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Jacobs New Zealand Limited
21-Feb-2019

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Grey Lynn Tunnel

Environmental Investigation

Grey Lynn Tunnel

Environmental Investigation

Client: Jacobs New Zealand Limited

Co No.: N/A

Prepared by

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21-Feb-2019

Job No.: 60435398

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Document Grey Lynn Tunnel

Ref 60435398

Date 21-Feb-2019

Prepared by Naomi Macorison

Reviewed by Emma Trembath

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			Name/Position	Signature
A	22-Aug-2018	Draft for Client Review	Emma Trembath Technical Practice Leader - Remediation Services	
B	23-January-2019	Final	Christiaan de Bruyn Project Manager	
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Executive Summary

AECOM New Zealand (AECOM) is a sub consultant to Jacobs New Zealand Limited (Jacobs), who has been engaged by Watercare Service Limited (Watercare) to complete an environmental investigation (contaminated soil) in support of the proposed wastewater interceptor from Tawariki Street, Grey Lynn to Western Springs ("Grey Lynn Tunnel"). TheGrey Lynn Tunnel will connect to the Central Interceptor at Western Springs. The location of the Grey Lynn Tunnel is illustrated on **Figure 1** (**Section 2.1**) and the locations of the Tawariki Street Shaft Site is illustrated on **Figure 1** in **Appendix A**.

The objective of the environmental investigation was to provide an assessment of the nature and extent of historical land use activities, including those activities that could potentially result in soil contamination, and whether such activities may have impacted soil which will be disturbed during the advancement of the Grey Lynn Tunnel at 44 - 48 Tawariki Street (the Site).

A limited Preliminary Site Investigation (PSI) was completed which involved the review of information pertaining to geologic and/or hydrologic features and conditions observable at the Site or from available record, and a review of historical aerial photographs for the period 1940 through to the present day. Historical aerial photographs indicate that the Site and Tawariki Street has been largely residential since 1940, along with the length of the proposed Grey Lynn Tunnel. This report concludes that an activity or industry described in the MfE Hazardous Activities and Industries List (HAIL) has unlikely been undertaken (both historical and current) within the vicinity of the Site.

A Detailed Site Investigation (DSI) was undertaken to provide an understanding of soil contaminant conditions within soil materials which will be disturbed at the Site. In summary:

- Observed soil conditions generally comprised of topsoil, underlain by natural sands and silts.
- No visual or olfactory evidence of contamination including asbestos containing materials (ACM) were noted during the advancement of the test pits.
- Laboratory results of the samples collected from the Site indicate that the soil contaminant conditions of materials to be disturbed as part of then advancement of the Grey Lynn Shaft are unlikely to present a risk to site workers or the environment in that:
  - No exceedances of the NES SCS[1] were recorded.
  - No exceedances of the Auckland Council Permitted Activity Criteria[2] were recorded.
  - ACM were not detected in the soil samples analysed.
  - Three minor exceedances of Auckland Background Concentrations were recorded (lead and heavy end hydrocarbons).

The following recommendations are provided:

- Contaminated land resource consents under both the NES SCS and Auckland Unitary Plan (Operative in Part) (AUP(OP)) are not required to authorise the land disturbance activities associated with the advancement of the Grey Lynn Shafts.
- Soil materials generated during the advancement of the shafts can be reused at the Site. If required to be transported off-site these should be disposed of at a licensed facility authorised to accept such materials. With the contaminant concentrations detected being generally low, the soil could be disposed of as managed fill subject to meeting the disposal facility's consented waste acceptance criteria.

[1] Resource Management Act (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations, 2011.
[2] Auckland Unitary Plan (Operative in Part), 2017.

1.0 Introduction

1.1 Preface

AECOM New Zealand (AECOM) is a sub consultant to Jacobs New Zealand Limited (Jacobs), who has been engaged by Watercare Service Limited (Watercare) to complete an environmental investigation (contaminated soil) in support of the proposed wastewater interceptor from Tawariki Street, Grey Lynn to Western Springs ("Grey Lynn Tunnel"). The Grey Lynn Tunnel will connect to the Central Interceptor at Western Springs. The location of the Grey Lynn Tunnel is illustrated on **Figure 1** (**Section 2.1**) and the locations of the Tawariki Street Shaft Site is illustrated on **Figure 1** in **Appendix A**.

1.2 Project Description

Watercare Services Limited ("Watercare") is the water and wastewater service provider for Auckland. Watercare is proposing to construct a wastewater interceptor from Tawariki Street, Grey Lynn to Western Springs ("Grey Lynn Tunnel"). The Grey Lynn Tunnel will connect to the Central Interceptor at Western Springs.

1.2.1 Project Overview

The Grey Lynn Tunnel involves the elements shown in the drawings and outlined in more detail in the reports which form part of the application. These elements are summarised as follows.

1. Grey Lynn Tunnel

The Grey Lynn Tunnel involves construction, operation and maintenance of a 1.6km gravity tunnel from Western Springs to Tawariki Street, Grey Lynn with a 4.5m internal diameter, at an approximate depth of between 15 to 62m below ground surface, depending on local topography. The tunnel will be constructed northwards from Western Springs using a Tunnel Boring Machine ("TBM"). The Grey Lynn Tunnel will connect to the Central Interceptor at Western Springs via the Western Springs shaft site.

2. Tawariki Street Shaft Site

The Grey Lynn Tunnel also involves construction, operation and maintenance of two shafts and associated structures at Tawariki Street, Grey Lynn ("Tawariki Street Shaft Site").

The Tawariki Street Shaft Site will be located at 44-48 Tawariki Street where the majority of the construction works will take place. Construction works will also take place within the road reserve at the eastern end of Tawariki Street and a small area of school land (St Paul's College) bordering the end of Tawariki Street (approximately 150m^2).The Tawariki Street Shaft Site will involve the following components:

a) Main Shaft

- A 25m deep shaft, with an internal diameter of approximately 10.8m, to drop flow from the existing sewers into the Grey Lynn Tunnel;
- Diversion of the Tawariki Local Sewer to a chamber to the north of the shaft. This chamber will be approximately 12m long, 5m wide and 5m deep below ground, and will connect to the shaft via a trenched sewer;
- Diversion of the Orakei Main Sewer to a chamber to the south of the shaft. This chamber will be approximately 10m long, 5m wide and 11m deep below ground;
- Construction of a stub pipe on the western edge of the shaft to enable future connections (that are not part of this proposal) from the CSO network;

