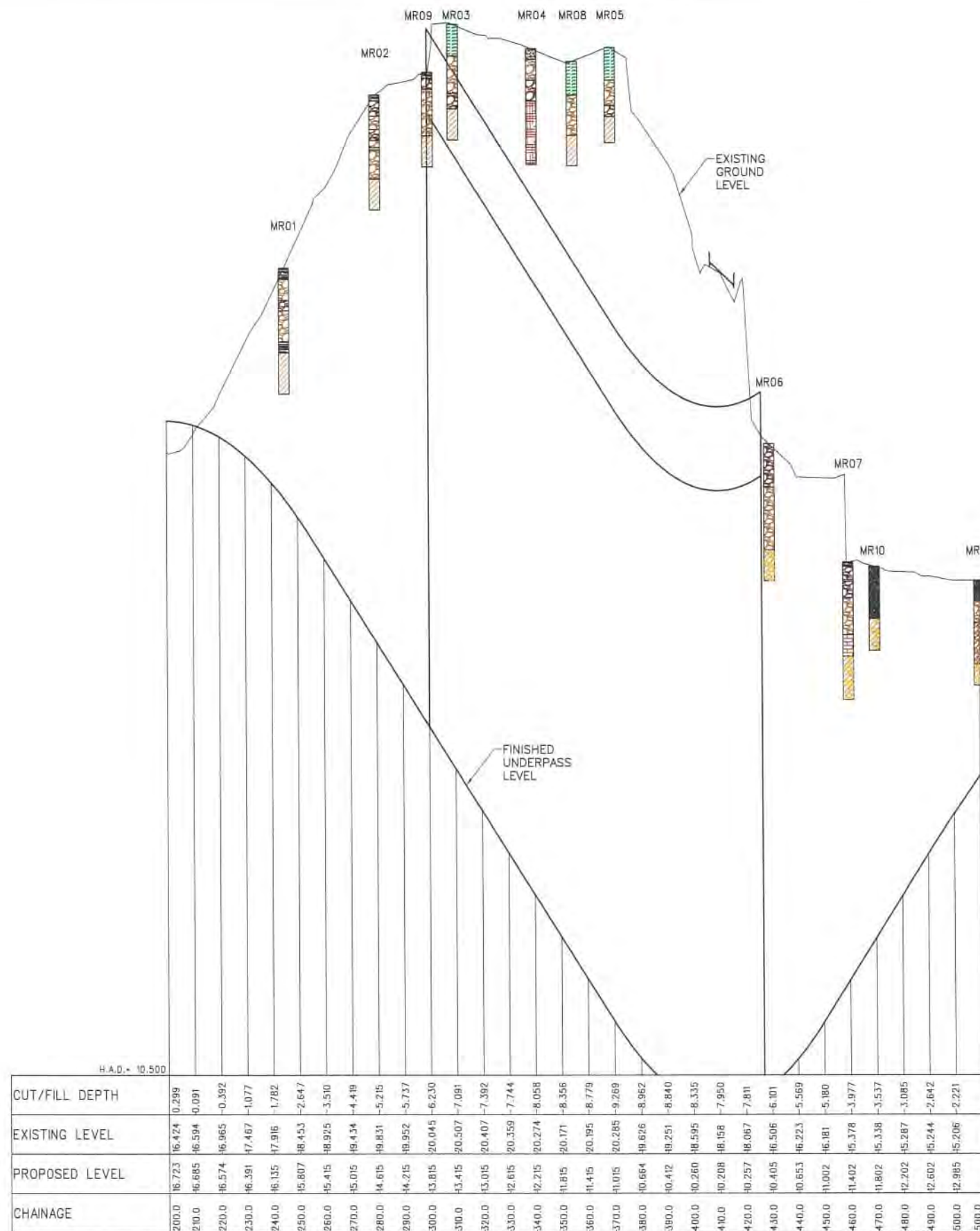
Memorial Park Alliance

NOTES:
1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.

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WELLINGTON INNER CITY IMPROVEMENTS	Approved
ENABLING WORKS - 14 TEMPORARY WORKS	NOT FOR CONSTRUCTION
MEMORIAL PARK UNDERPASS	Status FOR INFORMATION
CONTAMINATED LAND MANAGEMENT SECTION	Drawing Number
	EW-14-901
	Revision A



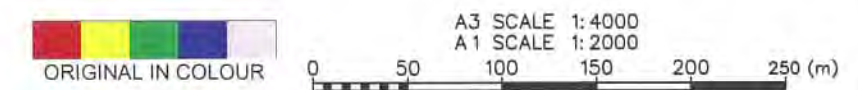
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LEGEND

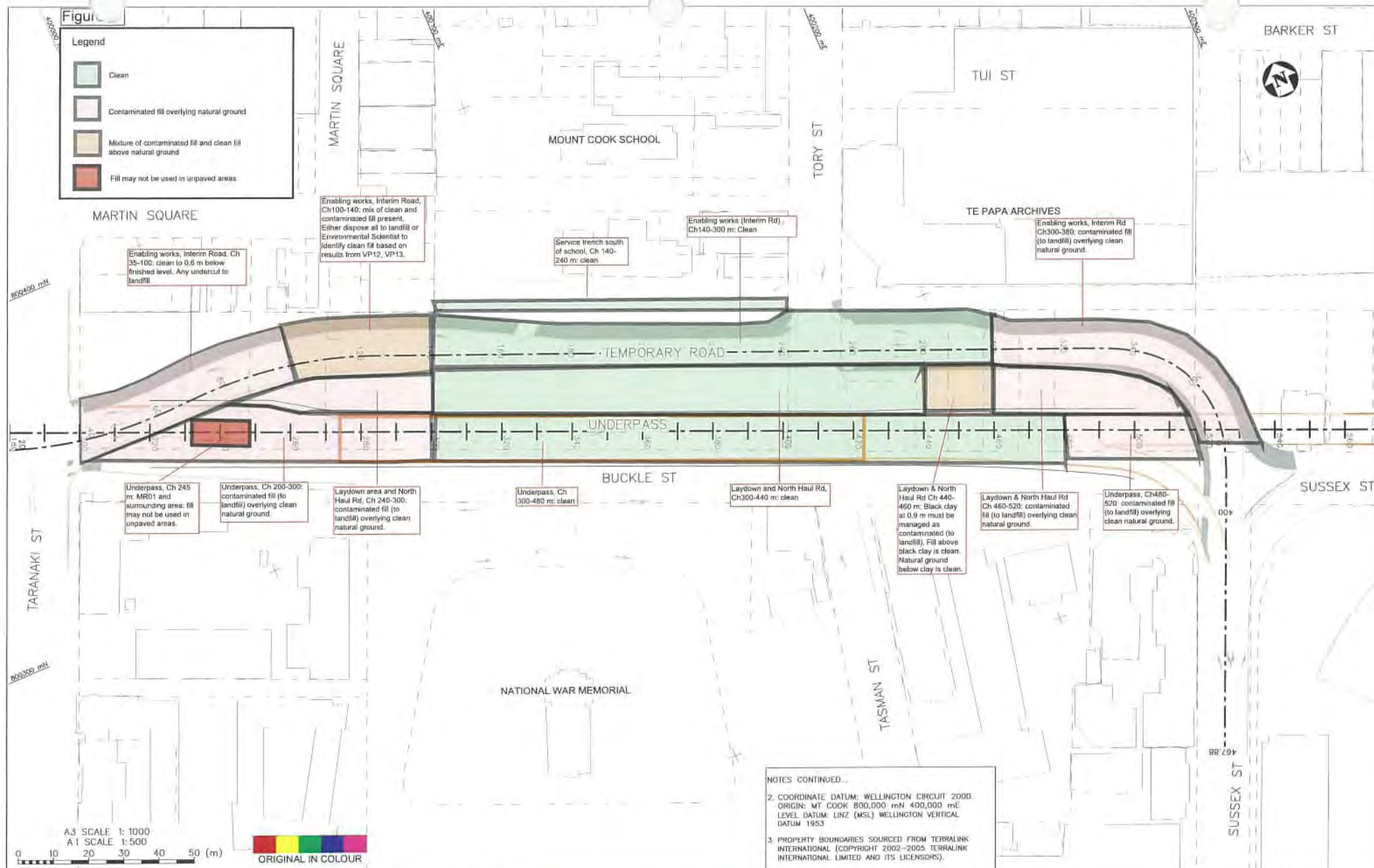
- CONCRETE + WIRE MESH
- PATH - SAND (IMPORTED)
- RED BRICK FRAGMENTS
- TOPSOIL
- BITUMEN
- COBBELS
- BLACK CLAY & GRAVEL
- BLACK CLAY
- DARK BROWN GRAVELS
- BROWN GRAVELS
- LIGHT BROWN GRAVELS
- LIGHT BROWN SANDY GRAVELS
- ORANGE SAND

LEGEND

- ORANGE BROWN SILT (NATURAL GROUND)
- ORANGE BROWN SILT & GRAVEL (NATURAL GROUND)



										Tab EW-14-902	 Memorial Park Alliance 	NOTES: 1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.		WELLINGTON INNER CITY IMPROVEMENTS		Approved NOT FOR CONSTRUCTION	
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A FIRST ISSUE FFAN PEK										Original Size A1		Document Controller Check: _____ Date: _____ This drawing is not to be used for construction purposes unless signed approved and issued For Construction		Drawing Number EW-14-902		Revision A	
Rev Revision Description FFAN PEK										Drawn Checked Designed Approved Date							
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A3 SCALE 1:1000 A1 SCALE 1:500		0 10 20 30 40 50 (m)		ORIGINAL IN COLOUR	
NOTES CONTINUED...		2. COORDINATE DATUM: WELLINGTON CIRCUIT 2000. ORIGIN: MT COOK 800,000 mN 400,000 mE LEVEL DATUM: LINZ (MSL) WELLINGTON VERTICAL DATUM 1953		3. PROPERTY BOUNDARIES SOURCED FROM TERRALINK INTERNATIONAL (COPYRIGHT 2002-2005 TERRALINK INTERNATIONAL LIMITED AND ITS LICENSORS).	
NOTES:		1. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.		DRAFT	
NOT FOR CONSTRUCTION		This drawing is not to be used for construction purposes unless signed and issued for construction		WELLINGTON INNER CITY IMPROVEMENTS	
CLMP LAYOUT PLAN		Approved		Status TARGET COST DESIGN	
Drawing Number EW 14 903		Revision A			



3 February 2012
Project No. 42780870

Multi Civil Contractors Ltd
19 Jamaica Drive
Grenada North
Wellington

Attention: Jim Ginty
Director

Dear Jim

**Subject: Underground Diesel Storage Tank Decommissioning at Bogarts Corner,
Corner of Ellice Street and Cambridge Terrace, Wellington**

This letter and the accompanying tank pull report have been prepared for Multi Civil Contractors Ltd (Multi Civil) by URS New Zealand Ltd (URS). They document soil sampling associated with the removal of a 4000 L underground storage tank (UST) and a petroleum hydrocarbon residuals assessment undertaken at Bogarts Corner, corner of Ellice Street and Cambridge Terrace, Wellington.

1 Risk Assessment Context

The assessment has been conducted in accordance with the Ministry for the Environment "Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand", 1999, hereafter referred to as the Oil Industry Guidelines.

A commercial building with several shops was previously located at the site. The site building was demolished the week prior to the tank removal. The diesel UST associated with the site had been used to supply a diesel boiler for the heating of a site building.

URS understand that the site is to be developed into a recreational park. In view of this, the assessment has been conducted using Oil Industry Guidelines Soil Acceptance Criteria for both Commercial/Industrial and Residential Land Uses as screening criteria against which to benchmark soil quality. The Commercial/Industrial Criteria are protective of the former and current site use. The Residential Criteria are considered to be conservatively protective of future recreational users of the site; there are no Recreational criteria given in the Oil Industry Guidelines.

Groundwater has been classified as "not sensitive" according to the methodology of the Oil Industry Guidelines (Section 5.2.3).

2 Site Works

Multi Civil removed the 4,000 L diesel UST on 10 January 2012.

URS collected ten soil samples during excavation and removal of the UST; one sample was collected from bedding material from the tank pit, one sample was collected from beneath the base of the tank and eight samples were collected from the walls of the tank pit. No lines associated

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Wellington 6011 PO Box 3367
Wellington 6140 New Zealand
T: 64 4 496 3750 F: 64 4 496 3755

Jim Ginty
Director
3 February 2012
Page 2

with the UST were present at the time of decommissioning. Bedding material was replaced within the tank pit on completion of sampling.

Six soil samples were submitted for total petroleum hydrocarbon (TPH) analysis at RJ Hill Laboratories in Hamilton. TPH concentrations in samples representing soil remaining onsite ranged from < 70 mg/kg to 1990 mg/kg. Slight hydrocarbon odours were noted in bedding material and in a shallow sample from the east wall of the tank pit.

3 Analytical Results Comparison with Guidelines

The analytical results for all samples representing soil remaining onsite comply with the Oil Industry Guidelines Tier 1 Soil Acceptance Criteria for Commercial/Industrial and Residential Land Uses.

4 Closure

We trust that this report meets your requirements. Please do not hesitate to contact the undersigned should you wish to discuss it.

Yours sincerely
URS New Zealand Limited



Suzanne Lowe
Senior Environmental Scientist



Kevin Tearney
Principal

Attachments: UPSS Decommissioning Report

UPSS DECOMMISSIONING – BOGARTS CORNER

REQUESTED BY: MULTI CIVIL CONTRACTORS LTD

COMMERCIAL

UPSS ENVIRONMENTAL INVESTIGATION							
Site address:	➤ Corner Ellice Street and Cambridge Terrace, Wellington						
Legal Description (Lot & DP):	➤ Section 1248, Town of Wellington						
Zoning:	➤ Open Space B						
New Zealand Topographical Map Reference:	➤ NZTM 1749545 E, 5425620 N						
URS representative on site:	➤ Rachael Forrest						
Date on-site:	➤ 10/01/2012 8:00 am to 10:30 am						
Purpose of investigation and Site future	➤ ☒ Complete tank pull ☐ Partial tank pull ☐ Upgrade ➤ ☐ Client Operated ☐ Non Client Operated ☒ Other The proposed land use of the site is a recreational park.						
Description of investigation methodologies:	➤ As per standard URS procedures						
Names of contractors and their responsibilities:	➤ Multi Civil Contractors Ltd – UPSS decommissioning ➤ Opus International Consultants Ltd - Archaeologist						
Name of Council Representative/Test Certifier onsite:	➤ Not onsite while URS was present						
Date and time that she/he was on site:							
When did contractor notify the Council Representative/Test Certifier of the tank pull?	➤ Unknown						
Photographs taken:	➤ ☒ Yes, appended ☐ No						
Weather conditions:	➤ Sunny and warm, no wind.						
SITE AND ENVIRONS DESCRIPTION							
- Site use prior to tank removal (type of site) - No. of tank pits - No. of tanks - Site ground surface covering - Site surface runoff patterns/collection - Are there underground services present? - Could they affect migration? - Lithology, soil type, description - Neighbouring land uses: - Topography - Nearby surface water bodies and distance to: - Surface water use: - Was groundwater encountered at the site?	➤ ☐ Service Station ☐ Workshop ☒ Commercial ☐ Truckstop ☐ Other: ➤ One ➤ One ➤ Currently unsealed over tank and remainder of site. ➤ Surface runoff currently soaks to ground in the vicinity of the tank pit. ➤ None observed in the vicinity of the tank pit. ➤ ☒ Yes ☐ No The lower permeability of the shallow natural silty sand soils compared to service trench bedding material could create a permeability differential which would enable preferential migration of contaminants if present.						
	<table border="1"> <thead> <tr> <th>Depth (m)</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0.0 – 1.0</td> <td>Silty SAND, soft, moist, loose, dark brown</td> </tr> <tr> <td>1.0 – 2.5</td> <td>Silt and Silty Clay, firm, dry to moist, light grey with orange mottles.</td> </tr> </tbody> </table>	Depth (m)	Description	0.0 – 1.0	Silty SAND, soft, moist, loose, dark brown	1.0 – 2.5	Silt and Silty Clay, firm, dry to moist, light grey with orange mottles.
Depth (m)	Description						
0.0 – 1.0	Silty SAND, soft, moist, loose, dark brown						
1.0 – 2.5	Silt and Silty Clay, firm, dry to moist, light grey with orange mottles.						
	➤ North – Commercial. ➤ South – Ellice Street, beyond which is the Basin Reserve. ➤ West – Commercial. ➤ East – Commercial. ➤ Flat ➤ ☐ <100m ☒ >100m Wellington Harbour is located approximately 1 km north of the site. ➤ ☒ Shipping ☐ Industrial ☐ Stock ☐ Irrigation ☐ ➤ Aquaculture ☒ Recreation ☐ Drinking ☐ Not utilised ☐ ➤ Not known ➤ ☐ Yes ☒ No Groundwater was not encountered in the excavation to a maximum exposed depth of 2.5 m bgl below ground level (bgl).						
- Are there any wells on the site? - Likely regional groundwater flow direction: - Distance to bores or wells outside the site boundaries:	➤ ☐ Yes ☒ No ➤ Groundwater is inferred to flow north towards the Wellington Harbour. ➤ A bore search undertaken by Greater Wellington Regional Council indicates there are 24 registered bores within a 1 km radius of the site. 23 bores are drilled to depths of 5 to 8 m bgl for groundwater monitoring purposes and one is for public supply and drilled to a depth of 151 m bgl.						

TANK INVENTORY									
Tank/Pit ID	Status	Reason for removal	Capacity (litres)	Contents (Product)	AST or UST	Age (years)	Construction	Condition	Tank pit construction (lined/unlined)
1/1	Removed	Closure	4,000	Diesel	UST	Unknown	Steel	Good, some rust	Unlined
VISUAL AND OLFACTORY PETROLEUM HYDROCARBON IMPACTS AND SAMPLING									
In relation to UPSS elements	Element Visually Observed		Samples Taken		Evidence of contamination in the area of the exposed element (odour, staining, SPH etc)				
	Yes	No	Yes	No					
• Walls of tank pits	☒	☐	☒	☐	➤ Slight diesel odours were noted in the shallow samples collected from the east wall of the tank pit.				
• Tank pit bedding material	☒	☐	☒	☐	➤ Slight odour observed.				
• Tank Pit Base	☒	☐	☒	☐	➤ No visual or olfactory evidence of hydrocarbon impact noted.				
• Groundwater in pit	☐	☒	☐	☒	➤ Groundwater not encountered in the excavation to a maximum exposed depth of 2.5 m bgl.				
• Under dispensers	☐	☐	☐	☐	➤ NA — no dispensers used.				
• Around dispensing lines	☐	☐	☐	☐	➤ NA — no dispensers used.				
• Around remote fills	☐	☐	☐	☐	➤ NA — Direct fill.				
• Around fill lines	☐	☐	☐	☐	➤ NA — Direct fill.				
• Around vent lines	☐	☐	☐	☐	➤ NA — vent was directly over tank.				
• Was SPH noted on site:				➤ ☐ Yes ☒ No					
• Signs of surface staining:				➤ ☐ Yes ☒ No					
• Condition of vegetation around the site:				➤ Healthy where present					
• Was impacted soil/bedding material removed from site?				➤ ☐ Yes ☒ No					
SAMPLE DESCRIPTIONS									
Sample ID	Date sampled	Sample location	Depth (m)	Sample description*		Remaining /removed			
				Soil type (in field classification)	Hydrocarbon Odour				
BC001	10/01/12	South wall	0.5	Silty sand, moist, dark brown.		None			
BC002	10/01/12	South wall	2.0	Sandy silt, dry, light brown with orange mottles.		None			
BC003	10/01/12	East wall	0.5	Silty sand, moist, grey with light grey clay mottles		Slight			
BC004	10/01/12	East wall	2.0	Silty clay, moist, firm, light grey.		None			
BC005	10/01/12	West Wall	0.5	Sandy silt, moist, loose, dark brown.		None			
BC006	10/01/12	West Wall	2.0	Silty sand, with 30mm angular gravels, light grey.		None			
BC007	10/01/12	North wall	0.5	Sandy silt, moist, loose, dark brown.		None			
BC008	10/01/12	North wall	2.0	Silty sand, firm, light grey with orange mottles.		None			
BC009	10/01/12	Base of pit	2.4	Silty sand, firm, light grey with orange mottles.		None			
BC010	10/01/12	Bedding material	-	Sandy gravel, loose, dark brown.		Slight			

* Soils classified as per New Zealand Geomechanics Society 2005 or New Zealand Soil Classification

SHALLOW AQUIFER ASSESSMENT				
(Section 5.2.3 Oil Industry Guidelines: An aquifer is defined as sensitive when either all of the first three criteria are met or the fourth criterion is met.)				
Criteria	Assessment			
The shallow groundwater aquifer is not artesian or confined; and	Yes			
The shallow groundwater aquifer is of quality appropriate for use, can yield water at a useful rate and is in an area where extraction and use of groundwater may be reasonably foreseen; and <i>A bore search undertaken by Greater Wellington Regional Council indicates that shallow groundwater is not used within the vicinity of the site.</i>	No			
The aquifer is expected to be less than 10 m below the potential suspected source of contamination; and	Yes			
The source of contamination is less than 100 m from a sensitive surface water body <i>No surface water bodies have been identified within a radius of 100 m from the site.</i>	No			
Based on the above, the shallow aquifer is classified as not sensitive				
DATA FOR TIER 1 RISK ASSESSMENT				
- Site land use after tank removal: - Adjoining land uses: - Possible future site land use: - Shallow groundwater use: - Soil type (Oil Industry Guidelines categories which most closely approximate site soils) - Depth of contamination - Depth to groundwater (m)	☐ Residential ☒ Commercial/Industrial ☐ Agricultural ☐ Petroleum Handling ☐ Residential ☒ Commercial/Industrial ☐ Agricultural ☐ Petroleum Handling ☐ Residential ☒ Commercial/Industrial ☐ Agricultural ☐ Petroleum Handling ☒ Recreation – As there are no recreational criteria within the Oil Industry Guidelines; residential guidelines have been adopted as a conservative measure. ☐ Potable ☐ Stocking ☐ Irrigation ☒ Not used ☐ Unknown ☒ SAND, sandy loams, silty sands ☒ SANDY SILT, silt, silty loams, clayey sands ☒ SILTY CLAY, clay loam, sandy clay ☐ CLAY ☐ PUMICE ☐ PEATS AND HIGHLY ORGANIC SOILS ☐ FRACTURED BASALT* (BEDROCK) ☐ GRAVELS* *Considered only for groundwater inhalation pathway; ☒ < 1m ☒ 1-4 m ☐ > 4 m ☐ ≤ 2 m ☐ ≤ 4 m ☐ ≤ 8 m ☐ >8m ☐ Unknown			
LABORATORY RESULTS AND COMPARISON WITH GUIDELINE TIER 1 ACCEPTANCE CRITERIA				
Refer to Table 1 attached.				
HUMAN HEALTH RISK ASSESSMENT SUMMARY - SOILS				
Land Use	Exposure Pathways	Lab results comply with Guidelines	Exposure Pathway Status Incomplete/Complete - Reasoning	Acceptable Hydrocarbon Residual
Site – Prior to Closure ☐ Residential ☒ Commercial/Industrial ☐ Agricultural ☐ Petroleum handling ☐ Other	Inhalation of vapours from soil Soil ingestion Dermal absorption Produce ingestion Maintenance/excavation workers Groundwater usage Inhalation of vapours from water	Yes Yes Yes NA Yes NA NA	Complete Complete Complete Incomplete – land use. Complete Incomplete - no groundwater use No groundwater monitoring data	Yes Yes Yes Yes Yes Yes NA
Site – Foreseeable Future ☐ Residential ☐ Commercial/Industrial ☐ Agricultural ☐ Petroleum handling ☒ Other: Recreational Park ¹	Inhalation of vapours from soil Soil ingestion Dermal absorption Produce ingestion Maintenance/excavation workers Groundwater usage Inhalation of vapours from water	Yes Yes Yes NA Yes NA NA	Complete Complete Complete Incomplete – land use. Complete Incomplete - no groundwater use No groundwater monitoring data	Yes Yes Yes Yes Yes Yes NA
Neighbouring Properties ☐ Residential ☒ Commercial/Industrial ☐ Agricultural ☐ Petroleum handling ☐ Other:	Inhalation of vapours from soil Soil ingestion Dermal absorption Produce ingestion Maintenance/excavation workers Groundwater usage Inhalation of vapours from water	NA NA NA NA NA NA NA	Incomplete – insufficient soil source* Incomplete – insufficient soil source* Incomplete – insufficient soil source* Incomplete – insufficient soil source* Incomplete – insufficient soil source* Incomplete – groundwater not used No groundwater monitoring data	Yes Yes Yes Yes Yes Yes NA
NA – not assessed				
* Sampled soil concentrations are sufficiently low that no significant impact is expected via migration in soils to neighbouring properties.				
¹ Laboratory results compared with Residential Land Use Acceptance Criteria.				

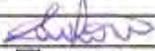
ECOLOGICAL RISK SCREENING			
Wellington Harbour is located 1 km north of the site.	No Impact ☒	Limited Impact ☐	Significant Impact ☐
AESTHETIC SCREENING			
Criteria	No Impact	Limited Impact	Significant Impact
Odour: <i>Slight odour noted in bedding material and in the shallow sample taken from the south wall.</i>	☐	☒	☐
Discolouration: <i>None noted.</i>	☒	☐	☐
Soil structure: <i>None noted</i>	☒	☐	☐
Vegetation: <i>None noted.</i>	☒	☐	☐
SUMMARY			
Findings: All samples comply with the Oil Industry Guidelines for Commercial/Industrial land use. Please refer to the covering letter for a discussion of the soil results.			
APPLICABILITY			
▪ This assessment relates only to those areas of the site that were exposed as part of the tank removal operation and to which access was made available to URS New Zealand Limited during our time on site. ▪ Consideration has not been given to extraordinary costs associated with off-site disposal of contaminated soils. ▪ This report has been prepared solely for the use of Multi Civil Contractors Ltd and any reliance of this report by third parties shall be at such party's sole risk as the report may not contain sufficient information for the purposes of other parties. This report shall only be presented in full and may not be used to support any other objectives than those set out in the report, except with the express permission of URS New Zealand Limited. ▪ URS New Zealand Limited have performed our services for this project in accordance with our Standard Agreement for Consulting Services and with current professional standards for environmental site assessments; no guarantees are either expressed or implied.			
REFERENCES			
1. Ministry for the Environment "Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand", August 1999. 2. Department of Occupational Safety and Health "Guidelines for the Design, Installation and Operation of Underground Storage Tanks", 1992.			
Prepared by: Suzanne Lowe 		Approved for issue by: Kevin Tearney  Issue date: 3 February 2012	
Distribution List: Multi Civil: ☒ Wellington City Council ☐ Greater Wellington Regional Council ☐ Others URS: ☐ Auckland ☒ Wellington ☐ Christchurch			
Appended: ☒ Locality plan ☒ Site plan ☒ Sample location plan ☒ Photographs ☒ Laboratory report & sample chain of custody.			



Table 1: Bogarts Corner - Soil Sample Analytical Results Compared to All Pathways Soil Acceptance Criteria

	Sample Details and Analytical Results						Oil Industry Guidelines: Tier 1 Soil Acceptance Criteria ¹				
URS Sample Reference	BC002	BC003	BC005	BC008	BC009	BC010	All Pathways Soil Acceptance Criteria - Commercial/Industrial ²		All Pathways Soil Acceptance Criteria - Residential ³		
Laboratory Sample Reference	967625.2	967625.3	967625.5	967625.8	967625.9	967625.10					
Date Sampled	10-Jan-12	10-Jan-12	10-Jan-12	10-Jan-12	10-Jan-12	10-Jan-12					
Sample Location	UST 1: 4,000 L Diesel						Contamination depth Surface (<1m) / 1m-4m		Contamination depth Surface (<1m) / 1m-4m		
	South wall	East wall	West wall	North wall	Base	Bedding material					
Sample Depth (m below ground level)	2.0	0.5	0.5	2.0	2.4	-	SAND		Sandy SILT	SAND	Sandy SILT
Sample Soil Type	Sandy Silt	Silty Sand	Sandy Silt	Silty Sand	Silty Sand	Sandy Gravel					
Guideline Soil Type ⁴	SANDY SILT	SAND	SANDY SILT	SAND	SAND	SAND					
Sample of soil remaining or removed	Remaining	Remaining	Remaining	Remaining	Remaining	Remaining					
Total Petroleum Hydrocarbons (TPH)											
C ₇ -C ₉	< 10	< 9	< 11	< 8	< 9	< 10	120 ^m / 120 ^m	(500) ^m / (500) ^m	120 ^m / 120 ^m	(500) ^m / (500) ^m	
C ₁₀ -C ₁₄	< 20	< 20	40	< 20	< 20	320	(1500) ^x / (1900) ^x	(1700) ^x / (2200) ^x	(470) ^x / (560) ^x	(510) ^x / (670) ^x	
C ₁₅ -C ₃₆	< 40	< 40	104	< 40	< 40	1680	NA / NA	NA / NA	NA / NA	NA / NA	
Total hydrocarbons (C ₇ - C ₃₆)	< 70	< 70	144	< 70	< 70	1990	-	-	-	-	

Notes:

All results and criteria are expressed in mg/kg dry weight

Bold - exceeds the Tier 1 Soil Acceptance Criteria.

Underlined - exceeds the Tier 1 soil acceptance criteria for the Protection of Groundwater Quality.

¹ Ministry for the Environment, 1999. Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand (Oil Industry Guidelines).

² Values taken from Table 4.14 of the Oil Industry Guidelines.

³ Values taken from Table 4.15 of the Oil Industry Guidelines.

⁴ Conservative soil category chosen for comparison with Oil Industry Guidelines Tier 1 acceptance criteria to best represent soils observed on site.

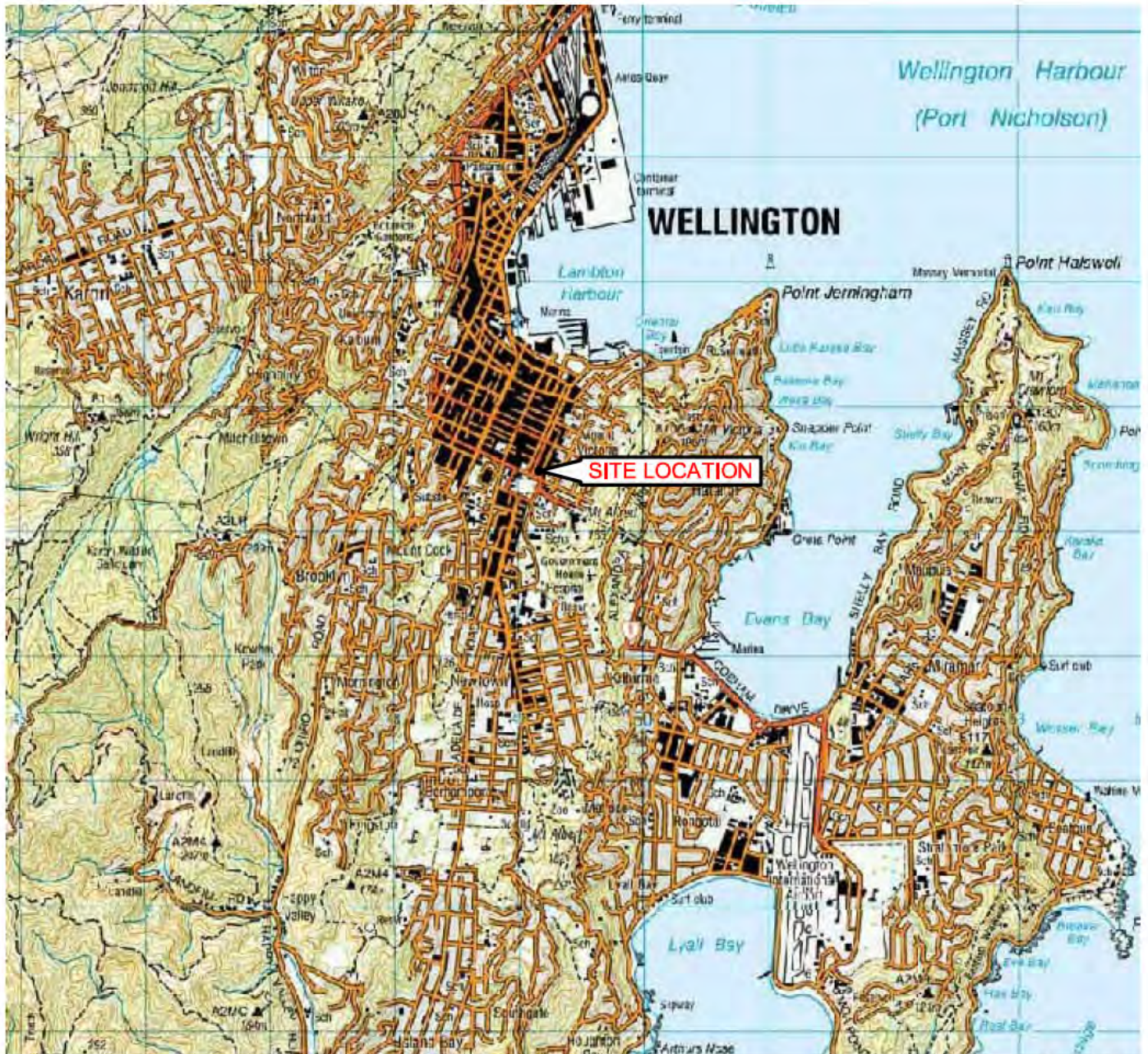
Groundwater at a depth greater than 2.5m at the site.

NA - indicates contaminant is not limiting as estimated health-based criterion is significantly higher than that likely to be encountered on site.

Brackets denote values exceed threshold likely to correspond to formation of residual separate phase hydrocarbons.

The following notes indicate the limiting pathway for each criterion:

v - volatilisation, s - soil ingestion, d - dermal exposure, p - produce ingestion, m - maintenance/excavation worker exposure, x - PAH surrogate.



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**CORNER ELLICE STREET & CAMBRIDGE TERRACE,
WELLINGTON**

0km 1km
APPROXIMATE SCALE

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BOGARTS CORNER WELLINGTON

SITE LOCATION PLAN

MULTI CIVIL CONTRACTORS LIMITED

URS

File No: MC870K01-03.dwg

Drawn: GW

Approved:

Date:

Figure: 1



Rev. - A4

Plotfile: 2:12 PM File Path: \\W:\Jobs\Jobs\427803705\Works\DWG Files Printed By: Grace Wang



MULTI CIVIL CONTRACTORS LIMITED

URS

File No: MC870K01-03.dwg

Drawn: GW

Approved:

Date:

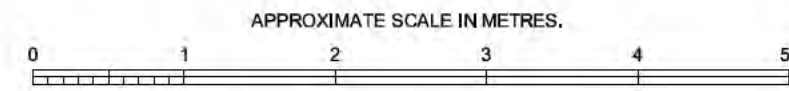
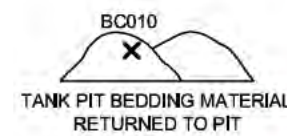
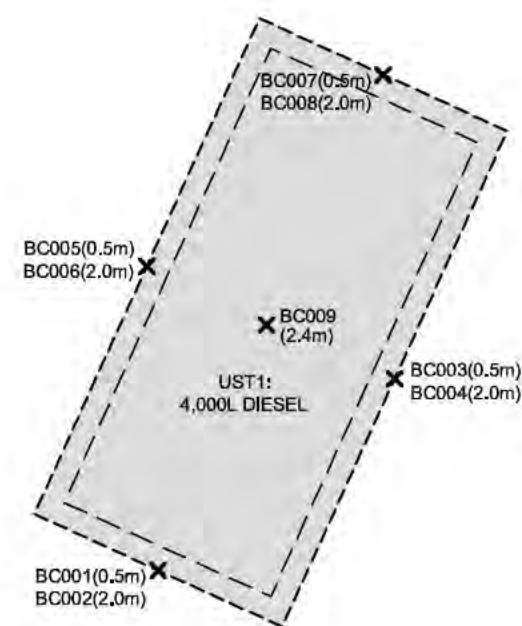
SITE LAYOUT PLAN

Figure: **2**

Rev. # A3



KEY	
	TANK PIT EXCAVATION
	SITE BOUNDARY
	SAMPLE OF SOIL REMAINING ON SITE
ALL DIMENSIONS AND FEATURES INCLUDING THE SERVICE LOCATIONS SHOWN ARE APPROXIMATE ONLY. THIS PLAN MUST NOT BE USED FOR LOCATING SERVICES PRIOR TO INTRUSIVE WORKS.	



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BOGARTS CORNER
WELLINGTON

MULTI CIVIL CONTRACTORS LIMITED

SAMPLE LOCATION PLAN



File No: MC870K01-03.dwg Drawn: GW Approved: Date:

Figure: 3
Rev. A3

Client Name: Multi Civil Contractors Limited		Site Location: Bogarts Corner	Project No. 42780870
Photo No. 1	Date: 10/01/12		
Description: View of the tank pit prior to UST removal.			

Photo No. 2	Date: 10/01/12		
Description: The removed 4 000 L diesel UST.			

Client Name:

Multi Civil Contractors Limited

Site Location:

Bogarts Corner

Project No.

42780870

Photo No.
3

Date:
10/01/12

Description:

View west to Bogarts Corner site and parking area.



Photo No.
4

Date:
10/01/12

Description:

View of the site looking towards the east.





ANALYSIS REPORT

Page 1 of 2

Client:	URS New Zealand Limited	Lab No:	967625	SPV1
Contact:	S Lowe	Date Registered:	11-Jan-2012	
	C/- URS New Zealand Limited	Date Reported:	18-Jan-2012	
	PO Box 3367	Quote No:	36794	
	WELLINGTON 6140	Order No:	.	
		Client Reference:	42780870 Bogarts Corner (M	
		Submitted By:	S Lowe	

Sample Type: Soil						
Sample Name:	BC002	BC003	BC005	BC008	BC009	
	10-Jan-2012	10-Jan-2012	10-Jan-2012	10-Jan-2012	10-Jan-2012	
Lab Number:	967625.2	967625.3	967625.5	967625.8	967625.9	
Individual Tests						
Dry Matter	g/100g as rcvd	79	75	65	81	78
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	< 10	< 9	< 11	< 8	< 9
C10 - C14	mg/kg dry wt	< 20	< 20	40	< 20	< 20
C15 - C36	mg/kg dry wt	< 40	< 40	104	< 40	< 40
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 70	< 70	144	< 70	< 70

Sample Name:	BC010					
	10-Jan-2012					
Lab Number:	967625.10					
Individual Tests						
Dry Matter	g/100g as rcvd	72	-	-	-	-
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	< 10	-	-	-	-
C10 - C14	mg/kg dry wt	320	-	-	-	-
C15 - C36	mg/kg dry wt	1,680	-	-	-	-
Total hydrocarbons (C7 - C36)	mg/kg dry wt	1,990	-	-	-	-

Analyst's Comments

Appendix No.1 - Total Petroleum Hydrocarbon Chromatograms

Appendix No.2 - Chain of Custody

SUMMARY OF METHODS

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively 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	Samples
Total Petroleum Hydrocarbons in Soil	Sonication extraction in DCM, Silica cleanup, GC-FID analysis US EPA 8015B/MfE Petroleum Industry Guidelines. Tested on as received sample	-	2-3, 5, 8-10
Dry Matter (Env)	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. US EPA 3550.	0.10 g/100g as rcvd	2-3, 5, 8-10



This Laboratory is accredited by International Accreditation New Zealand (IANZ), which represents New Zealand in the International Laboratory Accreditation Cooperation (ILAC). Through the ILAC Mutual Recognition Arrangement (ILAC-MRA) this accreditation is internationally recognised.

The tests reported herein have been performed in accordance with the terms of accreditation, with the exception of tests marked *, which are not accredited.

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

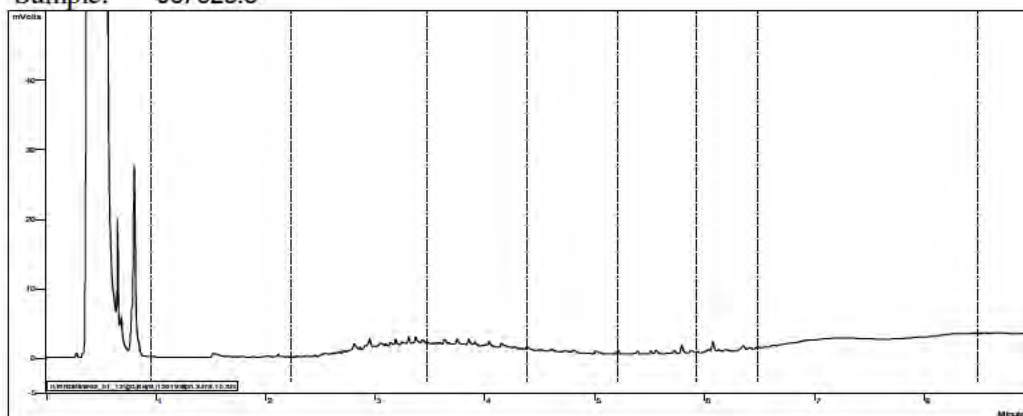
Samples are held at the laboratory after reporting for a length of time depending on the preservation used and the stability of the analytes being tested. Once the storage period is completed the samples are discarded unless otherwise advised by the client.

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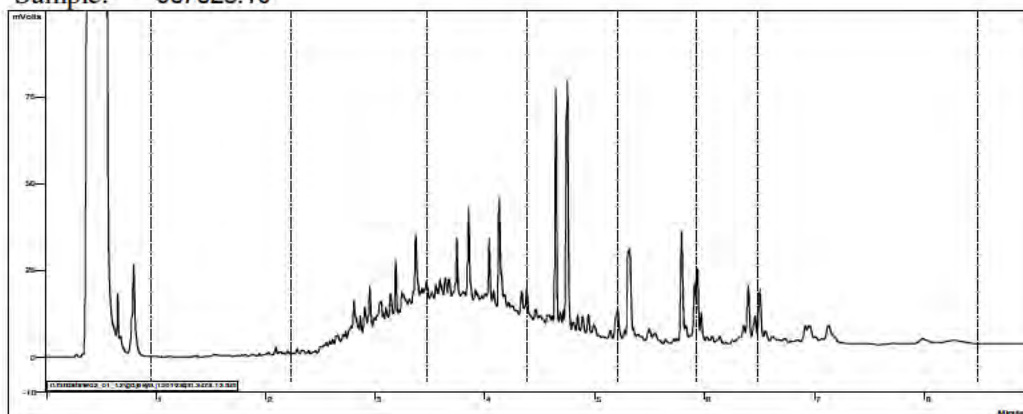
A handwritten signature in blue ink, consisting of several overlapping loops and a long horizontal stroke extending to the right.

Ara Heron BSc (Tech)
Client Services Manager - Environmental Division

Sample: 967625.5



Sample: 967625.10



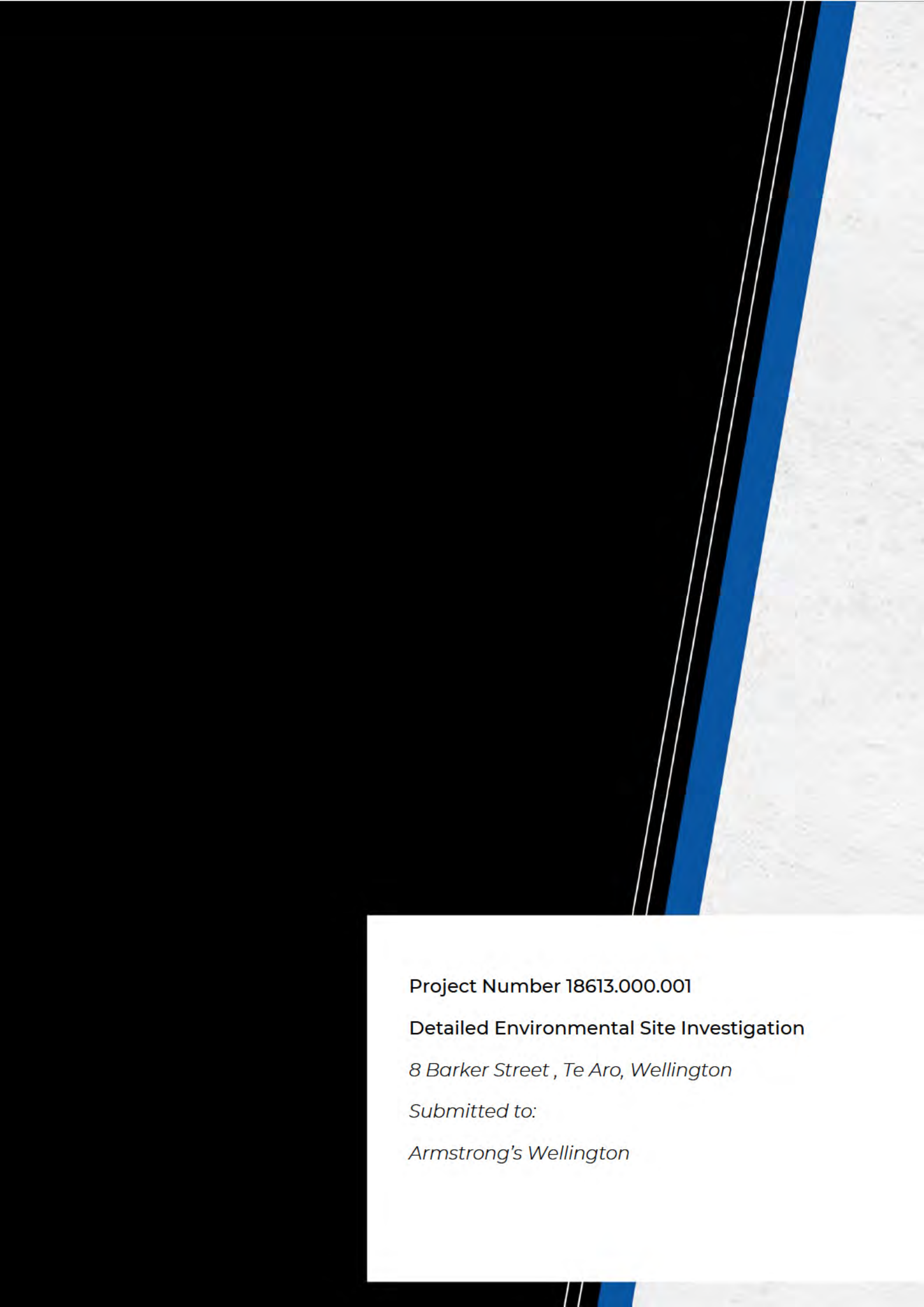
C7 C10 C15 C20 C25 C30 C34 C44



CHAIN OF CUSTODY AND SAMPLE RECEIPT DOCUMENTATION

FROM: URS New Zealand Limited Lambton House 160 Lambton Quay Wellington Ph: (04) 496 3750 Fax (09) 496 3755		TO: Hill Laboratories 4-5000 Auckland		ANALYSES REQUIRED																					
RESULTS ATTENTION: Suzanne Lowe		CLIENT: Muldrew		SITE: 42780870		PROJECT NO: 36794 Normal Priority		LAB QUOTE NO: ☒ 36795 High Priority ☐ 36796 Urgent Priority		CONTAINERS		ANALYTES		Blank or Duplicate Samples											
SAMPLER(S): Rachel Forrest		DATE/TIME: 10-1-12		COMMENTS:		RESULTS REQUIRED BY:		DATE/TIME:		INCLUDING:		CHAIN OF CUSTODY DATA:		RECEIVED BY											
SAMPLE ID: BC001 BC002 BC003 BC004 BC005 BC006 BC007 BC008 BC009 BC010		MATRIX: Soil Soil Soil Soil Soil Soil Soil Soil Soil		DATE/TIME: 10-1-12		COMMENTS:		RESULTS REQUIRED BY:		DATE/TIME:		INCLUDING:		CHAIN OF CUSTODY DATA:		RECEIVED BY									
NAME: Rachel Forrest		DATE: 10-1-12		TIME: 2pm		NAME: 13m by A.		DATE: 11-01-12		TIME: 10:30am		DATE: 11-01-12		TIME: 10:30am		METHOD OF SHIPMENT									
COMPANY: URS		DATE: 10-1-12		TIME: 2pm		NAME: 13m by A.		DATE: 11-01-12		TIME: 10:30am		DATE: 11-01-12		TIME: 10:30am		METHOD OF SHIPMENT									
PLEASE COMPLETE (ISSUED TO: CIRCLE AS APPROPRIATE) AND RETURN FAX A COPY IMMEDIATELY AFTER RECEIVING SAMPLES.		YES / NO		YES / NO		YES / NO		YES / NO		YES / NO		YES / NO		YES / NO		YES / NO									
ALL SAMPLES AND ASSOCIATED DOCUMENTATION WERE RECEIVED IN GOOD ORDER		YES / NO		YES / NO		YES / NO		YES / NO		YES / NO		YES / NO		YES / NO		YES / NO									
SPECIAL HANDLING/STORAGE/DISPOSAL INSTRUCTIONS:		YES / NO		YES / NO		YES / NO		YES / NO		YES / NO		YES / NO		YES / NO		YES / NO									
CAUTION - SAMPLES MAY CONTAIN HAZARDOUS SUBSTANCES		YES / NO		YES / NO		YES / NO		YES / NO		YES / NO		YES / NO		YES / NO		YES / NO									

Time Received 11-Jan-2012 1:24:32 pm
 Job No. 967625
 No of Samples 10 No of Fractions 32
 0319676252



Project Number 18613.000.001

Detailed Environmental Site Investigation

8 Barker Street , Te Aro, Wellington

Submitted to:

Armstrong's Wellington

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ENGEO Document Control:

Report Title	Detailed Environmental Site Investigation - 8 Barker Street , Te Aro			
Project No.	18613.000.001	Doc ID	07	
Client	Armstrong's Wellington	Client Contact	C/- Mark Darrow Archaus Architects	
Distribution (PDF)				
Date	Revision Details/Status	Author	Reviewer	WP
02/09/2022	Issued to Client	KS/GS	DR	JT

1 Introduction

ENGEO Ltd was requested by to undertake a detailed environmental site investigation (DSI) of the property at 8 Barker Street, Te Aro, Wellington (herein referred to as 'the site'). This work has been carried out in accordance with our signed agreement, reference P2021.000.922_05, dated 7 June 2022.

ENGEO understands that the site is currently commercial / industrial and is proposed to be redeveloped. This DSI has been prepared for inclusion in the application for resource consent for the proposed redevelopment.

This DSI has been undertaken to satisfy the requirements of the Resource Management (National Environmental Standards for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011, herein referred to as the "NES" (NES, 2011). The investigation provides information regarding the presence of soil impacts from site uses that may pose a potential human health risk to future site users and redevelopment workers during earthworks and construction and also to the surrounding environment. The results of this investigation have been used to evaluate whether remediation is necessary prior to site earthworks, and to further assess the resource consents required under the NES.

This investigation has been undertaken in general accordance with the Ministry for the Environment (MfE) Contaminated Land Management Guidelines No. 1: Reporting on Contaminated Sites in New Zealand (MfE, 2011), MfE Contaminated Land Management Guidelines No.5: Site Investigation and Analysis of Soils (MfE, 2011) and Building Research Association of New Zealand (BRANZ) (2017) New Zealand Guidelines for Assessing and Managing Asbestos in Soil. This DSI has been reviewed by a Suitably Qualified and Experienced Practitioner (SQEP).

2 Objectives of the Assessment

The DSI was undertaken to assess:

- The potential extent and concentrations of contaminants in soil at the site.
- Where contaminants of concern identified present an unacceptable risk to human health or identified environmental receptors.
- The adequacy and completeness of information used in decisions on remedial options.
- If remediation, management or ongoing monitoring is required at the site.
- Disposal options for the potentially impacted soil that may be required to be removed from site during redevelopment.
- The requirement for resource consent under the NES.

The soil sampling locations were positioned to target potential general contamination on-site. Further details of the scope of work are provided in Section 6.

3 Site Description and Setting

The site consists of fully developed, flat land and is located in a commercial / industrial area in Te Aro. The site contains a building, which cover the majority of the site footprint.

Site information is summarised in , the site setting is summarised in Table 2 and the current site conditions are provided in . The site location is presented on Figure 1.

Table 1: Site Information

Item	Description
Location	8 Barker Street, Te Aro, Wellington
Legal Description	LOT 1 DP 48488 LOT 1 DP 73447 - SUBJ TO ROW - 139 M2 COMMERCIAL CARYARD & SIGNAGE ON ROAD RESERVE
Property Owner	Armstrong's Wellington
Current Land Use	Commercial / industrial
Proposed Land Use	Commercial / industrial
Site Area	2117 m ²
Regional Authority	Great Wellington Regional Council (GWRC) and WCC.

Table 2: Site Setting

Item	Description
Topography and Hydrology	The site is generally flat, and is at an elevation of approximately 8 to 9 m above sea level (asl). Stormwater is diverted into storm drains on the northern and eastern sides of the site and is carried to a main stormwater pipe beneath Cambridge Terrace. Stormwater is carried north toward Oriental Bay.
Local Setting	The site is located in a commercial / industrial area in Te Aro. Businesses adjacent of the site include: - Armstrong's Porsche Dealership - Armstrong's Audi Dealership - Armstrong's Volvo Dealership - Armstrong's Jaguar & Land Rover Wellington - Primal Rehab - Hiko Health & Fitness - Resene ColorShop - Mercedes Benz Dealership
Nearest Surface Water □ Use	The nearest surface water course is the Wellington Harbour, at Oriental Bay located approximately 830 m north of the site.
Geology	A review of published sources of relevant geological information (GNS Semmens et al 2010) indicates that the site is located near a lithological boundary between the swamp deposits and old alluvium / colluvium deposits
Hydrogeology	There is no known aquifer present beneath the site with the aquifer potential indicated to be poor. The 2022 DSI investigation found groundwater level varied from 1.1 m - 2.1 m. Groundwater flow is anticipated to be to the north towards Oriental Bay.
Groundwater Abstractions	There are no active groundwater abstraction consents on the site. There are no active groundwater abstraction consents within 100 m of the site
Discharge Consents	There are no active discharge consents on the site. There are no active discharge consents within 100 m of the site.

Table 3: Current Site Conditions (2021)

Site Conditions	Comments
Visible Signs of Contamination	A waste storage area is located south of the car wash building. Multiple Castrol oil steel drums and a skip are located in this area and some staining is visible on the pavement. From this area, waste oil is pumped into storage containers above the car wash building. Various cleaning supplies are located within the car wash building.
Surface Water Appearance	Surface water was visible in the car wash building. Cleaning foam was visible on surface water.
Current Surrounding Land Use	Commercial / industrial.
Local Sensitive Environments	None identified – fully developed.
Visible Signs of Plant Stress	No vegetation on-site.
Ground Cover	Concrete / cement hardstanding. Large buildings cover the majority of the site footprint.
Potential for On or Off Site Migration Of Contaminants	Storm drains are present within the eastern warehouse and in the car wash building. Private stormwater systems were likely installed around 1974. If stormwater systems have deteriorated since then, there is potential to impact groundwater, which is shallow.
Buildings Present	One building.

3.1 Proposed Works

The site is proposed to be redeveloped for commercial/industrial purposes.

4 Previous Site Investigations

A summary of previous site investigations undertaken within the site footprint and information relevant to this report is provided below.

4.1 Geotechnical Investigation (Abuild Consulting Engineers, Ltd. 2006)

A geotechnical investigation was carried out between 19 and 20 December 2005 for the Porsche Audi Showrooms at the corner of Fifeshire Avenue and Cambridge Terrace (east of the site). Three boreholes were drilled to depths between 8.95 and 10.3 metres below existing ground level.

The investigation has shown that the site is underlain with both alluvial and colluvial soils of varying strength and density. The site was blanketed with fill and basecourse beneath tar seal. The basecourse is underlain in turn with variable strength fine grained soil comprising silts and clays. Groundwater was encountered at approximately 2.5 m below ground surface.

4.2 Preliminary Site Investigation (ENGEO, 2021)

A preliminary site investigation was undertaken at 8 & 20 Barker Street by ENGEO in 2021. This included a review of historical aerial images and property files. This report identified a number of SLUR properties within 100 m of the site, as well as three HAIL categories potentially applicable to the site (listed below).

- HAIL Category A17: Chemical manufacture, application and bulk storage; storage tanks or drums for fuel, chemicals or liquid waste.
- HAIL Category F7: Vehicle refuelling, service and repair; service stations including retail or commercial refuelling facilities.
- HAIL Category 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 PSI concluded that further environmental assessment was required (due to the identified HAIL activities) before land use change, soil disturbance or subdivision occurs on this site.

5 Initial Conceptual Site Model

For a contaminant to present a risk to human health or an environmental receptor, all three components are required to be present and connected. The three components of a conceptual site model are:

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

The potential source, pathway, receptor linkages at this subject site are provided in Table 4.

Table 4: Initial Conceptual Site Model

Potential Source	Exposure Pathway	Potential Receptor	Acceptable Risk?
SN/05/206/02 169 Tory Street Bulk storage of hydrocarbons Category A17: Chemical manufacture, application and bulk storage; storage tanks or drums for fuel, chemicals or liquid waste <i>TPH, Heavy Metals, BTEX, PAH</i>	Direct contact Ingestion of soil Inhalation of volatile contaminants or windblown dust Surface water run-off or leaching of contaminants into groundwater	Future site users / site redevelopment workers Surrounding residents and environment	Unknown Hydrocarbons may have leaked into the groundwater, which is shallow. The groundwater direction is likely to flow north, towards the site, which is located 6 meters northeast of the property. Further investigation is required to assess potential impact to groundwater at the site.
SN/05/225/02 64 Cambridge Terrace Bulk storage of hydrocarbons Category F7: Vehicle refuelling, service and repair; service stations including retail or commercial refuelling facilities <i>TPH, Heavy Metals, BTEX, PAH</i>	Direct contact Ingestion of soil Inhalation of volatile contaminants or windblown dust Leaching of contaminants into groundwater	Future site users / site redevelopment workers Surrounding residents and environment	Unknown From 1974-1977 two underground storage tanks were installed. It is unknown if these tanks have been removed. Hydrocarbons may have leaked into the groundwater, which is shallow. The property is located only 10 m from the site. Further investigation is required to assess potential impact to groundwater at the site.

Potential Source	Exposure Pathway	Potential Receptor	Acceptable Risk?
SN/05/230/02 76 Cambridge Terrace Bulk storage of hydrocarbons Category F7: Vehicle refuelling, service and repair; service stations including retail or commercial refuelling facilities <i>TPH, Heavy Metals, BTEX, PAH</i>	Direct contact Ingestion of soil Inhalation of volatile contaminants or windblown dust Surface water run-off or leaching of contaminants into groundwater	Future site users / site redevelopment workers Surrounding residents and environment	Unknown This site has stored hydrocarbons in bulk. The tank was to be removed in 1998 by BP oil. It is unknown if any contamination has occurred. Hydrocarbons may have leaked into the groundwater, which is shallow. The groundwater direction is likely to flow north, towards the site, which is located 10 meters north of the property. Further investigation is required to assess potential impact to groundwater at the site.
SN/05/617/02 20 Barker Street Bulk storage of hydrocarbons Category A17: Chemical manufacture, application and bulk storage; storage tanks or drums for fuel, chemicals or liquid waste <i>TPH, Heavy Metals, BTEX, PAH</i>	Direct contact Ingestion of soil Inhalation of volatile contaminants or windblown dust Surface water run-off or leaching of contaminants into groundwater	Future site users / site redevelopment workers Surrounding residents and environment	Unknown The storage of hydrocarbons in underground tanks has been undertaken on the site. Hydrocarbons may have leaked into the groundwater, which is shallow. Further investigation is required to assess potential impact to groundwater at the site.
20 Barker Street Waste oil storage Category A17: Chemical manufacture, application and bulk storage; storage tanks or drums for fuel, chemicals or liquid waste <i>TPH, Heavy Metals, BTEX, PAH</i>	Direct contact Ingestion of soil Surface water run-off or leaching of contaminants into groundwater	Future site users / site redevelopment workers Surrounding residents and environment	Unknown Waste oil is stored on-site and may have leaked into the groundwater, which is shallow. Further investigation is required to assess potential impact to groundwater at the site.

Potential Source	Exposure Pathway	Potential Receptor	Acceptable Risk?
8 □ 20 Barker Street Undocumented fill Category 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. <i>PAH, Asbestos, Heavy Metals</i>	Direct contact Ingestion of soil Inhalation of volatile contaminants or windblown dust Surface water run-off or leaching of contaminants into groundwater	Future site users / site redevelopment workers	Unknown Undocumented fill is present beneath the site and may be contaminated. Further investigation is required to assess potential impact to groundwater at the site.
Site and on Adjacent Properties Building demolition Category 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. <i>Asbestos and Lead</i>	Direct contact Ingestion of soil Inhalation of fibres or windblown dust Surface water run-off	Future site users / site redevelopment workers	Unknown Historical photographs indicate that building demolition and redevelopment has occurred on the site and on the properties adjacent to the site. Further investigation is required to assess potential impact to soil at the site.

6 Site Investigations

Based on the area of the site (approximately 2,120 m²). MfE guidelines indicate that a minimum sample location number of nine was required. To achieve full site coverage, soil samples were collected from thirteen locations. The sample locations were placed systematically and intended to span the site evenly. Samples were collected from various depths to target the fill material below the site and the groundwater interface.

6.1 Investigation Methodology

6 May 2021 - Window Sampler Investigation

Two window samplers were carried out at 8 Barker Street (WS01 and WS02). Three soil samples were collected at each of the window sampler locations by ENGEO's Calum MacRae.

13 September 2021- Borehole Investigation

Two boreholes were carried out at 8 Barker Street (BH01 and BH02). Soil samples were collected at 0.5 m and 1.8 m at each borehole by ENGEO's Matthew Spencer-Philips.

2, 16, and 30 July 2022 - Window Sampler Investigation

ENGEO undertook soil sampling on 2 July by ENGEO'S Kate Standish and Gabriela Staehle. The remaining soil sampling was carried out on 16 July and 30 July by ENGEO's Josh Law. Nine locations were selected to achieve full site coverage (WS01-WS09) with soil samples taken within each layer of fill and also deeper samples below groundwater level.

Concrete coring was conducted at each location to access the soil below.

Table 5: Summary of Soil Samples Collected and Requested Analyses

Sample ID	Date Collected	Soil Type	Sample Depth (m bgl)	Requested Analyses
WS01 @ 0.2-0.4 m	6/5/21	GRAVEL (FILL)	0.2-0.4 m	Asbestos
WS01 @ 0.4-0.6 m	6/5/21	GRAVEL (FILL). Change to Sandy SILT @ 0.5m	0.4-0.6 m	HM, SVOCs, BTEX
WS01 @ 0.7-0.9 m	6/5/21	Sandy GRAVEL	0.7-0.9 m	BTEX, PAH's, TPH
WS01 @ 1.5-1.6 m	6/5/21	Clayey SILT	1.5-1.6 m	HM, TPH, BTEX, PAH's
WS02 @ 0.2-0.4 m	6/5/21	Sandy gravelly SILT (FILL)	0.2-0.4 m	Asbestos
WS02 @ 0.4-0.5 m	6/5/21	Sandy gravelly SILT (FILL)	0.4-0.5 m	HM, SVOC's, VOC's, pH
WS02 @ 0.7-0.8 m	6/5/21	Clayey SILT	0.7-0.8 m	BTEX, PAH's, TPH
WS02 @ 1.2-1.4 m	6/5/21	Silty SAND. Change to Clayey SILT @ 1.3m	1.2-1.4 m	HM, SVOC's, PAH's, TPH, BTEX, VOC's, pH
BH01 @ 0.5 m	13/9/21	Silty sandy GRAVEL (FILL)	0.5 m	Asbestos, HM, BTEX, TPH
BH01 @ 1.8 m	13/9/21	Sandy SILT	1.8 m	Asbestos, HM, BTEX, TPH
BH02 @ 0.5 m	13/9/21	Clayey Sandy SILT	0.5 m	Asbestos, HM, BTEX, TPH
BH02 @ 1.8 m	13/9/21	Clayey Sandy SILT	1.8 m	Asbestos, HM, BTEX, TPH

Sample ID	Date Collected	Soil Type	Sample Depth (m bgl)	Requested Analyses
S01 @ 0.5 m	2/7/22	Sandy GRAVEL (FILL)	0.5 m	HM, TPH□PAH, asbestos
S01 @ 1.5 m	2/7/22	Silty SAND	1.5 m	HM, TPH□PAH□BTEX Profile, VOC, asbestos
WS-2 @ 0.5 m	30/7/22	Gravelly SILT	0.5 m	HM, TPH□PAH, asbestos
WS-2 @ 2.5 m	30/7/22	Sandy SILT	2.5 m	HM, TPH□PAH□BTEX Profile, VOC
WS-3 @ 0.3 m	30/7/22	Sandy GRAVEL (FILL)	0.3 m	HM, TPH□PAH, asbestos
WS-3 @ 2.5 m	30/7/22	Silty SAND	2.5 m	HM, TPH□PAH□BTEX Profile, VOC
S04 @ 0.5 m	2/7/22	Sandy GRAVEL (FILL)	0.5 m	HM, TPH□PAH, asbestos
S04 @ 2 m	2/7/22	Silty SAND	2 m	HM, TPH□PAH□BTEX Profile, VOC, asbestos
WS-5 @ 0.5 m	30/7/22	Sandy SILT (FILL)	0.5 m	HM, TPH□PAH, asbestos
WS-5 @ 2.5 m	30/7/22	Gravelly SILT	2.5 m	HM, TPH□PAH□BTEX Profile, VOC
S06 @ 0.5 m	16/7/22	Gravelly SILT (FILL)	0.5 m	HM, TPH□PAH, asbestos
S06 @ 0.5 m (duplicate)	16/7/22	Gravelly SILT (FILL)	0.5 m	HM, TPH□PAH
S06 @ 2.1 m	16/7/22	Sandy SILT	2.1m	HM, TPH□PAH□BTEX Profile
S07 @ 0.5 m	2/7/22	Sandy GRAVEL (FILL)	0.5 m	HM, PAH, asbestos
S07 @ 2.5 m	2/7/22	Sandy SILT	2.5 m	HM, TPH□PAH□BTEX Profile, VOC, asbestos

Sample ID	Date Collected	Soil Type	Sample Depth (m bgl)	Requested Analyses
S08 @ 0.5 m	2/7/22	Gravelly SILT (FILL)	0.5 m	HM, TPH□PAH, asbestos
S08 @ 2 m	2/7/22	Silty SAND	2 m	HM, TPH□PAH□BTEX Profile, VOC, asbestos
S09 @ 0.5 m	2/7/22	Sandy SILT (FILL)	0.5 m	HM, TPH□PAH, asbestos
S09 @ 1.5 m	2/7/22	Silty SAND	1.5 m	HM, TPH□PAH□BTEX Profile, VOC, asbestos
WS-12 @ 0.5 m (duplicate of WS-5)	30/7/22	Sandy SILT (FILL)	0.5 m	HM, TPH□PAH

6.2 Sample Methodology

The following methodology was used for taking the samples:

6.2.1 Soil

- All soil samples were screened for visual and olfactory evidence of contamination.
- For the investigation, following concrete coring, a window sampler was used to collect samples.
- To reduce the potential for cross-contamination, a new pair of disposable nitrile gloves was used for each sample collected and discarded following use.
- A Photoionisation Detector (PID) was used to assess the levels of volatile compounds emitted from samples during the July 2022 window sampling by placing the PID close to the retrieved sample while it was still in the core tube investigation.
- After the collection of each soil sample, the sampling equipment was decontaminated by brushing off soil adhering to the sampling equipment, washing with a solution of Decon90 and rinsing with tap water followed by high purity analytical grade deionised water.
- All samples collected were placed in containers supplied by RJ Hill Laboratories (Hills) which were then capped, labelled with a unique identifier prior to transportation to the laboratory. Samples were transported to Hills under standard chain of custody documentation for analysis; these are provided in Appendix 1.
- Geological logging of the soil was completed in general accordance with the New Zealand Geotechnical Society (NZGS) “*Guideline for the Field Classification and Description of Soil and Rock for Engineering purposes*”, December 2005.

- All fieldwork and soil sampling was undertaken in general accordance with the procedures for the appropriate handling of potentially contaminated soils as described in the MfE “*Contaminated Land Management Guidelines No.5: Site Investigation and Analysis of Soils*” (MfE, 2011).
- Following receipt of samples by Hills, the soil samples were scheduled for analysis of the identified contaminants of concern, which includes Heavy metals, PAHs, TPHs, BTEX, and asbestos.

6.3 Quality Assurance and Quality Control

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

- The use of standard sample registers and chain of custody records for all samples collected.
- Each soil sample was given a unique identification number.
- Hills are an International Accreditation New Zealand (IANZ) laboratory for the analyses performed. To maintain their IANZ accreditation, Hills undertake rigorous cross checking and routine duplicate sample testing to ensure the accuracy of their results.
- During the site investigation, every attempt was made to ensure that cross contamination did not occur through the use of procedures outlined in this document.

7 Regulatory Framework and Assessment Criteria

The regulatory frameworks and rules relating to the management and control of contaminated sites in the Wellington Region are specified in two documents: the NES and a GWRC Regional Plan. A summary of each and its implications for the site are provided in the section below. Values relating to these stated criteria can be found in Tables 9 and 10.

7.1 Resource Management Regulations (NES)

The Resource Management (National Environmental Standards for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (NES) came into effect on 1 January 2012 (MfE, 2011).

Soil Contaminant Standards

The NES introduced soil contaminant standards (SCSs) for 12 priority contaminants for the protection of human health under five land use scenarios.

The NES requires the Contaminated Land Management Guidelines (CLMG) No.2: *Hierarchy and Application in New Zealand of Environmental Guideline Values (Revised 2011)*, (MfE, 2003) to be used for the selection of a guideline value for a contaminant where a NES SCS is not available.

The NES does not consider environmental receptors; accordingly, the application of guidelines relevant to environmental receptors shall be implemented according to the MfE CLMG No. 2 and any relevant rules in the Regional Plan.

In addition, local background levels in soil have been referenced to establish consenting implications under the NES and disposal requirements. Background levels for contaminants in soils in the area were obtained from the URS document – “*Determination of Common Pollutant Background Soil Concentrations for the Wellington Region*” (2003) prepared for GWRC.

Relevant criteria have been outlined with laboratory result summary tables for both Human Health and Regional Background. Human health criteria screening for commercial / industrial outdoor worker (unpaved) have been undertaken based on the proposed redevelopment and end use of the site. Human health criteria screening for commercial / industrial have also been undertaken based on the short-term works involved in earthworks and construction.

Disturbing Soil

Soil disturbance on sites with potentially contaminated soils are covered by the NES.

If the limits of soil disturbance or soil removal exceed the permitted activity criteria, then a resource consent will be required for the works. The permitted activity criteria are given in Regulation 8(3) of the NES and are as follows:

“Disturbing the soil of the piece of land is a permitted activity while the following requirements are met:

- (a) controls to minimise the exposure of humans to mobilised contaminants must –*
 - (i) be in place when the activity begins:*
 - (ii) be effective while the activity is done:*
 - (iii) be effective until the soil is reinstated to an erosion-resistant state:*
- (b) the soil must be reinstated to an erosion-resistant state within 1 month after the serving of the purpose for which the activity was done:*
- (c) the volume of the disturbance of the soil of the piece of land must be no more than 25 m³ per 500 m²:*
- (d) soil must not be taken away in the course of the activity, except that, -*
 - (i) for the purpose of laboratory analysis, any amount of soil may be taken away as samples:*
 - (ii) for all other purposes combined, a maximum of 5 m³ per 500 m² of soil may be taken away per year:*
- (e) soil taken away in the course of the activity must be disposed of at a facility authorised to receive soil of that kind:*
- (f) the duration of the activity must be no longer than 2 months:*
- (g) the integrity of a structure designed to contain contaminated soil or other contaminated materials must not be compromised.”*

7.2 Greater Wellington Regional Council Regional Plan

Regional Plan for Discharges to Land for the Wellington Region

Under the GWRC regional plans, policies and strategies (Greater Wellington Regional Council, 2014), specifically “*Regional Plan for Discharges to Land for the Wellington Region*” (Plan) Rules 1, 2, 21 and 22 potentially apply to the site. In accordance with the Plan “*Unless specifically stated otherwise, the rules in the Plan apply to discharges to land irrespective of the source of the discharge... The rules apply throughout the Region. With the exception of Rules 1 and 2, which are the default rules in the Plan, all rules are specific in their application.*”

These are provided below for information; further explanation for each rule is provided in the Plan.

“Rule 1: Discharges of contaminants not entering water

The discharge of any contaminant onto or into land is a **Permitted Activity** provided:

- (a) the contaminants are stormwater discharged into a pipe which then discharges to surface water; or
- (b) with the exception of Rule 2, the discharge is not regulated by any rule in this Plan; and
- (c) the discharge **will not**
 - (i) result in that contaminant (or any other contaminant emanating as a result of natural processes from that contaminant) entering water in any water body, water supply race, farm drain, or the coastal marine area; or
 - (ii) create a contaminated site.”

“Rule 2 Discharges of contaminants not otherwise provided for

The discharge of any contaminant onto or into land that is

- (a) not allowed as a Permitted Activity by Rule 1; or
- (b) provided for as a Permitted Activity by Rule 3, 4, 9(2), 11, 12, 14, 16 or 18 but does not meet any condition of the rule; or
- (c) provided for as a Controlled Activity in Rule 13, 17, 19 or 22 but does not meet any standard of the rule
- (d) not described as a Discretionary Activity in Rule 8, 10, or 20; or
- (e) not described as a Non-Complying Activity in Rule 15

is a **Discretionary Activity**.”

“Rule 21: Contaminated sites (on-site discharges)

The discharge of any contaminants:

- (1) into or onto land from a contaminated site (and not from any activity located on the site) other than as provided in clause (1) of Rule 22; or
- (2) into or onto land which is, or is part of, a contaminated site, in association with the on-site remediation of the contaminated site;

is a **Permitted Activity** provided

- (a) there shall be no noxious, dangerous, offensive or objectionable levels of contaminants in the air at or beyond the site boundary as a result of the discharge;
- (b) there shall be no contaminants from the contaminated site or from any discharge associated with site remediation (or any other contaminants emanating as a result of natural processes from those contaminants) beyond the boundary of the contaminated site at concentrations above the background levels for that location;
- (c) the site owner shall undertake such monitoring as is necessary to ensure that the site complies with conditions (a) and (b) above, and shall make the monitoring results available to the Wellington Regional Council, on request.”

“Rule 22: Contaminated sites (off-site discharges)”

The discharge of any contaminants:

- (1) into or onto land from a contaminated site (and not from any activity located on the site; or
- (2) into or onto land which is, or is part of, a contaminated site, in association with the on-site remediation of the contaminated site;

if:

- (3) the activity involves the removal of material from the contaminated site and the discharge of contaminated material at some other location (unless the material is discharged at a landfill which holds resource consents which enable it to accept the discharge); or
- (4) the discharge does not comply with any of the conditions in Rule 21;

is a **Controlled Activity** and shall comply with the standards” as outlined in the Regional Plan.

7.3 Asbestos Criteria

The fieldwork and reporting for this site have been undertaken in general accordance with The Building Research Association New Zealand (BRANZ) New Zealand Guidelines for Assessing and Managing Asbestos in Soil (BRANZ, 2017) (herein referred to as ‘The BRANZ Guideline’).

The BRANZ guideline criteria have been adopted as investigation criteria for this assessment and are presented in .

Table 6: Adopted Asbestos Investigation Criteria

Form of Asbestos		Soil Guideline Values for Asbestos (w/w)			
		Residential ¹	High-density Residential ²	Recreational ³	Commercial and Industrial ⁴
ACM (bonded)		0.01%	0.04%	0.02%	0.05%
FA and / or AF ⁵		0.001%			
All Forms of Asbestos – Surface		No visible asbestos on surface soil ⁶			
Capping Requirements for Residual Contamination above Selected Soil Guideline Value					
Depth ⁷	Hard cap	No depth limitation, no controls – except for long-term management			
	Soft cap	≥0.5 m			≥0.2 m

Notes:

ACM: “Any material or item that, by its design, contains asbestos (typically comprising bonded cement board). The concentration of ACM in soil can either be quantified using an IANZ accredited laboratory or in the field using less-reliable field techniques.”

FA: “Fibrous asbestos, as per WA Guidelines, is “friable asbestos material, such as severely weathered ACM, and asbestos in the form of loose fibrous material such as insulation products”. FA can be detected visually, but to quantify the concentration of FA in soil, an accredited laboratory should be used.”

AF: "Asbestos fines. Includes free fibres of asbestos, fibrous asbestos, small fibre bundles and also ACM fragments that pass through a 7 x 7 mm sieve for field screening and 10 x 10 mm sieve in the laboratory. The measurement of AF in soil is completed by an IANZ accredited laboratory."

"1. **Residential:** Single dwelling site with garden and / or accessible soil. Also includes daycare centres, preschools, primary and secondary schools and rural residential."

2. **High-density residential:** Urban residential site with limited exposed soil / soil contact, including small gardens. Applicable to urban townhouses, flats and ground-floor apartments with small ornamental gardens but not high-rise apartments (with very low opportunity for soil contact).

3. **Recreational:** Public and private green areas and sports and recreation reserves. Includes playing fields, suburban reserves where children play frequently and school playing fields.

4. **Commercial and industrial:** Includes accessible soils within retail, office, factory and industrial sites. Many commercial and industrial properties are well paved with concrete pavement and buildings that will adequately cover / cap any contaminated soils.

5. **FA and / or AF:** Where free fibre is present at concentrations at or below 0.001% w/w, a proportion of these samples should be analysed using the laboratory analysis method described in section 5.4.4" of the BRANZ Guideline "(≥10% of samples). This is due to limitations in the AS 4964-2004 and WA Guidelines 500 ml sample method for free fibre (see section 5.4" of the BRANZ guideline "for more information).

6. **Surface:** Effective options include raking / tilling the top 100 mm of asbestos-contaminated soil (or to clean soil / fill if shallower to avoid contaminating clean material at depth) and hand picking to remove visible asbestos and ACM fragments or covering with a soft cap of virgin natural material (VNM) 100 mm thick delineated by a permeable geotextile marker layer or hard cap. Near-surface fragments of ACM can become exposed in soft soils such as sandy pumiceous soils after periods of rain.

7. **Depth:** Capping is used where contamination levels exceed soil guideline values. Considerations of depth need to incorporate the type and likelihood of future disturbance activities at the site and site capping requirements (see section 6.1" of the BRANZ guideline). "Ideally, any capping layer should be delineated by a permeable geotextile marker layer between the cap and underlying asbestos / contaminated material. Institutional controls must be used to manage long-term risks, particularly where the cap may be disturbed (see section 7" of the BRANZ guideline). "Two forms of capping are typically used:

a. Hard cap comprises surfaces that are difficult to penetrate and isolate the asbestos contamination, such as tar seal or concrete driveway cover. This would typically not include pavers or decking due to maintenance and coverage factors.

b. Soft cap consists of a layer(s) of material which either comprise virgin natural material or soils that meet the asbestos residential soil guideline value from an on-site source. Use of on-site soils may require resource consent."

7.4 Assessment Criteria

Contaminant concentrations in soil were compared to human health criteria based on one land use:

- Commercial / industrial outdoor worker (unpaved) (for protection of development workers as well as site use).

The land use scenarios for commercial/industrial use are relevant to the future use of the site. The land use scenarios for commercial / industrial land use are also used as a surrogate to assess short-term risks to on-site workers during redevelopment.

The NES methodology document notes that the exposure parameters assumed for the maintenance / excavation scenario in other New Zealand guidelines are unrealistic (perhaps by a factor of 10 or more). The technical committee preparing the NES decided that a maintenance / excavation worker scenario should not be included in the NES as sites would not be cleaned up to this standard. It was considered more appropriate that exposure to these workers be limited through the use of site-specific controls that are required under health and safety legislation. However, this report uses commercial / industrial outdoor worker criteria to get a general sense of potential risks to excavation workers during the works.

Note that commercial / industrial outdoor worker criteria are based on personnel carrying out activities involving soil exposure to surface soil for example during landscaping activities and occasional shallow excavation for routine underground service maintenance. Exposure to soil is less intensive than would occur during installation works but occurs over a longer period.

For a construction worker developing the site, the soil exposure is limited when compared to a large earthworks project (e.g. for a residential subdivision or industrial development).

As such, the commercial / industrial outdoor worker criteria are considered suitable for obtaining a high-level understanding of potential risks to excavation workers during site redevelopment and confirming the need for site controls.

The soil analysis results have been compared to NES SCSs, United States (U.S.) Environmental Protection Agency (EPA) Regional Screening Levels (RSLs), San Francisco Bay Regional Water Quality Control Board Environmental Screening Level (ESLs) for SVOCs, TPH, PAH, BTEX, heavy metals, and Regional Background levels for heavy metals, TPH, and PAH. The asbestos results have been compared to BRANZ Guidance criteria.

7.5 Disposal Criteria

An assessment of potential off-site disposal options for materials generated during site development works has been conducted. Dependent on the contamination conditions of the materials, off-site disposal options range from disposal to “clean fill” sites to licensed Class A and B landfills. As outlined in the Waste Management Institute New Zealand (WasteMINZ) publication “Technical Guidelines for Disposal to Land” (2016) clean fill material is:

“Virgin excavated natural materials (VENM) such as clay, soil and rock that are free of:

- combustible, putrescible, degradable or leachable components;
- hazardous substances or materials (such as municipal solid waste) likely to create leachate by means of biological breakdown;
- products or materials derived from hazardous waste treatment, stabilisation or disposal practices;
- materials such as medical and veterinary waste, asbestos, or radioactive substances that may present a risk to human health if excavated;
- contaminated soil and other contaminated materials; and
- liquid waste.

When discharged to the environment, clean fill material will not have a detectable effect relative to the background.”

8 Results

8.1 On-site Observations

During the 2022 investigation, fill material was encountered in each of the nine window sampler holes. WS09 smelt strongly, and a wave of vapour could be seen coming out of the hole. Depth to groundwater ranged from 1.1 to 2.1 m bgs.

When the PID was inserted into the window sampler holes, PID readings ranged between approximately 50 and 250 ppm in all locations (except S07), the highest of these being 253.2 ppm in S06 at 3 m bgl. However, where there was high PID reading over window sampler hole, the PID reading for the soil itself was significantly lower; for example, at S09 @ 2.5 m, when the probe was held over hole, the reading was 200 ppm, while PID when held next to soil sample, gave a reading of 25 ppm. It is possible

that the elevated readings recording in the holes were a result of window sampler equipment fumes or background values as the area is used for automotive purposes.