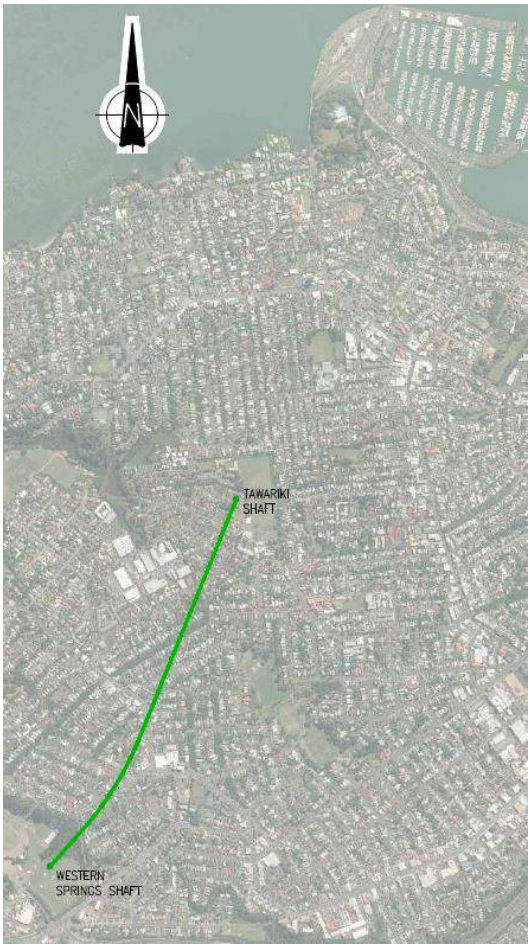
- Construction of a grit trap within the property at 48 Tawariki St to replace the existing grit trap located within the Tawariki Street road reserve. The replacement grit trap will be approximately 16m long, 5m wide and 13m deep below ground;
- Permanent retaining of the bank at the end of Tawariki Street to enable the construction of the chamber for the Orakei Main Sewer. The area of the bank requiring retaining will be approximately 44m long, 3m wide and 2m high; and
- An above ground plant and ventilation building that is approximately 14m long, 6m wide and 4m high. An air vent in a form of a stack will be incorporated into the plant and ventilation building and discharge air vertically via a roof vent. The vent stack will be designed with a flange to allow future extension of up to 8m in total height and approximately 1m in diameter in the unexpected event of odour issues.

b) Tawariki Connection Sewer Shaft – Secondary Shaft

A secondary shaft will be constructed at the Tawariki Street Shaft Site to enable the connection of future sewers (that are not part of this proposal) from the Combined Sewers Overflows ("CSO") network. This will involve the following components:

- A 25m deep drop shaft with an internal diameter of approximately 10.2m; and
- A sewer pipe constructed by pipe-jacking to connect the secondary shaft to the main shaft.

Figure 1 Location of Grey Lynn Tunnel Extension



1.3 Objective

The objective of the environmental investigation is to provide an understanding of the nature and extent of historical land use activities at the Site, including the activities that could potentially result in soil contamination, and whether such activities may have impacted soil which will be disturbed during the construction of the Grey Lynn Shafts. The results of the environmental investigation are intended to assist in the assessment of the potential as contaminated land resource consent requirements for the Grey Lynn Tunnel and make recommendations as to soil reuse/disposal.

1.4 Scope of Works

In order to meet the objective, the following scope has been undertaken:

Limited Preliminary Site Investigation (PSI)

- Review of information pertaining to geologic and/or hydrologic features and conditions observable at the shaft locations and/or from available records.
- Review of historical aerial photographs for the period 1940 through to the present day (as made available through public information sources – Auckland Council GIS and Retrolens).

Detailed Site Investigation (DSI)

- Collection, analysis and assessment of soil samples during the advancement of two test pits within the vicinity of the proposed shaft locations. McMillan Jacobs Associates are the geotechnical leads for the project. The test pits were excavated by a subcontractor of McMillan Jacobs Associates.

1.5 Environmental Investigation Framework

The environmental investigation has been completed in general accordance with the following MfE good practice guidance:

- Contaminated Land Management Guidelines No. 1: Reporting on Contaminated Site in New Zealand (revised 2011).
- Contaminated Land Management Guidelines No. 2: Hierarchy and Application in New Zealand of Environmental Guideline Values (revised 2011).
- Contaminated Land Management Guidelines No 5: Site Investigation and Analysis of Soil (revised 2011).

2.0 Site, Environmental, and Historical Setting

2.1 Site Details

The Tawariki Street Shaft Site is located at 44 - 48 Tawariki Street in Grey Lynn. Tawariki Street is a residential street, with Marist School and St Pauls College located north and east of the Site. **Table 1** provides a summary of the land use activities surrounding the Site.

Table 1 Summary of Surrounding Landuse Activities

Direction from Site	Surrounding Landuse
North	Marist College
East	St Pauls College
South	Tawariki Street (residential) and Moira Reserve
West	Residential. Hukanui Reserve is located at the western end of Tawariki Street

2.2 Environmental Conditions

Table 2 presents a summary of the environmental conditions at the Site.

Table 2 Summary of Environmental Conditions

Item	Description
Topography	44 - 48 Tawariki Street properties are located on relatively flat ground. The length of Tawariki Street is also generally flat, with a very slight slope towards the west. St Pauls College is located east of the Site and is elevated above Tawariki Street.
Geology	The published geological map of the area (Kermode, 1992), indicates that the Site is underlain by Flysch: greenish grey, alternating muddy sandstone and mudstone, with occasional interbedded lenses of grit.
Hydrogeology	A detailed groundwater investigation has not been completed at the Site. However, groundwater was measured at approximately 2 metres below ground surface (m bgs) during the environmental investigation. Based on local topography, groundwater flow is inferred to be west towards a stream which is a tributary of Cox's Bay. As part of this environmental investigation a bore and water takes search was ordered through Auckland Council (AC), and according to records there are no registered bores or water takes within a 500 m radius from the proposed shaft locations.
Ecology	Hukanui Reserve is located west of Tawariki Street.

2.3 Historical Aerial Photographs

Historical aerial photographs and detailed descriptions of observations are presented in **Appendix B**. Historical aerial photographs indicate that the Site and Tawariki Street have been largely residential since 1940, along with the entire length of the Grey Lynn Tunnel. The residential properties located at 44 - 48 Tawariki Street are identified in the 1940s aerial photograph and the footprints appear identical to the current footprints.