Table 7: Site Photographs



Photo 1: Window sampler 1 (2022)



Photo 2: Window sampler 7 (2022)



Photo 3: Window sampler 8 (2022)



Photo 4: Window sampler 9 (2022)

9 Laboratory Analysis

Soil samples collected during the soil sampling investigations were analysed for SVOCs, VOCs, TPH, PAH, BTEX, heavy metals and asbestos.

9.1 Soil

Human Health Criteria (Industrial)

- No contaminants were detected at concentrations that exceed industrial / commercial human health criteria.
- Commercial / Industrial human health criteria for 1,2-Dibromo-3-chloropropane, 1,2-Dibromoethane and 1,2,3-Trichloropropane are lower than the laboratory limit of detection for those analytes. It is unlikely that human health criteria have actually been exceeded.

Wellington Region Background Criteria

- Heavy metals were detected above predicted background concentrations in the majority samples analysed, except for samples collected at S03 and S08.

Landfill Acceptance Criteria (Class A)

- Heavy metals were detected above Landfill Class A acceptance criteria.
 - Copper exceeded at S06 at 0.9 m, S09 at 0.5 m, WS-12 at 0.5 m and WS-5 at 0.5 m.
 - Lead exceeded at S01 at 0.5 m, S06 at 0.5 m and 0.9 m, S09 at 0.5 m, WS-12 at 0.5 m, WS-5 at 0.5 m, WS01 at 0.4-0.6 m, WS02 at 0.4-0.5 m, and BH01 at 0.5 m.
 - Zinc exceeded at S01 at 0.5 m, S06 at 0.9 m, S09 at 0.5 m, WS-12 at 0.5 m, WS-5 at 0.5 m, WS02 at 0.4-0.5 m, BH01 at 0.5 m and BH02 at 0.5 m.

Ecological Receptor Guidelines

- S09 at 0.5 m exceeded copper and zinc ecological guidelines, as well as a zinc exceedance at S06 at 0.9 m. Zinc exceeded ecological criteria at BH01 at 0.5 m.

Asbestos

- Asbestos fibres were detected in one of the samples collected during the July 2022 window sampler investigation (at S01 at 0.5 m). This was below human health criteria.

9.2 Duplicate Information

As part of the sampling programme, duplicate samples were collected during the investigation to identify the potential for cross contamination while sampling at the site. The following duplicate samples were taken, with the relative percentage difference (RPD) calculated, to identify if the difference is acceptable.

An acceptable percentage difference is less than 30-50%. The RPD is calculated by:

$$\text{Relative percent difference} = \frac{(\text{Result No.1} - \text{Result No.2})}{\text{Mean Result}} \times 100$$

Two samples were collected for duplicate analysis. If results were returned below the laboratory limits of detection (LOD), they were not included in the comparison. All laboratory analysis results, including the duplicates, are presented in Appendices 2. The RPD assessment is included as Appendix 6.

For analytes where the RPD was 'unacceptable', they have been deemed acceptable because the values returned were very low, resulting in higher percentage differences. The relative percentage

difference is likely due to soil heterogeneity. The thirteen soil sample locations across the site are considered adequate to capture potential heterogeneity.

The data quality objectives of the investigation have been met and the laboratory results are therefore considered to be suitable for basing conclusions on.

10 Updated Conceptual Site Model

The initial CSM presented in Table 4 has been updated based on the laboratory analysis results and is presented in Table 8.

Table 8: Conceptual Site Model

Potential Source	Exposure Pathway	Potential Receptor	Acceptable Risk?
SN/05/206/02 169 Tory Street Bulk storage of hydrocarbons Category A17: Chemical manufacture, application and bulk storage; storage tanks or drums for fuel, chemicals or liquid waste <i>TPH, Heavy Metals, BTEX, PAH</i>	Direct contact Ingestion of soil Inhalation of volatile contaminants or windblown dust Surface water run-off or leaching of contaminants into groundwater	Future site users / site redevelopment workers Surrounding residents and environment	Likely TPH, Heavy Metals, BTEX, PAH did not exceed industrial human health criteria.
SN/05/225/02 64 Cambridge Terrace Bulk storage of hydrocarbons Category F7: Vehicle refuelling, service and repair; service stations including retail or commercial refuelling facilities <i>TPH, Heavy Metals, BTEX, PAH</i>	Direct contact Ingestion of soil Inhalation of volatile contaminants or windblown dust Leaching of contaminants into groundwater	Future site users / site redevelopment workers Surrounding residents and environment	Likely TPH, Heavy Metals, BTEX, PAH did not exceed industrial human health criteria.

Potential Source	Exposure Pathway	Potential Receptor	Acceptable Risk?
SN/05/230/02 76 Cambridge Terrace Bulk storage of hydrocarbons Category F7: Vehicle refuelling, service and repair; service stations including retail or commercial refuelling facilities <i>TPH, Heavy Metals, BTEX, PAH</i>	Direct contact Ingestion of soil Inhalation of volatile contaminants or windblown dust Surface water run-off or leaching of contaminants into groundwater	Future site users / site redevelopment workers Surrounding residents and environment	Likely TPH, Heavy Metals, BTEX, PAH did not exceed industrial human health criteria
SN/05/617/02 20 Barker Street Bulk storage of hydrocarbons Category A17: Chemical manufacture, application and bulk storage; storage tanks or drums for fuel, chemicals or liquid waste <i>TPH, Heavy Metals, BTEX, PAH</i>	Direct contact Ingestion of soil Inhalation of volatile contaminants or windblown dust Surface water run-off or leaching of contaminants into groundwater	Future site users / site redevelopment workers Surrounding residents and environment	Likely TPH, Heavy Metals, BTEX, PAH did not exceed industrial human health criteria
20 Barker Street Waste oil storage Category A17: Chemical manufacture, application and bulk storage; storage tanks or drums for fuel, chemicals or liquid waste <i>TPH, Heavy Metals, BTEX, PAH</i>	Direct contact Ingestion of soil Surface water run-off or leaching of contaminants into groundwater	Future site users / site redevelopment workers Surrounding residents and environment	Likely TPH, Heavy Metals, BTEX, PAH did not exceed industrial human health criteria

Potential Source	Exposure Pathway	Potential Receptor	Acceptable Risk?
8 □ 20 Barker Street Undocumented fill Category 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. <i>TPH, Asbestos, Heavy Metals</i>	Direct contact Ingestion of soil Inhalation of volatile contaminants or windblown dust Surface water run-off or leaching of contaminants into groundwater	Future site users / site redevelopment workers	Likely for human health, No for environmental receptors TPH, Heavy Metals, asbestos, did not exceed industrial human health criteria. Zinc was detected in exceedance of Soil Guideline Values for the Protection of Ecological Receptors (Landcare Research 2019) at BH01 (0.5 m), S06 (at 0.9 m), and S09 (0.5 m). Copper was detected in exceedance Soil Guideline Values for the Protection of Ecological Receptors (Landcare Research 2019) at S09 (0.5 m).
Site and on Adjacent Properties Building demolition Category 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. <i>Asbestos and Lead</i>	Direct contact Ingestion of soil Inhalation of volatile contaminants or windblown dust Surface water run-off	Future site users / site redevelopment workers	Likely Lead and asbestos did not exceed industrial human health criteria.

11 Conclusions and Recommendations

ENGEO Ltd was requested by to undertake a detailed environmental site investigation (DSI) of the property at 8 Barker Street. The site is currently commercial / industrial and is proposed to be redeveloped for commercial / industrial purposes.

A number of HAIL categories were identified at the site and include:

- HAIL Category A17: Chemical manufacture, application and bulk storage; storage tanks or drums for fuel, chemicals or liquid waste.
- HAIL Category F7: Vehicle refuelling, service and repair; service stations including retail or commercial refuelling facilities.

- HAIL Category 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. This includes undocumented fill and building demolition.

ENGEO's site investigation works comprised sampling and testing soil from window sampler holes and boreholes between 2021 - 2022. This included two borehole locations and a total of eleven window sampler locations. The samples were analysed for a range of TPH, PAH, BTEX, VOCs, SVOCs, heavy metals, and asbestos.

The laboratory analysis of the sample collected during ENGEO's DSI indicate:

- No contaminants exceeded industrial human health criteria.
- Heavy metals were detected above Landfill Class A acceptance criteria.
- Heavy metals were detected above Ecological Receptor Guidelines.
- Asbestos fibres were detected in one of the samples (below human health criteria).

11.1 Recommendations

Site Management Plan

Prior to any earthworks being undertaken a Site Management Plan (SMP) is needed to provide procedures to protect human health and the environment during construction works and for future residential site use. Asbestos was detected on-site, albeit below human health guidelines. Ground disturbing works at the site will need to be conducted in accordance with "unlicensed asbestos works." Protocols associated with "unlicensed asbestos work" will be included in the SMP.

Landfill Acceptance Criteria

Heavy metals were detected above Landfill Class A acceptance criteria across the site. Therefore, it is unlikely that material on the site can be considered cleanfill. Acceptance of material to a landfill is subject to approval from the landfill manager. Toxicity characteristic leaching procedure (TCLP) tests may be required on soils from this location.

Consenting Requirements

Resource consent under the NES may be required for a Restricted Discretionary activity under Regulation 10 for the removal or disturbance of soil from site depending on volumes to be disturbed / removed. For soil disturbance, consent may be required should soil disturbance exceed the threshold volume allowed as a Permitted Activity (25 m³ per 500 m² disturbed or 5 m³ per 500 m² of soil may be taken away per year).

Consent will likely be required for disposal of soil material from the site since concentrations of heavy metals were reported in exceedance of predicted background concentrations and the soil cannot be classified as cleanfill.

Due to the detection of lead and copper in exceedance of ecological criteria, resource consent may be required for discharges from the property as a Discretionary Activity in accordance with Rule R56 of the GWRC Proposed Natural Resources Plan.

The requirements for consent should be confirmed with the relevant regulatory authorities.

12 References

- BRANZ, 2017. The Building Research Association New Zealand. New Zealand Guidelines for Assessing and Managing Asbestos in Soil.
- GWRC, 2013. Greater Wellington Regional Council. Regional Policy Statement for the Wellington Region.
- GWRC, 2014. Greater Wellington Regional Council Regional Plan for Discharges to Land.
- LRIS, 2016. Landcare Research Limited. Predicted Background Soil Concentrations, New Zealand
- MfE, 1997. Ministry for the Environment. Guidelines for assessing and managing contaminated gasworks sites in New Zealand.
- MfE, 2006. Ministry for the Environment. Identifying, investigating and managing risks associated with former sheep-dip sites: A guide for local authorities.
- MfE, 2011. Ministry for the Environment. Contaminated Land Management Guidelines No.1: Reporting on Contaminated Sites in New Zealand.
- MfE, 2011. Ministry for the Environment. Contaminated Land Management Guidelines No.2: Hierarchy and Application in New Zealand of environmental guideline values.
- MfE, 2011. Ministry for the Environment. Contaminated Land Management Guidelines No. 5: Site Investigation and Analysis of Soils.
- MfE, 2011. Ministry for the Environment. Hazardous Activities and Industries List (HAIL).
- MfE, 2011. Ministry for the Environment. Guidelines for assessing and managing petroleum hydrocarbon contaminated sites in New Zealand.
- MfE, 2011f. Ministry for the Environment. Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health.
- MfE, 2012. Ministry for the Environment. Users' Guide National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health.
- NEPM, 2013. Australian National Environmental Protection Council. National Environmental Protection (Assessment of Site Contamination) Measure 1999, Schedule B(1): Guideline on the Investigation Levels for Soil and Groundwater.
- NES, 2011. The Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations.
- URS, 2003. Determination of Common Pollutant Background Soil Concentrations for the Wellington Region.
- WasteMINZ, 2018. Waste Management Institute New Zealand. Technical Guidelines for Disposal to Land.

13 Limitations

- i. We have prepared this report in accordance with the brief as provided. This report has been prepared for the use of our client, , their professional advisers and the relevant Territorial Authorities in relation to the specified project brief described in this report. No liability is accepted for the use of any part of the report for any other purpose or by any other person or entity.
- ii. The recommendations in this report are based on the ground conditions indicated from published sources, site assessments and subsurface investigations described in this report based on accepted normal methods of site investigations. Only a limited amount of information has been collected to meet the specific financial and technical requirements of the client's brief and this report does not purport to completely describe all the site characteristics and properties. The nature and continuity of the ground between test locations has been inferred using experience and judgement and it should be appreciated that actual conditions could vary from the assumed model.
- iii. Subsurface conditions relevant to construction works should be assessed by contractors who can make their own interpretation of the factual data provided. They should perform any additional tests as necessary for their own purposes.
- iv. This Limitation should be read in conjunction with the Engineering NZ/ACENZ Standard Terms of Engagement.
- v. This report is not to be reproduced either wholly or in part without our prior written permission.

We trust that this information meets your current requirements. Please do not hesitate to contact the undersigned on (04) 472 0820 if you require any further information.

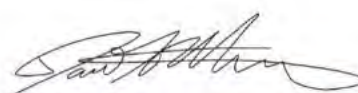
Report prepared by



Kate Standish

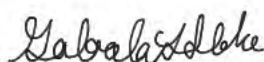
Environmental Scientist

Report reviewed by



Dave Robotham, CEnvP SC

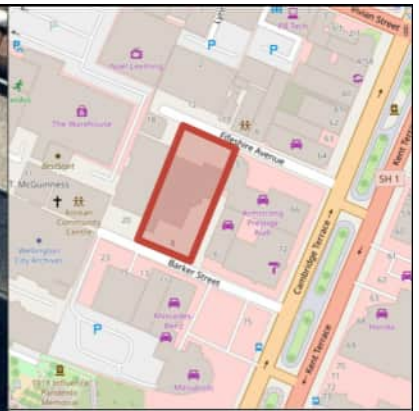
Principal Environmental Consultant



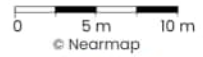
Gabriela Staehle

Environmental Engineer

FIGURES



- Legend**
- Window Sample Locations (2021)
 - Window Sample Locations (2022)
 - Borehole Sample Locations (2021)
 - 8 Barker St Boundary



ENGEO

Produced by [Datanest.earth](https://www.datanest.com)

Title: Site Location and Sampling Plan		
Client: Armstrong's Wellington		Figure No: 4 Size: A4
Project: 8&20 Barker Street	Drawn: KS	
Date: 23-08-2022	Checked: DR	Version: Final
Proj No: 18613.000.001	Scale: 1:464	

APPENDIX 1: Summary of Laboratory Results

Analyte	Units	BH01 - 0.5m (2021)	BH01 - 1.8m (2021)	BH02 - 0.5m (2021)	BH02-1.8m (2021)	WS01 @ 0.4- 0.6m (2021)	WS01 @ 0.7- 0.9m (2021)	WS01 @ 1.5- 1.6m (2021)	WS02 @ 0.4- 0.5m (2021)	WS02 @ 0.7- 0.8m (2021)	WS02 @ 1.2- 1.4m (2021)	S01	S01	S04	S04	S06	S06	S06	S06	S06	S06	S07	S07	S08	S08	S09	S09	WS-12	WS-2	WS-2	WS-3	WS-3	WS-5	WS-5	Industrial	Soil Guideline Values for the Protection of Ecological Receptors (Ecor, SVGs, Aged, Commercial/Industrial)(Landcare Research 2019)	Class A - Screening Criteria	LFRS PBC - Predicted Background Soil Concentrations, Landcare Research Limited, Upper 95th quantile estimates.
Depth												1.5m	0.5m	2m	0.5m	0.9m	0.5m	0.5m	2.1m	0.5m	2.9m	0.5m	2m	0.5m	1.5m	0.5m	1.5m	0.5m	0.5m	0.5m	2.5m	0.3m	2.5m	0.5m				
Sampled Date		13-09-2021	13-09-2021	13-09-2021	13/09/2021	6/05/2021	6/05/2021	6/05/2021	6/05/2021	6/05/2021	6/05/2021	02-07-2022	02-07-2022	02-07-2022	02-07-2022	16-07-2022	16-07-2022	16-07-2022	16-07-2022	02-07-2022	02-07-2022	02-07-2022	02-07-2022	02-07-2022	02-07-2022	02-07-2022	02-07-2022	30-07-2022	30-07-2022	30-07-2022	30-07-2022	30-07-2022	30-07-2022	30-07-2022	30-07-2022			
Heavy metals																																						
Arsenic	mg/kg	27	3	5	5	5		2	8		2	< 2	9	< 2	5	23	6	6	8	5	5	12	3	19	8	24	9	9	5	< 2	21	8	70 ¹	150	100	12.67		
Cadmium	mg/kg	1.25	0.13	0.21	0.13	0.22		<0.1	0.34		<0.10	< 0.1	0.19	< 0.1	< 0.1	3.1	0.18	0.15	0.1	< 0.1	< 0.1	< 0.1	< 0.1	3	< 0.1	0.3	0.22	< 0.1	< 0.1	< 0.1	0.29	< 0.1	1,300 ¹	33	20	0.28		
Chromium	mg/kg	26	11	14	11	15		17	18		8	10	21	9	16	28	18	16	14	15	24	18	11	32	10	19	21	17	19	10	18	14	6,300 ¹	-	-	60.5		
Copper	mg/kg	68	9	16	8	11		7	37		6	6	62	5	14	190	22	19	9	8	14	20	5	1,478	6	134	40	6	31	5	149	10	10,000 ¹	420	100	40.17		
Lead	mg/kg	1,300	73	98	22	390		13.3	2090		11.6	8.8	380	11	67	1340	108	78	15	18.9	14.4	30	9.6	2,300	15.3	360	87	11.8	28	10.2	420	13.9	3,300 ¹	2,500	100	30.08		
Nickel	mg/kg	12	7	9	9	7		10	18		8	5	18	5	9	18	13	14	9	10	14	15	7	22	7	18	17	9	16	5	16	9	6,000 ²	-	200	32.88		
Zinc	mg/kg	1,220	83	240	67	162		45	340		30	27	290	25	88	1,840	154	127	45	121	54	77	34	1,530	36	330	127	39	72	28	330	43	400,000 ³	480	200	101.8		
Polycyclic Aromatic Hydrocarbons																																						
Total PAH ⁴	mg/kg	-	-	-	-		<0.3	<0.3		0.4		< 0.3	4	< 0.4	1.2	65	7.9	5.1	< 0.4	< 0.3	< 0.3	< 0.3	< 0.4	25	< 0.4	3.4	1.4	< 0.3	< 0.3	< 0.4	8.2	< 0.4	4,000 ⁵	-	-	-	-	
~Methylnaphthalene, 1-	mg/kg	-	-	-	-		<0.012	<0.013	<0.013		< 0.013	0.012	< 0.014	< 0.012	0.154	0.019	< 0.011	< 0.015	< 0.012	< 0.012	< 0.011	< 0.013	0.23	< 0.013	0.055	< 0.011	< 0.012	< 0.011	< 0.013	0.125	< 0.014	110 ⁵	-	-	-	-		
2-Methylnaphthalene	mg/kg	-	-	-	-	<0.5	<0.012	<0.013	<0.5	<0.013	<0.5	< 0.013	0.014	< 0.014	< 0.012	0.168	0.021	< 0.011	< 0.015	< 0.012	< 0.012	< 0.011	< 0.013	0.23	< 0.013	0.042	< 0.011	< 0.012	< 0.011	< 0.013	0.113	< 0.014	3,000 ⁵	-	-	-	-	
Acenaphthylene	mg/kg	-	-	-	-	<0.5	<0.012	<0.013	<0.5	<0.013	<0.5	< 0.013	0.047	< 0.014	< 0.012	0.39	0.084	0.031	< 0.015	< 0.012	< 0.012	< 0.011	< 0.013	0.23	< 0.013	0.027	< 0.011	< 0.012	< 0.011	< 0.013	0.066	< 0.014	-	-	-	-		
Acenaphthene	mg/kg	-	-	-	-	<0.5	<0.012	<0.013	<0.5	<0.013	<0.5	< 0.013	< 0.011	< 0.014	< 0.012	0.144	< 0.011	< 0.011	< 0.015	< 0.012	< 0.012	< 0.011	< 0.013	0.05	< 0.013	< 0.013	< 0.011	< 0.012	< 0.011	< 0.013	0.024	< 0.014	130,000 ⁵	-	-	-	-	
Anthracene	mg/kg	-	-	-	-	<0.5	<0.012	<0.013	<0.5	<0.013	<0.5	< 0.013	0.055	< 0.014	0.013	1.14	0.122	0.06	< 0.015	< 0.012	< 0.012	< 0.011	< 0.013	0.34	< 0.013	0.047	0.012	< 0.012	< 0.011	< 0.013	0.138	< 0.014	230,000 ⁵	-	-	-	-	
Benzo(a)anthracene	mg/kg	-	-	-	-	<0.5	<0.012	<0.013	<0.5	0.023	<0.5	< 0.013	0.3	< 0.014	0.09	4.5	0.59	0.39	< 0.015	< 0.012	< 0.012	< 0.011	< 0.013	1.88	< 0.013	0.28	0.133	< 0.012	< 0.011	< 0.013	0.65	< 0.014	21 ⁵	-	-	-	-	
Benzo(a)pyrene	mg/kg	-	-	-	-	<0.5	<0.012	<0.013	<0.5	0.027	<0.5	< 0.013	0.4	< 0.014	0.133	5.3	0.73	0.46	< 0.015	< 0.012	< 0.012	< 0.011	< 0.013	2.4	< 0.013	0.31	0.14	< 0.012	< 0.011	< 0.013	0.72	< 0.014	10 ⁵	-	-	-	-	
Benzo(b)fluoranthene + Benzo(k)fluoranthene	mg/kg	-	-	-	-	<0.5	<0.012	<0.013	<0.5	0.035	<0.5	< 0.013	0.42	< 0.014	0.13	5.9	0.78	0.52	< 0.015	< 0.012	< 0.012	< 0.011	< 0.013	2.7	< 0.013	0.34	0.166	< 0.012	< 0.011	< 0.013	0.78	< 0.014	-	-	-	-		
Benzo(e)pyrene	mg/kg	-	-	-	-		<0.012	<0.013		0.023		< 0.013	0.24	< 0.014	0.074	3.1	0.41	0.27	< 0.015	< 0.012	< 0.012	< 0.011	< 0.013	1.37	< 0.013	0.163	0.063	< 0.012	< 0.011	< 0.013	0.38	< 0.014	-	-	-	-		
Benzo(a)pyrene Toxic Equivalence (TEF)	mg/kg	-	-	-	-	<1.3	<0.3	<0.3		<1.3	0.04	<1.3	< 0.03	0.57	< 0.04	0.18	7.6	1.03	0.67	< 0.04	< 0.03	< 0.03	< 0.03	< 0.04	3.5	< 0.04	0.45	0.2	< 0.03	< 0.03	< 0.04	1.05	< 0.04	-	-	-	-	
Benzo(a)pyrene Potency Equivalency Factor (PEF) NES	mg/kg	-	-	-	-	<1.3	<0.3	<0.4		<1.3	0.04	<1.3	< 0.03	0.57	< 0.04	0.19	7.8	1.05	0.68	< 0.04	< 0.03	< 0.03	< 0.03	< 0.04	3.5	< 0.04	0.45	0.21	< 0.03	< 0.03	< 0.04	1.06	< 0.04	-	-	-	-	
Benzo(g,h,i)perylene	mg/kg	-	-	-	-	<0.5	<0.012	<0.013	<0.5	0.029	<0.5	< 0.013	0.29	< 0.014	0.084	3.7	0.5	0.35	< 0.015	< 0.012	< 0.012	0.011	< 0.013	1.65	< 0.013	0.22	0.092	< 0.012	< 0.011	< 0.013	0.48	< 0.014	-	-	-	-		
Benzo(k)fluoranthene	mg/kg	-	-	-	-	<0.5	<0.012	<0.013	<0.5	<0.013	<0.5	< 0.013	0.153	< 0.014	0.049	2.2	0.28	0.193	< 0.015	< 0.012	< 0.012	< 0.011	< 0.013	0.9	< 0.013	0.111	0.054	< 0.012	< 0.011	< 0.013	0.26	< 0.014	210 ⁵	-	-	-	-	
Chrysene	mg/kg	-	-	-	-	<0.5	<0.012	<0.013	<0.5	0.017	<0.5	< 0.013	0.25	< 0.014	0.073	4	0.46	0.33	< 0.015	< 0.012	< 0.012	< 0.011	< 0.013	1.4	< 0.013	0.23	0.102	< 0.012	< 0.011	< 0.013	0.51	< 0.014	2,100 ⁵	-	-	-	-	
Dibenz(a,h)anthracene	mg/kg	-	-	-	-	<0.5	<0.012	<0.013	<0.5	<0.013	<0.5	< 0.013	0.053	< 0.014	0.017	0.67	0.092	0.061	< 0.015	< 0.012	< 0.012	< 0.011	< 0.013	0.33	< 0.013	0.042	0.017	< 0.012	< 0.011	< 0.013	0.102	< 0.014	2.1 ⁵	-	-	-	-	
Fluoranthene	mg/kg	-	-	-	-	<0.5	<0.012	<0.013	<0.5	0.027	<0.5	< 0.013	0.56	< 0.014	0.155	11.6	1.23	0.85	< 0.015	< 0.012	< 0.012	< 0.011	< 0.013	3.6	< 0.013	0.48	0.22	< 0.012	< 0.011	< 0.013	1.22	< 0.014	30,000 ⁵	-	-	-	-	
Fluorene	mg/kg	-	-	-	-	<0.5	<0.012	<0.013	<0.5	<0.013	<0.5	< 0.013	< 0.011	< 0.014	< 0.012	0.27	0.021	< 0.011	< 0.015	< 0.012	< 0.012	< 0.011	< 0.013	0.088	< 0.013													

APPENDIX 2: Laboratory Results



Certificate of Analysis

Page 1 of 7

Client:	Engeo Limited	Lab No:	3026449	SPV1
Contact:	Gabriela Staehle	Date Received:	04-Jul-2022	
	C/- Engeo Limited	Date Reported:	12-Jul-2022	
	PO Box 25047	Quote No:	118712	
	Wellington 6146	Order No:		
		Client Reference:	18613	
		Add. Client Ref:	8 Barker St	
		Submitted By:	Kate Standish	

Sample Type: Soil

Sample Name:	S01@ 0.5m 02-Jul-2022	S01@ 1.5m 02-Jul-2022	S04@ 0.5m 02-Jul-2022	S04@ 2m 02-Jul-2022	S08@ 0.5m 02-Jul-2022
Lab Number:	3026449.1	3026449.2	3026449.3	3026449.4	3026449.5

Individual Tests

Dry Matter	g/100g as rcvd	91	78	81	74	90
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Heavy Metals, Screen Level

Total Recoverable Arsenic	mg/kg dry wt	9	< 2	5	< 2	12
Total Recoverable Cadmium	mg/kg dry wt	0.19	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	21	10	16	9	18
Total Recoverable Copper	mg/kg dry wt	62	6	14	5	20
Total Recoverable Lead	mg/kg dry wt	380	8.8	67	11.0	30
Total Recoverable Nickel	mg/kg dry wt	18	5	9	5	15
Total Recoverable Zinc	mg/kg dry wt	290	27	88	25	77

Polycyclic Aromatic Hydrocarbons Screening in Soil*

Total of Reported PAHs in Soil	mg/kg dry wt	4.0	< 0.3	1.2	< 0.4	< 0.3
1-Methylnaphthalene	mg/kg dry wt	0.012	< 0.013	< 0.012	< 0.014	< 0.011
2-Methylnaphthalene	mg/kg dry wt	0.014	< 0.013	< 0.012	< 0.014	< 0.011
Acenaphthylene	mg/kg dry wt	0.047	< 0.013	< 0.012	< 0.014	< 0.011
Acenaphthene	mg/kg dry wt	< 0.011	< 0.013	< 0.012	< 0.014	< 0.011
Anthracene	mg/kg dry wt	0.055	< 0.013	0.013	< 0.014	< 0.011
Benzo[a]anthracene	mg/kg dry wt	0.30	< 0.013	0.090	< 0.014	< 0.011
Benzo[a]pyrene (BAP)	mg/kg dry wt	0.40	< 0.013	0.133	< 0.014	< 0.011
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	0.57	< 0.03	0.19	< 0.04	< 0.03
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	0.57	< 0.03	0.18	< 0.04	< 0.03
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	0.42	< 0.013	0.130	< 0.014	< 0.011
Benzo[e]pyrene	mg/kg dry wt	0.24	< 0.013	0.074	< 0.014	< 0.011
Benzo[g,h,i]perylene	mg/kg dry wt	0.29	< 0.013	0.084	< 0.014	0.011
Benzo[k]fluoranthene	mg/kg dry wt	0.153	< 0.013	0.049	< 0.014	< 0.011
Chrysene	mg/kg dry wt	0.25	< 0.013	0.073	< 0.014	< 0.011
Dibenzo[a,h]anthracene	mg/kg dry wt	0.053	< 0.013	0.017	< 0.014	< 0.011
Fluoranthene	mg/kg dry wt	0.56	< 0.013	0.155	< 0.014	< 0.011
Fluorene	mg/kg dry wt	< 0.011	< 0.013	< 0.012	< 0.014	< 0.011
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	0.27	< 0.013	0.081	< 0.014	< 0.011
Naphthalene	mg/kg dry wt	< 0.06	< 0.07	< 0.06	< 0.07	< 0.06
Perylene	mg/kg dry wt	0.096	0.025	0.040	0.016	< 0.011
Phenanthrene	mg/kg dry wt	0.198	< 0.013	0.059	< 0.014	< 0.011
Pyrene	mg/kg dry wt	0.59	< 0.013	0.165	< 0.014	< 0.011



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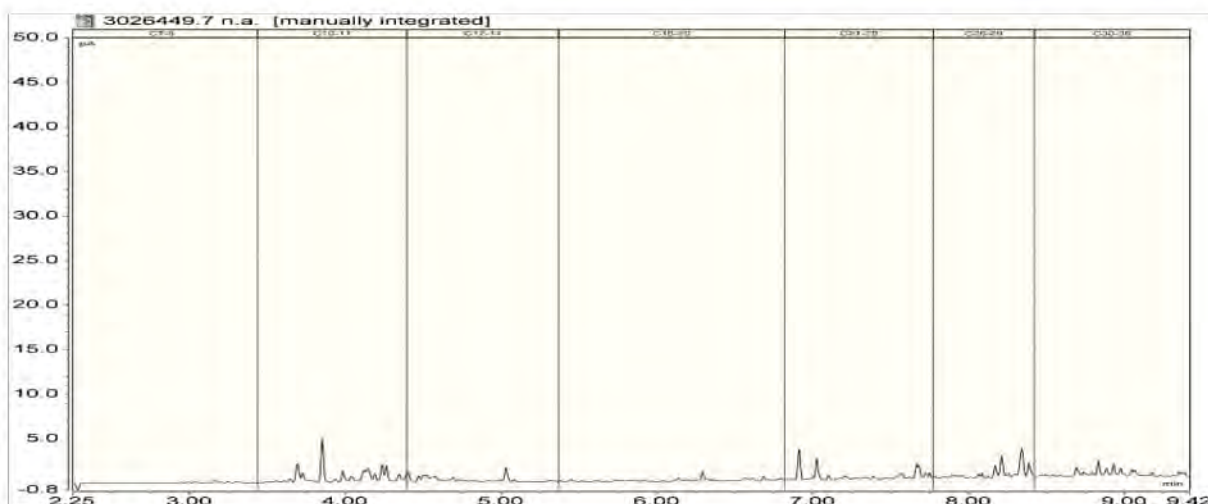
Sample Type: Soil						
Sample Name:		S01@ 0.5m 02-Jul-2022	S01@ 1.5m 02-Jul-2022	S04@ 0.5m 02-Jul-2022	S04@ 2m 02-Jul-2022	S08@ 0.5m 02-Jul-2022
Lab Number:		3026449.1	3026449.2	3026449.3	3026449.4	3026449.5
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	< 20	< 20	< 20	< 20	< 20
C10 - C14	mg/kg dry wt	< 20	< 20	< 20	< 20	< 20
C15 - C36	mg/kg dry wt	< 40	< 40	< 40	< 40	< 40
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 80	< 80	< 80	< 80	< 80
BTEX in VOC Soils by Headspace GC-MS						
Benzene	mg/kg dry wt	-	< 0.2	-	< 0.3	-
Ethylbenzene	mg/kg dry wt	-	< 0.3	-	< 0.3	-
Toluene	mg/kg dry wt	-	< 0.3	-	< 0.3	-
m&p-Xylene	mg/kg dry wt	-	< 0.4	-	< 0.5	-
o-Xylene	mg/kg dry wt	-	< 0.3	-	< 0.3	-
Halogenated Aliphatics in VOC Soils by Headspace GC-MS						
Bromomethane (Methyl Bromide)	mg/kg dry wt	-	< 0.3	-	< 0.3	-
Carbon tetrachloride	mg/kg dry wt	-	< 0.3	-	< 0.3	-
Chloroethane	mg/kg dry wt	-	< 0.3	-	< 0.3	-
Chloromethane	mg/kg dry wt	-	< 0.3	-	< 0.3	-
1,2-Dibromo-3-chloropropane	mg/kg dry wt	-	< 0.5	-	< 0.5	-
1,2-Dibromoethane (ethylene dibromide, EDB)	mg/kg dry wt	-	< 0.3	-	< 0.3	-
Dibromomethane	mg/kg dry wt	-	< 0.3	-	< 0.3	-
1,3-Dichloropropane	mg/kg dry wt	-	< 0.3	-	< 0.3	-
Dichlorodifluoromethane	mg/kg dry wt	-	< 0.5	-	< 0.5	-
1,1-Dichloroethane	mg/kg dry wt	-	< 0.3	-	< 0.3	-
1,2-Dichloroethane	mg/kg dry wt	-	< 0.3	-	< 0.3	-
1,1-Dichloroethene	mg/kg dry wt	-	< 0.3	-	< 0.3	-
cis-1,2-Dichloroethene	mg/kg dry wt	-	< 0.3	-	< 0.3	-
trans-1,2-Dichloroethene	mg/kg dry wt	-	< 0.3	-	< 0.3	-
Dichloromethane (methylene chloride)	mg/kg dry wt	-	< 4	-	< 5	-
1,2-Dichloropropane	mg/kg dry wt	-	< 0.3	-	< 0.3	-
1,1-Dichloropropene	mg/kg dry wt	-	< 0.3	-	< 0.3	-
cis-1,3-Dichloropropene	mg/kg dry wt	-	< 0.3	-	< 0.3	-
trans-1,3-Dichloropropene	mg/kg dry wt	-	< 0.3	-	< 0.3	-
Hexachlorobutadiene	mg/kg dry wt	-	< 0.3	-	< 0.3	-
1,1,1,2-Tetrachloroethane	mg/kg dry wt	-	< 0.3	-	< 0.3	-
1,1,2,2-Tetrachloroethane	mg/kg dry wt	-	< 0.3	-	< 0.3	-
Tetrachloroethene (tetrachloroethylene)	mg/kg dry wt	-	< 0.3	-	< 0.3	-
1,1,1-Trichloroethane	mg/kg dry wt	-	< 0.3	-	< 0.3	-
1,1,2-Trichloroethane	mg/kg dry wt	-	< 0.3	-	< 0.3	-
Trichloroethene (trichloroethylene)	mg/kg dry wt	-	< 0.3	-	< 0.3	-
Trichlorofluoromethane	mg/kg dry wt	-	< 0.3	-	< 0.3	-
1,2,3-Trichloropropane	mg/kg dry wt	-	< 0.5	-	< 0.5	-
1,1,2-Trichlorotrifluoroethane (Freon 113)	mg/kg dry wt	-	< 0.3	-	< 0.3	-
Vinyl chloride	mg/kg dry wt	-	< 0.3	-	< 0.3	-
Haloaromatics in VOC Soils by Headspace GC-MS						
Bromobenzene	mg/kg dry wt	-	< 0.3	-	< 0.3	-
1,3-Dichlorobenzene	mg/kg dry wt	-	< 0.3	-	< 0.3	-
4-Chlorotoluene	mg/kg dry wt	-	< 0.3	-	< 0.3	-
Chlorobenzene (monochlorobenzene)	mg/kg dry wt	-	< 0.3	-	< 0.3	-
1,2-Dichlorobenzene	mg/kg dry wt	-	< 0.3	-	< 0.3	-
1,4-Dichlorobenzene	mg/kg dry wt	-	< 0.3	-	< 0.3	-
2-Chlorotoluene	mg/kg dry wt	-	< 0.3	-	< 0.3	-
1,2,3-Trichlorobenzene	mg/kg dry wt	-	< 0.3	-	< 0.3	-

Sample Type: Soil						
Sample Name:		S01@ 0.5m 02-Jul-2022	S01@ 1.5m 02-Jul-2022	S04@ 0.5m 02-Jul-2022	S04@ 2m 02-Jul-2022	S08@ 0.5m 02-Jul-2022
Lab Number:		3026449.1	3026449.2	3026449.3	3026449.4	3026449.5
Haloaromatics in VOC Soils by Headspace GC-MS						
1,2,4-Trichlorobenzene	mg/kg dry wt	-	< 0.3	-	< 0.3	-
1,3,5-Trichlorobenzene	mg/kg dry wt	-	< 0.3	-	< 0.3	-
Monoaromatic Hydrocarbons in VOC Soils by Headspace GC-MS						
n-Butylbenzene	mg/kg dry wt	-	< 0.3	-	< 0.3	-
tert-Butylbenzene	mg/kg dry wt	-	< 0.3	-	< 0.3	-
Isopropylbenzene (Cumene)	mg/kg dry wt	-	< 0.3	-	< 0.3	-
4-Isopropyltoluene (p-Cymene)	mg/kg dry wt	-	< 0.3	-	< 0.3	-
n-Propylbenzene	mg/kg dry wt	-	< 0.3	-	< 0.3	-
sec-Butylbenzene	mg/kg dry wt	-	< 0.3	-	< 0.3	-
Styrene	mg/kg dry wt	-	< 0.3	-	< 0.3	-
1,2,4-Trimethylbenzene	mg/kg dry wt	-	< 0.3	-	< 0.3	-
1,3,5-Trimethylbenzene	mg/kg dry wt	-	< 0.3	-	< 0.3	-
Ketones in VOC Soils by Headspace GC-MS						
2-Butanone (MEK)	mg/kg dry wt	-	< 40	-	< 50	-
4-Methylpentan-2-one (MIBK)	mg/kg dry wt	-	< 8	-	< 9	-
Acetone	mg/kg dry wt	-	< 40	-	< 50	-
Methyl tert-butylether (MTBE)	mg/kg dry wt	-	< 0.3	-	< 0.3	-
Trihalomethanes in VOC Soils by Headspace GC-MS						
Bromodichloromethane	mg/kg dry wt	-	< 0.3	-	< 0.3	-
Bromoform (tribromomethane)	mg/kg dry wt	-	< 0.5	-	< 0.5	-
Chloroform (Trichloromethane)	mg/kg dry wt	-	< 0.3	-	< 0.3	-
Dibromochloromethane	mg/kg dry wt	-	< 0.3	-	< 0.3	-
Other VOC in Soils by Headspace GC-MS						
Carbon disulphide	mg/kg dry wt	-	< 0.3	-	< 0.3	-
Naphthalene	mg/kg dry wt	-	< 0.3	-	< 0.3	-
Sample Name:		S08@ 2m 02-Jul-2022	S09@ 0.5m 02-Jul-2022	S09@ 1.5m 02-Jul-2022	S07@ 0.5m 02-Jul-2022	S07@ 2.5m 02-Jul-2022
Lab Number:		3026449.6	3026449.7	3026449.8	3026449.9	3026449.10
Individual Tests						
Dry Matter	g/100g as rcvd	76	76	75	87	84
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	3	19	8	5	5
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	3.0	< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	11	32	10	15	24
Total Recoverable Copper	mg/kg dry wt	5	1,470	6	8	14
Total Recoverable Lead	mg/kg dry wt	9.6	2,300	15.3	18.9	14.4
Total Recoverable Nickel	mg/kg dry wt	7	22	7	10	14
Total Recoverable Zinc	mg/kg dry wt	34	1,530	36	121	54
Polycyclic Aromatic Hydrocarbons Screening in Soil*						
Total of Reported PAHs in Soil	mg/kg dry wt	< 0.4	25	< 0.4	< 0.3	< 0.3
1-Methylnaphthalene	mg/kg dry wt	< 0.013	0.23	< 0.013	< 0.012	< 0.012
2-Methylnaphthalene	mg/kg dry wt	< 0.013	0.23	< 0.013	< 0.012	< 0.012
Acenaphthylene	mg/kg dry wt	< 0.013	0.23	< 0.013	< 0.012	< 0.012
Acenaphthene	mg/kg dry wt	< 0.013	0.050	< 0.013	< 0.012	< 0.012
Anthracene	mg/kg dry wt	< 0.013	0.34	< 0.013	< 0.012	< 0.012
Benzo[a]anthracene	mg/kg dry wt	< 0.013	1.88	< 0.013	< 0.012	< 0.012
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.013	2.4	< 0.013	< 0.012	< 0.012
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	< 0.04	3.5	< 0.04	< 0.03	< 0.03
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	< 0.04	3.5	< 0.04	< 0.03	< 0.03
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.013	2.7	< 0.013	< 0.012	< 0.012
Benzo[e]pyrene	mg/kg dry wt	< 0.013	1.37	< 0.013	< 0.012	< 0.012
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.013	1.65	< 0.013	< 0.012	< 0.012

Sample Type: Soil						
Sample Name:		S08@ 2m 02-Jul-2022	S09@ 0.5m 02-Jul-2022	S09@ 1.5m 02-Jul-2022	S07@ 0.5m 02-Jul-2022	S07@ 2.5m 02-Jul-2022
Lab Number:		3026449.6	3026449.7	3026449.8	3026449.9	3026449.10
Polycyclic Aromatic Hydrocarbons Screening in Soil*						
Benzo[k]fluoranthene	mg/kg dry wt	< 0.013	0.90	< 0.013	< 0.012	< 0.012
Chrysene	mg/kg dry wt	< 0.013	1.40	< 0.013	< 0.012	< 0.012
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.013	0.33	< 0.013	< 0.012	< 0.012
Fluoranthene	mg/kg dry wt	< 0.013	3.6	< 0.013	< 0.012	< 0.012
Fluorene	mg/kg dry wt	< 0.013	0.088	< 0.013	< 0.012	< 0.012
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.013	1.64	< 0.013	< 0.012	< 0.012
Naphthalene	mg/kg dry wt	< 0.07	0.29	< 0.07	< 0.06	< 0.06
Perylene	mg/kg dry wt	0.020	0.52	< 0.013	< 0.012	< 0.012
Phenanthrene	mg/kg dry wt	< 0.013	1.58	< 0.013	< 0.012	< 0.012
Pyrene	mg/kg dry wt	< 0.013	3.8	< 0.013	< 0.012	< 0.012
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	< 20	< 20	< 20	-	< 20
C10 - C14	mg/kg dry wt	< 20	74	< 20	-	< 20
C15 - C36	mg/kg dry wt	< 40	178	< 40	-	< 40
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 80	250	< 80	-	< 80
BTEX in VOC Soils by Headspace GC-MS						
Benzene	mg/kg dry wt	< 0.3	-	< 0.3	-	< 0.18
Ethylbenzene	mg/kg dry wt	< 0.3	-	< 0.3	-	< 0.3
Toluene	mg/kg dry wt	< 0.3	-	< 0.3	-	< 0.3
m&p-Xylene	mg/kg dry wt	< 0.5	-	< 0.5	-	< 0.4
o-Xylene	mg/kg dry wt	< 0.3	-	< 0.3	-	< 0.3
Halogenated Aliphatics in VOC Soils by Headspace GC-MS						
Bromomethane (Methyl Bromide)	mg/kg dry wt	< 0.3	-	< 0.3	-	< 0.3
Carbon tetrachloride	mg/kg dry wt	< 0.3	-	< 0.3	-	< 0.3
Chloroethane	mg/kg dry wt	< 0.3	-	< 0.3	-	< 0.3
Chloromethane	mg/kg dry wt	< 0.3	-	< 0.3	-	< 0.3
1,2-Dibromo-3-chloropropane	mg/kg dry wt	< 0.5	-	< 0.5	-	< 0.5
1,2-Dibromoethane (ethylene dibromide, EDB)	mg/kg dry wt	< 0.3	-	< 0.3	-	< 0.3
Dibromomethane	mg/kg dry wt	< 0.3	-	< 0.3	-	< 0.3
1,3-Dichloropropane	mg/kg dry wt	< 0.3	-	< 0.3	-	< 0.3
Dichlorodifluoromethane	mg/kg dry wt	< 0.5	-	< 0.5	-	< 0.5
1,1-Dichloroethane	mg/kg dry wt	< 0.3	-	< 0.3	-	< 0.3
1,2-Dichloroethane	mg/kg dry wt	< 0.3	-	< 0.3	-	< 0.3
1,1-Dichloroethene	mg/kg dry wt	< 0.3	-	< 0.3	-	< 0.3
cis-1,2-Dichloroethene	mg/kg dry wt	< 0.3	-	< 0.3	-	< 0.3
trans-1,2-Dichloroethene	mg/kg dry wt	< 0.3	-	< 0.3	-	< 0.3
Dichloromethane (methylene chloride)	mg/kg dry wt	< 5	-	< 5	-	< 4
1,2-Dichloropropane	mg/kg dry wt	< 0.3	-	< 0.3	-	< 0.3
1,1-Dichloropropene	mg/kg dry wt	< 0.3	-	< 0.3	-	< 0.3
cis-1,3-Dichloropropene	mg/kg dry wt	< 0.3	-	< 0.3	-	< 0.3
trans-1,3-Dichloropropene	mg/kg dry wt	< 0.3	-	< 0.3	-	< 0.3
Hexachlorobutadiene	mg/kg dry wt	< 0.3	-	< 0.3	-	< 0.3
1,1,1,2-Tetrachloroethane	mg/kg dry wt	< 0.3	-	< 0.3	-	< 0.3
1,1,2,2-Tetrachloroethane	mg/kg dry wt	< 0.3	-	< 0.3	-	< 0.3
Tetrachloroethene (tetrachloroethylene)	mg/kg dry wt	< 0.3	-	< 0.3	-	< 0.3
1,1,1-Trichloroethane	mg/kg dry wt	< 0.3	-	< 0.3	-	< 0.3
1,1,2-Trichloroethane	mg/kg dry wt	< 0.3	-	< 0.3	-	< 0.3
Trichloroethene (trichloroethylene)	mg/kg dry wt	< 0.3	-	< 0.3	-	< 0.3
Trichlorofluoromethane	mg/kg dry wt	< 0.3	-	< 0.3	-	< 0.3
1,2,3-Trichloropropane	mg/kg dry wt	< 0.5	-	< 0.5	-	< 0.5
1,1,2-Trichlorotrifluoroethane (Freon 113)	mg/kg dry wt	< 0.3	-	< 0.3	-	< 0.3

Sample Type: Soil						
Sample Name:		S08@ 2m 02-Jul-2022	S09@ 0.5m 02-Jul-2022	S09@ 1.5m 02-Jul-2022	S07@ 0.5m 02-Jul-2022	S07@ 2.5m 02-Jul-2022
Lab Number:		3026449.6	3026449.7	3026449.8	3026449.9	3026449.10
Halogenated Aliphatics in VOC Soils by Headspace GC-MS						
Vinyl chloride	mg/kg dry wt	< 0.3	-	< 0.3	-	< 0.3
Haloaromatics in VOC Soils by Headspace GC-MS						
Bromobenzene	mg/kg dry wt	< 0.3	-	< 0.3	-	< 0.3
1,3-Dichlorobenzene	mg/kg dry wt	< 0.3	-	< 0.3	-	< 0.3
4-Chlorotoluene	mg/kg dry wt	< 0.3	-	< 0.3	-	< 0.3
Chlorobenzene (monochlorobenzene)	mg/kg dry wt	< 0.3	-	< 0.3	-	< 0.3
1,2-Dichlorobenzene	mg/kg dry wt	< 0.3	-	< 0.3	-	< 0.3
1,4-Dichlorobenzene	mg/kg dry wt	< 0.3	-	< 0.3	-	< 0.3
2-Chlorotoluene	mg/kg dry wt	< 0.3	-	< 0.3	-	< 0.3
1,2,3-Trichlorobenzene	mg/kg dry wt	< 0.3	-	< 0.3	-	< 0.3
1,2,4-Trichlorobenzene	mg/kg dry wt	< 0.3	-	< 0.3	-	< 0.3
1,3,5-Trichlorobenzene	mg/kg dry wt	< 0.3	-	< 0.3	-	< 0.3
Monoaromatic Hydrocarbons in VOC Soils by Headspace GC-MS						
n-Butylbenzene	mg/kg dry wt	< 0.3	-	< 0.3	-	< 0.3
tert-Butylbenzene	mg/kg dry wt	< 0.3	-	< 0.3	-	< 0.3
Isopropylbenzene (Cumene)	mg/kg dry wt	< 0.3	-	< 0.3	-	< 0.3
4-Isopropyltoluene (p-Cymene)	mg/kg dry wt	< 0.3	-	< 0.3	-	< 0.3
n-Propylbenzene	mg/kg dry wt	< 0.3	-	< 0.3	-	< 0.3
sec-Butylbenzene	mg/kg dry wt	< 0.3	-	< 0.3	-	< 0.3
Styrene	mg/kg dry wt	< 0.3	-	< 0.3	-	< 0.3
1,2,4-Trimethylbenzene	mg/kg dry wt	< 0.3	-	< 0.3	-	< 0.3
1,3,5-Trimethylbenzene	mg/kg dry wt	< 0.3	-	< 0.3	-	< 0.3
Ketones in VOC Soils by Headspace GC-MS						
2-Butanone (MEK)	mg/kg dry wt	< 50	-	< 50	-	< 40
4-Methylpentan-2-one (MIBK)	mg/kg dry wt	< 9	-	< 9	-	< 8
Acetone	mg/kg dry wt	< 50	-	< 50	-	< 40
Methyl tert-butylether (MTBE)	mg/kg dry wt	< 0.3	-	< 0.3	-	< 0.3
Trihalomethanes in VOC Soils by Headspace GC-MS						
Bromodichloromethane	mg/kg dry wt	< 0.3	-	< 0.3	-	< 0.3
Bromoform (tribromomethane)	mg/kg dry wt	< 0.5	-	< 0.5	-	< 0.5
Chloroform (Trichloromethane)	mg/kg dry wt	< 0.3	-	< 0.3	-	< 0.3
Dibromochloromethane	mg/kg dry wt	< 0.3	-	< 0.3	-	< 0.3
Other VOC in Soils by Headspace GC-MS						
Carbon disulphide	mg/kg dry wt	< 0.3	-	< 0.3	-	< 0.3
Naphthalene	mg/kg dry wt	< 0.3	-	< 0.3	-	< 0.3

3026449.7
S09@ 0.5m 02-Jul-2022
Client Chromatogram for TPH by FID



Analyst's Comments

It was observed that the container(s) for sample # 2,4,6,8,10, on Job 3026449 were not completely filled. Volatile loss may have occurred due to the headspace created in the container.

Appendix No.1 - Chain of Custody

Summary of Methods

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

Sample Type: Soil			
Test	Method Description	Default Detection Limit	Sample No
Individual Tests			
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%.	-	1-10
Total of Reported PAHs in Soil	Sonication extraction, GC-MS analysis. In-house based on US EPA 8270.	0.03 mg/kg dry wt	1-10
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	1-10
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	BaP Potency Equivalence calculated from; Benzo(a)anthracene x 0.1 + Benzo(b)fluoranthene x 0.1 + Benzo(j)fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Benzo(a)pyrene x 1.0 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Fluoranthene x 0.01 + Indeno(1,2,3-c,d)pyrene x 0.1. Ministry for the Environment. 2011. Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health. Wellington: Ministry for the Environment.	0.002 mg/kg dry wt	1-10
Benzo[a]pyrene Toxic Equivalence (TEF)*	Benzo[a]pyrene Toxic Equivalence (TEF) calculated from; Benzo[a]pyrene x 1.0 + Benzo(a)anthracene x 0.1 + Benzo(b)fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Indeno(1,2,3-c,d)pyrene x 0.1. Guidelines for assessing and managing contaminated gasworks sites in New Zealand (GMG) (MfE, 1997).	0.002 mg/kg dry wt	1-10
TPH Oil Industry Profile + PAHscreen	Sonication extraction, GC-FID and GC-MS analysis. Tested on as received sample. In-house based on US EPA 8015 and US EPA 8270.	0.002 - 70 mg/kg dry wt	1-8, 10
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	1-10
Polycyclic Aromatic Hydrocarbons Screening in Soil*	Sonication extraction, GC-MS analysis. Tested on as received sample. In-house based on US EPA 8270.	0.002 - 0.05 mg/kg dry wt	9
Volatile Organic Compounds Screening in Soil by Headspace GC-MS	Sonication extraction, Headspace GC-MS analysis. Tested on as received sample. In-house based on US EPA 8260 and 5021.	0.13 - 30 mg/kg dry wt	2, 4, 6, 8, 10

Sample Type: Soil			
Test	Method Description	Default Detection Limit	Sample No
Total Petroleum Hydrocarbons in Soil			
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	7
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	1-8, 10
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	1-8, 10
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	1-8, 10
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	1-8, 10

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

Testing was completed between 08-Jul-2022 and 12-Jul-2022. For completion dates of individual analyses please contact the laboratory.

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

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

Ara Heron BSc (Tech)
Client Services Manager - Environmental



Quote No

Primary Contact Gabriela StaehleSubmitted By Kate Standish

Client Name

Address ENGEO Limited Level 18 PlimmerTowers

Postcode

Phone

Mobile

Email

Charge To

Client Reference 18 613

Order No

Results To

Reports will be emailed to Primary Contact by default.
Additional Reports will be sent as specified below.☒ Email Primary Contact ☒ Email Submitter ☐ Email Client☐ Email Other☐ Other**ADDITIONAL INFORMATION**Hold & cold glass jars**ANALYSIS REQUEST**R J Hill Laboratories Limited
3/204 Thorndon Quay
Pipitea
Wellington 6011
New Zealand

Job No: Date Recv: 04-Jul-22 11:24

302 6449Received by: Charlotte O'Leary

3130264494

CHAIN OF CUSTODY RECORDSent to
Hill LaboratoriesDate & Time: 9/7/22Name: Kate Standish☒ Tick if you require COC
to be emailed backSignature: KLSSamples will be processed at a Hill Laboratories site with the appropriate
testing capability and capacity. Please inform the Laboratory if you wish
samples to be retained and analysed at the site of receipt.Received at
Hill Laboratories

Date & Time:

Name:

12.5°C

Signature:

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

Requested Reporting Date:

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

No.	Sample Name	Sample Material	Sample Location	Sample Date	Tests Required (if not as per Quote)
1	S02 @ 0.5m (tub)	soil	8 Barker st	2/7/22	Asbestos
2	S02 S02 @ 1.5m (tub)				
3	S04 @ 0.5m (tub)				
4	S04 @ 2m (tub)				
5	S08 @ 0.5m (tub)				
6	S08 @ 2m (tub)				
7	S09 @ 0.5m (tub)				
8	S09 @ 1.5m (tub)				
S09 @ 2.5m (tub)					
10	S07 @ 0.5m (tub)				
11	S07 @ 2.5m (tub)				

P70 →

No.	Sample Name	Sample Material	Sample Location	Sample Date	Tests Required (if not as per Quote)
13	SO7 @ 0.5m (Jar)	Soil	8 Barker	2/7/22	Hold & Cold
14	SO7 @ 2.5m (Jar)				
15	SO9 @ 0.5m (Jar)				
16	SO9 @ 1.5m (Jar)				
17	SO4 @ 2.5m (Jar)				
18	SO8 @ 0.5m (Jar)				
19	SO8 @ 2m (Jar)				
20	SO4 @ 0.5m (Jar)				
21	SO4 @ 2m (Jar)				
22	SO1 @ 0.5m (Jar)				
23	SO1 @ 1.5m (Jar)				
24					
25					
26					
27					
28					
29					
30					
31					
32					
33					
34					
35					
36					
37					
38					
39					
40					



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

Job Information Summary

Page 1 of 1

Client: Engeo Limited
Contact: Gabriela Staehle
C/- Engeo Limited
PO Box 25047
Wellington 6146

Lab No: 3026449
Date Registered: 05-Jul-2022 8:19 am
Priority: High
Quote No: 82742
Order No:
Client Reference: 18613
Add. Client Ref:
Submitted By: Kate Standish
Charge To: Engeo Limited
Target Date: 06-Jul-2022 4:30 pm

Samples				
No	Sample Name	Sample Type	Containers	Tests Requested
1	S01@ 0.5m 02-Jul-2022	Soil	GSoil300	Hold Cold HM, TPH+PAH
2	S01@ 1.5m 02-Jul-2022	Soil	GSoil300	Hold Cold HM, TPH+PAH+BTEX Profile,
3	S04@ 0.5m 02-Jul-2022	Soil	GSoil300	Hold Cold HM, TPH+PAH
4	S04@ 2m 02-Jul-2022	Soil	GSoil300	Hold Cold HM, TPH+PAH+BTEX Profile,
5	S08@ 0.5m 02-Jul-2022	Soil	cGSoil	Hold Cold HM, TPH+PAH
6	S08@ 2m 02-Jul-2022	Soil	cGSoil	Hold Cold HM, TPH+PAH+BTEX Profile,
7	S09@ 0.5m 02-Jul-2022	Soil	cGSoil	Hold Cold HM, TPH+PAH
8	S09@ 1.5m 02-Jul-2022	Soil	GSoil300	Hold Cold HM, TPH+PAH+BTEX Profile,
9	S07@ 0.5m 02-Jul-2022	Soil	GSoil300	Hold Cold HM, PAH
10	S07@ 2.5m 02-Jul-2022	Soil	GSoil300	Hold Cold HM, TPH+PAH+BTEX Profile
11	S09@ 2.5m 02-Jul-2022	Soil	GSoil300	Hold Cold



Certificate of Analysis

Page 1 of 4

Client:	Engeo Limited	Lab No:	3035766	SPV1
Contact:	Gabriela Staehle	Date Received:	18-Jul-2022	
	C/- Engeo Limited	Date Reported:	25-Jul-2022	
	PO Box 25047	Quote No:	82742	
	Wellington 6146	Order No:		
		Client Reference:	8 Barker St	
		Submitted By:	Josh Law	

Sample Type: Soil

Sample Name:		S06 @ 0.5m 16-Jul-2022 10:15 am	S06 @ 0.5m [Duplicate] 16-Jul-2022 10:15 am	S06 @ 0.9m 16-Jul-2022	S06 @ 2.1m 16-Jul-2022 11:00 am
Lab Number:		3035766.1	3035766.2	3035766.3	3035766.4
Individual Tests					
Dry Matter	g/100g as rcvd	94	93	59	69
Heavy Metals, Screen Level					
Total Recoverable Arsenic	mg/kg dry wt	6	6	23	8
Total Recoverable Cadmium	mg/kg dry wt	0.15	0.18	3.1	0.10
Total Recoverable Chromium	mg/kg dry wt	16	18	28	14
Total Recoverable Copper	mg/kg dry wt	19	22	190	9
Total Recoverable Lead	mg/kg dry wt	78	108	1,340	15.0
Total Recoverable Nickel	mg/kg dry wt	14	13	18	9
Total Recoverable Zinc	mg/kg dry wt	127	154	1,840	45
BTEX in Soil by Headspace GC-MS					
Benzene	mg/kg dry wt	-	-	-	< 0.07
Toluene	mg/kg dry wt	-	-	-	< 0.07
Ethylbenzene	mg/kg dry wt	-	-	-	< 0.07
m&p-Xylene	mg/kg dry wt	-	-	-	< 0.13
o-Xylene	mg/kg dry wt	-	-	-	< 0.07
Polycyclic Aromatic Hydrocarbons Screening in Soil*					
Total of Reported PAHs in Soil	mg/kg dry wt	5.1	7.9	65	< 0.4
1-Methylnaphthalene	mg/kg dry wt	< 0.011	0.019	0.154	< 0.015
2-Methylnaphthalene	mg/kg dry wt	< 0.011	0.021	0.168	< 0.015
Acenaphthylene	mg/kg dry wt	0.031	0.084	0.39	< 0.015
Acenaphthene	mg/kg dry wt	< 0.011	< 0.011	0.144	< 0.015
Anthracene	mg/kg dry wt	0.060	0.122	1.14	< 0.015
Benzo[a]anthracene	mg/kg dry wt	0.39	0.59	4.5	< 0.015
Benzo[a]pyrene (BAP)	mg/kg dry wt	0.46	0.73	5.3	< 0.015
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	0.68	1.05	7.8	< 0.04
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	0.67	1.03	7.6	< 0.04
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	0.52	0.78	5.9	< 0.015
Benzo[e]pyrene	mg/kg dry wt	0.27	0.41	3.1	< 0.015
Benzo[g,h,i]perylene	mg/kg dry wt	0.35	0.50	3.7	< 0.015
Benzo[k]fluoranthene	mg/kg dry wt	0.193	0.28	2.2	< 0.015
Chrysene	mg/kg dry wt	0.33	0.46	4.0	< 0.015
Dibenzo[a,h]anthracene	mg/kg dry wt	0.061	0.092	0.67	< 0.015
Fluoranthene	mg/kg dry wt	0.85	1.23	11.6	< 0.015
Fluorene	mg/kg dry wt	< 0.011	0.021	0.27	< 0.015
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	0.33	0.47	3.8	< 0.015



This Laboratory is accredited by International Accreditation New Zealand (IANZ), which represents New Zealand in the International Laboratory Accreditation Cooperation (ILAC). Through the ILAC Mutual Recognition Arrangement (ILAC-MRA) this accreditation is internationally recognised. The tests reported herein have been performed in accordance with the terms of accreditation, with the exception of tests marked * or any comments and interpretations, which are not accredited.

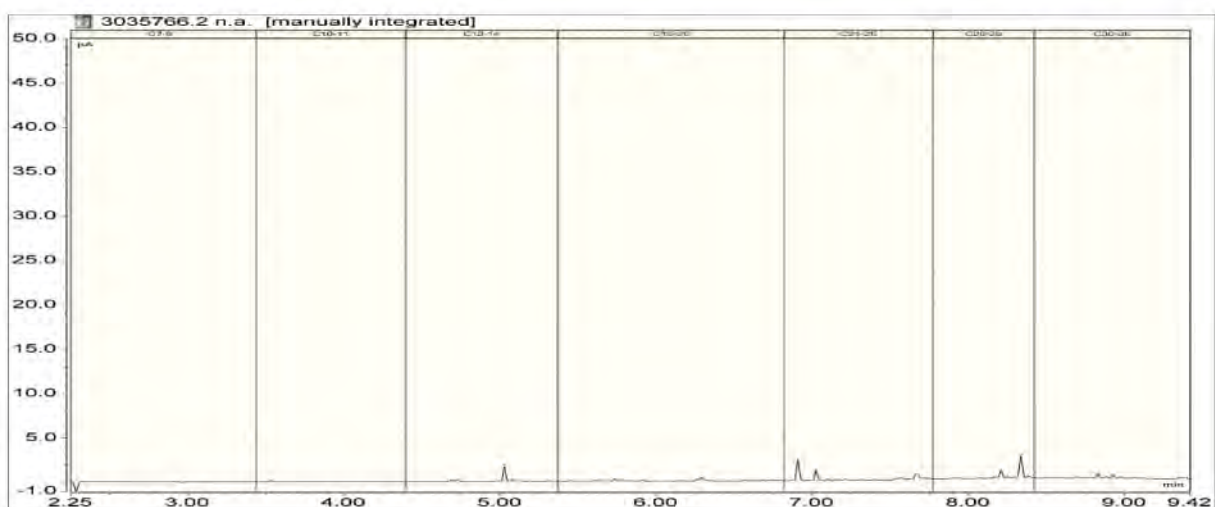
Sample Type: Soil

Sample Name:		S06 @ 0.5m 16-Jul-2022 10:15 am	S06 @ 0.5m [Duplicate] 16-Jul-2022 10:15 am	S06 @ 0.9m 16-Jul-2022	S06 @ 2.1m 16-Jul-2022 11:00 am
Lab Number:		3035766.1	3035766.2	3035766.3	3035766.4
Polycyclic Aromatic Hydrocarbons Screening in Soil*					
Naphthalene	mg/kg dry wt	< 0.06	< 0.06	0.21	< 0.08
Perylene	mg/kg dry wt	0.113	0.170	1.24	0.026
Phenanthrene	mg/kg dry wt	0.27	0.51	6.1	< 0.015
Pyrene	mg/kg dry wt	0.83	1.37	10.9	< 0.015
Total Petroleum Hydrocarbons in Soil					
C7 - C9	mg/kg dry wt	< 20	< 20	< 30	< 30
C10 - C14	mg/kg dry wt	< 20	< 20	< 20	< 20
C15 - C36	mg/kg dry wt	< 40	63	420	< 40
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 80	< 80	440	< 90

3035766.2

S06 @ 0.5m [Duplicate] 16-Jul-2022 10:15 am

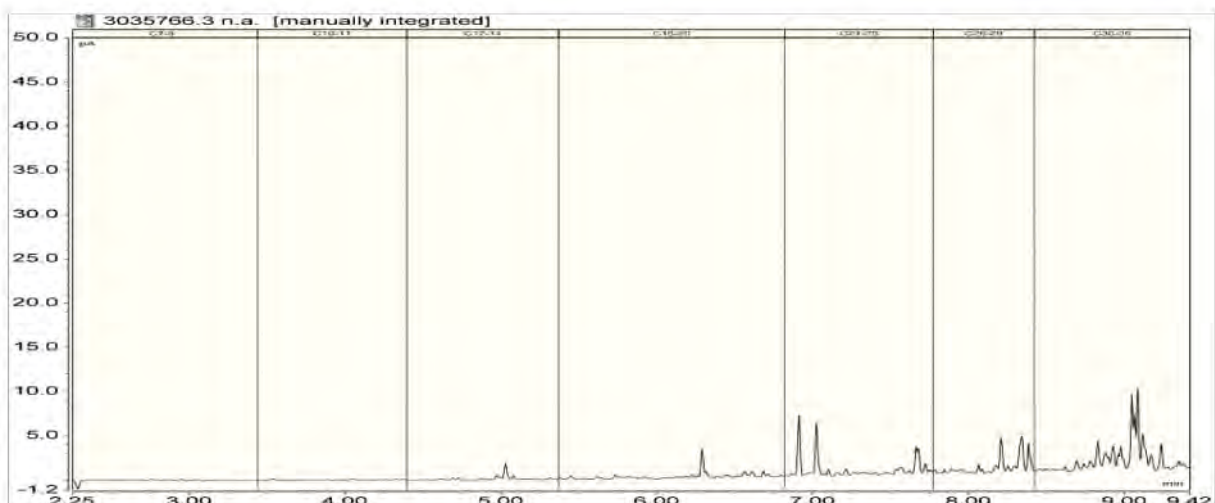
Client Chromatogram for TPH by FID



3035766.3

S06 @ 0.9m 16-Jul-2022

Client Chromatogram for TPH by FID


Analyst's Comments

Appendix No.1 - Chain of Custody

Summary of Methods

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

Sample Type: Soil			
Test	Method Description	Default Detection Limit	Sample No
Individual Tests			
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%.	-	1-4
Total of Reported PAHs in Soil	Sonication extraction, GC-MS analysis. In-house based on US EPA 8270.	0.03 mg/kg dry wt	1-4
Dry Matter (Env)	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	1-4
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	BaP Potency Equivalence calculated from; Benzo(a)anthracene x 0.1 + Benzo(b)fluoranthene x 0.1 + Benzo(j)fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Benzo(a)pyrene x 1.0 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Fluoranthene x 0.01 + Indeno(1,2,3-c,d)pyrene x 0.1. Ministry for the Environment. 2011. Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health. Wellington: Ministry for the Environment.	0.002 mg/kg dry wt	1-4
Benzo[a]pyrene Toxic Equivalence (TEF)*	Benzo[a]pyrene Toxic Equivalence (TEF) calculated from; Benzo[a]pyrene x 1.0 + Benzo(a)anthracene x 0.1 + Benzo(b)fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Indeno(1,2,3-c,d)pyrene x 0.1. Guidelines for assessing and managing contaminated gasworks sites in New Zealand (GMG) (MfE, 1997).	0.002 mg/kg dry wt	1-4
TPH Oil Industry Profile + PAHscreen	Sonication extraction, GC-FID and GC-MS analysis. Tested on as received sample. In-house based on US EPA 8015 and US EPA 8270.	0.002 - 70 mg/kg dry wt	1-3
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	1-4
BTEX in Soil by Headspace GC-MS	Solvent extraction, Headspace GC-MS analysis. Tested on as received sample. In-house based on US EPA 8260 and 5021.	0.05 - 0.10 mg/kg dry wt	4
Polycyclic Aromatic Hydrocarbons Screening in Soil*	Sonication extraction, GC-MS analysis. Tested on as received sample. In-house based on US EPA 8270.	0.002 - 0.05 mg/kg dry wt	4
TPH + PAH + BTEX profile	Sonication extraction, GC-FID and GC-MS analysis. Tested on as received sample. In-house based on US EPA 8015 and US EPA 8270.	0.002 - 70 mg/kg dry wt	4
Total Petroleum Hydrocarbons in Soil			
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	2-3
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	1-4
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	1-4
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	1-4
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	1-4

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

Testing was completed between 21-Jul-2022 and 25-Jul-2022. For completion dates of individual analyses please contact the laboratory.

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

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



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



Quote No 8 Barber St
 Primary Contact Gabriela Stachle
 Submitted By Joshua Law
 Client Name ENGEO Ltd.
 Address _____
 Postcode _____

Phone _____ Mobile _____

Email _____

Charge To _____

Client Reference _____

Order No _____

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

☐ Email Primary Contact ☐ Email Submitter ☐ Email Client

☐ Email Other _____

☐ Other _____

ADDITIONAL INFORMATION

No.	Sample Name	Sample Material	Sample Location	Sample Date	Tests Required (if not as per Quote)
1	SO6 @ 0.5m (+ Duplicate)		9 Barber St	16 July 22	Hold & Cold please
2	SO6 @ 0.9m		"	"	"
3	SO6 @ 2.1m		"	"	"
4	Asbo SO6 @ 0.5m (+ Duplicate)		"	"	"
5	Asbo SO6 @ 0.9m		"	"	"
6	Asbo SO6 @ 2.1m		"	"	"
7					
8					
9					
10					

ANALYSIS REQUEST

J Hill Laboratories Limited
 204 Thorndon Quay
 Ptehea
 Wellington 6011
 New Zealand

Job No: _____ Date Recv: 18-Jul-22 11:03

303 5766

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

Received by: Kelsey Rohloff



3130357668

18.2°C

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories Date & Time: 11:00am 18 July 22
 Name: Joshua Law
 Signature: _____
 Tick if you require COC to be emailed back ☐

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

Received at Hill Laboratories Date & Time: _____
 Name: _____
 Signature: _____

Priority ☐ Low ☒ Normal ☐ High

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

Requested Reporting Date: _____

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



Certificate of Analysis

Page 1 of 7

Client:	Engeo Limited	Lab No:	3044639	SPV1
Contact:	Gabriela Staehle	Date Received:	01-Aug-2022	
	C/- Engeo Limited	Date Reported:	05-Aug-2022	
	PO Box 25047	Quote No:	82742	
	Wellington 6146	Order No:		
		Client Reference:	8 Barker Street, Te Aro	
		Submitted By:	Josh Law	

Sample Type: Soil

Sample Name:		WS-3 @ 0.3 30-Jul-2022 9:05 am	WS-3 @ 2.5 30-Jul-2022 9:20 am	WS-5 @ 0.5 30-Jul-2022 10:00 am	WS-5 @ 2.5 30-Jul-2022 10:15 am	WS-2 @ 0.5 30-Jul-2022 10:45 am
Lab Number:		3044639.1	3044639.3	3044639.5	3044639.6	3044639.7
Individual Tests						
Dry Matter	g/100g as rcvd	91	76	75	72	92
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	5	< 2	21	8	9
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	0.29	< 0.10	0.22
Total Recoverable Chromium	mg/kg dry wt	19	10	18	14	21
Total Recoverable Copper	mg/kg dry wt	31	5	149	10	40
Total Recoverable Lead	mg/kg dry wt	28	10.2	420	13.9	87
Total Recoverable Nickel	mg/kg dry wt	16	5	16	9	17
Total Recoverable Zinc	mg/kg dry wt	72	28	330	43	127
Polycyclic Aromatic Hydrocarbons Screening in Soil*						
Total of Reported PAHs in Soil	mg/kg dry wt	< 0.3	< 0.4	8.2	< 0.4	1.4
1-Methylnaphthalene	mg/kg dry wt	< 0.011	< 0.013	0.125	< 0.014	< 0.011
2-Methylnaphthalene	mg/kg dry wt	< 0.011	< 0.013	0.113	< 0.014	< 0.011
Acenaphthylene	mg/kg dry wt	< 0.011	< 0.013	0.066	< 0.014	< 0.011
Acenaphthene	mg/kg dry wt	< 0.011	< 0.013	0.024	< 0.014	< 0.011
Anthracene	mg/kg dry wt	< 0.011	< 0.013	0.138	< 0.014	0.012
Benzo[a]anthracene	mg/kg dry wt	< 0.011	< 0.013	0.65	< 0.014	0.133
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.011	< 0.013	0.72	< 0.014	0.140
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	< 0.03	< 0.04	1.06	< 0.04	0.21
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	< 0.03	< 0.04	1.05	< 0.04	0.20
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.011	< 0.013	0.78	< 0.014	0.166
Benzo[e]pyrene	mg/kg dry wt	< 0.011	< 0.013	0.38	< 0.014	0.063
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.011	< 0.013	0.48	< 0.014	0.092
Benzo[k]fluoranthene	mg/kg dry wt	< 0.011	< 0.013	0.26	< 0.014	0.054
Chrysene	mg/kg dry wt	< 0.011	< 0.013	0.51	< 0.014	0.102
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.011	< 0.013	0.102	< 0.014	0.017
Fluoranthene	mg/kg dry wt	< 0.011	< 0.013	1.22	< 0.014	0.22
Fluorene	mg/kg dry wt	< 0.011	< 0.013	0.029	< 0.014	< 0.011
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.011	< 0.013	0.49	< 0.014	0.096
Naphthalene	mg/kg dry wt	< 0.06	< 0.07	0.08	< 0.07	< 0.06
Perylene	mg/kg dry wt	< 0.011	< 0.013	0.161	< 0.014	0.030
Phenanthrene	mg/kg dry wt	< 0.011	< 0.013	0.63	< 0.014	0.051
Pyrene	mg/kg dry wt	< 0.011	< 0.013	1.21	< 0.014	0.21



This Laboratory is accredited by International Accreditation New Zealand (IANZ), which represents New Zealand in the International Laboratory Accreditation Cooperation (ILAC). Through the ILAC Mutual Recognition Arrangement (ILAC-MRA) this accreditation is internationally recognised. The tests reported herein have been performed in accordance with the terms of accreditation, with the exception of tests marked * or any comments and interpretations, which are not accredited.

Sample Type: Soil						
Sample Name:		WS-3 @ 0.3 30-Jul-2022 9:05 am	WS-3 @ 2.5 30-Jul-2022 9:20 am	WS-5 @ 0.5 30-Jul-2022 10:00 am	WS-5 @ 2.5 30-Jul-2022 10:15 am	WS-2 @ 0.5 30-Jul-2022 10:45 am
Lab Number:		3044639.1	3044639.3	3044639.5	3044639.6	3044639.7
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	< 20	< 20	< 20	< 20	< 20
C10 - C14	mg/kg dry wt	< 20	< 20	< 20	< 20	< 20
C15 - C36	mg/kg dry wt	< 40	< 40	91	< 40	< 40
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 80	< 80	99	< 80	< 80
BTEX in VOC Soils by Headspace GC-MS						
Benzene	mg/kg dry wt	-	< 0.3	-	< 0.3	-
Ethylbenzene	mg/kg dry wt	-	< 0.3	-	< 0.3	-
Toluene	mg/kg dry wt	-	< 0.3	-	< 0.3	-
m&p-Xylene	mg/kg dry wt	-	< 0.5	-	< 0.5	-
o-Xylene	mg/kg dry wt	-	< 0.3	-	< 0.3	-
Halogenated Aliphatics in VOC Soils by Headspace GC-MS						
Bromomethane (Methyl Bromide)	mg/kg dry wt	-	< 0.3	-	< 0.3	-
Carbon tetrachloride	mg/kg dry wt	-	< 0.3	-	< 0.3	-
Chloroethane	mg/kg dry wt	-	< 0.3	-	< 0.3	-
Chloromethane	mg/kg dry wt	-	< 0.3	-	< 0.3	-
1,2-Dibromo-3-chloropropane	mg/kg dry wt	-	< 0.5	-	< 0.5	-
1,2-Dibromoethane (ethylene dibromide, EDB)	mg/kg dry wt	-	< 0.3	-	< 0.3	-
Dibromomethane	mg/kg dry wt	-	< 0.3	-	< 0.3	-
1,3-Dichloropropane	mg/kg dry wt	-	< 0.3	-	< 0.3	-
Dichlorodifluoromethane	mg/kg dry wt	-	< 0.5	-	< 0.5	-
1,1-Dichloroethane	mg/kg dry wt	-	< 0.3	-	< 0.3	-
1,2-Dichloroethane	mg/kg dry wt	-	< 0.3	-	< 0.3	-
1,1-Dichloroethene	mg/kg dry wt	-	< 0.3	-	< 0.3	-
cis-1,2-Dichloroethene	mg/kg dry wt	-	< 0.3	-	< 0.3	-
trans-1,2-Dichloroethene	mg/kg dry wt	-	< 0.3	-	< 0.3	-
Dichloromethane (methylene chloride)	mg/kg dry wt	-	< 5	-	< 5	-
1,2-Dichloropropane	mg/kg dry wt	-	< 0.3	-	< 0.3	-
1,1-Dichloropropene	mg/kg dry wt	-	< 0.3	-	< 0.3	-
cis-1,3-Dichloropropene	mg/kg dry wt	-	< 0.3	-	< 0.3	-
trans-1,3-Dichloropropene	mg/kg dry wt	-	< 0.3	-	< 0.3	-
Hexachlorobutadiene	mg/kg dry wt	-	< 0.3	-	< 0.3	-
1,1,1,2-Tetrachloroethane	mg/kg dry wt	-	< 0.3	-	< 0.3	-
1,1,2,2-Tetrachloroethane	mg/kg dry wt	-	< 0.3	-	< 0.3	-
Tetrachloroethene (tetrachloroethylene)	mg/kg dry wt	-	< 0.3	-	< 0.3	-
1,1,1-Trichloroethane	mg/kg dry wt	-	< 0.3	-	< 0.3	-
1,1,2-Trichloroethane	mg/kg dry wt	-	< 0.3	-	< 0.3	-
Trichloroethene (trichloroethylene)	mg/kg dry wt	-	< 0.3	-	< 0.3	-
Trichlorofluoromethane	mg/kg dry wt	-	< 0.3	-	< 0.3	-
1,2,3-Trichloropropane	mg/kg dry wt	-	< 0.5	-	< 0.5	-
1,1,2-Trichlorotrifluoroethane (Freon 113)	mg/kg dry wt	-	< 0.3	-	< 0.3	-
Vinyl chloride	mg/kg dry wt	-	< 0.3	-	< 0.3	-
Haloaromatics in VOC Soils by Headspace GC-MS						
Bromobenzene	mg/kg dry wt	-	< 0.3	-	< 0.3	-
1,3-Dichlorobenzene	mg/kg dry wt	-	< 0.3	-	< 0.3	-
4-Chlorotoluene	mg/kg dry wt	-	< 0.3	-	< 0.3	-
Chlorobenzene (monochlorobenzene)	mg/kg dry wt	-	< 0.3	-	< 0.3	-
1,2-Dichlorobenzene	mg/kg dry wt	-	< 0.3	-	< 0.3	-
1,4-Dichlorobenzene	mg/kg dry wt	-	< 0.3	-	< 0.3	-
2-Chlorotoluene	mg/kg dry wt	-	< 0.3	-	< 0.3	-
1,2,3-Trichlorobenzene	mg/kg dry wt	-	< 0.3	-	< 0.3	-

Sample Type: Soil						
Sample Name:		WS-3 @ 0.3 30-Jul-2022 9:05 am	WS-3 @ 2.5 30-Jul-2022 9:20 am	WS-5 @ 0.5 30-Jul-2022 10:00 am	WS-5 @ 2.5 30-Jul-2022 10:15 am	WS-2 @ 0.5 30-Jul-2022 10:45 am
Lab Number:		3044639.1	3044639.3	3044639.5	3044639.6	3044639.7
Haloaromatics in VOC Soils by Headspace GC-MS						
1,2,4-Trichlorobenzene	mg/kg dry wt	-	< 0.3	-	< 0.3	-
1,3,5-Trichlorobenzene	mg/kg dry wt	-	< 0.3	-	< 0.3	-
Monoaromatic Hydrocarbons in VOC Soils by Headspace GC-MS						
n-Butylbenzene	mg/kg dry wt	-	< 0.3	-	< 0.3	-
tert-Butylbenzene	mg/kg dry wt	-	< 0.3	-	< 0.3	-
Isopropylbenzene (Cumene)	mg/kg dry wt	-	< 0.3	-	< 0.3	-
4-Isopropyltoluene (p-Cymene)	mg/kg dry wt	-	< 0.3	-	< 0.3	-
n-Propylbenzene	mg/kg dry wt	-	< 0.3	-	< 0.3	-
sec-Butylbenzene	mg/kg dry wt	-	< 0.3	-	< 0.3	-
Styrene	mg/kg dry wt	-	< 0.3	-	< 0.3	-
1,2,4-Trimethylbenzene	mg/kg dry wt	-	< 0.3	-	< 0.3	-
1,3,5-Trimethylbenzene	mg/kg dry wt	-	< 0.3	-	< 0.3	-
Ketones in VOC Soils by Headspace GC-MS						
2-Butanone (MEK)	mg/kg dry wt	-	< 50	-	< 50	-
4-Methylpentan-2-one (MIBK)	mg/kg dry wt	-	< 9	-	< 9	-
Acetone	mg/kg dry wt	-	< 50	-	< 50	-
Methyl tert-butylether (MTBE)	mg/kg dry wt	-	< 0.3	-	< 0.3	-
Trihalomethanes in VOC Soils by Headspace GC-MS						
Bromodichloromethane	mg/kg dry wt	-	< 0.3	-	< 0.3	-
Bromoform (tribromomethane)	mg/kg dry wt	-	< 0.5	-	< 0.5	-
Chloroform (Trichloromethane)	mg/kg dry wt	-	< 0.3	-	< 0.3	-
Dibromochloromethane	mg/kg dry wt	-	< 0.3	-	< 0.3	-
Other VOC in Soils by Headspace GC-MS						
Carbon disulphide	mg/kg dry wt	-	< 0.3	-	< 0.3	-
Naphthalene	mg/kg dry wt	-	< 0.3	-	< 0.3	-
Sample Name:		WS-2 @ 2.5 30-Jul-2022 10:50 am		WS-12 @ 0.5 30-Jul-2022 11:15 am		
Lab Number:		3044639.10		3044639.11		
Individual Tests						
Dry Matter	g/100g as rcvd	83		77		
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	9		24		
Total Recoverable Cadmium	mg/kg dry wt	< 0.10		0.30		
Total Recoverable Chromium	mg/kg dry wt	17		19		
Total Recoverable Copper	mg/kg dry wt	6		134		
Total Recoverable Lead	mg/kg dry wt	11.8		360		
Total Recoverable Nickel	mg/kg dry wt	9		18		
Total Recoverable Zinc	mg/kg dry wt	39		330		
Polycyclic Aromatic Hydrocarbons Screening in Soil*						
Total of Reported PAHs in Soil	mg/kg dry wt	< 0.3		3.4		
1-Methylnaphthalene	mg/kg dry wt	< 0.012		0.055		
2-Methylnaphthalene	mg/kg dry wt	< 0.012		0.042		
Acenaphthylene	mg/kg dry wt	< 0.012		0.027		
Acenaphthene	mg/kg dry wt	< 0.012		< 0.013		
Anthracene	mg/kg dry wt	< 0.012		0.047		
Benzo[a]anthracene	mg/kg dry wt	< 0.012		0.28		
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.012		0.31		
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	< 0.03		0.45		
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	< 0.03		0.45		
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.012		0.34		
Benzo[e]pyrene	mg/kg dry wt	< 0.012		0.163		
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.012		0.22		