2.4 PSI Summary

The PSI was limited to the information listed above. Due to the area being residential in nature, and has been for some time, Jacobs did not request further property file information of certificates of title.

The results of the limited PSI completed as part of this environmental investigation indicated that an activity or industry described in the MfE Hazardous Activities and Industries List (HAIL) is unlikely to have been undertaken (both historical and current) within the vicinity of the Site.

3.0 Field Methodology

3.1 Contaminants of Potential Concern and Investigation Rationale

As set out above, an activity or industry described in the MfE HAIL is unlikely to have occurred at the Site (both historical and current). Soil samples were proposed to be collected as a precautionary measure. Due to this and the location of the Site within a residential area, it was determined that selected soil samples collected as part of this environmental investigation should be analysed for a broad suite of compounds:

- Heavy metals.
- Polycyclic aromatic hydrocarbons (PAH compounds).
- Asbestos containing materials (ACM).

3.2 Environmental Soil Sampling

On 10 July 2018 two test pits were advanced within the Site. **Table 3** presents a summary of the works completed. Investigation locations are presented on **Figure 1** in **Appendix A** and test pit logs are provided in **Appendix C**.

Table 3 Summary of Field Methodologies

Scope of Works Completed	Date	Methodology
Test pit advancement	10 July 2018	• Two test pits were advanced by subcontractors of McMillan Jacobs Associates to depths up to 3.5 m bgs. The locations of the test pits are illustrated on **Figure 1** in **Appendix A**.
Soil sample collection	9 to13 October 2018	• During the advancement of the test pits, three soil samples were collected from each test pit (until natural soils were encountered). • Samples were placed directly into laboratory supplied containers and stored on ice in a chilled container while onsite and during transit to Hill Laboratories Limited (Hills). • Samples were transported to Hills under standard AECOM chain of custody (CoC) procedures. • To prevent cross contamination, a new pair of disposable nitrile gloves was used for each soil sample collected. • The six soil samples were analysed for a range of potential contaminants including heavy metals, PAH compounds and ACM. • Spoil generated during the advancement of the works was reinstated at the completion of soil sampling.

4.0 Investigation Results

4.1 Adopted Acceptance Criteria

The adopted acceptance criteria for soil quality results have been adopted in accordance with the hierarchy defined by MfE Contaminated Land Management Guidelines No.2 (MfE, 2003, revised 2011) and are summarised below:

- Resource Management Act (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations, 2011 (NES Soil). Soil contaminant standards for commercial/industrial outdoor worker (unpaved) landuse scenario have been adopted allowing for exposure of outdoor workers to near-surface soil during routine maintenance / gardening and any ground disturbance activities associated with the proposed development. Hereinafter referred to as the **NES SCS**.
- Auckland Council, 2017. Auckland Unitary Plan (Operative in Part) (AUPOiP). Reference Table E30.6.1.4.1 Permitted Activity Soil Acceptance Criteria. Hereinafter referred to as the **AC Permitted Activity Criteria**.
- Auckland Council, 2017. AUPOiP. Reference Table E30.6.1.4.2 Background ranges of trace elements in Auckland soils sources from Table 3 of TP153:2001 Background Concentrations of Inorganic Elements in Soils from the Auckland Region. Background ranges for naturally occurring heavy metal concentrations in non-volcanic range soils were adopted. Hereinafter referred to as the **Auckland Background Concentrations**.
- Building Research Advisory Council New Zealand (BRANZ), New Zealand Guidelines for Managing and Assessing Asbestos in Soil, 2017. Hereinafter referred to as **NZBRANZ Guidelines**.

4.2 Visual/Olfactory Observations

Observed soil conditions generally comprised of topsoil, underlain by natural sands and silts. Test pit logs are presented in **Appendix C**. No visual or olfactory evidence of contamination was noted during the advancement of the test pits.

4.3 Soil Analytical Results

Analytical results for soil samples collected across the Site are summarised in **Table D1** in **Appendix D**. Laboratory results are provided in **Appendix E**. Key findings of the analysis of soil materials have been summarised as follows:

- No exceedances of the NES SCS or the AC Permitted Activity Criteria were recorded.
- No exceedances of the Auckland Background Concentrations were recorded for heavy metals, excluding one soil sample collected from Test Pit 2 (CI_TP02-0.3) which returned a lead concentration of 77 mg/kg which marginally exceeded the Auckland Background Concentration of 65 mg/kg.
- Two soil samples were analysed for PAH compounds. Minor detections were recorded; however these complied with the adopted acceptance criteria.
- Two surface soil samples were analysed for semi quantitative asbestos analysis. The presence of asbestos was not detected in either sample.

5.0 Discussion

5.1 Conceptual Site Model

Based on the results of the assessment a basic conceptual site model (CSM) has been developed for the Site.

- An activity or industry described in the MfE HAIL is unlikely to have been undertaken (both historical and current) within the vicinity of the Site.
- Historical aerial photographs indicate that the Site and Tawariki Street have been largely residential since 1940, along with the entire length of the Grey Lynn tunnel.
- Observed soil conditions generally comprised of topsoil, underlain by natural sands and silts.
- Soil samples collected within materials from the vicinity of the proposed shaft locations returned concentrations of contaminants generally commensurate with background for an urban area of Auckland. Only one minor background exceedance was recorded. Importantly, no exceedances of the NES SCS or AC Permitted Activity Criteria were recorded, and ACM was not detected.

5.2 Human Health Risk Assessment

Results of the assessment indicate that the soil contaminant conditions within materials to be disturbed at the Site are unlikely to present a risk to site workers or the environment.

5.3 Regulatory Assessment (Contaminated Land)

5.3.1 NES SCS

In accordance with Regulation 5(7) and 5(9), the NES Soil does not apply to land disturbance associated with the advancement of the Grey Lynn Shafts as an activity or industry described in the MfE HAIL is unlikely to have occurred at the Site (both historical and current).

5.3.2 AUP(OP)

No exceedances of the AC Permitted Activity Criteria were recorded as part of the environmental investigation. No resource consent is required under Section E30 Contaminated Land of The AUP(OP).

5.4 Soil Reuse or Removal

Soil materials generated during the advancement of the shafts can be reused at the Site. If required to be transported off-site, these should be disposed of at a licensed facility authorised to accept such materials. With the contaminant concentrations detected being generally low, the soil could be disposed of as managed fill subject to meeting the disposal facility's consented waste acceptance criteria.

6.0 References

Auckland Council, 2017. Auckland Unitary Plan Operative in Part, September 2017.

Auckland Regional Council, 2001. Background Concentrations of Inorganic Elements in Soils from the Auckland Region. Technical Publication 153.

Building Research Advisory Council New Zealand (BRANZ), New Zealand Guidelines for Managing and Assessing Asbestos in Soil, 2017.

Kermode, 1992. Geology of the Auckland Urban Area. Institute of Geological & Nuclear Sciences Ltd., Lower Hutt, New Zealand. 1:50 000 geological map 1. 1 sheet + 63 p.

Ministry for the Environment, 2001. Contaminated Land Management Guidelines No. 1. Reporting on Contaminated Sites in New Zealand. Revised 2011.

Ministry for the Environment, 2003. Contaminated Land Management Guidelines No. 2. Hierarchy and Application in New Zealand of Environmental Guideline Values. Revised 2011.

Ministry for the Environment, 2004. Contaminated Land Management Guidelines No. 5. Site Investigation and Analysis of Soils. Revised 2011.

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

Ministry for the Environment, 2012. Users' Guide, National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health.

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Appendix A

Figure

ISO A1 594mm x 841mm

NOTES:

1. CO-ORDINATES ARE IN NZTM AND LEVELS ARE TO AUCKLAND L&S 1946 DATUM.
2. LOCATION OF EXISTING SERVICES HAVE BEEN EXTRACTED FROM AUCKLAND COUNCIL GIS AND UTILITIES PLANS AND ARE INDICATIVE.
3. SITE SURFACE FORMATION MAY REQUIRE RELOCATION OF UTILITIES.

LEGEND

- PROPOSED MAIN TUNNEL
- PROPOSED LINK SEWER
- FUTURE CSO COLLECTOR SEWER AND MANHOLE
- PROPOSED SEWERAGE
- PROPOSED STORMWATER
- PROPOSED POWER/CONTROL DUCT
- SW — EXISTING STORMWATER
- EXISTING STORMWATER STREAM
- SS — EXISTING NETWORK WASTEWATER
- SS — SS — SS — EXISTING TRANSMISSION WASTEWATER
- W — EXISTING WATERMAIN
- LV — LV POWER CABLE
- HV — HV POWER CABLE
- MV — MV POWER CABLE
- FIBRE OPTIC CABLE
- TRANSPOWER LINE
- VECTOR TRANSMISSION LINE
- COMM CABLES
- T — TELECOM
- GAS — GAS LINE
- X — X — X — TO BE ABANDONED
- EXISTING SEWER PREVIOUSLY ABANDONED
- DESIGNATION BOUNDARY
- (1) SITE OFFICE
- (2) WORKSHOP
- (3) PARKING
- (4) SPOIL STORAGE
- (5) WHEEL WASH
- (6) CRAWLER CRANE PAD (MIN. DIMENSION)
- (7) LAYDOWN TEMP. MATERIAL STORAGE
- TEST PIT LOCATION

5 0 5 10 15 20 25
DIMENSIONS ARE IN METRES

1:250 (A1)
1:500 (A3)

AECOM

PROJECT

GREY LYNN TUNNEL

CLIENT

JACOBS NEW ZEALAND LIMITED

CONSULTANT

AECOM New Zealand Limited
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SS	NM	NM
DESIGNER	CHECKED	APPROVED

ISSUE/REVISION

I/R	DATE	DESCRIPTION
A	23/01/19	FINAL

PROJECT NUMBER

60435398

SHEET TITLE

SITE LAYOUT PLAN

SHEET NUMBER

FIGURE 1

Last saved by: SERGEY.SOKOLOV(2018-12-12) Last Plotted: 2018-12-12
Filename: \\NZAKL1FP001\GIS\JOBS\42074300\DWG\20_SHEETS\60435398-001.DWG

Appendix B

Historical Aerial Photography

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1940

0 10 20 30
Metres

Scale @ A4
= 1:2,500

Date Printed:
16/08/2018

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1959

0 10 20 30
Metres

Scale @ A4
= 1:2,500

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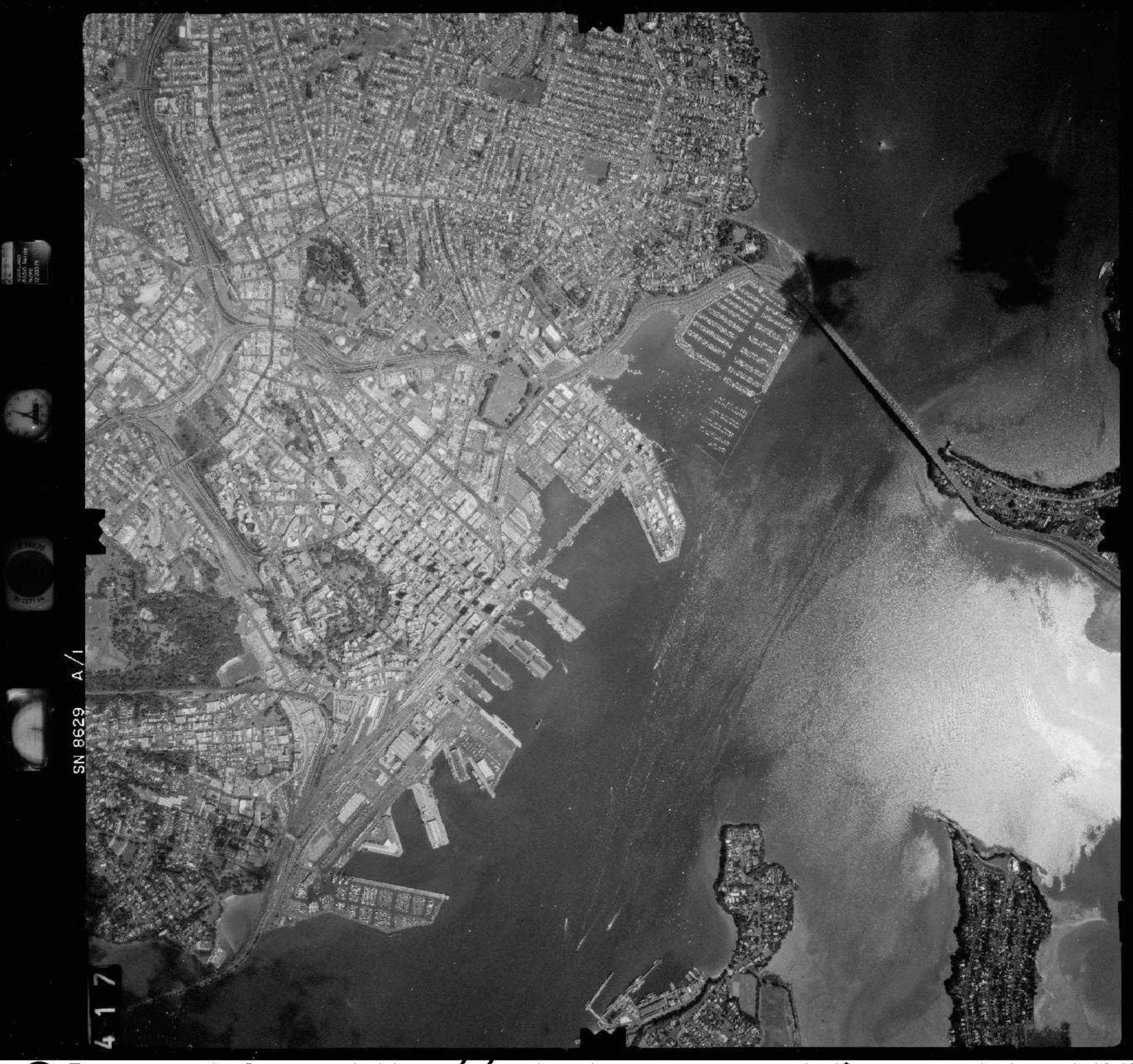