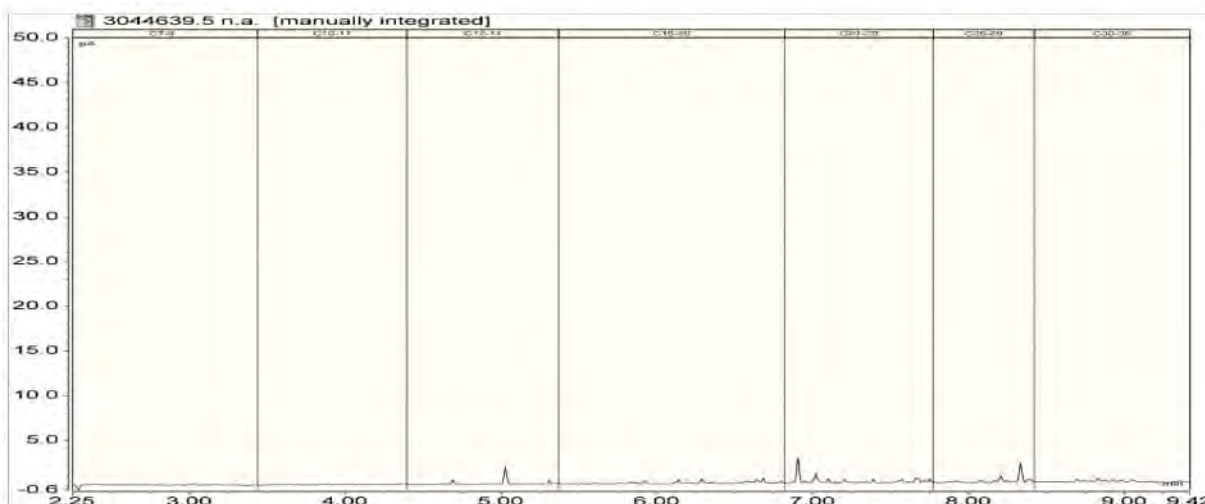
Sample Type: Soil			
Sample Name:		WS-2 @ 2.5 30-Jul-2022 10:50 am	WS-12 @ 0.5 30-Jul-2022 11:15 am
Lab Number:		3044639.10	3044639.11
Polycyclic Aromatic Hydrocarbons Screening in Soil*			
Benzo[k]fluoranthene	mg/kg dry wt	< 0.012	0.111
Chrysene	mg/kg dry wt	< 0.012	0.23
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.012	0.042
Fluoranthene	mg/kg dry wt	< 0.012	0.48
Fluorene	mg/kg dry wt	< 0.012	< 0.013
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.012	0.22
Naphthalene	mg/kg dry wt	< 0.06	< 0.07
Perylene	mg/kg dry wt	0.21	0.078
Phenanthrene	mg/kg dry wt	< 0.012	0.24
Pyrene	mg/kg dry wt	< 0.012	0.49
Total Petroleum Hydrocarbons in Soil			
C7 - C9	mg/kg dry wt	< 20	< 20
C10 - C14	mg/kg dry wt	< 20	< 20
C15 - C36	mg/kg dry wt	< 40	68
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 80	< 80
BTEX in VOC Soils by Headspace GC-MS			
Benzene	mg/kg dry wt	< 0.18	-
Ethylbenzene	mg/kg dry wt	< 0.3	-
Toluene	mg/kg dry wt	< 0.3	-
m&p-Xylene	mg/kg dry wt	< 0.4	-
o-Xylene	mg/kg dry wt	< 0.3	-
Halogenated Aliphatics in VOC Soils by Headspace GC-MS			
Bromomethane (Methyl Bromide)	mg/kg dry wt	< 0.3	-
Carbon tetrachloride	mg/kg dry wt	< 0.3	-
Chloroethane	mg/kg dry wt	< 0.3	-
Chloromethane	mg/kg dry wt	< 0.3	-
1,2-Dibromo-3-chloropropane	mg/kg dry wt	< 0.5	-
1,2-Dibromoethane (ethylene dibromide, EDB)	mg/kg dry wt	< 0.3	-
Dibromomethane	mg/kg dry wt	< 0.3	-
1,3-Dichloropropane	mg/kg dry wt	< 0.3	-
Dichlorodifluoromethane	mg/kg dry wt	< 0.5	-
1,1-Dichloroethane	mg/kg dry wt	< 0.3	-
1,2-Dichloroethane	mg/kg dry wt	< 0.3	-
1,1-Dichloroethene	mg/kg dry wt	< 0.3	-
cis-1,2-Dichloroethene	mg/kg dry wt	< 0.3	-
trans-1,2-Dichloroethene	mg/kg dry wt	< 0.3	-
Dichloromethane (methylene chloride)	mg/kg dry wt	< 4	-
1,2-Dichloropropane	mg/kg dry wt	< 0.3	-
1,1-Dichloropropene	mg/kg dry wt	< 0.3	-
cis-1,3-Dichloropropene	mg/kg dry wt	< 0.3	-
trans-1,3-Dichloropropene	mg/kg dry wt	< 0.3	-
Hexachlorobutadiene	mg/kg dry wt	< 0.3	-
1,1,1,2-Tetrachloroethane	mg/kg dry wt	< 0.3	-
1,1,2,2-Tetrachloroethane	mg/kg dry wt	< 0.3	-
Tetrachloroethene (tetrachloroethylene)	mg/kg dry wt	< 0.3	-
1,1,1-Trichloroethane	mg/kg dry wt	< 0.3	-
1,1,2-Trichloroethane	mg/kg dry wt	< 0.3	-
Trichloroethene (trichloroethylene)	mg/kg dry wt	< 0.3	-
Trichlorofluoromethane	mg/kg dry wt	< 0.3	-
1,2,3-Trichloropropane	mg/kg dry wt	< 0.5	-
1,1,2-Trichlorotrifluoroethane (Freon 113)	mg/kg dry wt	< 0.3	-
Vinyl chloride	mg/kg dry wt	< 0.3	-

Sample Type: Soil			
Sample Name:		WS-2 @ 2.5 30-Jul-2022 10:50 am	WS-12 @ 0.5 30-Jul-2022 11:15 am
Lab Number:		3044639.10	3044639.11
Haloaromatics in VOC Soils by Headspace GC-MS			
Bromobenzene	mg/kg dry wt	< 0.3	-
1,3-Dichlorobenzene	mg/kg dry wt	< 0.3	-
4-Chlorotoluene	mg/kg dry wt	< 0.3	-
Chlorobenzene (monochlorobenzene)	mg/kg dry wt	< 0.3	-
1,2-Dichlorobenzene	mg/kg dry wt	< 0.3	-
1,4-Dichlorobenzene	mg/kg dry wt	< 0.3	-
2-Chlorotoluene	mg/kg dry wt	< 0.3	-
1,2,3-Trichlorobenzene	mg/kg dry wt	< 0.3	-
1,2,4-Trichlorobenzene	mg/kg dry wt	< 0.3	-
1,3,5-Trichlorobenzene	mg/kg dry wt	< 0.3	-
Monoaromatic Hydrocarbons in VOC Soils by Headspace GC-MS			
n-Butylbenzene	mg/kg dry wt	< 0.3	-
tert-Butylbenzene	mg/kg dry wt	< 0.3	-
Isopropylbenzene (Cumene)	mg/kg dry wt	< 0.3	-
4-Isopropyltoluene (p-Cymene)	mg/kg dry wt	< 0.3	-
n-Propylbenzene	mg/kg dry wt	< 0.3	-
sec-Butylbenzene	mg/kg dry wt	< 0.3	-
Styrene	mg/kg dry wt	< 0.3	-
1,2,4-Trimethylbenzene	mg/kg dry wt	< 0.3	-
1,3,5-Trimethylbenzene	mg/kg dry wt	< 0.3	-
Ketones in VOC Soils by Headspace GC-MS			
2-Butanone (MEK)	mg/kg dry wt	< 40	-
4-Methylpentan-2-one (MIBK)	mg/kg dry wt	< 8	-
Acetone	mg/kg dry wt	< 40	-
Methyl tert-butylether (MTBE)	mg/kg dry wt	< 0.3	-
Trihalomethanes in VOC Soils by Headspace GC-MS			
Bromodichloromethane	mg/kg dry wt	< 0.3	-
Bromoform (tribromomethane)	mg/kg dry wt	< 0.5	-
Chloroform (Trichloromethane)	mg/kg dry wt	< 0.3	-
Dibromochloromethane	mg/kg dry wt	< 0.3	-
Other VOC in Soils by Headspace GC-MS			
Carbon disulphide	mg/kg dry wt	< 0.3	-
Naphthalene	mg/kg dry wt	< 0.3	-

3044639.5

WS-5 @ 0.5 30-Jul-2022 10:00 am

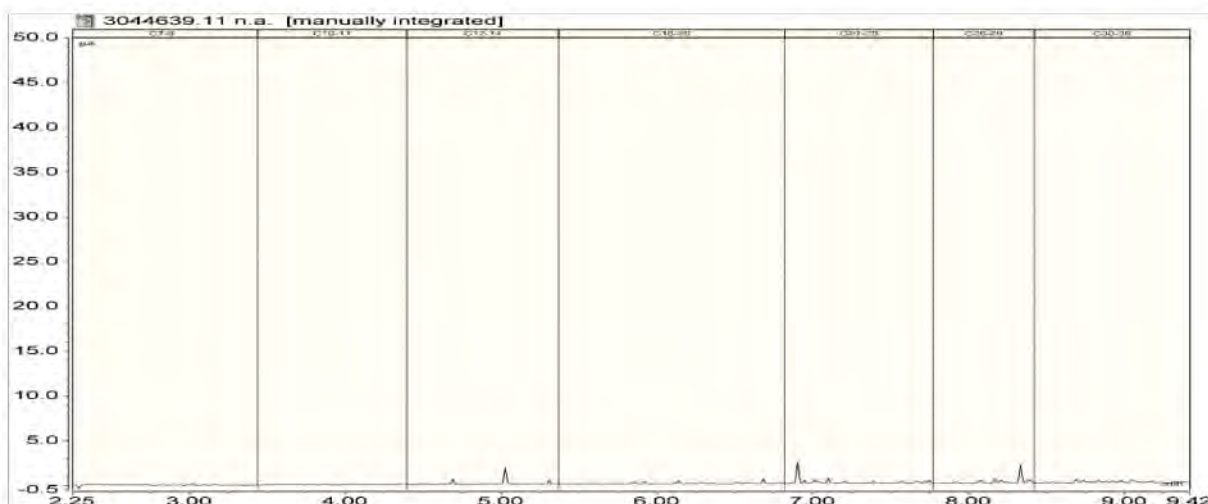
Client Chromatogram for TPH by FID



3044639.11

WS-12 @ 0.5 30-Jul-2022 11:15 am

Client Chromatogram for TPH by FID



Analyst's Comments

Appendix No.1 - Chain of Custody

Summary of Methods

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

Sample Type: Soil

Test	Method Description	Default Detection Limit	Sample No
Individual Tests			
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%.	-	1, 3, 5-7, 10-11
Total of Reported PAHs in Soil	Sonication extraction, GC-MS analysis. In-house based on US EPA 8270.	0.03 mg/kg dry wt	1, 3, 5-7, 10-11
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, 10-11
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	BaP Potency Equivalence calculated from; Benzo(a)anthracene x 0.1 + Benzo(b)fluoranthene x 0.1 + Benzo(j)fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Benzo(a)pyrene x 1.0 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Fluoranthene x 0.01 + Indeno(1,2,3-c,d)pyrene x 0.1. Ministry for the Environment. 2011. Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health. Wellington: Ministry for the Environment.	0.002 mg/kg dry wt	1, 3, 5-7, 10-11
Benzo[a]pyrene Toxic Equivalence (TEF)*	Benzo[a]pyrene Toxic Equivalence (TEF) calculated from; Benzo[a]pyrene x 1.0 + Benzo(a)anthracene x 0.1 + Benzo(b)fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Indeno(1,2,3-c,d)pyrene x 0.1. Guidelines for assessing and managing contaminated gasworks sites in New Zealand (GMG) (MfE, 1997).	0.002 mg/kg dry wt	1, 3, 5-7, 10-11
TPH Oil Industry Profile + PAHscreen	Sonication extraction, GC-FID and GC-MS analysis. Tested on as received sample. In-house based on US EPA 8015 and US EPA 8270.	0.002 - 70 mg/kg dry wt	1, 3, 5-7, 10-11
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, 10-11
Volatile Organic Compounds Screening in Soil by Headspace GC-MS	Sonication extraction, Headspace GC-MS analysis. Tested on as received sample. In-house based on US EPA 8260 and 5021.	0.13 - 30 mg/kg dry wt	3, 6, 10
Total Petroleum Hydrocarbons in Soil			

Sample Type: Soil			
Test	Method Description	Default Detection Limit	Sample No
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	5, 11
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	1, 3, 5-7, 10-11
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	1, 3, 5-7, 10-11
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	1, 3, 5-7, 10-11
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	1, 3, 5-7, 10-11

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

Testing was completed between 04-Aug-2022 and 05-Aug-2022. For completion dates of individual analyses please contact the laboratory.

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

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



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



Quote No 8 Barker St.
 Primary Contact Gabriella Staehle
 Submitted By Joshua Law
 Client Name ENGED
 Address _____

Postcode _____
 Phone _____ Mobile _____

Email _____

Charge To _____

Client Reference 8 Barker Street, Te Anau

Order No _____

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

☒ Email Primary Contact ☒ Email Submitter ☐ Email Client

☐ Email Other _____

☐ Other _____

ADDITIONAL INFORMATION

ANALYSIS REQUEST

R J Hill Laboratories Limited
 3/204 Thorndon Quay
 Pipitea
 Wellington 6011
 New Zealand

Job No: _____ Date Recv 01-Aug-22 08:43

304 4639

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

Received by: Zandra Fenton



3130446390

CHAIN OF CUSTODY RECORD

Sent to **Hill Laboratories** Date & Time: 18-22 8:40

Name: Josh Law

☐ Tick if you require COC to be emailed back

Signature: [Signature]

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

Received at **Hill Laboratories** Date & Time: _____
 Name: _____

Signature: _____

Priority ☐ Low ☒ Normal ☐ High

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

Requested Reporting Date: _____

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

No.	Sample Name	Sample Material	Sample Location	Sample Date	Tests Required (if not as per Quote)
1	WS-3 @ 0.3			30-7-22	Hold & Call
2	WS-3 @ 0.5			"	"
3	WS-3 @ 2.5			"	"
4	WS-3 @ 4.0			"	"
5	WS-5 @ 0.5			"	"
6	WS-5 @ 2.5			"	"
7	WS-2 @ 0.5			"	"
8	WS-2 @ 0.8			"	"
9	WS-2 @ 1.5			"	"
10	WS-2 @ 2.5			"	"
11	WS-12 @ 0.5			"	"

(Must off for this one)



Certificate of Analysis

Page 1 of 9

Client:	Engeo Limited	Lab No:	2605455	SPv1
Contact:	Gabriela Staehle	Date Received:	06-May-2021	
	C/- Engeo Limited	Date Reported:	13-May-2021	
	PO Box 25047	Quote No:	82742	
	Wellington 6146	Order No:		
		Client Reference:	8 Barker St	
		Submitted By:	Calum MacRae	

Sample Type: Soil

Sample Name:	WS01 0.4-0.6 06-May-2021	WS01 0.7-0.9 06-May-2021	WS01 1.5-1.6 06-May-2021	WS02 0.4-0.5 06-May-2021	WS02 0.7-0.8 06-May-2021
Lab Number:	2605455.1	2605455.2	2605455.3	2605455.4	2605455.5

Individual Tests

Dry Matter	g/100g as rcvd	65	85	79	86	74
pH*	pH Units	-	-	-	7.8	-

Heavy Metals, Screen Level

Total Recoverable Arsenic	mg/kg dry wt	5	-	2	8	-
Total Recoverable Cadmium	mg/kg dry wt	0.22	-	< 0.10	0.34	-
Total Recoverable Chromium	mg/kg dry wt	15	-	17	18	-
Total Recoverable Copper	mg/kg dry wt	11	-	7	37	-
Total Recoverable Lead	mg/kg dry wt	390	-	13.3	2,000	-
Total Recoverable Nickel	mg/kg dry wt	7	-	10	18	-
Total Recoverable Zinc	mg/kg dry wt	162	-	45	340	-

BTEX in Soil by Headspace GC-MS

Benzene	mg/kg dry wt	-	< 0.05	< 0.06	-	< 0.06
Toluene	mg/kg dry wt	-	< 0.05	< 0.06	-	< 0.06
Ethylbenzene	mg/kg dry wt	-	< 0.05	< 0.06	-	< 0.06
m&p-Xylene	mg/kg dry wt	-	< 0.10	< 0.11	-	< 0.12
o-Xylene	mg/kg dry wt	-	< 0.05	< 0.06	-	< 0.06

Polycyclic Aromatic Hydrocarbons Screening in Soil*

Total of Reported PAHs in Soil	mg/kg dry wt	-	< 0.3	< 0.3	-	0.4
1-Methylnaphthalene	mg/kg dry wt	-	< 0.012	< 0.013	-	< 0.013
2-Methylnaphthalene	mg/kg dry wt	-	< 0.012	< 0.013	-	< 0.013
Acenaphthylene	mg/kg dry wt	-	< 0.012	< 0.013	-	< 0.013
Acenaphthene	mg/kg dry wt	-	< 0.012	< 0.013	-	< 0.013
Anthracene	mg/kg dry wt	-	< 0.012	< 0.013	-	< 0.013
Benzo[a]anthracene	mg/kg dry wt	-	< 0.012	< 0.013	-	0.023
Benzo[a]pyrene (BAP)	mg/kg dry wt	-	< 0.012	< 0.013	-	0.027
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	-	< 0.03	< 0.04	-	0.04
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	-	< 0.03	< 0.03	-	0.04
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	-	< 0.012	< 0.013	-	0.035
Benzo[e]pyrene	mg/kg dry wt	-	< 0.012	< 0.013	-	0.023
Benzo[g,h,i]perylene	mg/kg dry wt	-	< 0.012	< 0.013	-	0.029
Benzo[k]fluoranthene	mg/kg dry wt	-	< 0.012	< 0.013	-	< 0.013
Chrysene	mg/kg dry wt	-	< 0.012	< 0.013	-	0.017
Dibenzo[a,h]anthracene	mg/kg dry wt	-	< 0.012	< 0.013	-	< 0.013
Fluoranthene	mg/kg dry wt	-	< 0.012	< 0.013	-	0.027
Fluorene	mg/kg dry wt	-	< 0.012	< 0.013	-	< 0.013



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Sample Type: Soil						
Sample Name:		WS01 0.4-0.6 06-May-2021	WS01 0.7-0.9 06-May-2021	WS01 1.5-1.6 06-May-2021	WS02 0.4-0.5 06-May-2021	WS02 0.7-0.8 06-May-2021
Lab Number:		2605455.1	2605455.2	2605455.3	2605455.4	2605455.5
Polycyclic Aromatic Hydrocarbons Screening in Soil*						
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	-	< 0.012	< 0.013	-	0.026
Naphthalene	mg/kg dry wt	-	< 0.06	< 0.07	-	< 0.07
Perylene	mg/kg dry wt	-	< 0.012	0.019	-	0.135
Phenanthrene	mg/kg dry wt	-	< 0.012	< 0.013	-	< 0.013
Pyrene	mg/kg dry wt	-	< 0.012	< 0.013	-	0.035
Haloethers in SVOC Soil Samples by GC-MS						
Bis(2-chloroethoxy) methane	mg/kg dry wt	< 0.5	-	-	< 0.5	-
Bis(2-chloroethyl)ether	mg/kg dry wt	< 0.5	-	-	< 0.5	-
Bis(2-chloroisopropyl)ether	mg/kg dry wt	< 0.5	-	-	< 0.5	-
4-Bromophenyl phenyl ether	mg/kg dry wt	< 0.5	-	-	< 0.4	-
4-Chlorophenyl phenyl ether	mg/kg dry wt	< 0.5	-	-	< 0.5	-
Nitrogen containing compounds in SVOC Soil Samples by GC-MS						
2,4-Dinitrotoluene	mg/kg dry wt	< 1.0	-	-	< 1.0	-
2,6-Dinitrotoluene	mg/kg dry wt	< 1.0	-	-	< 1.0	-
Nitrobenzene	mg/kg dry wt	< 0.5	-	-	< 0.5	-
N-Nitrosodi-n-propylamine	mg/kg dry wt	< 1.0	-	-	< 0.7	-
N-Nitrosodiphenylamine + Diphenylamine	mg/kg dry wt	< 1.0	-	-	< 0.7	-
Organochlorine Pesticides in SVOC Soil Samples by GC-MS						
Aldrin	mg/kg dry wt	< 0.5	-	-	< 0.5	-
alpha-BHC	mg/kg dry wt	< 0.5	-	-	< 0.5	-
beta-BHC	mg/kg dry wt	< 0.5	-	-	< 0.5	-
delta-BHC	mg/kg dry wt	< 0.5	-	-	< 0.5	-
gamma-BHC (Lindane)	mg/kg dry wt	< 0.5	-	-	< 0.5	-
4,4'-DDD	mg/kg dry wt	< 0.5	-	-	< 0.5	-
4,4'-DDE	mg/kg dry wt	< 0.5	-	-	< 0.5	-
4,4'-DDT	mg/kg dry wt	< 1.0	-	-	< 1.0	-
Dieldrin	mg/kg dry wt	< 0.5	-	-	< 0.5	-
Endosulfan I	mg/kg dry wt	< 1.0	-	-	< 1.0	-
Endosulfan II	mg/kg dry wt	< 2	-	-	< 2	-
Endosulfan sulphate	mg/kg dry wt	< 1.0	-	-	< 1.0	-
Endrin	mg/kg dry wt	< 1.0	-	-	< 0.7	-
Endrin ketone	mg/kg dry wt	< 1.0	-	-	< 1.0	-
Heptachlor	mg/kg dry wt	< 0.5	-	-	< 0.5	-
Heptachlor epoxide	mg/kg dry wt	< 0.5	-	-	< 0.5	-
Hexachlorobenzene	mg/kg dry wt	< 0.5	-	-	< 0.5	-
Polycyclic Aromatic Hydrocarbons in SVOC Soil Samples by GC-MS*						
Acenaphthene	mg/kg dry wt	< 0.5	-	-	< 0.5	-
Acenaphthylene	mg/kg dry wt	< 0.5	-	-	< 0.5	-
Anthracene	mg/kg dry wt	< 0.5	-	-	< 0.5	-
Benzo[a]anthracene	mg/kg dry wt	< 0.5	-	-	< 0.5	-
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.5	-	-	< 0.5	-
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.5	-	-	< 0.5	-
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.5	-	-	< 0.5	-
Benzo[k]fluoranthene	mg/kg dry wt	< 0.5	-	-	< 0.5	-
1&2-Chloronaphthalene	mg/kg dry wt	< 0.5	-	-	< 0.5	-
Chrysene	mg/kg dry wt	< 0.5	-	-	< 0.5	-
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.5	-	-	< 0.5	-
Fluoranthene	mg/kg dry wt	< 0.5	-	-	< 0.5	-
Fluorene	mg/kg dry wt	< 0.5	-	-	< 0.5	-
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.5	-	-	< 0.5	-
2-Methylnaphthalene	mg/kg dry wt	< 0.5	-	-	< 0.5	-
Naphthalene	mg/kg dry wt	< 0.5	-	-	< 0.5	-
Phenanthrene	mg/kg dry wt	< 0.5	-	-	< 0.5	-

Sample Type: Soil						
Sample Name:		WS01 0.4-0.6 06-May-2021	WS01 0.7-0.9 06-May-2021	WS01 1.5-1.6 06-May-2021	WS02 0.4-0.5 06-May-2021	WS02 0.7-0.8 06-May-2021
Lab Number:		2605455.1	2605455.2	2605455.3	2605455.4	2605455.5
Polycyclic Aromatic Hydrocarbons in SVOC Soil Samples by GC-MS*						
Pyrene	mg/kg dry wt	< 0.5	-	-	< 0.5	-
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	< 1.3	-	-	< 1.3	-
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	< 1.3	-	-	< 1.3	-
Phenols in SVOC Soil Samples by GC-MS						
4-Chloro-3-methylphenol	mg/kg dry wt	< 5	-	-	< 5	-
2-Chlorophenol	mg/kg dry wt	< 1.0	-	-	< 1.0	-
2,4-Dichlorophenol	mg/kg dry wt	< 1.0	-	-	< 1.0	-
2,4-Dimethylphenol	mg/kg dry wt	< 3	-	-	< 3	-
3 & 4-Methylphenol (m- + p- cresol)	mg/kg dry wt	< 3	-	-	< 3	-
2-Methylphenol (o-Cresol)	mg/kg dry wt	< 1.0	-	-	< 1.0	-
2-Nitrophenol	mg/kg dry wt	< 5	-	-	< 5	-
Pentachlorophenol (PCP)	mg/kg dry wt	< 30	-	-	< 30	-
Phenol	mg/kg dry wt	< 1.0	-	-	< 1.0	-
2,4,5-Trichlorophenol	mg/kg dry wt	< 1.0	-	-	< 1.0	-
2,4,6-Trichlorophenol	mg/kg dry wt	< 1.0	-	-	< 1.0	-
Plasticisers in SVOC Soil Samples by GC-MS						
Bis(2-ethylhexyl)phthalate	mg/kg dry wt	< 5	-	-	< 5	-
Butylbenzylphthalate	mg/kg dry wt	< 1.0	-	-	< 1.0	-
Di(2-ethylhexyl)adipate	mg/kg dry wt	< 1.0	-	-	< 1.0	-
Diethylphthalate	mg/kg dry wt	< 1.0	-	-	< 1.0	-
Dimethylphthalate	mg/kg dry wt	< 1.0	-	-	< 1.0	-
Di-n-butylphthalate	mg/kg dry wt	< 1.0	-	-	< 1.0	-
Di-n-octylphthalate	mg/kg dry wt	< 1.0	-	-	< 1.0	-
Other Halogenated compounds in SVOC Soil Samples by GC-MS						
1,2-Dichlorobenzene	mg/kg dry wt	< 1.0	-	-	< 0.7	-
1,3-Dichlorobenzene	mg/kg dry wt	< 1.0	-	-	< 0.7	-
1,4-Dichlorobenzene	mg/kg dry wt	< 1.0	-	-	< 0.7	-
Hexachlorobutadiene	mg/kg dry wt	< 1.0	-	-	< 0.7	-
Hexachloroethane	mg/kg dry wt	< 1.0	-	-	< 0.7	-
1,2,4-Trichlorobenzene	mg/kg dry wt	< 0.5	-	-	< 0.5	-
Other compounds in SVOC Soil Samples by GC-MS						
Benzyl alcohol	mg/kg dry wt	< 10	-	-	< 10	-
Carbazole	mg/kg dry wt	< 0.5	-	-	< 0.5	-
Dibenzofuran	mg/kg dry wt	< 0.5	-	-	< 0.5	-
Isophorone	mg/kg dry wt	< 0.5	-	-	< 0.5	-
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	-	< 8	< 8	-	< 8
C10 - C14	mg/kg dry wt	-	< 20	< 20	-	< 20
C15 - C36	mg/kg dry wt	-	< 40	< 40	-	< 40
Total hydrocarbons (C7 - C36)	mg/kg dry wt	-	< 70	< 70	-	< 70
BTEX in VOC Soils by Headspace GC-MS						
Benzene	mg/kg dry wt	< 0.3	-	-	< 0.17	-
Ethylbenzene	mg/kg dry wt	< 0.3	-	-	< 0.3	-
Toluene	mg/kg dry wt	< 0.3	-	-	< 0.3	-
m&p-Xylene	mg/kg dry wt	< 0.6	-	-	< 0.4	-
o-Xylene	mg/kg dry wt	< 0.3	-	-	< 0.3	-
Halogenated Aliphatics in VOC Soils by Headspace GC-MS						
Bromomethane (Methyl Bromide)	mg/kg dry wt	< 0.3	-	-	< 0.3	-
Carbon tetrachloride	mg/kg dry wt	< 0.3	-	-	< 0.3	-
Chloroethane	mg/kg dry wt	< 0.3	-	-	< 0.3	-
Chloromethane	mg/kg dry wt	< 0.3	-	-	< 0.3	-
1,2-Dibromo-3-chloropropane	mg/kg dry wt	< 0.5	-	-	< 0.5	-

Sample Type: Soil						
Sample Name:		WS01 0.4-0.6 06-May-2021	WS01 0.7-0.9 06-May-2021	WS01 1.5-1.6 06-May-2021	WS02 0.4-0.5 06-May-2021	WS02 0.7-0.8 06-May-2021
Lab Number:		2605455.1	2605455.2	2605455.3	2605455.4	2605455.5
Halogenated Aliphatics in VOC Soils by Headspace GC-MS						
1,2-Dibromoethane (ethylene dibromide, EDB)	mg/kg dry wt	< 0.3	-	-	< 0.3	-
Dibromomethane	mg/kg dry wt	< 0.3	-	-	< 0.3	-
1,3-Dichloropropane	mg/kg dry wt	< 0.3	-	-	< 0.3	-
Dichlorodifluoromethane	mg/kg dry wt	< 0.5	-	-	< 0.5	-
1,1-Dichloroethane	mg/kg dry wt	< 0.3	-	-	< 0.3	-
1,2-Dichloroethane	mg/kg dry wt	< 0.3	-	-	< 0.3	-
1,1-Dichloroethene	mg/kg dry wt	< 0.3	-	-	< 0.3	-
cis-1,2-Dichloroethene	mg/kg dry wt	< 0.3	-	-	< 0.3	-
trans-1,2-Dichloroethene	mg/kg dry wt	< 0.3	-	-	< 0.3	-
Dichloromethane (methylene chloride)	mg/kg dry wt	< 6	-	-	< 4	-
1,2-Dichloropropane	mg/kg dry wt	< 0.3	-	-	< 0.3	-
1,1-Dichloropropene	mg/kg dry wt	< 0.3	-	-	< 0.3	-
cis-1,3-Dichloropropene	mg/kg dry wt	< 0.3	-	-	< 0.3	-
trans-1,3-Dichloropropene	mg/kg dry wt	< 0.3	-	-	< 0.3	-
Hexachlorobutadiene	mg/kg dry wt	< 0.3	-	-	< 0.3	-
1,1,1,2-Tetrachloroethane	mg/kg dry wt	< 0.3	-	-	< 0.3	-
1,1,2,2-Tetrachloroethane	mg/kg dry wt	< 0.3	-	-	< 0.3	-
Tetrachloroethene (tetrachloroethylene)	mg/kg dry wt	< 0.3	-	-	< 0.3	-
1,1,1-Trichloroethane	mg/kg dry wt	< 0.3	-	-	< 0.3	-
1,1,2-Trichloroethane	mg/kg dry wt	< 0.3	-	-	< 0.3	-
Trichloroethene (trichloroethylene)	mg/kg dry wt	< 0.3	-	-	< 0.3	-
Trichlorofluoromethane	mg/kg dry wt	< 0.3	-	-	< 0.3	-
1,2,3-Trichloropropane	mg/kg dry wt	< 0.5	-	-	< 0.5	-
1,1,2-Trichlorotrifluoroethane (Freon 113)	mg/kg dry wt	< 0.3	-	-	< 0.3	-
Vinyl chloride	mg/kg dry wt	< 0.3	-	-	< 0.3	-
Haloaromatics in VOC Soils by Headspace GC-MS						
Bromobenzene	mg/kg dry wt	< 0.3	-	-	< 0.3	-
1,3-Dichlorobenzene	mg/kg dry wt	< 0.3	-	-	< 0.3	-
4-Chlorotoluene	mg/kg dry wt	< 0.3	-	-	< 0.3	-
Chlorobenzene (monochlorobenzene)	mg/kg dry wt	< 0.3	-	-	< 0.3	-
1,2-Dichlorobenzene	mg/kg dry wt	< 0.3	-	-	< 0.3	-
1,4-Dichlorobenzene	mg/kg dry wt	< 0.3	-	-	< 0.3	-
2-Chlorotoluene	mg/kg dry wt	< 0.3	-	-	< 0.3	-
1,2,3-Trichlorobenzene	mg/kg dry wt	< 0.3	-	-	< 0.3	-
1,2,4-Trichlorobenzene	mg/kg dry wt	< 0.3	-	-	< 0.3	-
1,3,5-Trichlorobenzene	mg/kg dry wt	< 0.3	-	-	< 0.3	-
Monoaromatic Hydrocarbons in VOC Soils by Headspace GC-MS						
n-Butylbenzene	mg/kg dry wt	< 0.3	-	-	< 0.3	-
tert-Butylbenzene	mg/kg dry wt	< 0.3	-	-	< 0.3	-
Isopropylbenzene (Cumene)	mg/kg dry wt	< 0.3	-	-	< 0.3	-
4-Isopropyltoluene (p-Cymene)	mg/kg dry wt	< 0.3	-	-	< 0.3	-
n-Propylbenzene	mg/kg dry wt	< 0.3	-	-	< 0.3	-
sec-Butylbenzene	mg/kg dry wt	< 0.3	-	-	< 0.3	-
Styrene	mg/kg dry wt	< 0.3	-	-	< 0.3	-
1,2,4-Trimethylbenzene	mg/kg dry wt	< 0.3	-	-	< 0.3	-
1,3,5-Trimethylbenzene	mg/kg dry wt	< 0.3	-	-	< 0.3	-
Ketones in VOC Soils by Headspace GC-MS						
2-Butanone (MEK)	mg/kg dry wt	< 60	-	-	< 40	-
4-Methylpentan-2-one (MIBK)	mg/kg dry wt	< 11	-	-	< 7	-
Acetone	mg/kg dry wt	< 60	-	-	< 40	-

Sample Type: Soil						
Sample Name:		WS01 0.4-0.6 06-May-2021	WS01 0.7-0.9 06-May-2021	WS01 1.5-1.6 06-May-2021	WS02 0.4-0.5 06-May-2021	WS02 0.7-0.8 06-May-2021
Lab Number:		2605455.1	2605455.2	2605455.3	2605455.4	2605455.5
Ketones in VOC Soils by Headspace GC-MS						
Methyl tert-butylether (MTBE)	mg/kg dry wt	< 0.3	-	-	< 0.3	-
Trihalomethanes in VOC Soils by Headspace GC-MS						
Bromodichloromethane	mg/kg dry wt	< 0.3	-	-	< 0.3	-
Bromoform (tribromomethane)	mg/kg dry wt	< 0.5	-	-	< 0.5	-
Chloroform (Trichloromethane)	mg/kg as rcvd	< 0.3	-	-	< 0.3	-
Dibromochloromethane	mg/kg dry wt	< 0.3	-	-	< 0.3	-
Other VOC in Soils by Headspace GC-MS						
Carbon disulphide	mg/kg dry wt	< 0.3	-	-	< 0.3	-
Naphthalene	mg/kg dry wt	< 0.3	-	-	< 0.3	-
Sample Name:		WS02 1.2-1.4 06-May-2021				
Lab Number:		2605455.6				
Individual Tests						
Dry Matter	g/100g as rcvd	74	-	-	-	-
pH*	pH Units	7.1	-	-	-	-
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	2	-	-	-	-
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	-	-	-	-
Total Recoverable Chromium	mg/kg dry wt	8	-	-	-	-
Total Recoverable Copper	mg/kg dry wt	6	-	-	-	-
Total Recoverable Lead	mg/kg dry wt	11.6	-	-	-	-
Total Recoverable Nickel	mg/kg dry wt	8 #1	-	-	-	-
Total Recoverable Zinc	mg/kg dry wt	30	-	-	-	-
Haloethers in SVOC Soil Samples by GC-MS						
Bis(2-chloroethoxy) methane	mg/kg dry wt	< 0.5	-	-	-	-
Bis(2-chloroethyl)ether	mg/kg dry wt	< 0.5	-	-	-	-
Bis(2-chloroisopropyl)ether	mg/kg dry wt	< 0.5	-	-	-	-
4-Bromophenyl phenyl ether	mg/kg dry wt	< 0.4	-	-	-	-
4-Chlorophenyl phenyl ether	mg/kg dry wt	< 0.5	-	-	-	-
Nitrogen containing compounds in SVOC Soil Samples by GC-MS						
2,4-Dinitrotoluene	mg/kg dry wt	< 1.0	-	-	-	-
2,6-Dinitrotoluene	mg/kg dry wt	< 1.0	-	-	-	-
Nitrobenzene	mg/kg dry wt	< 0.5	-	-	-	-
N-Nitrosodi-n-propylamine	mg/kg dry wt	< 0.8	-	-	-	-
N-Nitrosodiphenylamine + Diphenylamine	mg/kg dry wt	< 0.8	-	-	-	-
Organochlorine Pesticides in SVOC Soil Samples by GC-MS						
Aldrin	mg/kg dry wt	< 0.5	-	-	-	-
alpha-BHC	mg/kg dry wt	< 0.5	-	-	-	-
beta-BHC	mg/kg dry wt	< 0.5	-	-	-	-
delta-BHC	mg/kg dry wt	< 0.5	-	-	-	-
gamma-BHC (Lindane)	mg/kg dry wt	< 0.5	-	-	-	-
4,4'-DDD	mg/kg dry wt	< 0.5	-	-	-	-
4,4'-DDE	mg/kg dry wt	< 0.5	-	-	-	-
4,4'-DDT	mg/kg dry wt	< 1.0	-	-	-	-
Dieldrin	mg/kg dry wt	< 0.5	-	-	-	-
Endosulfan I	mg/kg dry wt	< 1.0	-	-	-	-
Endosulfan II	mg/kg dry wt	< 2	-	-	-	-
Endosulfan sulphate	mg/kg dry wt	< 1.0	-	-	-	-
Endrin	mg/kg dry wt	< 0.8	-	-	-	-
Endrin ketone	mg/kg dry wt	< 1.0	-	-	-	-
Heptachlor	mg/kg dry wt	< 0.5	-	-	-	-
Heptachlor epoxide	mg/kg dry wt	< 0.5	-	-	-	-
Hexachlorobenzene	mg/kg dry wt	< 0.5	-	-	-	-

Sample Type: Soil						
Sample Name:		WS02 1.2-1.4 06-May-2021				
Lab Number:		2605455.6				
Polycyclic Aromatic Hydrocarbons in SVOC Soil Samples by GC-MS*						
Acenaphthene	mg/kg dry wt	< 0.5	-	-	-	-
Acenaphthylene	mg/kg dry wt	< 0.5	-	-	-	-
Anthracene	mg/kg dry wt	< 0.5	-	-	-	-
Benzo[a]anthracene	mg/kg dry wt	< 0.5	-	-	-	-
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.5	-	-	-	-
Benzo[b]fluoranthene + Benzo[j]fluoranthene	mg/kg dry wt	< 0.5	-	-	-	-
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.5	-	-	-	-
Benzo[k]fluoranthene	mg/kg dry wt	< 0.5	-	-	-	-
1&2-Chloronaphthalene	mg/kg dry wt	< 0.5	-	-	-	-
Chrysene	mg/kg dry wt	< 0.5	-	-	-	-
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.5	-	-	-	-
Fluoranthene	mg/kg dry wt	< 0.5	-	-	-	-
Fluorene	mg/kg dry wt	< 0.5	-	-	-	-
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.5	-	-	-	-
2-Methylnaphthalene	mg/kg dry wt	< 0.5	-	-	-	-
Naphthalene	mg/kg dry wt	< 0.5	-	-	-	-
Phenanthrene	mg/kg dry wt	< 0.5	-	-	-	-
Pyrene	mg/kg dry wt	< 0.5	-	-	-	-
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	< 1.3	-	-	-	-
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	< 1.3	-	-	-	-
Phenols in SVOC Soil Samples by GC-MS						
4-Chloro-3-methylphenol	mg/kg dry wt	< 5	-	-	-	-
2-Chlorophenol	mg/kg dry wt	< 1.0	-	-	-	-
2,4-Dichlorophenol	mg/kg dry wt	< 1.0	-	-	-	-
2,4-Dimethylphenol	mg/kg dry wt	< 3	-	-	-	-
3 & 4-Methylphenol (m- + p-cresol)	mg/kg dry wt	< 3	-	-	-	-
2-Methylphenol (o-Cresol)	mg/kg dry wt	< 1.0	-	-	-	-
2-Nitrophenol	mg/kg dry wt	< 5	-	-	-	-
Pentachlorophenol (PCP)	mg/kg dry wt	< 30	-	-	-	-
Phenol	mg/kg dry wt	< 1.0	-	-	-	-
2,4,5-Trichlorophenol	mg/kg dry wt	< 1.0	-	-	-	-
2,4,6-Trichlorophenol	mg/kg dry wt	< 1.0	-	-	-	-
Plasticisers in SVOC Soil Samples by GC-MS						
Bis(2-ethylhexyl)phthalate	mg/kg dry wt	< 5	-	-	-	-
Butylbenzylphthalate	mg/kg dry wt	< 1.0	-	-	-	-
Di(2-ethylhexyl)adipate	mg/kg dry wt	< 1.0	-	-	-	-
Diethylphthalate	mg/kg dry wt	< 1.0	-	-	-	-
Dimethylphthalate	mg/kg dry wt	< 1.0	-	-	-	-
Di-n-butylphthalate	mg/kg dry wt	< 1.0	-	-	-	-
Di-n-octylphthalate	mg/kg dry wt	< 1.0	-	-	-	-
Other Halogenated compounds in SVOC Soil Samples by GC-MS						
1,2-Dichlorobenzene	mg/kg dry wt	< 0.8	-	-	-	-
1,3-Dichlorobenzene	mg/kg dry wt	< 0.8	-	-	-	-
1,4-Dichlorobenzene	mg/kg dry wt	< 0.8	-	-	-	-
Hexachlorobutadiene	mg/kg dry wt	< 0.8	-	-	-	-
Hexachloroethane	mg/kg dry wt	< 0.8	-	-	-	-
1,2,4-Trichlorobenzene	mg/kg dry wt	< 0.5	-	-	-	-
Other compounds in SVOC Soil Samples by GC-MS						
Benzyl alcohol	mg/kg dry wt	< 10	-	-	-	-
Carbazole	mg/kg dry wt	< 0.5	-	-	-	-
Dibenzofuran	mg/kg dry wt	< 0.5	-	-	-	-
Isophorone	mg/kg dry wt	< 0.5	-	-	-	-

Sample Type: Soil						
Sample Name:		WS02 1.2-1.4 06-May-2021				
Lab Number:		2605455.6				
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	< 9	-	-	-	-
C10 - C14	mg/kg dry wt	< 20	-	-	-	-
C15 - C36	mg/kg dry wt	< 40	-	-	-	-
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 70	-	-	-	-
BTEX in VOC Soils by Headspace GC-MS						
Benzene	mg/kg dry wt	< 0.3	-	-	-	-
Ethylbenzene	mg/kg dry wt	< 0.3	-	-	-	-
Toluene	mg/kg dry wt	< 0.3	-	-	-	-
m&p-Xylene	mg/kg dry wt	< 0.5	-	-	-	-
o-Xylene	mg/kg dry wt	< 0.3	-	-	-	-
Halogenated Aliphatics in VOC Soils by Headspace GC-MS						
Bromomethane (Methyl Bromide)	mg/kg dry wt	< 0.3	-	-	-	-
Carbon tetrachloride	mg/kg dry wt	< 0.3	-	-	-	-
Chloroethane	mg/kg dry wt	< 0.3	-	-	-	-
Chloromethane	mg/kg dry wt	< 0.3	-	-	-	-
1,2-Dibromo-3-chloropropane	mg/kg dry wt	< 0.5	-	-	-	-
1,2-Dibromoethane (ethylene dibromide, EDB)	mg/kg dry wt	< 0.3	-	-	-	-
Dibromomethane	mg/kg dry wt	< 0.3	-	-	-	-
1,3-Dichloropropane	mg/kg dry wt	< 0.3	-	-	-	-
Dichlorodifluoromethane	mg/kg dry wt	< 0.5	-	-	-	-
1,1-Dichloroethane	mg/kg dry wt	< 0.3	-	-	-	-
1,2-Dichloroethane	mg/kg dry wt	< 0.3	-	-	-	-
1,1-Dichloroethene	mg/kg dry wt	< 0.3	-	-	-	-
cis-1,2-Dichloroethene	mg/kg dry wt	< 0.3	-	-	-	-
trans-1,2-Dichloroethene	mg/kg dry wt	< 0.3	-	-	-	-
Dichloromethane (methylene chloride)	mg/kg dry wt	< 5	-	-	-	-
1,2-Dichloropropane	mg/kg dry wt	< 0.3	-	-	-	-
1,1-Dichloropropene	mg/kg dry wt	< 0.3	-	-	-	-
cis-1,3-Dichloropropene	mg/kg dry wt	< 0.3	-	-	-	-
trans-1,3-Dichloropropene	mg/kg dry wt	< 0.3	-	-	-	-
Hexachlorobutadiene	mg/kg dry wt	< 0.3	-	-	-	-
1,1,1,2-Tetrachloroethane	mg/kg dry wt	< 0.3	-	-	-	-
1,1,2,2-Tetrachloroethane	mg/kg dry wt	< 0.3	-	-	-	-
Tetrachloroethene (tetrachloroethylene)	mg/kg dry wt	< 0.3	-	-	-	-
1,1,1-Trichloroethane	mg/kg dry wt	< 0.3	-	-	-	-
1,1,2-Trichloroethane	mg/kg dry wt	< 0.3	-	-	-	-
Trichloroethene (trichloroethylene)	mg/kg dry wt	< 0.3	-	-	-	-
Trichlorofluoromethane	mg/kg dry wt	< 0.3	-	-	-	-
1,2,3-Trichloropropane	mg/kg dry wt	< 0.5	-	-	-	-
1,1,2-Trichlorotrifluoroethane (Freon 113)	mg/kg dry wt	< 0.3	-	-	-	-
Vinyl chloride	mg/kg dry wt	< 0.3	-	-	-	-
Haloaromatics in VOC Soils by Headspace GC-MS						
Bromobenzene	mg/kg dry wt	< 0.3	-	-	-	-
1,3-Dichlorobenzene	mg/kg dry wt	< 0.3	-	-	-	-
4-Chlorotoluene	mg/kg dry wt	< 0.3	-	-	-	-
Chlorobenzene (monochlorobenzene)	mg/kg dry wt	< 0.3	-	-	-	-
1,2-Dichlorobenzene	mg/kg dry wt	< 0.3	-	-	-	-
1,4-Dichlorobenzene	mg/kg dry wt	< 0.3	-	-	-	-
2-Chlorotoluene	mg/kg dry wt	< 0.3	-	-	-	-
1,2,3-Trichlorobenzene	mg/kg dry wt	< 0.3	-	-	-	-

Sample Type: Soil						
Sample Name:		WS02 1.2-1.4 06-May-2021				
Lab Number:		2605455.6				
Haloaromatics in VOC Soils by Headspace GC-MS						
1,2,4-Trichlorobenzene	mg/kg dry wt	< 0.3	-	-	-	-
1,3,5-Trichlorobenzene	mg/kg dry wt	< 0.3	-	-	-	-
Monoaromatic Hydrocarbons in VOC Soils by Headspace GC-MS						
n-Butylbenzene	mg/kg dry wt	< 0.3	-	-	-	-
tert-Butylbenzene	mg/kg dry wt	< 0.3	-	-	-	-
Isopropylbenzene (Cumene)	mg/kg dry wt	< 0.3	-	-	-	-
4-Isopropyltoluene (p-Cymene)	mg/kg dry wt	< 0.3	-	-	-	-
n-Propylbenzene	mg/kg dry wt	< 0.3	-	-	-	-
sec-Butylbenzene	mg/kg dry wt	< 0.3	-	-	-	-
Styrene	mg/kg dry wt	< 0.3	-	-	-	-
1,2,4-Trimethylbenzene	mg/kg dry wt	< 0.3	-	-	-	-
1,3,5-Trimethylbenzene	mg/kg dry wt	< 0.3	-	-	-	-
Ketones in VOC Soils by Headspace GC-MS						
2-Butanone (MEK)	mg/kg dry wt	< 50	-	-	-	-
4-Methylpentan-2-one (MIBK)	mg/kg dry wt	< 9	-	-	-	-
Acetone	mg/kg dry wt	< 50	-	-	-	-
Methyl tert-butylether (MTBE)	mg/kg dry wt	< 0.3	-	-	-	-
Trihalomethanes in VOC Soils by Headspace GC-MS						
Bromodichloromethane	mg/kg dry wt	< 0.3	-	-	-	-
Bromoform (tribromomethane)	mg/kg dry wt	< 0.5	-	-	-	-
Chloroform (Trichloromethane)	mg/kg as rcvd	< 0.3	-	-	-	-
Dibromochloromethane	mg/kg dry wt	< 0.3	-	-	-	-
Other VOC in Soils by Headspace GC-MS						
Carbon disulphide	mg/kg dry wt	< 0.3	-	-	-	-
Naphthalene	mg/kg dry wt	< 0.3	-	-	-	-

Analyst's Comments

#1 It should be noted that the replicate analyses performed on this sample as part of our in-house Quality Assurance procedures showed greater variation than would normally be expected. This may reflect the heterogeneity of the sample. Replicate 1 = 8mg/kg, replicate 2 = 5mg/kg.

Appendix No.1 - Chain of Custody

Summary of Methods

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

Sample Type: Soil			
Test	Method Description	Default Detection Limit	Sample No
Individual Tests			
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%.	-	1, 3-4, 6
Soil Prep Dry & Sieve for Agriculture	Air dried at 35°C and sieved, <2mm fraction.	-	4, 6
Total of Reported PAHs in Soil	Sonication extraction, GC-MS analysis. In-house based on US EPA 8270.	0.03 mg/kg dry wt	2-3, 5
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	1-6
pH*	1:2 (v/v) soil : water slurry followed by potentiometric determination of pH. In-house.	0.1 pH Units	4, 6
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	BaP Potency Equivalence calculated from; Benzo(a)anthracene x 0.1 + Benzo(b)fluoranthene x 0.1 + Benzo(j)fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Benzo(a)pyrene x 1.0 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Fluoranthene x 0.01 + Indeno(1,2,3-c,d)pyrene x 0.1. Ministry for the Environment. 2011. Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health. Wellington: Ministry for the Environment.	0.002 mg/kg dry wt	2-3, 5

Sample Type: Soil			
Test	Method Description	Default Detection Limit	Sample No
Benzo[a]pyrene Toxic Equivalence (TEF)*	Benzo[a]pyrene Toxic Equivalence (TEF) calculated from; Benzo[a]pyrene x 1.0 + Benzo(a)anthracene x 0.1 + Benzo(b)fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Indeno(1,2,3-c,d)pyrene x 0.1. Guidelines for assessing and managing contaminated gasworks sites in New Zealand (GMG) (MfE, 1997).	0.002 mg/kg dry wt	2-3, 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, 3-4, 6
BTEX in Soil by Headspace GC-MS	Solvent extraction, Headspace GC-MS analysis. Tested on as received sample. In-house based on US EPA 8260 and 5021.	0.05 - 0.10 mg/kg dry wt	2-3, 5
Polycyclic Aromatic Hydrocarbons Screening in Soil*	Sonication extraction, GC-MS analysis. Tested on as received sample. In-house based on US EPA 8270.	0.002 - 0.05 mg/kg dry wt	2-3, 5
Semivolatile Organic Compounds Screening in Soil by GC-MS	Sonication extraction, GC-MS analysis. Tested on as received sample. In-house based on US EPA 8270.	0.002 - 30 mg/kg dry wt	1, 4, 6
TPH + PAH + BTEX profile	Sonication extraction, GC-FID and GC-MS analysis. Tested on as received sample. In-house based on US EPA 8015 and US EPA 8270.	0.002 - 70 mg/kg dry wt	2-3, 5
Volatile Organic Compounds Screening in Soil by Headspace GC-MS	Sonication extraction, Headspace GC-MS analysis. Tested on as received sample. In-house based on US EPA 8260 and 5021.	-	1, 4, 6
Total Petroleum Hydrocarbons in Soil			
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	8 mg/kg dry wt	2-3, 5-6
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	2-3, 5-6
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	2-3, 5-6
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	2-3, 5-6

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

Testing was completed between 11-May-2021 and 13-May-2021. For completion dates of individual analyses please contact the laboratory.

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

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Ara Heron BSc (Tech)
Client Services Manager - Environmental



Quote No

Primary Contact **G STAEBLE**Submitted By **C MACRAE**Client Name **ENGEO**

Address

Postcode

Phone

Mobile

Email

Charge To **ENGEO**Client Reference **8th BARKER ST**

Order No

Results To

Reports will be emailed to Primary Contact by default.
Additional Reports will be sent as specified below.☐ Email Primary Contact ☐ Email Submitter ☐ Email Client☐ Email Other☐ Other

ADDITIONAL INFORMATION

No.	Sample Name	Sample Material	Sample Location	Sample Date	Tests Required (if not as per Quote)
1	WS01 0.2-0.4	SOIL	-	6/5/21	Hold & cold
2	WS01 0.4-0.6	"	-	"	"
3	WS01 0.7-0.9	"	-	"	"
4	WS01 1.5-1.6	"	-	"	"
5	WS02 0.2-0.4	"	-	"	"
6	WS02 0.4-0.5	"	-	"	"
7	WS02 0.7-0.8	"	-	"	"
8	WS02 1.2-1.4	"	-	"	"
9					
10					

ANALYSIS REQUEST

R J Hill Laboratories Limited
3/204 Thorndon Quay
Pipitea
Wellington 6011
New Zealand

Job No: Date Recv: **06-May-21 15:11**

260 5455

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

Received by: **Kelsey Rohloff**

3126054556

19.6°C

CHAIN OF CUSTODY RECORD

Sent to

Hill Laboratories

Date & Time:

Name:

☐ Tick if you require COC
to be emailed back

Signature:

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

Received at

Hill Laboratories

Date & Time:

Name:

Signature:

Priority

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

Requested Reporting Date:

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



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

Job Information Summary

Page 1 of 1

Client: Engeo Limited
Contact: Gabriela Staehle
C/- Engeo Limited
PO Box 25047
Wellington 6146

Lab No: 2605455
Date Registered: 07-May-2021 10:11 am
Priority: High
Quote No: 82742
Order No:
Client Reference: 8 Barker St
Add. Client Ref:
Submitted By: Calum MacRae
Charge To: Engeo Limited
Target Date: 10-May-2021 4:30 pm

Samples				
No	Sample Name	Sample Type	Containers	Tests Requested
1	WS01 0.4-0.6 06-May-2021	Soil	GSoil300	Hold Cold HM, SVOCs, VOCs
2	WS01 0.7-0.9 06-May-2021	Soil	GSoil300	Hold Cold TPH, PAH, BTEX Profile
3	WS01 1.5-1.6 06-May-2021	Soil	GSoil300	Hold Cold HM and TPH, PAH, BTEX Profile
4	WS02 0.4-0.5 06-May-2021	Soil	GSoil300	Hold Cold HM, ph, SVOCs, VOCs
5	WS02 0.7-0.8 06-May-2021	Soil	GSoil300	Hold Cold TPH, PAH, BTEX Profile
6	WS02 1.2-1.4 06-May-2021	Soil	GSoil300	Hold Cold HM and TPH, PAH, BTEX Profile, ph, SVOCs, VOCs



Certificate of Analysis

Page 1 of 3

Client:	Engeo Limited	Lab No:	2702875	SPV1
Contact:	Gabriela Staehle	Date Received:	13-Sep-2021	
	C/- Engeo Limited	Date Reported:	20-Sep-2021	
	PO Box 25047	Quote No:	82742	
	Wellington 6146	Order No:		
		Client Reference:	Barker St, Wellington - 18613	
		Submitted By:	Matthew Spencer-Phillips	

Sample Type: Soil						
Sample Name:		BH01 - 0.5m 13-Sep-2021	BH01 - 1.8m 13-Sep-2021	BH02 - 0.5m 13-Sep-2021	BH02 - 1.8m 13-Sep-2021	
Lab Number:		2702875.1	2702875.2	2702875.3	2702875.4	
Individual Tests						
Dry Matter	g/100g as rcvd	74	71	71	74	-
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	27	3	5	5	-
Total Recoverable Cadmium	mg/kg dry wt	1.25	0.13	0.21	0.13	-
Total Recoverable Chromium	mg/kg dry wt	26	11	14	11	-
Total Recoverable Copper	mg/kg dry wt	68	9	16	8	-
Total Recoverable Lead	mg/kg dry wt	1,300	73	98	22	-
Total Recoverable Nickel	mg/kg dry wt	12	7	9	9	-
Total Recoverable Zinc	mg/kg dry wt	1,290	83	240	67	-
BTEX in Soil by Headspace GC-MS						
Benzene	mg/kg dry wt	< 0.06	< 0.07	< 0.07	< 0.06	-
Toluene	mg/kg dry wt	< 0.06	< 0.07	< 0.07	< 0.06	-
Ethylbenzene	mg/kg dry wt	< 0.06	< 0.07	< 0.07	< 0.06	-
m&p-Xylene	mg/kg dry wt	< 0.12	< 0.13	< 0.13	< 0.12	-
o-Xylene	mg/kg dry wt	< 0.06	< 0.07	< 0.07	< 0.06	-
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	< 8	< 9	< 9	< 8	-
C10 - C14	mg/kg dry wt	< 20	< 20	< 20	< 20	-
C15 - C36	mg/kg dry wt	340	68	< 40	74	-
Total hydrocarbons (C7 - C36)	mg/kg dry wt	340	71	< 70	80	-

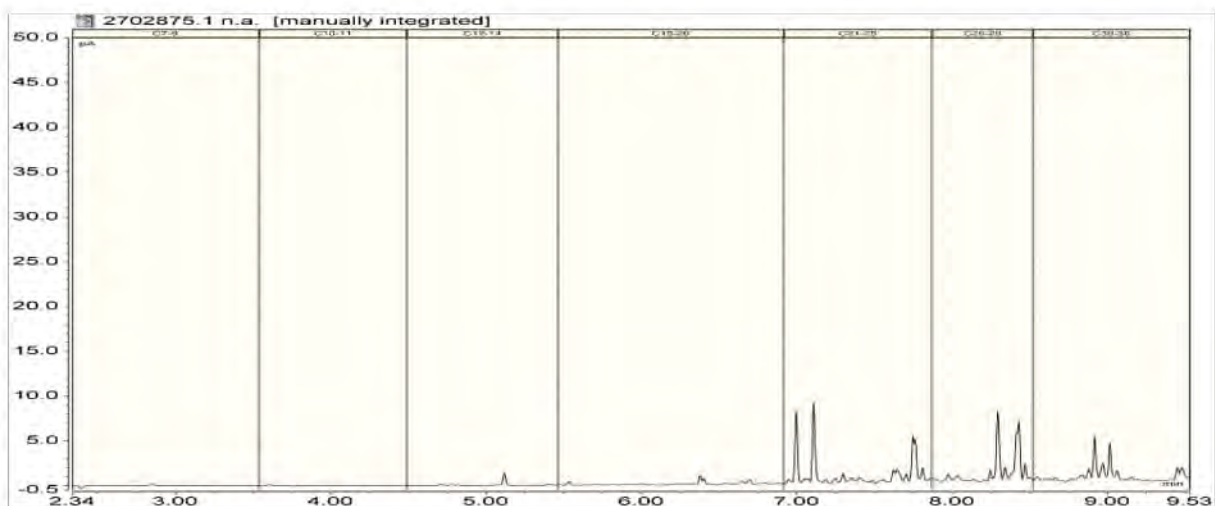


This Laboratory is accredited by International Accreditation New Zealand (IANZ), which represents New Zealand in the International Laboratory Accreditation Cooperation (ILAC). Through the ILAC Mutual Recognition Arrangement (ILAC-MRA) this accreditation is internationally recognised. The tests reported herein have been performed in accordance with the terms of accreditation, with the exception of tests marked * or any comments and interpretations, which are not accredited.

2702875.1

BH01 - 0.5m 13-Sep-2021

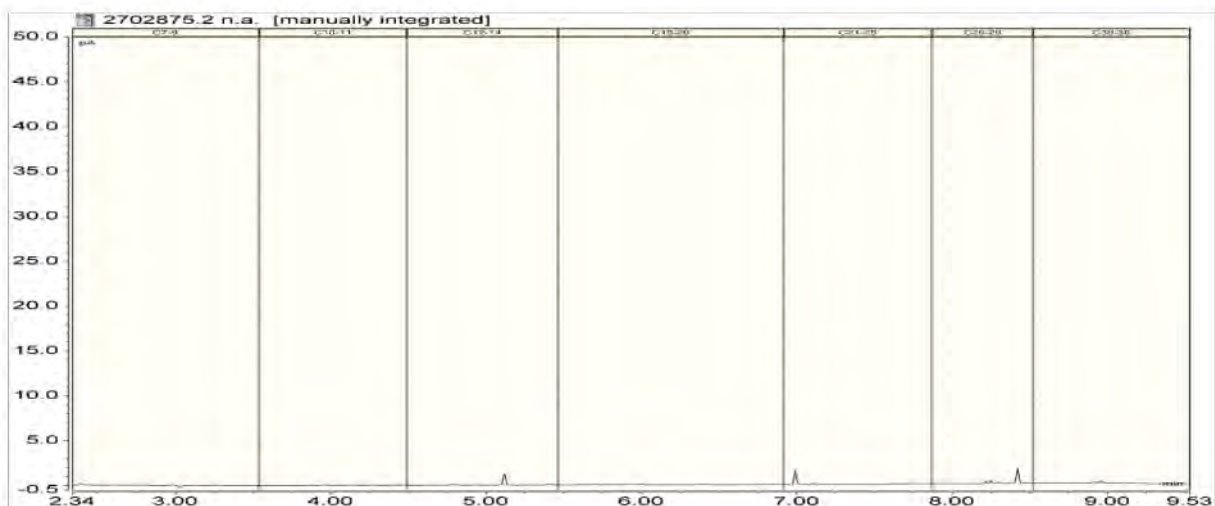
Client Chromatogram for TPH by FID



2702875.2

BH01 - 1.8m 13-Sep-2021

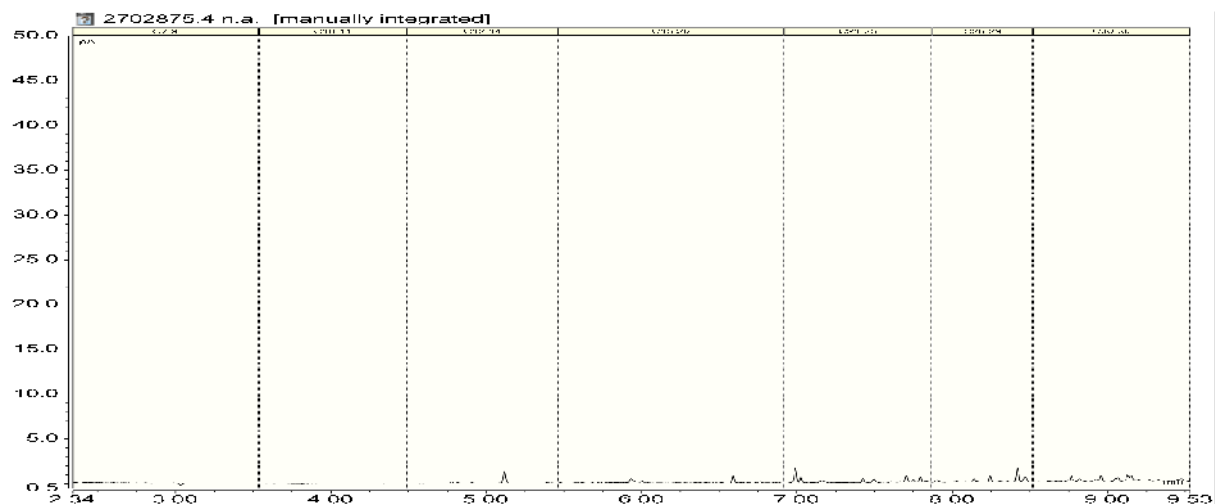
Client Chromatogram for TPH by FID



2702875.4

BH02 - 1.8m 13-Sep-2021

Client Chromatogram for TPH by FID



Analyst's Comments

Appendix No.1 - Chain of Custody

Summary of Methods

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

Sample Type: Soil			
Test	Method Description	Default Detection Limit	Sample No
Individual Tests			
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%.	-	1-4
Dry Matter (Env)	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	1-4
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	1-4
BTEX in Soil by Headspace GC-MS	Solvent extraction, Headspace GC-MS analysis. Tested on as received sample. In-house based on US EPA 8260 and 5021.	0.05 - 0.10 mg/kg dry wt	1-4
Total Petroleum Hydrocarbons in Soil			
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	1-2, 4
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	8 mg/kg dry wt	1-4
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	1-4
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	1-4
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	1-4

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

Testing was completed on 20-Sep-2021. For completion dates of individual analyses please contact the laboratory.

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

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



Quote No

Primary Contact (ENGEO) Gabbi

Submitted By Matthew Spencer-Phillips (ENGEO)

Client Name

Address

Postcode

Phone

Mobile

Email

Charge To

Client Reference

Order No

Results To

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

☒ Email Primary Contact
 ☒ Email Submitter
 ☐ Email Client

☐ Email Other

☐ Other

ADDITIONAL INFORMATION

Barker St, Wellington
ref: 18613

ANALYSIS REQUEST

R J Hill Laboratories Limited
3/204 Thorndon Quay
Pipitea
Wellington 6011
New Zealand

Job No: Date Recv: 13-Sep-21 15:14

270 2875

Received by: Kelsey Rohloff

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



3127028755

CHAIN OF CUSTODY RECORD

Sent to

Hill Laboratories

Date & Time:

Name:

☐ Tick if you require COC
to be emailed back

Signature:

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

Received at

Hill Laboratories

Date & Time:

Name:

Signature:

 Priority ☐ Low ☐ Normal ☐ High

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

Requested Reporting Date:

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

No.	Sample Name	Sample Material	Sample Location	Sample Date	Tests Required (if not as per Quote)
1	BH01 0.5m (x3)	Sandy SECT	BH01	13/9/21	Hold & Cold
2	BH01 1.8m (x3)	Sandy SECT	BH01	"	"
3	BH02 0.5m (x3)	Sandy SECT	BH02	"	"
4	BH02 1.8m (x3)	Sandy SECT	BH02	"	"
5					
6					
7					
8					
9					
10					



Certificate of Analysis

Page 1 of 3

Client:	Engeo Limited	Lab No:	3044640	A2Pv1
Contact:	Gabriela Staehle	Date Received:	01-Aug-2022	
	C/- Engeo Limited	Date Reported:	05-Aug-2022	
	PO Box 25047	Quote No:	82742	
	Wellington 6146	Order No:		
		Client Reference:	8 Barker Street, Te Aro	
		Submitted By:	Josh Law	

Sample Type: Soil				
Sample Name:		WS-3 @ 0.3 30-Jul-2022 9:05 am	WS-5 @ 0.5 30-Jul-2022 10:00 am	WS-2 @ 0.5 30-Jul-2022 10:45 am
Lab Number:		3044640.1	3044640.4	3044640.6
Asbestos Presence / Absence		Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.
Description of Asbestos Form		-	-	-
Asbestos in ACM as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001
Asbestos as Fibrous Asbestos as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001
Asbestos as Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001
As Received Weight	g	815.1	888.5	897.9
Dry Weight	g	735.1	623.9	838.7
Moisture	%	10	30	7
Sample Fraction >10mm	g dry wt	256.4	98.6	356.2
Sample Fraction <10mm to >2mm	g dry wt	233.0	161.1	286.3
Sample Fraction <2mm	g dry wt	234.5	361.1	194.9
<2mm Subsample Weight	g dry wt	50.5	51.6	53.8
Weight of Asbestos in ACM (Non-Friable)	g dry wt	< 0.00001	< 0.00001	< 0.00001
Weight of Asbestos as Fibrous Asbestos (Friable)	g dry wt	< 0.00001	< 0.00001	< 0.00001
Weight of Asbestos as Asbestos Fines (Friable)*	g dry wt	< 0.00001	< 0.00001	< 0.00001

Glossary of Terms

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

Please refer to the **BRANZ New Zealand Guidelines for Assessing and Managing Asbestos in Soil.**
<https://www.branz.co.nz/asbestos>

The following assumptions have been made:

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

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



This Laboratory is accredited by International Accreditation New Zealand (IANZ), which represents New Zealand in the International Laboratory Accreditation Cooperation (ILAC). Through the ILAC Mutual Recognition Arrangement (ILAC-MRA) this accreditation is internationally recognised. The tests reported herein have been performed in accordance with the terms of accreditation, with the exception of tests marked * or any comments and interpretations, which are not accredited.

Summary of Methods

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

Sample Type: Soil			
Test	Method Description	Default Detection Limit	Sample No
Individual Tests			
Weight of Asbestos as Asbestos Fines in <10mm >2mm Fraction*	Measurement on analytical balance, from the <10mm >2mm Fraction. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.00001 g dry wt	1, 4, 6
New Zealand Guidelines Semi Quantitative Asbestos in Soil			
As Received Weight	Measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	1, 4, 6
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	1, 4, 6
Moisture	Sample dried at 100 to 105°C. Calculation = (As received weight - Dry weight) / as received weight x 100.	1 %	1, 4, 6
Sample Fraction >10mm	Sample dried at 100 to 105°C, 10mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g dry wt	1, 4, 6
Sample Fraction <10mm to >2mm	Sample dried at 100 to 105°C, 10mm and 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g dry wt	1, 4, 6
Sample Fraction <2mm	Sample dried at 100 to 105°C, 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g dry wt	1, 4, 6
Asbestos Presence / Absence	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0.01%	1, 4, 6
Description of Asbestos Form	Description of asbestos form and/or shape if present.	-	1, 4, 6
Weight of Asbestos in ACM (Non-Friable)	Measurement on analytical balance, from the >10mm Fraction. Weight of asbestos based on assessment of ACM form. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 4, 6
Asbestos in ACM as % of Total Sample*	Calculated from weight of asbestos in ACM and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1, 4, 6
Weight of Asbestos as Fibrous Asbestos (Friable)	Measurement on analytical balance, from the >10mm Fraction. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 4, 6
Asbestos as Fibrous Asbestos as % of Total Sample*	Calculated from weight of fibrous asbestos and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1, 4, 6
Weight of Asbestos as Asbestos Fines (Friable)*	Measurement on analytical balance, from the <10mm Fractions. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 4, 6
Asbestos as Asbestos Fines as % of Total Sample*	Calculated from weight of asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1, 4, 6
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	Calculated from weight of fibrous asbestos plus asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1, 4, 6

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

Testing was completed on 05-Aug-2022. For completion dates of individual analyses please contact the laboratory.

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

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



Rhodri Williams BSc (Hons)
Technical Manager - Asbestos



Certificate of Analysis

Page 1 of 3

Client:	Engeo Limited	Lab No:	3026454	A2Pv1
Contact:	Gabriela Staehle	Date Received:	04-Jul-2022	
	C/- Engeo Limited	Date Reported:	06-Jul-2022	
	PO Box 25047	Quote No:	82742	
	Wellington 6146	Order No:		
		Client Reference:	18613	
		Add. Client Ref:	8 Barker St	
		Submitted By:	Kate Standish	

Sample Type: Soil

Sample Name:	S01 @ 0.5m 02-Jul-2022	S01 @ 1.5m 02-Jul-2022	S04 @ 0.5m 02-Jul-2022	S04 @ 2m 02-Jul-2022	S08 @ 0.5m 02-Jul-2022
Lab Number:	3026454.1	3026454.2	3026454.3	3026454.4	3026454.5
Asbestos Presence / Absence	Chrysotile (White Asbestos) detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.
Description of Asbestos Form	Loose fibres	-	-	-	-
Asbestos in ACM as % of Total Sample*	% w/w < 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	% w/w < 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Asbestos as Fibrous Asbestos as % of Total Sample*	% w/w < 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Asbestos as Asbestos Fines as % of Total Sample*	% w/w < 0.001	< 0.001	< 0.001	< 0.001	< 0.001
As Received Weight	g 798.0	465.4	635.5	522.7	852.2
Dry Weight	g 731.7	360.8	516.5	401.8	734.1
Moisture	% 8	22	19	23	14
Sample Fraction >10mm	g dry wt 348.8	< 0.1	178.6	203.7	275.3
Sample Fraction <10mm to >2mm	g dry wt 269.6	140.5	212.9	124.9	274.0
Sample Fraction <2mm	g dry wt 113.0	218.5	124.2	71.7	184.4
<2mm Subsample Weight	g dry wt 55.8	53.8	58.8	50.4	56.3
Weight of Asbestos in ACM (Non-Friable)	g dry wt < 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Weight of Asbestos as Fibrous Asbestos (Friable)	g dry wt < 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Weight of Asbestos as Asbestos Fines (Friable)*	g dry wt 0.00003	< 0.00001	< 0.00001	< 0.00001	< 0.00001

Sample Name:	S08 @ 2m 02-Jul-2022	S09 @ 0.5m 02-Jul-2022	S09 @ 1.5m 02-Jul-2022	S07 @ 0.5m 02-Jul-2022	S07 @ 2.5m 02-Jul-2022
Lab Number:	3026454.6	3026454.7	3026454.8	3026454.9	3026454.10
Asbestos Presence / Absence	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.
Description of Asbestos Form	-	-	-	-	-
Asbestos in ACM as % of Total Sample*	% w/w < 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	% w/w < 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Asbestos as Fibrous Asbestos as % of Total Sample*	% w/w < 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Asbestos as Asbestos Fines as % of Total Sample*	% w/w < 0.001	< 0.001	< 0.001	< 0.001	< 0.001
As Received Weight	g 582.3	613.8	562.1	857.3	1,112.7
Dry Weight	g 424.4	430.1	403.9	776.1	907.1



This Laboratory is accredited by International Accreditation New Zealand (IANZ), which represents New Zealand in the International Laboratory Accreditation Cooperation (ILAC). Through the ILAC Mutual Recognition Arrangement (ILAC-MRA) this accreditation is internationally recognised. The tests reported herein have been performed in accordance with the terms of accreditation, with the exception of tests marked * or any comments and interpretations, which are not accredited.

Sample Type: Soil						
Sample Name:		S08 @ 2m 02-Jul-2022	S09 @ 0.5m 02-Jul-2022	S09 @ 1.5m 02-Jul-2022	S07 @ 0.5m 02-Jul-2022	S07 @ 2.5m 02-Jul-2022
Lab Number:		3026454.6	3026454.7	3026454.8	3026454.9	3026454.10
Moisture	%	27	30	28	9	18
Sample Fraction >10mm	g dry wt	52.8	12.7	29.1	109.5	536.7
Sample Fraction <10mm to >2mm	g dry wt	135.5	106.5	64.3	341.5	249.4
Sample Fraction <2mm	g dry wt	234.3	310.2	309.0	324.3	118.3
<2mm Subsample Weight	g dry wt	57.4	56.2	60.0	56.6	57.0
Weight of Asbestos in ACM (Non-Friable)	g dry wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Weight of Asbestos as Fibrous Asbestos (Friable)	g dry wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Weight of Asbestos as Asbestos Fines (Friable)*	g dry wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001

Glossary of Terms

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

For further details, please contact the Asbestos Team.

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

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

The following assumptions have been made:

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

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

Analyst's Comments
Appendix No.1 - Chain of Custody

Summary of Methods

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

Sample Type: Soil			
Test	Method Description	Default Detection Limit	Sample No
Individual Tests			
Weight of Asbestos as Asbestos Fines in <10mm >2mm Fraction*	Measurement on analytical balance, from the <10mm >2mm Fraction. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.00001 g dry wt	1-10
New Zealand Guidelines Semi Quantitative Asbestos in Soil			
As Received Weight	Measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	1-10
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	1-10
Moisture	Sample dried at 100 to 105°C. Calculation = (As received weight - Dry weight) / as received weight x 100.	1 %	1-10
Sample Fraction >10mm	Sample dried at 100 to 105°C, 10mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g dry wt	1-10
Sample Fraction <10mm to >2mm	Sample dried at 100 to 105°C, 10mm and 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g dry wt	1-10
Sample Fraction <2mm	Sample dried at 100 to 105°C, 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g dry wt	1-10

Sample Type: Soil			
Test	Method Description	Default Detection Limit	Sample No
Asbestos Presence / Absence	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0.01%	1-10
Description of Asbestos Form	Description of asbestos form and/or shape if present.	-	1-10
Weight of Asbestos in ACM (Non-Friable)	Measurement on analytical balance, from the >10mm Fraction. Weight of asbestos based on assessment of ACM form. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1-10
Asbestos in ACM as % of Total Sample*	Calculated from weight of asbestos in ACM and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1-10
Weight of Asbestos as Fibrous Asbestos (Friable)	Measurement on analytical balance, from the >10mm Fraction. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1-10
Asbestos as Fibrous Asbestos as % of Total Sample*	Calculated from weight of fibrous asbestos and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1-10
Weight of Asbestos as Asbestos Fines (Friable)*	Measurement on analytical balance, from the <10mm Fractions. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1-10
Asbestos as Asbestos Fines as % of Total Sample*	Calculated from weight of asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1-10
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	Calculated from weight of fibrous asbestos plus asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1-10

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

Testing was completed on 06-Jul-2022. For completion dates of individual analyses please contact the laboratory.

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

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



Dexter Paguirigan Dip Chem Engineering Tech
Laboratory Technician - Asbestos



Quote No

Primary Contact Gabriela StaehleSubmitted By Kate Standish

Client Name

Address ENGE0 Limited Level 18 PimmsTowers

Postcode

Phone

Mobile

0210297028Email Kstandish@engeo.co.nz

Charge To

Client Reference 18 613

Order No

Results To

Reports will be emailed to Primary Contact by default.
Additional Reports will be sent as specified below.☒ Email Primary Contact ☒ Email Submitter ☐ Email Client☐ Email Other☐ Other**ADDITIONAL INFORMATION**Hold 2 cold glass jars**ANALYSIS REQUEST**R J Hill Laboratories Limited
3/204 Thorndon Quay
Pipitea
Wellington 6011
New ZealandJob No: Date Recv: 04-Jul-22 11:26**302 6454**T 0508 HILL LAB (44 555 22)
T +64 7 858 2000
E mail@hill-labs.co.nz
W www.hill-laboratories.comReceived by: Charlotte O'Leary

3130264544

CHAIN OF CUSTODY RECORDSent to
Hill LaboratoriesDate & Time: 9/7/22Name: Kate Standish☒ Tick if you require COC
to be emailed backSignature: [Signature]

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

Received at
Hill Laboratories

Date & Time:

Name:

12.5°C

Signature:

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

Requested Reporting Date:

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

No.	Sample Name	Sample Material	Sample Location	Sample Date	Tests Required (if not as per Quote)
1	SO1 @ 0.5m (tub)	soil	8 Barker st	2/7/22	Asbestos
2	SO1 @ 1.5m (tub)				
3	SO4 @ 0.5m (tub)				
4	SO4 @ 2m (tub)				
5	SO8 @ 0.5m (tub)				
6	SO8 @ 2m (tub)				
7	SO9 @ 0.5m (tub)				
8	SO9 @ 1.5m (tub)				
9	SO9 @ 2.5m (tub)				
10	SO7 @ 0.5m (tub)				
11	SO7 @ 2.5m (tub)				

PTO →

No.	Sample Name	Sample Material	Sample Location	Sample Date	Tests Required (If not as per Quote)
13	SO7 @ 0.5m (Jar)	Soil	g Barker	2/7/22	Hold & Cold
14	SO7 @ 2.5m (Jar)				
15	SO9 @ 0.5m (Jar)				
16	SO9 @ 1.5m (Jar)				
17	SO4 @ 2.5m (Jar)				
18	SO8 @ 0.5m (Jar)				
19	SO8 @ 2m (Jar)				
20	SO7 @ 0.5m (Jar)				
21	SO4 @ 2m (Jar)				
22	SO1 @ 0.5m (Jar)				
23	SO1 @ 1.5m (Jar)				
24					
25					
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38					
39					
40					



Certificate of Analysis

Page 1 of 3

Client:	Engeo Limited	Lab No:	3035767	A2Pv1
Contact:	Gabriela Staehle	Date Received:	18-Jul-2022	
	C/- Engeo Limited	Date Reported:	25-Jul-2022	
	PO Box 25047	Quote No:	82742	
	Wellington 6146	Order No:		
		Client Reference:	8 Barker Street	
		Add. Client Ref:	Sampled: 16/07/22	
		Submitted By:	Josh Law	

Sample Type: Soil		
Sample Name:	Asb S06 @ 0.5m	
Lab Number:	3035767.1	
Asbestos Presence / Absence	Asbestos NOT detected.	
Description of Asbestos Form	-	
Asbestos in ACM as % of Total Sample*	% w/w	< 0.001
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	% w/w	< 0.001
Asbestos as Fibrous Asbestos as % of Total Sample*	% w/w	< 0.001
Asbestos as Asbestos Fines as % of Total Sample*	% w/w	< 0.001
As Received Weight	g	885.9
Dry Weight	g	843.3
Moisture	%	5
Sample Fraction >10mm*	g dry wt	434.5
Sample Fraction <10mm to >2mm*	g dry wt	323.4
Sample Fraction <2mm*	g dry wt	85.1
<2mm Subsample Weight*	g dry wt	50.9
Weight of Asbestos in ACM (Non-Friable)	g dry wt	< 0.00001
Weight of Asbestos as Fibrous Asbestos (Friable)*	g dry wt	< 0.00001
Weight of Asbestos as Asbestos Fines (Friable)*	g dry wt	< 0.00001

Glossary of Terms

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

Please refer to the BRANZ New Zealand Guidelines for Assessing and Managing Asbestos in Soil.
<https://www.branz.co.nz/asbestos>

The following assumptions have been made:

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

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



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Analyst's Comments

Appendix No.1 - Chain of Custody

Summary of Methods

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

Sample Type: Soil

Test	Method Description	Default Detection Limit	Sample No
New Zealand Guidelines Semi Quantitative Asbestos in Soil			
As Received Weight	Measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland.	0.1 g	1
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland.	0.1 g	1
Moisture	Sample dried at 100 to 105°C. Calculation = (As received weight - Dry weight) / as received weight x 100.	1 %	1
Sample Fraction >10mm*	Sample dried at 100 to 105°C, 10mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland.	0.1 g dry wt	1
Sample Fraction <10mm to >2mm*	Sample dried at 100 to 105°C, 10mm and 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland.	0.1 g dry wt	1
Sample Fraction <2mm*	Sample dried at 100 to 105°C, 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland.	0.1 g dry wt	1
Asbestos Presence / Absence	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0.01%	1
Description of Asbestos Form	Description of asbestos form and/or shape if present. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland.	-	1
Weight of Asbestos in ACM (Non-Friable)	Measurement on analytical balance, from the >10mm Fraction. Weight of asbestos based on assessment of ACM form. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1
Asbestos in ACM as % of Total Sample*	Calculated from weight of asbestos in ACM and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1
Weight of Asbestos as Fibrous Asbestos (Friable)*	Measurement on analytical balance, from the >10mm Fraction. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1
Asbestos as Fibrous Asbestos as % of Total Sample*	Calculated from weight of fibrous asbestos and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1
Weight of Asbestos as Asbestos Fines (Friable)*	Measurement on analytical balance, from the <10mm Fractions. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1
Asbestos as Asbestos Fines as % of Total Sample*	Calculated from weight of asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	Calculated from weight of fibrous asbestos plus asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1

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

Testing was completed on 25-Jul-2022. For completion dates of individual analyses please contact the laboratory.