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1996

0 10 20 30
Metres

Scale @ A4
= 1:2,500

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2008

0 10 20 30
Meters

Scale @ A4
= 1:2,500

Date Printed:
16/08/2018

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Appendix C

Test Pit Logs

LOG OF INSPECTION PIT

INSPECTION PIT IDENTIFICATION	TP01

Client: McMillan Jacobs
Project: Grey Lynn Tunnel
Project number: 60435398

Co-ordinates: 298195.788mE 5919114.118mN
Orientation: -90° Elevation
Location: 46 Tawaiki Street, Grey Lynn
Feature

Face Sketch (Includes Stratum Boundaries, Stratum Reference Numbers and face(s) sketched.

m. bgl	Face A	Face B	Face C	Face D	m. bgl

Depth	Excavation Method / Casing remarks	Sample ID	Analysis	PID (ppm)	Graphic Log	MATERIAL DESCRIPTION (consistency, relative density, water content, plasticity, grading, etc)	GEOLOGICAL DESCRIPTION	STAINING/ ODOURS AND COMMENTS	Groundwater
		CI_TP01_0.3	Metals Asb			Silty fine SAND, medium fine gravel, minor clay, trace rootlets; brown; moist; loose, non plastic.	TS	TS=Top Soil	
		CI_TP01_0.6				Fine sandy SILT, some clay; light brown; firm; moist, low plasticity.	Sandy SILT		
1		CI_TP01_0.9	Metals PAH						
		CI_TP01_1.5							
						Silty fine SAND, trace clay; dark grey; wet, non plastic.	Silty SAND		▽
2		CI_TP01_2.0	Metals						
		CI_TP01_2.5							
						Clayey SILT, trace fine sand; light grey; moist, high plasticity.	CLAYey SILT		
3		CI_TP01_3.0							
		CI_TP01_3.5							
						TP01 terminated at 3.5m Target Depth			

For explanation of symbols and observations, see key sheet

GROUNDWATER OBSERVATIONS

Number	Depth (m)	Date	Post strike observations
	2m.	10/07/2018	

Length
Width
Stability: Stable

Excavation Method: CAT Excavator Mounted
Orientation

Remarks

Started: 10/07/2018
Finished: 10/07/2018
Date logged: 10/07/2018
Logged: SN2
Checked: NM

INSPECTION PIT (ENVIONMENTAL) CI TAWARIKI STREET.GPJ BASE.GDT 21/08/18

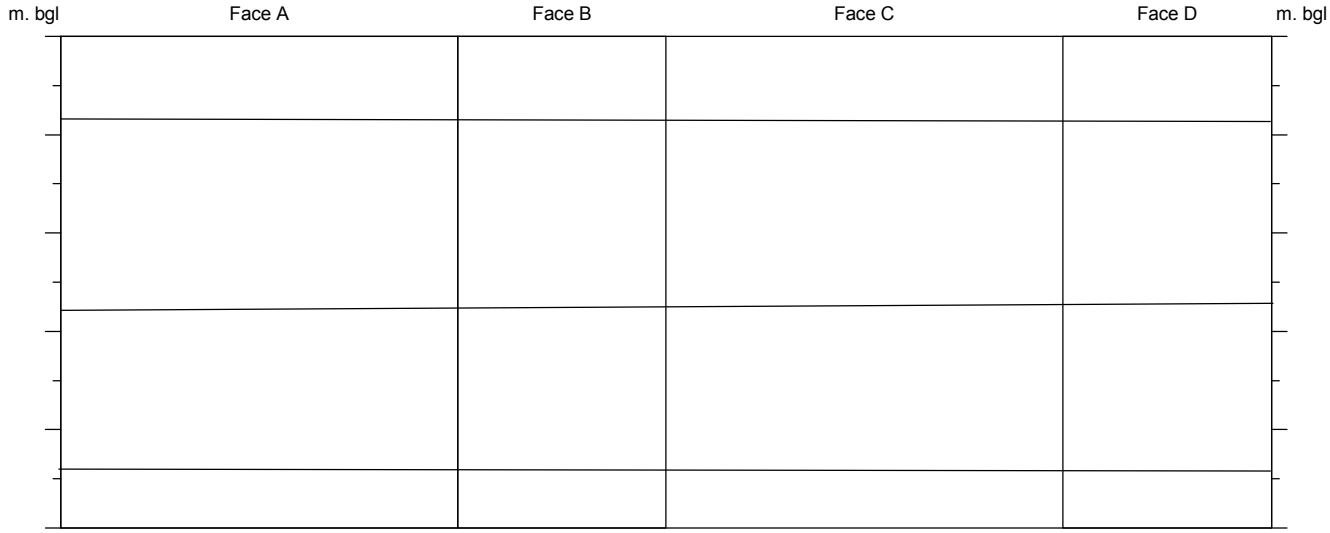
LOG OF INSPECTION PIT

INSPECTION PIT IDENTIFICATION	**TP02**

Client	McMillan Jacobs
Project	Grey Lynn Tunnel
Project number	60435398

Co-ordinates	298195.734mE 5919108.899mN
Orientation	-90° Elevation
Location	46 Tawaiki Street, Grey Lynn
Feature	

Face Sketch (Includes Stratum Boundaries, Stratum Reference Numbers and face(s) sketched.