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

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



Danielle Carter BSc, PGDipSci, MSc
Laboratory Technician - Asbestos


Hill Laboratories
 TRIED, TESTED AND TRUSTED

Quote No 8 Barber St
 Primary Contact Gabriela Staehle
 Submitted By Joshua Law
 Client Name ENGE0 Ltd.
 Address _____

Postcode _____
 Phone _____ Mobile _____

Email _____

Charge To _____

Client Reference _____

Order No _____

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

☐ Email Primary Contact ☐ Email Submitter ☐ Email Client

☐ Email Other _____

☐ Other _____

ADDITIONAL INFORMATION

ANALYSIS REQUEST

Hill Laboratories Limited
 3204 Thorndon Quay
 P.O. Box 100
 Wellington 6011
 New Zealand

Job No: _____ Date Recv: 18-Jul-22 11:03

303 5767

T 08 HILL LAB (44 555 :
 +4 7 858 2000
 E mail@hill-labs.co.nz
 W www.hill-laboratories.com

Received by: Kelsey Rohloff



3130357870

18.2°C

CHAIN OF CUSTODY RECORD

Sent to
 Hill Laboratories

Date & Time: 11:00am 18 July 22

Name: Joshua Law

☐ Tick if you require COC
 to be emailed back

Signature: _____

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

Received at
 Hill Laboratories

Date & Time: _____

Name: _____

Signature: _____

Priority ☐ Low ☒ Normal ☐ High

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

Requested Reporting Date: _____

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

No.	Sample Name	Sample Material	Sample Location	Sample Date	Tests Required (if not as per Quote)
1	SO6 @ 0.5m (+ Duplicate)		8 Barber St	16-July-22	Hold & Cold please
2	SO6 @ 0.9m		"	"	"
3	SO6 @ 2.1m		"	"	"
4	Asbo SO6 @ 0.5m (+ Duplicate)		"	"	"
5	Asbo SO6 @ 0.9m		"	"	"
6	Asbo SO6 @ 2.1m		"	"	"
7					
8					
9					
10					



Certificate of Analysis

Page 1 of 3

Client:	Engeo Limited	Lab No:	2702874	A2Pv1
Contact:	Gabriela Staehle	Date Received:	13-Sep-2021	
	C/- Engeo Limited	Date Reported:	21-Sep-2021	
	PO Box 25047	Quote No:	82742	
	Wellington 6146	Order No:		
		Client Reference:	Barker St, Wellington ref 18613	
		Submitted By:	Matthew Spencer-Phillips	

Sample Type: Soil

Sample Name:	BH01 0.5m 13-Sep-2021	BH01 1.8m 13-Sep-2021	BH02 0.5m 13-Sep-2021	BH02 1.8m 13-Sep-2021	
Lab Number:	2702874.1	2702874.2	2702874.3	2702874.4	
Asbestos Presence / Absence	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	-
Description of Asbestos Form	-	-	-	-	-
Asbestos in ACM as % of Total Sample*	% w/w < 0.001	% w/w < 0.001	% w/w < 0.001	% w/w < 0.001	-
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	% w/w < 0.001	% w/w < 0.001	% w/w < 0.001	% w/w < 0.001	-
Asbestos as Fibrous Asbestos as % of Total Sample*	% w/w < 0.001	% w/w < 0.001	% w/w < 0.001	% w/w < 0.001	-
Asbestos as Asbestos Fines as % of Total Sample*	% w/w < 0.001	% w/w < 0.001	% w/w < 0.001	% w/w < 0.001	-
As Received Weight	g 536.9	g 644.6	g 394.0	g 594.2	-
Dry Weight	g 392.2	g 467.0	g 264.7	g 353.3	-
Moisture	% 27	% 28	% 33	% 41	-
Sample Fraction >10mm	g dry wt 23.4	g dry wt < 0.1	g dry wt 3.6	g dry wt 23.8	-
Sample Fraction <10mm to >2mm	g dry wt 147.0	g dry wt 67.1	g dry wt 107.8	g dry wt 116.1	-
Sample Fraction <2mm	g dry wt 221.5	g dry wt 397.2	g dry wt 151.7	g dry wt 211.6	-
<2mm Subsample Weight	g dry wt 53.2	g dry wt 52.5	g dry wt 59.5	g dry wt 55.7	-
Weight of Asbestos in ACM (Non-Friable)	g dry wt < 0.00001	g dry wt < 0.00001	g dry wt < 0.00001	g dry wt < 0.00001	-
Weight of Asbestos as Fibrous Asbestos (Friable)	g dry wt < 0.00001	g dry wt < 0.00001	g dry wt < 0.00001	g dry wt < 0.00001	-
Weight of Asbestos as Asbestos Fines (Friable)*	g dry wt < 0.00001	g dry wt < 0.00001	g dry wt < 0.00001	g dry wt < 0.00001	-

Glossary of Terms

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

For further details, please contact the Asbestos Team.

Please refer to the **BRANZ New Zealand Guidelines for Assessing and Managing Asbestos in Soil**.
<https://www.branz.co.nz/asbestos>

The following assumptions have been made:

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

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



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Summary of Methods

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

Sample Type: Soil			
Test	Method Description	Default Detection Limit	Sample No
Individual Tests			
Wgt of Asbestos as Asbestos Fines in <10mm >2mm Fraction*	Measurement on analytical balance, from the <10mm >2mm Fraction. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.00001 g dry wt	1-4
New Zealand Guidelines Semi Quantitative Asbestos in Soil			
As Received Weight	Measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	1-4
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	1-4
Moisture	Sample dried at 100 to 105°C. Calculation = (As received weight - Dry weight) / as received weight x 100.	1 %	1-4
Sample Fraction >10mm	Sample dried at 100 to 105°C, 10mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g dry wt	1-4
Sample Fraction <10mm to >2mm	Sample dried at 100 to 105°C, 10mm and 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g dry wt	1-4
Sample Fraction <2mm	Sample dried at 100 to 105°C, 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g dry wt	1-4
Asbestos Presence / Absence	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0.01%	1-4
Description of Asbestos Form	Description of asbestos form and/or shape if present.	-	1-4
Weight of Asbestos in ACM (Non-Friable)	Measurement on analytical balance, from the >10mm Fraction. Weight of asbestos based on assessment of ACM form. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1-4
Asbestos in ACM as % of Total Sample*	Calculated from weight of asbestos in ACM and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1-4
Weight of Asbestos as Fibrous Asbestos (Friable)	Measurement on analytical balance, from the >10mm Fraction. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1-4
Asbestos as Fibrous Asbestos as % of Total Sample*	Calculated from weight of fibrous asbestos and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1-4
Weight of Asbestos as Asbestos Fines (Friable)*	Measurement on analytical balance, from the <10mm Fractions. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1-4
Asbestos as Asbestos Fines as % of Total Sample*	Calculated from weight of asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1-4
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	Calculated from weight of fibrous asbestos plus asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1-4

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

Testing was completed between 17-Sep-2021 and 21-Sep-2021. For completion dates of individual analyses please contact the laboratory.

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

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Rhodri Williams BSc (Hons)
Technical Manager - Asbestos



Certificate of Analysis

Page 1 of 3

Client:	Engeo Limited	Lab No:	2605454	A2Pv1
Contact:	Gabriela Staehle C/- Engeo Limited PO Box 25047 Wellington 6146	Date Received:	06-May-2021	
		Date Reported:	19-May-2021	
		Quote No:	82742	
		Order No:		
		Client Reference:	8 Barker Street	
		Add. Client Ref:	Sampled: 06/05/21	
		Submitted By:	Gabriela Staehle	

Sample Type: Soil					
Sample Name:		WS01 0.2 - 0.4	WS02 0.2 - 0.4		
Lab Number:		2605454.1	2605454.2		
Asbestos Presence / Absence		Asbestos NOT detected.	Asbestos NOT detected.	-	-
Description of Asbestos Form		-	-	-	-
Asbestos in ACM as % of Total Sample*	% w/w	< 0.001	< 0.001	-	-
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001	-	-
Asbestos as Fibrous Asbestos as % of Total Sample*	% w/w	< 0.001	< 0.001	-	-
Asbestos as Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001	-	-
As Received Weight	g	1,006.7	896.5	-	-
Dry Weight	g	829.5	790.6	-	-
Moisture	%	18	12	-	-
Sample Fraction >10mm*	g dry wt	308.3	198.6	-	-
Sample Fraction <10mm to >2mm*	g dry wt	300.3	368.8	-	-
Sample Fraction <2mm*	g dry wt	219.5	222.6	-	-
<2mm Subsample Weight*	g dry wt	50.6	50.3	-	-
Weight of Asbestos in ACM (Non-Friable)	g dry wt	< 0.00001	< 0.00001	-	-
Weight of Asbestos as Fibrous Asbestos (Friable)*	g dry wt	< 0.00001	< 0.00001	-	-
Weight of Asbestos as Asbestos Fines (Friable)*	g dry wt	< 0.00001	< 0.00001	-	-



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

For further details, please contact the Asbestos Team.

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

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

The following assumptions have been made:

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

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

Summary of Methods

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

Sample Type: Soil			
Test	Method Description	Default Detection Limit	Sample No
New Zealand Guidelines Semi Quantitative Asbestos in Soil			
As Received Weight	Measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland.	0.1 g	1-2
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland.	0.1 g	1-2
Moisture	Sample dried at 100 to 105°C. Calculation = (As received weight - Dry weight) / as received weight x 100.	1 %	1-2
Sample Fraction >10mm*	Sample dried at 100 to 105°C, 10mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland.	0.1 g dry wt	1-2
Sample Fraction <10mm to >2mm*	Sample dried at 100 to 105°C, 10mm and 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland.	0.1 g dry wt	1-2
Sample Fraction <2mm*	Sample dried at 100 to 105°C, 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland.	0.1 g dry wt	1-2
Asbestos Presence / Absence	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0.01%	1-2
Description of Asbestos Form	Description of asbestos form and/or shape if present. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland.	-	1-2
Weight of Asbestos in ACM (Non-Friable)	Measurement on analytical balance, from the >10mm Fraction. Weight of asbestos based on assessment of ACM form. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1-2
Asbestos in ACM as % of Total Sample*	Calculated from weight of asbestos in ACM and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1-2
Weight of Asbestos as Fibrous Asbestos (Friable)*	Measurement on analytical balance, from the >10mm Fraction. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1-2
Asbestos as Fibrous Asbestos as % of Total Sample*	Calculated from weight of fibrous asbestos and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1-2
Weight of Asbestos as Asbestos Fines (Friable)*	Measurement on analytical balance, from the <10mm Fractions. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1-2
Asbestos as Asbestos Fines as % of Total Sample*	Calculated from weight of asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1-2

Sample Type: Soil			
Test	Method Description	Default Detection Limit	Sample No
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	Calculated from weight of fibrous asbestos plus asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1-2

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

Testing was completed on 19-May-2021. For completion dates of individual analyses please contact the laboratory.

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

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

APPENDIX 3:

Window Sample Logs 2022



47C Kenepuru Drive,
Wellington
M:021796477
E:info@geocivil.co.nz

TEST REPORT

Lab Job No.: 8398-057
Your Ref.: -
Date of Issue: 19/08/2022
Page: 1 of 11

Test Report.

No. WLG8398-057-R001

PROJECT: 8 Barker Street, Te Aro, Wellington
CLIENT: Engeo
Plimmer Towers,
Level 18/2-6 Gilmer Terrace,
Wellington
ATTENTION: Gabriela Staehle
INSTRUCTIONS: Window sampler boreholes where required
TEST METHODS: NZGS December 2005 (not accredited)

TEST RESULTS: As per laboratory sheets attached.

Hamish Drysdale
Laboratory Technician

Briana Nicoll
Supervisor

- CPT - Aggregates - Soil - Roding -

This report shall not be reproduced except in full, without the written approval of the laboratory.



TEST RIGHT • BUILD RIGHT

WINDOW SAMPLE LOG

47C Kenepuru Drive,
Wellington
M:021796477
E:info@geocivil.co.nz

Lab Job No: 8398-057

Borehole No.: WS01

Client: Engeo
Job: Geotechnical Investigation

Hole Depth: 2.00 m
Coordinates:

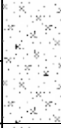
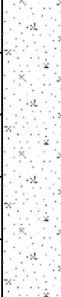
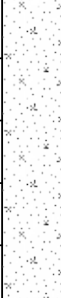
Sheet: 1 of 1
Location: 8 Barker Street, Te
Aro, Wellington

Report No.: WLG8398-057-R001

Elevation (m):

Client Ref. No.: -

Date: 02/07/22

UCS	Geological Interpretation In accordance with NZGS 2005	Depth (m)	Legend	Water	Scala Penetrometer NZS4402: 1988 Test 6.5.2 - Procedure 2 (blows / 100mm)				Vane Shear Strength(kPa) Tested in accordance with NZGS Aug 2001	
					5	10	15	Values		
GP	Sandy GRAVEL (FILL), dark grey, medium dense to dense, moist, poorly graded; gravels are medium to coarse, slightly to moderately weathered, sub-angular to angular, strong; sands are fine to coarse	0.2		Groundwater Not Encountered						
		0.4								
CORE LOSS		0.6	C/L							
		0.8	C/L							
MH	Sandy SILT, dark brown, firm to stiff, moist, moderate to high plasticity; sands are fine	1.0								
SM	Silty SAND, dark brownish grey, medium dense to dense, moist to wet, poorly graded; sands are fine	1.2								
		1.4								
SM	Colour change: dark bluish grey	1.6								
		1.8								
	End of borehole: target depth reached	2.0								

Remarks

Water

Investigation Type

Note: All Scala Penetrometer readings taken below 1.5m from start depth are outside the scope of this test

Note: Scala Penetrometer interpretation is not endorsed

- ▼ Standing Water Level
▷ Out flow
◁ In flow

- ☐ Window Sampler
☒ Window Sampler +
Scala (DCP)

Contractor:

Geocivil

Equipment:

Window Sampler

Recorded By:

M.F/B.N

Recorded Date:

2/07/2022

Checked By:

H.D

Checked Date:

15/08/2022

Supervisor:

No accredited tests

WINDOW SAMPLE LOG

Lab Job No: 8398-057

Borehole No.: WS02

Client: Engeo
Job: Geotechnical Investigation

Hole Depth: 3.00 m
Coordinates:

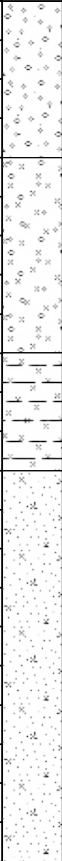
Sheet: 1 of 1
Location: 8 Barker Street, Te
Aro, Wellington

Report No.: WLG8398-057-R001

Elevation (m):

Client Ref. No.: -

Date: 30/07/22

UCS	Geological Interpretation In accordance with NZGS 2005	Depth (m)	Legend	Water	Scala Penetrometer NZS4402: 1988 Test 6.5.2 - Procedure 2 (blows / 100mm)			Vane Shear Strength(kPa) Tested in accordance with NZGS Aug 2001	
					5	10	15	Values	
GP	Sandy GRAVEL (FILL), dark yellowish brown, very dense to dense, moist, poorly graded; gravels are fine to coarse, slightly weathered, sub-angular to angular, strong; sands are fine to coarse	0.2		Water SWL 1.20m					
MH	Gravelly SILT with rootlets, black, firm, moist, high plasticity; gravels are fine to medium, slightly to moderately weathered, sub-angular to angular, poorly graded, strong	0.4							
MH	Clayey SILT, light grey, firm, moist, high plasticity	0.6							
		0.8							
		1.0							
		1.2							
SM	Silty SAND, light greenish grey, medium density, moist to wet; sands are fine	1.4							
		1.6							
		1.8							
		2.0							
		2.2							
MH	Sandy SILT, dark grey, stiff to firm, moist to wet, high plasticity; sands are fine	2.4							
		2.6							
	End of borehole: target depth reached	2.8							
		3.0							
		3.2							
		3.4							

Remarks		Water		Investigation Type	
Note: All Scala Penetrometer readings taken below 1.5m from start depth are outside the scope of this test Note: Scala Penetrometer interpretation is not endorsed		▼ Standing Water Level ▷ Out flow ◁ In flow		☐ Window Sampler ☒ Window Sampler + Scala (DCP)	
		Contractor: Geocivil		Equipment: Window Sampler	
		Recorded By: B.N/J.R Recorded Date: 30/07/2022		Checked By: H.D Checked Date: 15/08/2022	
				Supervisor: No accredited tests	

WINDOW SAMPLE LOG

Lab Job No: 8398-057

Borehole No.: WS03

Client: Engeo
Job: Geotechnical Investigation

Hole Depth: 3.70 m
Coordinates:

Sheet: 1 of 1
Location: 8 Barker Street, Te Aro, Wellington

Report No.: WLG8398-057-R001

Elevation (m):

Client Ref. No.: -

Date: 30/07/22

UCS	Geological Interpretation In accordance with NZGS 2005	Depth (m)	Legend	Water	Scala Penetrometer NZS4402: 1988 Test 6.5.2 - Procedure 2 (blows / 100mm)		Vane Shear Strength(kPa) Tested in accordance with NZGS Aug 2001
					5	10	
SP	Gravelly SAND (FILL), dark yellowish grey, very dense to dense, moist, poorly graded; gravels are fine to coarse, slightly to moderately weathered, sub-angular, strong; sands are fine to coarse	0.2					
GP							
SM	Sandy GRAVEL (FILL), dark bluish grey, very dense to dense, moist, poorly graded; gravels are fine to medium, slightly weathered, sub-angular to angular, very strong; sands are fine to coarse	0.4					
MH		0.6					
	Sandy SILT (FILL), carbonaceous material, trace brick, dark black, firm, moist, moderate plasticity; sands are fine to medium, poorly graded	0.8	CL				
	Clayey SILT, dark brownish grey, stiff, moist, high plasticity	1.0	CL				
SM	Core loss	1.2					
	Silty SAND, dark grey, loose to medium dense, moist; sands are fine	1.4	CL				
	Core loss	1.6	CL				
SM	Silty SAND, dark grey, medium dense, moist; sands are fine	1.8	CL				
	Core loss	2.0	CL				
SM	Silty SAND, rootlets, dark greenish grey, medium dense, moist to wet; sands are fine	2.2		SWL 2.00m			
		2.4					
		2.6					
		2.8					
MH	Sandy SILT, dark grey, firm, moist to wet, high plasticity; sands are fine	3.0					
SM	Silty SAND with minor gravels, dark brownish grey, medium dense, moist to wet, poorly graded; gravels are fine to medium, slightly weathered, sub-rounded to sub-angular, moderately strong; sands are fine	3.2					
GM		3.4					
MH	Silty sandy GRAVEL, light greenish grey, medium dense, moist to wet, poorly graded; gravels are fine to medium, moderately weathered, sub-rounded to sub-angular, strong; sands are fine	3.6					
	Sandy SILT, light greyish blue, firm, moist to wet, high plasticity; sands are fine	3.8					
	End of borehole: target depth reached	4.0					
		4.2					
		4.4					

Remarks

Note: Total depth of 3m- hole collapse

Note: All Scala Penetrometer readings taken below 1.5m from start depth are outside the scope of this test

Note: Scala Penetrometer interpretation is not endorsed

Water

▼ Standing Water Level
▷ Out flow
◁ In flow

Investigation Type

☐ Window Sampler
☒ Window Sampler + Scala (DCP)

Contractor:

Geocivil

Equipment:

Window Sampler

Recorded By:

B.N/J.R

Recorded Date:

30/07/2022

Checked By:

H.D

Checked Date:

15/08/2022

Supervisor:

No accredited tests



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WINDOW SAMPLE LOG

47C Kenepuru Drive,
Wellington
M:021796477
E:info@geocivil.co.nz

Lab Job No: 8398-057

Client: Engeo
Job: Geotechnical Investigation

Borehole No.: WS04

Hole Depth: 2.00 m
Coordinates:

Sheet: 1 of 1

Location: 8 Barker Street, Te
Aro, Wellington

Report No.: WLG8398-057-R001

Elevation (m):

Client Ref. No.: -

Date: 02/07/22

UCS	Geological Interpretation In accordance with NZGS 2005	Depth (m)	Legend	Water	Scala Penetrometer NZS4402: 1988 Test 6.5.2 - Procedure 2 (blows / 100mm)			Vane Shear Strength(kPa) Tested in accordance with NZGS Aug 2001
					5	10	15	
Values								
GP	Sandy GRAVEL (FILL), dark grey, medium dense to dense, moist, poorly graded; gravels are fine to coarse, slightly to moderately weathered, medium dense to dense, sub-rounded to sub-angular, strong; sands are fine to coarse	0.2						
MH	Sandy SILT, trace rootlets, dark greyish brown, firm to stiff, moist to wet, high plasticity; sands are fine	0.6						
		0.8						
		1.0						
		1.2						
		1.4						
SM	Silty SAND, dark bluish grey with green mottling, medium dense to dense, wet, well graded; sands are fine	1.6						
		1.8						
		2.0						
	End of borehole: target depth reached							

Remarks

Water

Investigation Type

Note: All Scala Penetrometer readings taken below 1.5m from start depth are outside the scope of this test

Note: Scala Penetrometer interpretation is not endorsed

- ▼ Standing Water Level
▷ Out flow
◁ In flow

- ☐ Window Sampler
☒ Window Sampler +
Scala (DCP)

Contractor:

Geocivil

Equipment:

Window Sampler

Recorded By:

M.F/B.N

Recorded Date:

2/07/2022

Checked By:

H.D

Checked Date:

15/08/2022

Supervisor:

No accredited tests

WINDOW SAMPLE LOG

Lab Job No: 8398-057

Client: Engeo
Job: Geotechnical Investigation

Report No.: WLG8398-057-R001

Client Ref. No.: -

Borehole No.: WS05

Hole Depth: 3.00 m
Coordinates:

Elevation (m):

Sheet: 1 of 1

Location: 8 Barker Street, Te
Aro, Wellington

Date: 30/07/22

UCS	Geological Interpretation In accordance with NZGS 2005	Depth (m)	Legend	Water	Scala Penetrometer NZS4402: 1988 Test 6.5.2 - Procedure 2 (blows / 100mm)				Vane Shear Strength(kPa) Tested in accordance with NZGS Aug 2001
					5	10	15	Values	
GM	Silty sandy GRAVEL (FILL), black with white specks, brick, dense, moist, poorly graded; gravels are fine to medium, slightly weathered, sub-angular to angular, strong; sands are fine to coarse								
MH	Sandy SILT (FILL) with minor gravels, greyish black, firm to soft, moist, high plasticity; gravels are fine to coarse, slightly weathered, sub-angular to angular, strong; sands are fine	0.2							
		0.4							
	Core loss	0.6	C/L						
MH	Clayey SILT, dark grey, firm, moist, high plasticity	0.8							
		1.0							
SM	Silty SAND, dark greenish grey, medium density, moist to wet; sands are fine	1.2							
		1.4							
		1.6							
		1.8							
		2.0		SWL 2.00m					
		2.2							
MH	Gravelly SILT with rootlets and fibrous peat, shell hash, dark grey, stiff, moist to wet, high plasticity; gravels are fine to medium, slightly weathered, sub-angular to angular, strong	2.4							
		2.6							
	End of borehole: target depth reached	2.8							
		3.0							

Remarks

Note: All Scala Penetrometer readings taken below 1.5m from start depth are outside the scope of this test

Note: Scala Penetrometer interpretation is not endorsed

Water

- ▼ Standing Water Level
▷ Out flow
◁ In flow

Investigation Type

- ☐ Window Sampler
☒ Window Sampler + Scala (DCP)

Contractor:

Geocivil

Equipment:

Window Sampler

Recorded By:

B.N/J.R

Recorded Date:

30/07/2022

Checked By:

H.D

Checked Date:

15/08/2022

Supervisor:

No accredited tests

WINDOW SAMPLE LOG

47C Kenepuru Drive,
Wellington
M:021796477
E:info@geocivil.co.nz

Lab Job No: 8398-057

Borehole No.: WS06

Client: Engeo
Job: Geotechnical Investigation

Hole Depth: 2.60 m
Coordinates:

Sheet: 1 of 1
Location: 8 Barker Street, Te
Aro, Wellington

Report No.: WLG8398-057-R001

Elevation (m):

Client Ref. No.: -

Date: 16/07/22

UCS	Geological Interpretation In accordance with NZGS 2005	Depth (m)	Legend	Water	Scala Penetrometer NZS4402: 1988 Test 6.5.2 - Procedure 2 (blows / 100mm)		Vane Shear Strength(kPa) Tested in accordance with NZGS Aug 2001
					5	10	
GP	Sandy GRAVEL (FILL), dark brownish grey, very dense to dense, dry to moist, gap graded; gravels are fine to coarse, slightly weathered, sub-angular to angular, very strong to strong; sands are fine to coarse	0.2					
ML	Gravelly SILT (FILL), peat, fibrous peat, black, brick, stiff to firm, moist, moderate plasticity; gravels are fine to medium, slightly weathered, sub-angular to angular, very strong	0.4					
CH	Clayey SILT, dark grey, firm to soft, moist, high plasticity	0.6					
		0.8					
		1.0					
SM	Silty SAND, light bluish grey, medium dense, moist; sands are fine	1.2					
		1.4					
		1.6					
MH	Sandy SILT, dark bluish grey, soft, wet, high plasticity; sands are fine	1.8					
		2.0					
		2.2		SWL 2.10m			
MH	Sandy SILT with minor gravels, fibrous peat, shell hash, dark bluish grey, soft to very soft, high plasticity; gravels are fine to medium, slightly weathered, rounded to sub-rounded, strong; sands are fine	2.4					
		2.6					
	End of borehole: target depth reached						

Remarks		Water		Investigation Type	
<i>Note: All Scala Penetrometer readings taken below 1.5m from start depth are outside the scope of this test</i> <i>Note: Scala Penetrometer interpretation is not endorsed</i>		▼ Standing Water Level		☐ Window Sampler	
		▷ Out flow		☒ Window Sampler + Scala (DCP)	
		◁ In flow			
Contractor:		Equipment:		Supervisor:	
Geocivil		Window Sampler		No accredited tests	
		Recorded By: M.F/B.N		Checked By: H.D	
		Recorded Date: 16/07/2022		Checked Date: 15/08/2022	

WINDOW SAMPLE LOG

Lab Job No: 8398-057

Client: Engeo
Job: Geotechnical Investigation

Report No.: WLG8398-057-R001

Client Ref. No.: -

Borehole No.: WS07

Hole Depth: 4.00 m
Coordinates:

Elevation (m):

Sheet: 1 of 1

Location: 8 Barker Street, Te
Aro, Wellington

Date: 02/07/22

UCS	Geological Interpretation In accordance with NZGS 2005	Depth (m)	Legend	Water	Scala Penetrometer NZS4402: 1988 Test 6.5.2 - Procedure 2 (blows / 100mm)		Vane Shear Strength(kPa) Tested in accordance with NZGS Aug 2001
					5	10	
GP	Sandy GRAVEL (FILL), dark grey, dense, moist to wet, poorly graded; gravels are moderately weathered, sub-angular to angular, strong; sands are fine to coarse	0.2					
SP	Gravelly SAND (FILL), dark grey, dense, moist to wet, poorly graded; gravels are fine to medium, moderately weathered, sub-angular to angular, strong; sands are fine to coarse	0.6					
MH	Sandy gravelly SILT (FILL), dark greyish brown, stiff, moist to wet, moderate plasticity; gravels are fine to coarse, moderately weathered, sub-angular to angular, poorly graded, strong; sands are fine to coarse	0.8					
SP	Gravelly SAND (FILL), trace rootlets and carbonaceous material, dark grey, loose to medium dense, wet, poorly graded; gravels are fine to medium, moderately weathered, sub-angular to angular, strong; sands are fine to coarse	1.0					
	CORE LOSS	1.2					
		1.4					
		1.6					
		1.8					
GP	Silty sandy GRAVEL (FILL), dark brownish grey, dense, moist to wet, poorly graded; gravels are fine, slightly to moderately weathered, angular, strong; sands are fine to medium	2.0					
MH	Sandy SILT with minor gravel, dark bluish grey, soft to firm, moist to wet, moderate to high plasticity; gravels are fine, slightly to moderately weathered, angular, poorly graded, strong; sands are fine to medium	2.2					
		2.4					
SM	Silty gravelly SAND, trace rootlets, dark bluish grey with brown mottling, medium dense, moist to wet, poorly graded; gravels are fine to coarse, slightly weathered, sub-angular to angular, strong; sands are fine to coarse	2.6					
		2.8					
		3.0					
		3.2					
		3.4					
MH	Sandy SILT with minor gravel, dark yellowish brown, firm to stiff, wet, moderate plasticity; gravels are fine to medium, moderately weathered, sub-rounded to sub-angular, poorly graded, strong; sands are fine to coarse	3.6					
		3.8					
MH	Sandy SILT, light grey, stiff, moist, moderate plasticity; sands are fine to medium	4.0					
	End of borehole: target depth reached						

Remarks		Water		Investigation Type	
Note: All Scala Penetrometer readings taken below 1.5m from start depth are outside the scope of this test Note: Scala Penetrometer interpretation is not endorsed		▼ Standing Water Level ▷ Out flow ◁ In flow		☐ Window Sampler ☒ Window Sampler + Scala (DCP)	
		Contractor: Geocivil		Equipment: Window Sampler	
		Recorded By: M.F/B.N Recorded Date: 2/07/2022		Checked By: H.D Checked Date: 15/08/2022	
				Supervisor:	
				No accredited tests	



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WINDOW SAMPLE LOG

47C Kenepuru Drive,
Wellington
M:021796477
E:info@geocivil.co.nz

Lab Job No: 8398-057

Client: Engeo
Job: Geotechnical Investigation

Borehole No.: WS08

Hole Depth: 2.00 m
Coordinates:

Sheet: 1 of 1

Location: 8 Barker Street, Te
Aro, Wellington

Report No.: WLG8398-057-R001

Elevation (m):

Client Ref. No.: -

Date: 02/07/22

UCS	Geological Interpretation In accordance with NZGS 2005	Depth (m)	Legend	Water	Scala Penetrometer NZS4402: 1988 Test 6.5.2 - Procedure 2 (blows / 100mm)		Vane Shear Strength(kPa) Tested in accordance with NZGS Aug 2001
					5	10	15
GP	Sandy GRAVEL (FILL), dark brown, medium dense, moist, poorly graded; gravels are fine to coarse, slightly to moderately weathered, sub-angular to angular, strong	0.2					
MH	Gravelly SILT (FILL), dark brown, firm, moist, moderate plasticity; gravels are fine to medium, moderately weathered, sub-rounded, poorly graded, strong	0.4					
SM	Silty SAND, dark bluish grey, medium dense, moist, well graded	0.8					
		1.0					
		1.2					
		1.4					
		1.6					
		1.8					
		2.0					
	End of borehole: target depth reached						

Remarks

Water

Investigation Type

Note: All Scala Penetrometer readings taken below 1.5m from start depth are outside the scope of this test

Note: Scala Penetrometer interpretation is not endorsed

- ▼ Standing Water Level
▷ Out flow
◁ In flow

- ☐ Window Sampler
☒ Window Sampler +
Scala (DCP)

Contractor:

Geocivil

Equipment:

Window Sampler

Recorded By:

M.F/B.N

Recorded Date:

2/07/2022

Checked By:

H.D

Checked Date:

15/08/2022

Supervisor:

No accredited tests



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WINDOW SAMPLE LOG

47C Kenepuru Drive,
Wellington
M:021796477
E:info@geocivil.co.nz

Lab Job No: 8398-057

Borehole No.: WS09

Client: Engeo
Job: Geotechnical InvestigationHole Depth: 3.00 m
Coordinates:Sheet: 1 of 1
Location: 8 Barker Street, Te
Aro, Wellington

Report No.: WLG8398-057-R001

Elevation (m):

Client Ref. No.: -

Date: 02/07/22

UCS	Geological Interpretation In accordance with NZGS 2005	Depth (m)	Legend	Water	Scala Penetrometer NZS4402: 1988 Test 6.5.2 - Procedure 2 (blows / 100mm)				Vane Shear Strength(kPa) Tested in accordance with NZGS Aug 2001
					5	10	15	Values	
GP	Sandy GRAVEL (FILL), dark grey, dense, moist, poorly graded; gravels are fine to coarse, moderately weathered, sub-angular to angular, strong; sands are fine to coarse	0.2							
MH	Sandy SILT (FILL), trace carbonaceous material, dark brown, soft, moist, moderate to high plasticity; sands are fine to medium	0.4			0.6				
MH	Sandy SILT, dark grey, soft to firm, moist, moderate to high plasticity; sands are fine to coarse	0.8							
		1.0							
		1.2							
		1.4							
SP	Silty SAND, trace rootlets, light bluish grey with green mottling, medium dense to dense, dry to moist, poorly graded; sands are fine	1.6		 SWL 1.70m					
SP	Silty SAND, dark bluish grey, medium dense, moist to wet, poorly graded; sands are fine	1.8							
		2.0							
		2.2							
		2.4							
SP	Silty SAND, trace shell hash, dark grey, medium dense, moist to wet, poorly graded; sands are fine	2.6							
		2.8							
		3.0							
	End of borehole: target depth reached								

Remarks

Water

Investigation Type

Note: All Scala Penetrometer readings taken below 1.5m from start depth are outside the scope of this test

Note: Scala Penetrometer interpretation is not endorsed

- ▼ Standing Water Level
▷ Out flow
◁ In flow

- ☐ Window Sampler
☒ Window Sampler +
Scala (DCP)

Contractor:

Geocivil

Equipment:

Window Sampler

Recorded By:

M.F/B.N

Recorded Date:

2/07/2022

Checked By:

H.D

Checked Date:

15/08/2022

Supervisor:

No accredited tests

SITE PLAN

Lab Job No: 8398-057
Client: Engeo
Job: Geotechnical Investigation
Location: 8 Barker Street, Te Aro, Wellington
Client Ref. No.: -
Report No.: WLG8398-057-R001



APPENDIX 4:

Window Sample Logs 2021



- Legend**
- Site Boundary
 - Abuild 2014 Boreholes
 - ENGEO CPT Testing
 - NZGD Borehole
 - ENGEO Window Sampler
 - Proposed Building Location

5m 0 5 10 15 20 25m

LINZ CC BY 4.0 © Imagery Basemap contributors

ENGEO

Produced by **Evalu8.earth**

Title: Test Location Plan

Client: Armstrong's Wellington

Project: 8 & 20 Barker Street

Figure No:
1

Date: 20-05-2021

Size: A3

Proj No: 18613.000.001_1

Version:
01

Drawn: CC

Checked:
SC

Scale:
1:600

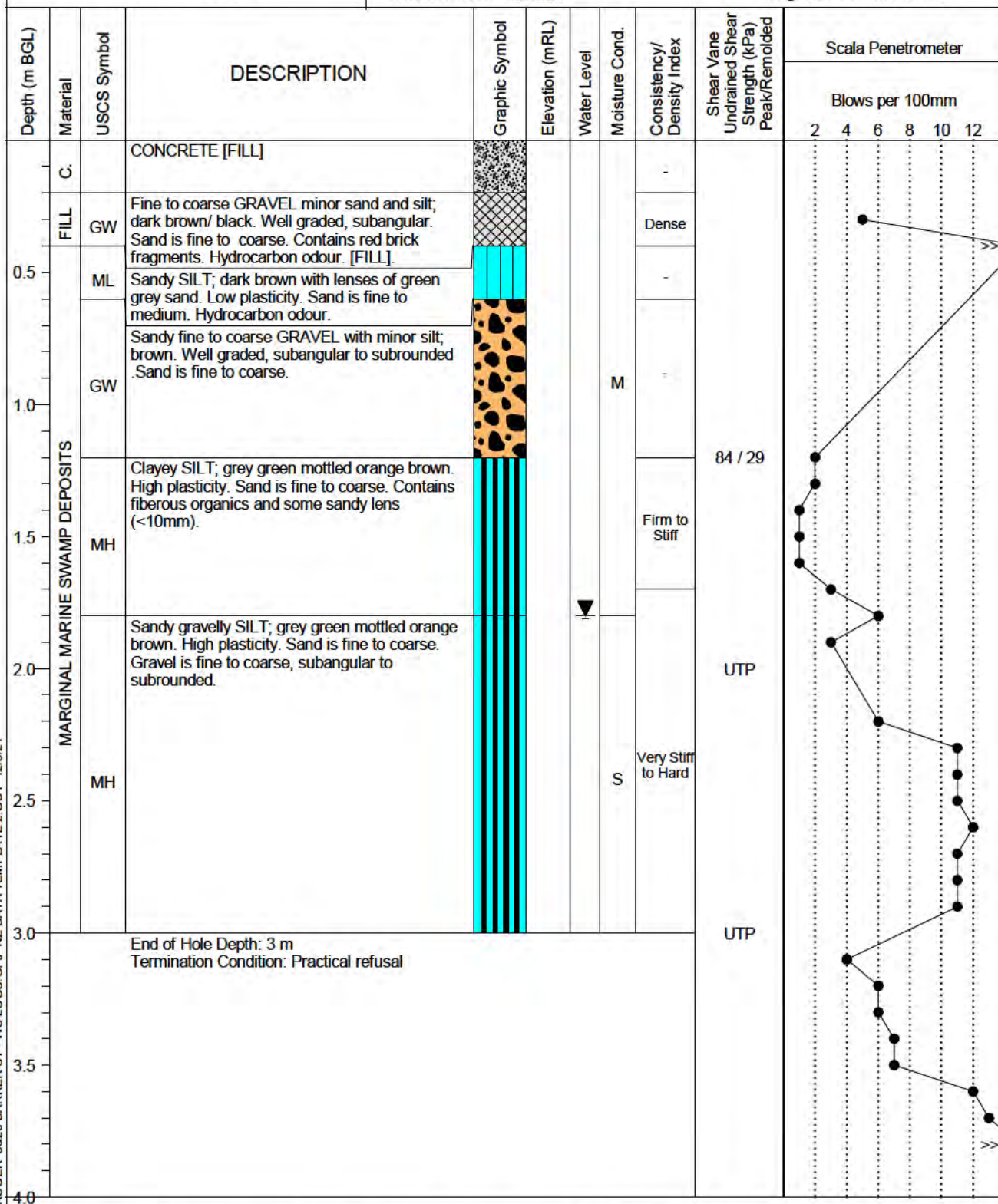


LOG OF WINDOW SAMPLE WS01

Geotechnical Investigation
8 & 20 Barker Street
Te Aro, Wellington
18613.000.000

Client : Mark Darrow
Client Ref. : -
Date : 6/5/2021
Hole Depth : 3 m
Hole Diameter : 83 mm

Shear Vane No : 3151
Logged By : MSP
Reviewed By : CM
Latitude : -41.29759326
Longitude : 174.78055467





LOG OF WINDOW SAMPLE WS02

Geotechnical Investigation
8 & 20 Barker Street
Te Aro, Wellington
18613.000.000

Client : Mark Darrow
Client Ref. : -
Date : 30/03/2021
Hole Depth : 4 m
Hole Diameter : 83 mm

Shear Vane No : 3151
Logged By : MSP
Reviewed By : CM
Latitude : -41.29810812
Longitude : 174.78046884

Depth (m BGL)	Material	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded	Scala Penetrometer					
										Blows per 100mm					
										2	4	6	8	10	12
	C.		CONCRETE												
0.5	FILL	ML	Sandy gravelly SILT; grey green mottled dark brown. Low plasticity. Sand is fine to coarse. Gravel is fine to coarse, angular to rounded. Contains organics, red brick fragments, shell fragments. [FILL]				M	Very Stiff							
1.0		MH	Clayey SILT trace sand; grey green. High plasticity. Sand is fine.						80 / 32						
		SM	1.0 - 1.1 m Fibrous wood fragment; dark brown / black.												
1.5			Silty fine to coarse SAND; grey green. Well graded.												
			Clayey SILT some sand; grey green mottled brown. Low plasticity. Sand is fine. Contains trace shell fragments.					Firm to Stiff							
2.0									85 / 30						
2.5			2.3 m becomes with some gravel . Gravel is fine to coarse, subrounded.												
			2.5 - 2.6 m layer of shell fragments.				S								
3.0			2.9 m becomes grey brown.						UTP						
3.5			3.3 - 3.5 m becomes green brown colour with organics.												
			3.5 - 4.0 m becomes grey green mottled bluish grey.					Firm to Very Stiff							
4.0			End of Hole Depth: 4 m Termination Condition: Target depth												

Window Sample met target depth at 4 m.
Scala Penetrometer met target depth at 3.9 m.
Dip test showed standing water at 1.1m.