Depth	Excavation Method / Casing remarks	Sample ID	Analysis	PID (ppm)	Graphic Log	MATERIAL DESCRIPTION (consistency, relative density, water content, plasticity, grading, etc)	GEOLOGICAL DESCRIPTION	STAINING/ ODOURS AND COMMENTS	Groundwater
		CI_TP02_0.3	Metals PAH Asb			Silty fine SAND, medium fine gravel, minor clay, trace rootlets; brown; moist; loose, non plastic.	TS		
		CI_TP02_0.6				Fine sandy SILT, some clay; light brown; firm; moist, low plasticity.	Sandy SILT	TS=Top Soil	
1		CI_TP02_0.9							
		CI_TP02_1.5	Metals PAH						
						Silty fine SAND, trace clay; dark grey; wet, non plastic.	Silty SAND		
2		CI_TP02_2.0				very thick layer of sand stone was observed at approximately 2.0mbgl.			
		CI_TP02_2.5				*TP02 terminated at 2.5m Unstable pit wall(s) / Spalling from pit wall(s)*			

For explanation of symbols and observations, see key sheet

GROUNDWATER OBSERVATIONS

Number	Depth (m)	Date	Post strike observations
	2m.	10/07/2018	

Length		Excavation Method	CAT Excavator Mounted
Width		Orientation	
Stability	Stable		

Remarks

Started	10/07/2018
Finished	10/07/2018
Date logged	10/07/2018
Logged	SN2
Checked	NM

INSPECTION PIT (ENVIONMENTAL) CI TAWARIKI STREET.GPJ BASE.GDT 21/08/18

12/04/2005

Appendix D

Soil Analytical Results Table

Table D1 - Soil Analytical Results

Site Location	Units	Tawariki St, Grey Lynn						Adopted Acceptance Criteria				
Sample Location		Test Pit 01			Test Pit 02							
Sample Date		10-Jul-18	10-Jul-18	10-Jul-18	10-Jul-18	10-Jul-18	10-Jul-18	Auckland Background Concentrations[1]	Auckland Council Permitted Activity Criteria[2]	NES Guidelines[3]	NZBRANZ Guidelines [4]	
AECOM Sample Reference		CI_TP01-0.3	CI_TP01-0.9	CI_TP01-2.0	CI_TP02-0.3	CI_TP02-1.5	CI_TP02-2.0					
Laboratory Sample Reference		2013426.1	2013426.3	2013426.5	2013426.9	2013426.12	2013426.13			Commercial / Industrial Outdoor Worker (unpaved)	All Site Uses (% w/w asbestos for FA and AF)	Commercial & Industrial (% w/w asbestos for ACM)
Sample Depth (m bgl)		0.3	0.9	2	0.3	1.5	2.0	Non-volcanic range				
Sample Soil Type		Silty SAND	Sandy SILT	Silty SAND	Silty SAND	Sandy SILT	Silty SAND					
Heavy Metals												
Total Recoverable Arsenic		3	< 2	< 2	< 2	3	3	0.4 - 12	**100**	**70**	-	-
Total Recoverable Cadmium		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.1 - 0.65	**7.5**	**1300**	-	-
Total Recoverable Chromium		8	7	7	9	10	7	2 - 55	**400**	**6300**	-	-
Total Recoverable Copper		12	3	11	14	14	9	1 - 45	**325**	**>10000**	-	-
Total Recoverable Lead		53.0	9.2	27	77	15.9	6.8	< 1.5 - 65	**250**	**3300**	-	-
Total Recoverable Nickel		6	4	9	9	9	12	0.9 - 35	**105**	-	-	-
Total Recoverable Zinc		33	11	50	44	48	55	9 - 180	**400**	-	-	-
Polycyclic Aromatic Hydrocarbons												
Acenaphthylene		-	< 0.013	-	-	0.015	-	-	-	-	-	-
Acenaphthene		-	< 0.013	-	-	< 0.013	-	-	-	-	-	-
Anthracene		-	< 0.013	-	-	0.021	-	-	-	-	-	-
Benzo[a]anthracene		-	< 0.013	-	-	0.20	-	-	-	-	-	-
Benzo[a]pyrene (BAP)		-	< 0.013	-	-	0.21	-	-	-	-	-	-
Benzo[b]fluoranthene + Benzo[j]fluoranthene		-	< 0.013	-	-	0.26	-	-	-	-	-	-
Benzo[e]pyrene		-	< 0.013	-	-	0.150	-	-	-	-	-	-
Benzo[g,h,i]perylene		-	< 0.013	-	-	0.140	-	-	-	-	-	-
Benzo[k]fluoranthene		-	< 0.013	-	-	0.093	-	-	-	-	-	-
Chrysene		-	< 0.013	-	-	0.195	-	-	-	-	-	-
Dibenzo[a,h]anthracene		-	< 0.013	-	-	< 0.013	-	-	-	-	-	-
Fluoranthene		-	0.015	-	-	0.45	-	-	-	-	-	-
Fluorene		-	< 0.013	-	-	< 0.013	-	-	-	-	-	-
Indeno(1,2,3-c,d)pyrene		-	< 0.013	-	-	0.142	-	-	-	-	-	-
Naphthalene		-	< 0.07	-	-	< 0.07	-	-	-	-	-	-
Phenanthrene		-	< 0.013	-	-	0.15	-	-	-	-	-	-
Pyrene		-	< 0.013	-	-	0.44	-	-	-	-	-	-
Benzo[a]pyrene equivalent*		-	0.016	-	-	0.29	-	-	**20**	**35**	-	-
Asbestos in Soil												
As Received Weight	g	583	-	-	588.8	-	-	-	-	-	-	-
Dry Weight	g	455.1	-	-	475.5	-	-	-	-	-	-	-
Ashed Weight	g	448.3	-	-	462.3	-	-	-	-	-	-	-
Moisture	g	22	-	-	19	-	-	-	-	-	-	-
Dry Sample Fraction >10mm	g	< 0.1	-	-	69.8	-	-	-	-	-	-	-
Sample Fraction <10mm to >2mm	g	105.8	-	-	175.8	-	-	-	-	-	-	-
Sample Fraction <2mm	g	340.7	-	-	215.8	-	-	-	-	-	-	-
<2mm Subsample Weight	g	53.1	-	-	56.9	-	-	-	-	-	-	-
Asbestos Presence / Absence	-	Asbestos NOT detected.	-	-	Asbestos NOT detected.	-	-	-	-	-	-	-
Description of Asbestos Form	-	-	-	-	-	-	-	-	-	-	-	-
Weight of Asbestos in ACM (Non-Friable)	g ashed wt	< 0.00001	-	-	< 0.00001	-	-	-	-	-	-	-
Asbestos in ACM as % of Total Sample	% w/w	< 0.001	-	-	< 0.001	-	-	-	-	-	-	0.05
Weight of Asbestos as Fibrous Asbestos (Friable)	g ashed wt	< 0.00001	-	-	< 0.00001	-	-	-	-	-	-	-
Asbestos as Fibrous Asbestos as % of Total Sample	% w/w	< 0.001	-	-	< 0.001	-	-	-	-	-	0.001	-
Weight of Asbestos as Asbestos Fines (Friable)	g ashed wt	< 0.00001	-	-	< 0.00001	-	-	-	-	-	-	-
Asbestos as Asbestos Fines 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	-