C. = Concrete
UTP = Unable to penetrate.

APPENDIX 5: Borehole Logs 2021



LOG OF BORING BH01

Geotechnical Investigation
8 & 20 Barker Street
Te Aro, Wellington
18613.000.000

Client : Mark Darrow
Date : 14/09/2021
Hole Depth : 20.45 m
Drilling Method : Rotasonic
Drilling Contractor : Griffiths Drilling

Core Diameter : 83 mm
Energy Transfer Ratio : 84.5%
Logged By/Reviewed By : MSP / CM
Latitude : -41.297702
Longitude : 174.78071

Depth (m BGL)	Material	Sample Type	USCS Symbol	DESCRIPTION	Log Symbol	Elevation (mRL)	Water Level	Moisture	Consistency/ Density Index	SPT N-Value	Torvane Shear (kPa)	Total Core Recovery (%)	Notes
												25 50 75	
			GM	ASPHALT									
				[FILL] Silty, sandy fine to coarse GRAVEL; grey brown. Well graded, angular to subangular. Sand is coarse. Contains plastic fragments upto 5mm.									
				REINFORCED CONCRETE									
0.5			GM	[FILL] Silty, sandy fine to medium GRAVEL; grey mottled brown, black. Well graded, subangular to subrounded. Sand is fine to coarse. Contains some brick fragments and shells / shell fragments (Bivalves).									
1.0			ML	Sandy SILT; brown grey green. Low plasticity. Sand is fine to coarse. Contains trace shell fragments and rootlets.									
1.5													
2.0			ML	Clayey SILT with trace gravel; green grey mottled grey. Low plasticity. Gravel is subangular to subrounded of weak rock. Contains trace shell fragments and rootlets						0/0/0/0/0/1 N=1			
2.5				2.5 m - Colour changes to brown grey.				M	Very Soft				
3.0			GM	Silty, sandy fine to coarse GRAVEL; blue grey mottled brown grey. Well graded, subangular to subrounded. Sand is medium to coarse.									
3.5			ML	SILT; light blue grey. Low plasticity. Contains trace organics.						0/0/1/1/2/3 N=5			
4.0			ML	3.7 m - with trace fine to coarse gravel, subangular to subrounded.									
4.5													
5.0			GM							5/3/2/2/2/3 N=9			
									Medium Dense				

GEOTECH MACHINE BORING 8&20 BARKER ST - BH.GPJ NZ DATA TEMPLATE 2.GDT 29/9/21

Borehole met target depth at 20.45m.

0.0 m - 2.0m Jetvac excavated. Material logged in excavated face

Dip test showed standing water at 1.8 m.

C. = Reinforced Concrete



LOG OF BORING BH01

Geotechnical Investigation
8 & 20 Barker Street
Te Aro, Wellington
18613.000.000

Client : Mark Darrow
Date : 14/09/2021
Hole Depth : 20.45 m
Drilling Method : Rotosonic
Drilling Contractor : Griffiths Drilling

Core Diameter : 83 mm
Energy Transfer Ratio : 84.5%
Logged By/Reviewed By : MSP / CM
Latitude : -41.297702
Longitude : 174.78071

Depth (m BGL)	Material	Sample Type	USCS Symbol	DESCRIPTION	Log Symbol	Elevation (mRL)	Water Level	Moisture	Consistency/ Density Index	SPT N-Value	Torvane Shear (kPa)	Total Core Recovery (%)	Notes
			GM	Silty, sandy fine to coarse GRAVEL; blue grey mottled brown grey. Well graded, subangular to subrounded. Sand is medium to coarse.					Medium Dense	2/5//8/7/7/14 N=26		25 50 75	
5.5			ML	SILT; grey mottled brown grey. Low plasticity. Contains some organics and wood fragments.									
6.0				5.9 m - wood fragment up to 5mm.						3/3//4/4/4/5 N=17			
6.5									Stiff to very Stiff				
7.0										3/3//3/4/3/3 N=13			
7.5			MH	Clayey SILT; brown grey mottled dark grey. High plasticity. Contains trace organics.				M					
8.0			SM	Silty fine SAND; grey. Poorly graded. Contains some organics.					Medium Dense	4/2//5/5/5/5 N=20			
8.3				8.3 m to 8.4 m - Layer of organics and wood fragments; dark brown black.									
8.5			ML	Sandy, gravelly SILT; blue grey. Low plasticity. Sand is fine. Gravel is fine to coarse, subangular to subrounded.									
			ML	SILT; grey mottled brown grey. Low plasticity. Contains some organics and wood fragments.									
9.0			ML	Sandy, gravelly SILT; dark blue grey mottled brown. Low plasticity. Sand is fine to medium. Gravel is fine to coarse, angular to subangular.					Very Stiff to Hard	3/2//3/4/10/7 N=24			
9.5													
10.0			MH										

GEOTECH MACHINE BORING 8&20 BARKER ST - BH GPJ NZ DATA TEMPLATE 2 GDT 29/9/21

Borehole met target depth at 20.45m.
0.0 m - 2.0m Jetvac excavated. Material logged in excavated face
Dip test showed standing water at 1.8 m.

C. = Reinforced Concrete



LOG OF BORING BH01

Geotechnical Investigation
8 & 20 Barker Street
Te Aro, Wellington
18613.000.000

Client : Mark Darrow
Date : 14/09/2021
Hole Depth : 20.45 m
Drilling Method : Rotasonic
Drilling Contractor : Griffiths Drilling

Core Diameter : 83 mm
Energy Transfer Ratio : 84.5%
Logged By/Reviewed By : MSP / CM
Latitude : -41.297702
Longitude : 174.78071

Depth (m BGL)	Material	Sample Type	USCS Symbol	DESCRIPTION	Log Symbol	Elevation (mRL)	Water Level	Moisture	Consistency/ Density Index	SPT N-Value	Torvane Shear (kPa)	Total Core Recovery (%)	Notes
			MH	Clayey SILT; brown mottled grey green. High plasticity. Contains some organics and wood fragments (<5mm).						3/7/17/10/8/12 N=37		25 50 75	
10.5			ML	Sandy SILT; green grey mottled brown. Low plasticity. Sand is fine.					Very Stiff to Hard				
11.0			GM	Silty, sandy fine to coarse GRAVEL; blue grey mottled brown grey. Well graded, subangular to subrounded. Sand is medium to coarse.					Very Dense	11/21/1/27/23/20 N=70+			
11.5			ML	SILT; grey mottled brown grey. Low plasticity. Contains some organics and wood fragments.									
12.0													
12.5										3/5/1/6/7/7/8 N=28			
			MH	Clayey SILT; brown mottled grey brown. High plasticity.					Very Stiff				
13.0			ML	SILT; grey mottled brown grey. Low plasticity. Contains some organics and wood fragments.						4/3/1/4/6/7/7 N=24			
13.5			ML	Clayey SILT; grey brown with white and black streaks. Low plasticity. Contains some organics.									
14.0			SM	Silty fine SAND; grey. Poorly graded. Contains some organics.					Very Dense	9/9/1/13/16/13/10 N=52			
14.5			MH	Clayey SILT; brown mottled grey green. High plasticity. Contains some organics and wood fragments (<5mm).									
			SM	Silty fine SAND; grey. Poorly graded. Contains some organics.									
15.0			MH						Stiff				

GEOTECH MACHINE BORING 8&20 BARKER ST - BH GPJ NZ DATA TEMPLATE 2 GDT 29/9/21

MARINE MARGINAL MARINE SWAMP DEPOSITS

Borehole met target depth at 20.45m.
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Latitude : -41.297702
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Depth (m BGL)	Material	Sample Type	USCS Symbol	DESCRIPTION	Log Symbol	Elevation (mRL)	Water Level	Moisture	Consistency/ Density Index	SPT N-Value	Torvane Shear (kPa)	Total Core Recovery (%)	Notes
15.5			MH	Clayey SILT; brown mottled grey green. High plasticity. Contains some organics and wood fragments (<5mm).					Stiff	3/3/3/4/4/4 N=15		25 50 75	
16.0			PT ML	Fibrous PEAT with some clay and silt; dark brown black. Organic clayey SILT; brown mottled dark brown. Contains organics and wood fragments (<10mm).					Very Stiff	5/5/6/7/5/8 N=26			
16.5			PT SM	Fibrous sandy PEAT with some clay and silt; dark brown black.									
17.0			ML	Organic medium SAND; dark brown black mottled grey. Poorly graded. Contains organics and wood fragments (<100mm). SILT; light grey green. Low plasticity. Contains some organics.						4/3/3/10/11/10 N=34			
17.5			ML	Sandy SILT; grey mottled brown. Low plasticity. Sand is fine.				M	Hard				
18.0			ML	17.7 m - Contains some gravel. Gravel is fine to coarse, subangular.									
18.5			ML	Sandy SILT; brown. Low plasticity. Sand is fine. Pockets of fine to medium sand (<5mm).					Stiff	2/3/3/4/3/4 N=14			
19.0			ML	Gravelly, sandy SILT; blue grey. Low plasticity. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded.					Hard	4/6/8/7/10/20 N=45			
19.5													
20.0													

GEOTECH MACHINE BORING 8&20 BARKER ST - BH.GPJ NZ DATA TEMPLATE 2.GDT 29/9/21

Borehole met target depth at 20.45m.

0.0 m - 2.0m Jetvac excavated. Material logged in excavated face

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LOG OF BORING BH01

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8 & 20 Barker Street
Te Aro, Wellington
18613.000.000
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Client : Mark Darrow
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Depth (m BGL)	Material	Sample Type	USCS Symbol	DESCRIPTION	Log Symbol	Elevation (mRL)	Water Level	Moisture	Consistency/ Density Index	SPT N-Value	Torvane Shear (kPa)	Total Core Recovery (%)	Notes
			ML	Gravelly, sandy SILT; blue grey. Low plasticity. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded.				M	Hard	13/14//12/15/13/18 N=56		25 50 75	

End of Hole Depth: 20.45 m
Termination: Target depth



LOG OF BORING BH02

Geotechnical Investigation
8 & 20 Barker Street
Te Aro, Wellington
18613.000.000

Client : Mark Darrow
Date : 14/09/2021
Hole Depth : 20.3 m
Drilling Method : Rotosonic
Drilling Contractor : Griffiths Drilling

Core Diameter : 83 mm
Energy Transfer Ratio : 89%
Logged By/Reviewed By : MSP / CM
Latitude : -41.29808926
Longitude : 174.780566

Depth (m BGL)	Material	Sample Type	USCS Symbol	DESCRIPTION	Log Symbol	Elevation (mRL)	Water Level	Moisture	Consistency/ Density Index	SPT N-Value	Torvane Shear (kPa)	Total Core Recovery (%)	Notes
				ASPHALT								25 50 75	
	FILL		GM	[FILL] Silty, sandy fine to coarse GRAVEL; grey brown. Well graded, angular to subangular. Sand is coarse. Contains plastic fragments up to 5 mm.									
0.5			ML	Clayey, sandy SILT with trace gravel; grey green mottled brown. Low plasticity. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded. Contains some organics, rootlets and shell fragments.									
1.0		NR	ML	Sandy SILT; brown grey green. Low plasticity. Sand is fine to coarse. Contains some shell fragments and rootlets.									
1.5			ML	1.2 m to 1.3 m - Fibrous wood fragment. Clayey, sandy SILT; dark brown. Low plasticity. Sand is fine to medium. Contains rootlets.				M					
2.0			ML	SILT with trace gravel; grey mottled dark grey. Low plasticity. Gravel is fine, subangular. Pockets of fine to medium sand (<5 mm). Contains minor rootlets and shell fragments (2 mm - 15 mm).					1/0/0/0/0/0 N=0				
2.5									Very Soft to Firm				
3.0									0/0/1/1/1/2 N=5				
3.5			GM	Silty, sandy fine to coarse GRAVEL; grey green. Well graded, subangular to subrounded. Sand is fine to coarse. 3.5 m - Cobble (80 mm), subrounded.				W					
4.0			SM	Silty fine SAND; light grey mottled dark grey. Poorly graded. Contains trace organics.					2/3/5/2/4/4 N=15				
4.5								M	Medium Dense				
5.0													

GEOTECH MACHINE BORING 8&20 BARKER ST - BH.GPJ NZ DATA TEMPLATE 2.GDT 29/9/21

Borehole met target depth at 20.3m.
0.0 m - 1.5 m Jetvac excavated. Material logged in excavated fac
Dip test showed standing water at 1.1 m.



LOG OF BORING BH02

Geotechnical Investigation
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Logged By/Reviewed By : MSP / CM
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Depth (m BGL)	Material	Sample Type	USCS Symbol	DESCRIPTION	Log Symbol	Elevation (mRL)	Water Level	Moisture	Consistency/ Density Index	SPT N-Value	Torvane Shear (kPa)	Total Core Recovery (%)	Notes
5.5			SM	Silty fine SAND; light grey mottled dark grey. Poorly graded. Contains trace organics.					Medium Dense	2/2//3/6/5/5 N=19			
6.0			ML	Sandy SILT; grey mottled blue grey. Low plasticity. Sand is fine. Contains minor organics and wood fragments (<10 mm).					Stiff	1/2//2/2/4/3 N=11			
6.5													
7.0			GM	Silty, sandy fine to coarse GRAVEL; grey green mottled dark brown. Well graded, angular to subangular. Sand is fine to coarse. Contains minor organics. 7.1 m - Changes to green grey with no organics.									
7.5								M					
8.0			SP	Fine SAND with minor gravel; green grey. Poorly graded. Gravel is fine to coarse, subrounded.									
8.5			GM	Silty, sandy fine to coarse GRAVEL; grey green mottled dark brown. Well graded, angular to subangular. Sand is fine to coarse.					Medium Dense	6/5//4/5/4/5 N=18			
9.0			ML	Sandy SILT; grey mottled blue grey. Low plasticity. Sand is fine. Contains minor organics.									
9.5			SM	Silty fine SAND; light grey mottled dark grey. Poorly graded. Contains trace organics.					Medium Dense	2/3//4/4/4/4 N=12			
10.0			ML						Stiff				

GEOTECH MACHINE BORING 8&20 BARKER ST - BH.GPJ NZ DATA TEMPLATE 2.GDT 29/9/21

Borehole met target depth at 20.3m.
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Dip test showed standing water at 1.1 m.



LOG OF BORING BH02

Geotechnical Investigation
8 & 20 Barker Street
Te Aro, Wellington
18613.000.000

Client : Mark Darrow
Date : 14/09/2021
Hole Depth : 20.3 m
Drilling Method : Rotosonic
Drilling Contractor : Griffiths Drilling

Core Diameter : 83 mm
Energy Transfer Ratio : 89%
Logged By/Reviewed By : MSP / CM
Latitude : -41.29808926
Longitude : 174.780566

Depth (m BGL)	Material	Sample Type	USCS Symbol	DESCRIPTION	Log Symbol	Elevation (mRL)	Water Level	Moisture	Consistency/ Density Index	SPT N-Value	Torvane Shear (kPa)	Total Core Recovery (%)	Notes
10.5			ML	Sandy SILT; grey mottled blue grey. Low plasticity. Sand is fine. Contains minor organics and wood fragments (<10 mm). 10 m - 10.4 m - Colour change to grey brown streaks of white and dark brown.					Stiff	2/2//2/3/3/4 N=12		25 50 75	
			GM	Silty, sandy fine to coarse GRAVEL; grey green mottled dark brown. Well graded, angular to subangular. Sand is fine to coarse. Contains minor organics.					-				
			SM	Silty fine SAND; light grey mottled dark grey. Poorly graded. Contains trace organics.					-				
11.0			GM	Silty, sandy fine to coarse GRAVEL; grey green mottled dark brown. Well graded, angular to subangular. Sand is fine to coarse. Contains minor organics.					Very Dense	5/18//33/37 N=70+			
11.5			ML	Sandy SILT; grey mottled blue grey. Low plasticity. Sand is fine. Contains minor organics and wood fragments (<10 mm).									
12.0									Very Stiff	2/2//3/4/5/6 N=18			
12.5			SM	Silty fine to coarse SAND with some gravel; green grey. Well graded. Gravel is fine to medium, subangular.				M	-				
13.0			MH	Clayey SILT; brown grey. High plasticity. Contains some organics.					Very Stiff	10/7//5/5/5/7 N=22			
13.5			SM	Silty fine to medium SAND; brown grey. Well graded. Contains some organics.					-				
14.0			ML	Sandy SILT with trace gravel; light grey glue. Sand is fine. Gravel is fine, subangular.					Very Stiff	3/4//6/5/8/11 N=30			
14.5													
15.0													

GEO TECH MACHINE BORING 8&20 BARKER ST - BH GPJ NZ DATA TEMPLATE 2 GDT 29/9/21

MARGINAL MARINE SWAMP DEPOSITS

Borehole met target depth at 20.3m.
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Dip test showed standing water at 1.1 m.



LOG OF BORING BH02

Geotechnical Investigation
8 & 20 Barker Street
Te Aro, Wellington
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Client : Mark Darrow
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Latitude : -41.29808926
Longitude : 174.780566

Depth (m BGL)	Material	Sample Type	USCS Symbol	DESCRIPTION	Log Symbol	Elevation (mRL)	Water Level	Moisture	Consistency/ Density Index	SPT N-Value	Torvane Shear (kPa)	Total Core Recovery (%)	Notes
15.5			ML	Sandy SILT with trace gravel; light grey glue. Sand is fine. Gravel is fine, subangular.					Very Stiff	9/12/10/14/20/26 N=70+			
16.0			GM	15.4 m - Colour change to grey. Silty, sandy fine to coarse GRAVEL; grey green mottled dark brown. Well graded, angular to subangular. Sand is fine to coarse. Contains minor organics.									
16.5			ML	Sandy, gravelly SILT; light grey blue. Sand is fine. Gravel is fine to coarse, angular to subangular.						6/10/7/14/11/10 N=42			
17.0			ML	Clayey SILT; green grey. Low plasticity. Contains trace organics.					Hard	4/5/4/4/15/18 N=41			
17.5			ML	Clayey, sandy SILT with trace gravel; green grey. Low Plasticity. Sand is fine. Gravel is fine, subangular.				M					
18.0			GM	Silty, sandy fine to coarse GRAVEL; grey green mottled dark brown. Well graded, angular to subangular. Sand is fine to coarse. Contains minor organics.						10/10/28/36/6 N=70+			
18.5													
19.0									Very Dense	8/8/7/12/15/24 N=58			
19.5			SM	Silty fine SAND; grey green. Poorly graded.									
20.0			GM	Silty, sandy fine to coarse GRAVEL; grey green mottled dark brown. Well graded, angular to subangular. Sand is fine to coarse. Contains minor organics.									

GEOTECH MACHINE BORING 8&20 BARKER ST - BH.GPJ NZ DATA TEMPLATE 2.GDT 29/9/21

Borehole met target depth at 20.3m.
0.0 m - 1.5 m Jetvac excavated. Material logged in excavated fac
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Depth (m BGL)	Material	Sample Type	USCS Symbol	DESCRIPTION	Log Symbol	Elevation (mRL)	Water Level	Moisture	Consistency/ Density Index	SPT N-Value	Torvane Shear (kPa)	Total Core Recovery (%)	Notes
			GM					M	Very Dense	5/6//11/22/36 N=70+		25 50 75	

End of Hole Depth: 20.3 m
Termination: Target depth

Borehole met target depth at 20.3m.
0.0 m - 1.5 m Jetvac excavated. Material logged in excavated fac
Dip test showed standing water at 1.1 m.

APPENDIX 6: Relative Difference Analysis

Appendix 6- Relative Percentage Difference Analysis

Analyte	Sample Result (mg/kg)		Duplicate Result (mg/kg)		RPD (%)	Acceptable?
Arsenic	WS-5 @ 0.5m	21	WS-12 @ 0.5m (Duplicate)	24	-13.33	Yes
Cadmium		0.29		0.3	3.39	Yes
Copper		149		134	10.60	Yes
Lead		420		360	15.38	Yes
Zinc		330		330	0.00	Yes
Chromium (total)		18		19	5.41	Yes
Nickel		16		18	11.76	Yes
Total of Reported PAHs in Soil		8.2		3.4	82.76	No
1-Methylnaphthalene		0.125		0.055	77.78	No
2-Methylnaphthalene		0.113		0.042	91.61	No
Acenaphthylene		0.066		0.027	83.87	No
Anthracene		0.138		0.047	98.38	No
Benzo[a]anthracene		0.65		0.28	79.57	No
Benzo[a]pyrene (BAP)		0.72		0.31	79.61	No
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES		1.06		0.45	80.79	No
Benzo[a]pyrene Toxic Equivalence (TEF)		1.05		0.45	80.00	No
Benzo[b]fluoranthene + Benzo[j]fluoranthene		0.78		0.34	78.57	No
Benzo[e]pyrene		0.38		0.163	79.93	No
Benzo[g,h,i]perylene		0.48		0.22	74.29	No
Benzo[k]fluoranthene		0.26		0.111	80.32	No
Chrysene		0.51		0.23	75.68	No
Dibenzo[a,h]anthracene		0.102		0.042	83.33	No
Fluoranthene		1.22		0.48	87.06	No
Perylene		0.161		0.078	69.46	No
Phenanthrene		0.63		0.24	89.66	No
Pyrene		1.21		0.49	84.71	No
C15 - C36		91		68	28.93	Yes
Analyte	Sample Result (mg/kg)		Duplicate Result (mg/kg)		RPD (%)	Acceptable?
Total Recoverable Arsenic	S06 @ 0.5m	6	S06 @ 0.5m (Duplicate)	6	0.00	Yes
Total Recoverable Cadmium		0.15		0.18	-18.18	Yes
Total Recoverable Chromium		16		18	-11.76	Yes
Total Recoverable Copper		19		22	14.63	Yes
Total Recoverable Lead		78		108	32.26	Yes
Total Recoverable Nickel		14		13	7.41	Yes
Total Recoverable Zinc		127		154	19.22	Yes
Total of Reported PAHs in Soil		5.1		7.9	43.08	Yes
Acenaphthylene		0.031		0.084	92.17	No
Anthracene		0.06		0.122	68.13	No
Benzo[a]anthracene		0.39		0.59	40.82	Yes
Benzo[a]pyrene (BAP)		0.46		0.73	45.38	Yes
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES		0.68		1.05	42.77	Yes
Benzo[a]pyrene Toxic Equivalence (TEF)		0.67		1.03	42.35	Yes
Benzo[b]fluoranthene + Benzo[j]fluoranthene		0.52		0.78	40.00	Yes
Benzo[e]pyrene		0.27		0.41	41.18	Yes
Benzo[g,h,i]perylene		0.35		0.5	35.29	Yes
Benzo[k]fluoranthene		0.193		0.28	36.79	Yes
Chrysene		0.33		0.46	32.91	Yes
Dibenzo[a,h]anthracene		0.061		0.092	40.52	Yes
Fluoranthene		0.85		1.23	36.54	Yes
Indeno(1,2,3-c,d)pyrene		0.33		0.47	35.00	Yes
Perylene		0.113		0.17	40.28	Yes
Phenanthrene		0.27		0.51	61.54	No
Pyrene		0.83		1.37	49.09	Yes



8 March 2021

By Email

Dear [REDACTED]

UNDERGROUND PETROLEUM STORAGE SYSTEM REMOVAL – CALTEX BASIN RESERVE, 28 ADELAIDE ROAD, WELLINGTON

1.0 Introduction

[REDACTED] (the client) has engaged Pattle Delamore Partners Limited (PDP) to report the results of soil sampling following the removal of an underground petroleum storage system (UPSS) located at the former Caltex Basin Reserve service station, 28 Adelaide Road, Wellington.

This site assessment has been carried out according to Regulation 8(1) of the *Resource Management (National Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011* (the NESCS). Accordingly, the soil sampling and interpretation of results have been carried out using the Tier 1 Risk assessment approach described in the Ministry for the Environment's (MfE's) *Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand* (MfE, 2011a), and is reported in general accordance with MfE's *Contaminated Land Management Guideline No.1 – Reporting on Contaminated Sites in New Zealand* (MfE, 2011b).

The site was visited by PDP staff on the 27 and 28 January 2021. This letter report describes the methods and results of the assessment.

2.0 Objectives and Scope

The objective of the assessment was to assess the environmental conditions in the immediate vicinity of the UPSS and to provide a preliminary assessment of the possible environmental effects of remaining hydrocarbon residues following the removal.

The scope of works included:

- ✧ Sampling soil within the immediate vicinity of the UPSS for petroleum hydrocarbon analysis.
- ✧ Comparing the analytical results to human health guidelines; and
- ✧ Reporting the results of the soil benchmarking and providing conclusions following the comparison of the results against human health guidelines.



3.0 Site Description and Background

3.1 Site Description

The former Caltex Basin Reserve service station is located at 28 Adelaide Road, Wellington, and is legally described as Section 1403 TN of Wellington, Part Lot 2 DP 10531, and Lots 1 and 2 DP 11151 (the site). The site is zoned as 'Centre' under the Wellington City Council's (WCC) District Plan. The underground storage tanks (USTs) were in the north-western corner of the site. Access to the site is gained directly from Adelaide Road to the east.

The site is generally flat. The site surface consists of concrete over the tank pit, located immediately to the west of the store, and the fuel dispenser area beneath the canopy, while the remainder of the site cover is mainly asphalt except for grassed areas along the Adelaide Road boundary.

The site is listed on the Greater Wellington Regional Council's (GWRC) Selected Land Use Register (SLUR) as having a verified history of hazardous activity or industry owing to the site's former use as a service station (*Category F7: Service stations including retail or commercial refuelling facilities*).

Land use in the vicinity of the site is as follows:

- ✧ North: Douglas Street with commercial properties beyond.
- ✧ East: Adelaide Road with commercial properties beyond.
- ✧ South: Commercial properties.
- ✧ West: Myrtle Crescent with residential properties beyond.

4.0 Environmental Setting

4.1 Geology and Hydrogeology

The geological map of the Wellington region shows that the site is underlain by Holocene river deposits comprising well-sorted floodplain gravels (Begg and Johnston, 2000).

Groundwater is expected to flow to the northward, towards Wellington Harbour (AECOM, 2018).

A search of GWRC records indicates that, aside from the four monitoring wells located on site, there are no registered groundwater bores or active water-take consents within a 500 m radius of the site.

4.2 Aquifer Sensitivity

The sensitivity of the underlying aquifer was assessed in accordance with Section 5.2.3 of the MfE (2011a) guidelines:

- ✧ The shallow groundwater below the investigation area is not artesian.
- ✧ The aquifer is expected to be less than 10 m below the potential suspected source of contamination. The groundwater level was observed at 2.5 m below ground level (bgl) at the time of the tank removal.
- ✧ Given the presence of reticulated water supply and based on the available GWRC groundwater information, the use of shallow groundwater for potable water supply purposes in the surrounding area is considered unlikely.

In accordance with the guidelines, the groundwater is not considered to be sensitive with respect to groundwater use.

In accordance with Section 5.2.3 of the MfE (2011a) guidelines, a surface water body may be considered sensitive if it is within 100 m of a contaminant source and if limited dilution is available to mitigate the impacts of contaminated groundwater discharging to the water body. The nearest surface water body is the Wellington Harbour, located approximately 1.4 km to the north of the site. Given the separation distance, the nearest surface water body is considered to not be sensitive with respect to potential impacts from the migration of impacted groundwater away from the site.

5.0 Site Investigation Activities

5.1 UPSS Removal

PDP attended site on 27 and 28 January 2021 during the removal by Petroleum Solutions Limited (PSL) of three tanks from one tank pit and the associated dispensers, remote fill points, fuel lines and vent risers. Validation soil sampling was conducted at this time.

Details of the removal of the UPSS from the site are presented below and the location of the removed UPSS is shown in Figure 1.

Table 1: UPSS Removal Details

Date of Removal	27 and 28 January 2021
Removal Contractor	PSL
Geology	Gravels with minor sands
Groundwater	Groundwater level observed at approximately 2.5 m bgl.
Pipework	Pipework was observed to be in a good condition with no obvious holes or defects.
Fill points	Remote filled
Field Observations	The removed tanks, dispensers, pipework, vent risers and remote fill points were noted as being in good condition. Grey staining and a slight hydrocarbon odour were noted between the two eastern-most fuel dispensers between 0.6 and 1.5 m bgl.
UST 1	
Size	40,000 L
Content	91-octane petrol
Age	26 years (installed 1994)
Bedding Material	Gravels
Tank Condition and Comments	The fibreglass UST was noted to be in good condition, with no obvious holes or defects (see attached photographs).

Table 1: UPSS Removal Details

UST 2	
Size	40,000 L
Content	96-octane petrol
Age	26 years (installed 1994)
Bedding Material	Gravels
Tank Condition and Comments	The fibreglass UST was noted to be in good condition, with no obvious holes or defects (see attached photographs).
UST 3	
Size	30,000 L
Content	Diesel
Age	26 years (installed 1994)
Bedding Material	Gravels
Tank Condition and Comments	The fibreglass UST was noted to be in good condition, with no obvious holes or defects (see attached photographs).

6.0 Sampling Methodology

A total of 31 soil samples were collected and analysed following the removal of the UPSS:

- ✧ Fourteen soil samples from the walls of the tank pit at 0.5 m bgl and 2.0 m bgl (TKP01 3/0.5 – TKP01 4/0.5, TKP01 6/0.5 – TKP01 8/0.5 and TKP01 1/2.0 – TKP01 8/2.0).
- ✧ Three soil samples were analysed from the base of the tank pit at 2.5 m bgl (TKP01 1/2.5 – TKP01 3/2.5).
- ✧ One soil sample was analysed from the bedding material of the tank pit (BM02).
- ✧ One sample was collected immediately below the remote fill points at 0.6 m bgl (RF01 0.6).
- ✧ One sample was collected from immediately beneath each of the four fuel dispensers at 0.6 m bgl (four samples total, FD01 0.6 – FD04 0.6).
- ✧ Seven samples were collected at 5 m intervals immediately beneath the fuel lines across the site at 0.6 m bgl (FL01 0.6 – FL07 0.6), with one additional deeper sample collected in sample location FL01 (FL01 2.0); and
- ✧ One sample was collected immediately below the vent riser location at 0.5 m bgl (V01 0.5).

Soil samples were analysed for total petroleum hydrocarbons (TPH) and benzene, toluene, ethylbenzene and total xylenes (BTEX) compounds. The locations of the samples are shown in Figure 1.

Soil samples were obtained using a mechanical excavator and were collected using a fresh pair of nitrile gloves directly from piles placed on the ground by the excavator bucket. Samples were collected into laboratory supplied glass jars and were placed immediately into a chilly bin containing ice before being

sent via overnight courier to IANZ accredited Analytica Laboratories Limited (Analytica) in Hamilton. Chain of custody documentation is appended.

In addition to the samples collected for laboratory analysis, duplicate soil samples were collected from each location for field screening of photo-ionising compounds, including petroleum hydrocarbon vapour, using a photo-ionisation detector (PID¹). The soil samples for field screening were placed into re-sealable plastic bags which were half filled and sealed. The samples were allowed to stand for several minutes prior to the bag being pierced and the headspace vapour readings measured with the PID. The PID results are reported with the analytical results in Tables 2 and 3, appended.

7.0 Results

7.1 Field Observations

Soils encountered during the validation sampling in the tank pit and in the vicinity of the vent risers comprised gravels with minor sands. The soils encountered below the fuel lines, fuel dispensers and the remote fill points generally comprised gravelly sands in the top 0.6 m bgl which were underlain by silty sands with some gravels down to a depth of 1.5 m bgl. Below this, sandy silts with minor gravels and trace amounts of clay and organic matter (wood) were encountered down to a depth of 2 m bgl. The water table was encountered at 2.5 m bgl at the time of tank pit sampling.

Ground conditions between the two eastern-most fuel dispensers were stained grey and had a slight hydrocarbon odour between 0.6 and 1.5 m bgl.

There were no obvious visual or olfactory signs of contamination observed in any of the other sampling locations.

Field screening of the samples from the tank pit recorded PID readings from 0 to 0.2 ppm. The sample collected beneath the vent risers and remote fill points returned PID readings of 0 and 0.1 ppm, respectively. PID readings for the samples collected from the fuel dispenser locations were all recorded at 0.1 ppm. The fuel line samples returned PID readings from 0.1 to 32.1 ppm, with the highest readings reported in sample location FL01 at 0.6 m bgl.

7.2 Analytical Results

Of the 31 samples analysed, nine had concentrations of TPH above the laboratory's method detection limit, ranging from 30 mg/kg (FD03 0.6) to 714 mg/kg (RF01 0.6). All of the detectable TPH concentrations were recorded within the C₁₅-C₃₆ hydrocarbon band.

Of the 31 samples analysed for BTEX, only one sample collected below the fuel lines (FL01 0.6) contained concentrations above the laboratory's method detection limit. Toluene and total xylene concentrations were recorded at 0.11 mg/kg and 0.14 mg/kg, respectively, in this sample.

A single gas chromatogram was provided with the laboratory report which was reviewed against reference chromatograms to determine the likely source of the TPH. This indicated that the remote fill point sample (RF01 0.6) is likely attributable to weathered diesel.

Results of the laboratory analysis are presented in Tables 2 and 3 and copies of the laboratory reports are appended.

¹ A PID measures most volatile photo-ionisable compounds providing they have an ionisation potential below 10.6 eV. This includes most petroleum hydrocarbon compounds with a carbon range of between 1 and 10.

7.3 Applicable Assessment Criteria

The MfE (2011a) Tier 1 soil acceptance criteria have been selected for comparison with the soil results for petroleum hydrocarbons. The MfE (2011a) Tier 1 criteria have been developed on a risk-based approach with the primary consideration being the protection of human health for a range of land uses including commercial/industrial, residential and agricultural. The criteria have also been developed to account for the protection of maintenance and/or excavation workers. In addition to site use, the Tier 1 acceptance criteria take into consideration the environmental settings including soil type (permeability), depth to contamination, depth to groundwater, groundwater quality and yield, and proximity to surface water and ecological receptors. As such, the Tier 1 soil acceptance criteria via “All Pathways” are a reflection of the most stringent criteria associated with the protection of human health via several exposure routes. Comparison of analytical results to these criteria reveals whether a more in-depth review of the potential exposure pathways is required at the site. Where a detailed review is required, route specific criteria are determined based on a site-specific assessment of both potential receptors and exposure pathways.

The shallow aquifer beneath the site is not considered sensitive with respect to groundwater use or the separation distance from a sensitive water body therefore the protection of groundwater criteria have not been applied. The future use of the site is unknown, however its former use as a service station fell under the commercial/industrial land use guidelines. Therefore, Commercial/Industrial Tier 1 soil guideline criteria have been used for comparison. The “sand”, “sandy silt” and “silty clay” soil type criteria have been used as this best represents the soil types observed.

7.4 Comparison of Results to Applicable Criteria – All Pathways

All of the 31 soil samples analysed for TPH and BTEX reported laboratory results below the MfE (2011a) Tier 1 soil acceptance criteria for a commercial/industrial land use scenario and therefore comply with the assessment criteria.

8.0 Risk Assessment

8.1 Human Health

All 31 soil samples collected and analysed by the laboratory represent material which remained on site following the removal of the UPSS. As the soil samples complied with the applicable MfE (2011a) criteria, the soil remaining in the sampled locations is considered to have an acceptably low health risk to future site users.

8.2 Ecology

A Tier 1 ecological risk assessment (appended) has been conducted in accordance with the MfE (2011a) guidelines. The nearest surface water body is the Wellington Harbour, which is approximately 1.4 km to the north of the site. It is considered that the risk to ecological receptors through the migration of impacted groundwater from the site is low.

9.0 Summary and Conclusions

Pattle Delamore Partners Limited (PDP) has been engaged to assess the environmental conditions in the immediate vicinity of disused underground petroleum storage systems (UPSS) following removal at the former Caltex Basin Reserve, located at 28 Adelaide Road, Wellington.

A total of 31 soil samples were analysed from the tank pit walls, bases and bedding material and from along the length of fuel lines, under the fuel dispensers, the remote fill points and the vent risers. Of these, 31 samples were analysed for total petroleum hydrocarbons (TPH) and benzene, toluene, ethylbenzene and total xylenes (BTEX) compounds, with a total of nine samples reporting concentrations of TPH or BTEX above the laboratory's method detection limit.

All samples recorded concentrations which complied with the MfE (2011a) Tier 1 soil acceptance criteria via All Pathways for commercial/industrial land use. Given this, the soil remaining in the sampled locations is considered to have an acceptably low health risk to future site users.

The ecological risk to receptors via the direct groundwater migration pathway is considered to be low given the separation distance to the nearest waterway.

10.0 Limitations

This document has been prepared by Pattle Delamore Partners Limited (PDP) on the specific instructions of Peter Fisher for the purposes described in the document. PDP accepts no liability if the document is used for a different purpose or if it is used or relied on by any other person. Any such use or reliance will be solely at their own risk.

This document has been prepared by Pattle Delamore Partners Limited (PDP) on the basis of information provided by Peter Fisher and others not directly contracted by PDP for the work, including Greater Wellington Regional Council. PDP has not independently verified the provided information and has relied upon it being accurate and sufficient for use by PDP in preparing the document. PDP accepts no responsibility for errors or omissions in, or the currency or sufficiency of, the provided information.

This document has been prepared based on the analysis of 31 soil samples in the immediate vicinity of the UPSS identified in the report and the results from laboratory analyses and field data gathered by PDP. The site conditions as described in this document have been interpreted from, and are subject to, this information and its limitations and accordingly PDP does not represent that its interpretation accurately represents the full site conditions.

The laboratory test results provide an approximation of the concentration of the tested analytes and are subject to the inherent limitations of the laboratory techniques used for the tests.

This assessment is limited to collection and analysis of soil samples from discrete sampling locations. Interpretations of subsurface conditions, including contaminant concentrations, are not guaranteed at distance away from the specific points of sampling.

If contaminants have been found at the site, it is possible that the contaminants could extend off-site, or that any contaminants existing on neighbouring sites might have contributed to the contamination that exists at the site. The presence or absence of contaminants off-site, and risks associated with any off-site contaminants, are not considered by this document.

The information contained within this document applies to sampling undertaken on the dates stated in this document, or if none is stated, the date of this document. With time, the site conditions and environmental standards may change. Accordingly, the reported assessment and

conclusions are not guaranteed to apply at a later date.

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References

AECOM, 2018. Caltex Basin Reserve, Environmental Site Assessment. AECOM New Zealand Limited, Wellington, 2018.

Begg, J.G.; Johnston, M.R. 2000: Geology of the Wellington area: scale 1:250,000. Lower Hutt: Institute of Geological & Nuclear Sciences. Institute of Geological & Nuclear Sciences 1:250,000 geological map.

MfE, 2011a. *Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand (updated 2011)*. Ministry for the Environment, Wellington.

MfE, 2011b. *Contaminated Land Management Guidelines No. 1 – Guidelines for Reporting on Contaminated Sites in New Zealand revised 2011*. Ministry for the Environment, Wellington.

Site Figure

Site Photographs



Photograph 1: The photograph shows the two 40,000 L underground storage tanks. The tanks appear to be in good condition.



Photograph 2: The photograph shows the 46,000 L diesel underground storage tank. The tank appears to be in good condition.



Photograph 3: The photograph shows the tank pit in the north-western corner of the site, from which three underground storage tanks were removed, and the location of the vent risers facing southwest. Groundwater is at about 2.5 m bgl.



Photograph 4: The photograph shows the former location of the remote fill points, fuel lines and fuel dispensers, facing northwest.



Photograph 5: The photograph shows the former location of the fuel lines and fuel dispensers, facing northwest.



Photograph 6: The photograph shows the former location of the fuel lines and fuel dispensers, facing north.



Photograph 7: The photograph shows the location of sample FL01 where stained soils with a hydrocarbon odour were encountered during excavation works.

Results Tables