Notes:

All results are presented in mg/kg unless otherwise stated.
Results from the full SVOC suite analysis have not been presented, refer to Appendix J for complete laboratory reports.

^ Natural materials refers to the East Coast Bays Formation (Waitemata Group) materials which underlay the fill materials. The East Coast Bays Formation generally comprised moderately to completely weathered siltstone and sandstone.
- Sample not analysed for compound and/or no criteria adopted
* some PAH compounds were below laboratory limits of reporting, so a value of half the detection limit has been used for the benzo(a)pyrene equivalent calculations in these situations.

Underlined, **bolded,** coloured and shaded text represents exceedances of adopted acceptance criteria.

1. Auckland Council, 2017. Auckland Unitary Plan - Operative in part (AUPOP). Table E30.6.1.4.2 Background ranges of trace elements in Auckland soils sources from Table 3 of TP153:2001 Background Concentrations of Inorganic Elements in Soils from the Auckland Region. (Auckland Background Concentrations).
2. Auckland Council, 2017. Auckland Unitary Plan - Operative in part (AUPOP). Table E30.6.1.4.1, Permitted Activity Soil Acceptance Criteria
3. Ministry for the Environment, 2012. User's Guide National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health. Values taken from Appendix B Soil Contaminant Standards, Tables B2 and B3 (NES Guidelines).
4. BRANZ, 2017. New Zealand Guidelines for Managing and Assessing Asbestos in Soil (referred to as NZBRANZ Guidelines).

% w/w - percentage weight for weight.
ACM - Asbestos containing material (restricted to material that cannot pass through a 7 mm x 7 mm sieve).
FA - fibrous asbestos (encompasses friable asbestos material, such as severely weathered ACM, and asbestos in the form of loose fibrous material such as insulation products).
AF - Asbestos fines (includes free fibres of asbestos, small fibre bundles and also ACM fragments that pass through a 7 mm x 7 mm sieve).

Appendix E

Laboratory Report

Hill Laboratories
TRIED, TESTED AND TRUSTED

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

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

Certificate of Analysis

Client:	AECOM New Zealand Limited	**Lab No:**	2013426 SPv1
Contact:	N Macorison	**Date Received:**	10-Jul-2018
	C/- AECOM New Zealand Limited	**Date Reported:**	23-Jul-2018
	PO Box 4241	**Quote No:**	81048
	Shortland Street	**Order No:**	60435398/6.21
	Auckland 1140	**Client Reference:**	
		Submitted By:	Suresh Nuthalapati

Sample Type: Soil

Sample Name:		CI_TP01-0.3 10-Jul-2018	CI_TP01-0.9 10-Jul-2018	CI_TP01-2.0 10-Jul-2018	CI_TP02-0.3 10-Jul-2018	CI_TP02-1.5 10-Jul-2018
Lab Number:		2013426.1	2013426.3	2013426.5	2013426.9	2013426.12
Individual Tests						
Dry Matter	g/100g as rcvd	-	79	-	-	77
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	3	< 2	< 2	< 2	3
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	8	7	7	9	10
Total Recoverable Copper	mg/kg dry wt	12	3	11	14	14
Total Recoverable Lead	mg/kg dry wt	53	9.2	27	77	15.9
Total Recoverable Nickel	mg/kg dry wt	6	4	9	9	9
Total Recoverable Zinc	mg/kg dry wt	33	11	50	44	48
New Zealand Guidelines Semi Quantitative Asbestos in Soil						
As Received Weight	g	583.0	-	-	588.8	-
Dry Weight	g	455.1	-	-	475.5	-
Ashed Weight	g	448.3	-	-	462.3	-
Moisture	%	22	-	-	19	-
Dry Sample Fraction >10mm	g ashed wt	< 0.1	-	-	69.8	-
Sample Fraction <10mm to >2mm	g ashed wt	105.8	-	-	175.8	-
Sample Fraction <2mm	g ashed wt	340.7	-	-	215.8	-
<2mm Subsample Weight	g ashed wt	53.1	-	-	56.9	-
Asbestos Presence / Absence		Asbestos NOT detected.	-	-	Asbestos NOT detected.	-
Description of Asbestos Form		-	-	-	-	-
Weight of Asbestos in ACM (Non-Friable)	g ashed wt	< 0.00001	-	-	< 0.00001	-
Asbestos in ACM as % of Total Sample*	% w/w	< 0.001	-	-	< 0.001	-
Weight of Asbestos as Fibrous Asbestos (Friable)	g ashed wt	< 0.00001	-	-	< 0.00001	-
Asbestos as Fibrous Asbestos as % of Total Sample*	% w/w	< 0.001	-	-	< 0.001	-
Weight of Asbestos as Asbestos Fines (Friable)*	g ashed wt	< 0.00001	-	-	< 0.00001	-
Asbestos as Asbestos Fines 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	-
Polycyclic Aromatic Hydrocarbons Screening in Soil						
1-Methylnaphthalene	mg/kg dry wt	-	< 0.013	-	-	< 0.013
2-Methylnaphthalene	mg/kg dry wt	-	< 0.013	-	-	< 0.013
Perylene	mg/kg dry wt	-	< 0.013	-	-	0.066

ilac-MRA IANZ ACCREDITED LABORATORY

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:		CI_TP01-0.3 10-Jul-2018	CI_TP01-0.9 10-Jul-2018	CI_TP01-2.0 10-Jul-2018	CI_TP02-0.3 10-Jul-2018	CI_TP02-1.5 10-Jul-2018
Lab Number:		2013426.1	2013426.3	2013426.5	2013426.9	2013426.12
Polycyclic Aromatic Hydrocarbons Screening in Soil						
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	mg/kg dry wt	-	< 0.03	-	-	0.30
Benzo[a]pyrene Toxic Equivalence (TEF)	mg/kg dry wt	-	< 0.04	-	-	0.30
Acenaphthylene	mg/kg dry wt	-	< 0.013	-	-	0.015
Acenaphthene	mg/kg dry wt	-	< 0.013	-	-	< 0.013
Anthracene	mg/kg dry wt	-	< 0.013	-	-	0.021
Benzo[a]anthracene	mg/kg dry wt	-	< 0.013	-	-	0.20
Benzo[a]pyrene (BAP)	mg/kg dry wt	-	< 0.013	-	-	0.21
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	-	< 0.013	-	-	0.26
Benzo[e]pyrene	mg/kg dry wt	-	< 0.013	-	-	0.150
Benzo[g,h,i]perylene	mg/kg dry wt	-	< 0.013	-	-	0.140
Benzo[k]fluoranthene	mg/kg dry wt	-	< 0.013	-	-	0.093
Chrysene	mg/kg dry wt	-	< 0.013	-	-	0.195
Dibenzo[a,h]anthracene	mg/kg dry wt	-	< 0.013	-	-	< 0.013
Fluoranthene	mg/kg dry wt	-	0.015	-	-	0.45
Fluorene	mg/kg dry wt	-	< 0.013	-	-	< 0.013
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	-	< 0.013	-	-	0.142
Naphthalene	mg/kg dry wt	-	< 0.07	-	-	< 0.07
Phenanthrene	mg/kg dry wt	-	< 0.013	-	-	0.154
Pyrene	mg/kg dry wt	-	< 0.013	-	-	0.44

Sample Name:		CI_TP02-2.0 10-Jul-2018				
Lab Number:		2013426.13				
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	3	-	-	-	-
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	-	-	-	-
Total Recoverable Chromium	mg/kg dry wt	7	-	-	-	-
Total Recoverable Copper	mg/kg dry wt	9	-	-	-	-
Total Recoverable Lead	mg/kg dry wt	6.8	-	-	-	-
Total Recoverable Nickel	mg/kg dry wt	12	-	-	-	-
Total Recoverable Zinc	mg/kg dry wt	55	-	-	-	-

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 clean matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis.

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Individual Tests			
Dry Matter (Env)	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	3, 12
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	BaP Potency Equivalence calculated from Benz(a)anthracene x 0.1 + Benzo(b)fluoranthene x 0.1 + Benzo(j)fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Benzo(a)pyrene x 1 + Chrysene x 0.01 + Dibenz(a,h)anthracene x 1 + Fluoranthene x 0.01 + Indeno(1,2,3-c,d)pyrene x 0.1. Ministry for the Environment. 2011. Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health. Wellington: Ministry for the Environment.	0.002 mg/kg dry wt	3, 12

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Benzo[a]pyrene Toxic Equivalence (TEF)	BaP Toxic Equivalence calculated from Benzo(a)anthracene x 0.1 + BaP x 1 + Benzo(b)fluoranthene x 0.1 + Benzo(k) fluoranthene x 0.1 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.1 + Indeno(1,2,3-c,d)pyrene x 0.1. Guidelines for assessing and managing contaminated gasworks sites in New Zealand (GMG) (MfE, 1997).	0.002 mg/kg dry wt	3, 12
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, 9, 12-13
New Zealand Guidelines Semi Quantitative Asbestos in Soil*		-	1, 9
Polycyclic Aromatic Hydrocarbons Screening in Soil	Sonication extraction, Dilution or SPE cleanup (if required), GC-MS SIM analysis (modified US EPA 8270). Tested on as received sample. [KBIs:5786,2805,2695]	0.002 - 0.05 mg/kg dry wt	3, 12
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, 9
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, 9
Ashed Weight	Sample ashed at 400°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	1, 9
Moisture	Sample dried at 100 to 105°C. Calculation = (As received weight - Dry weight) / as received weight x 100. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	1 %	1, 9
Sample Fraction >10mm	Sample ashed at 400°C, 10mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g ashed wt	1, 9
Sample Fraction <10mm and >2mm	Sample ashed at 400°C, 10mm and 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g ashed wt	1, 9
Sample Fraction <2mm	Sample ashed at 400°C, 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g ashed wt	1, 9
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.	-	1, 9
Description of Asbestos Form	Description of asbestos form and/or shape if present.	-	1, 9
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 ashed wt	1, 9
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, 9
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 ashed wt	1, 9
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, 9
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 ashed wt	1, 9
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, 9
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, 9

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 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

Hill Laboratories
BETTER TESTING BETTER RESULTS

ANALYSIS

Job No: **201 3426**

Date Recv: 10-Jul-18 17:09

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

Received by: Zandra Edwards

3120134269

Client

Name AECOM New Zealand Limited

Address 8 Mahuhu Crescent

Phone *Fax*

Client Reference

Quote No *Order Number* 60435398/6.21

Primary Contact Noami Macorison

Submitted By Suresh Nuthalapati

Charge To Aecom Auckland

Results To ☑ Mail Client ☑ Mail Submitter

☐ Fax Results

☑ Email Results

Office use only Job No:

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories
Date & Time: 10/07/2018
Name: Suresh Nuthalapati
☑ *Please tick if you require COC to be faxed back*
Signature: S.N

Received at Hill Laboratories
Date & Time:
Name:
Signature:

Condition ☐ *Room Temp* ☐ *Chilled* ☐ *Frozen* *Temp:* 9.6

☐ Sample Analysis details checked
Signature:

ADDITIONAL INFORMATION

Priority

☐ **Low** ☑ **Normal** ☐ **High**

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

Requested Reporting Date:

Sample Types

Waters	**E**	Effluent	**G**	Geothermal	**Pot1**	Potable Water (LAS/EU)	**Pot2**	Potable Water (NZDWS)
	GW	Ground Water	**L**	Leachate	☐	Audit Monitoring	**Pot3**	Potable Water (other)
	SW	Surface Water	**S**	Saline	☐	Check Monitoring	**Pool**	Swimming/Spa Pool
	TW	Trade Waste						
Solids	**ES**	Soil	**SE**	Sediment	**SL**	Sludge	**PL**	Plant
Other	**O**	O Oil	**M**	Miscellaneous	**FS**	FS Fish/shellfish/biota	**BM**	BM Biological Material

No.	*Sample Name*	*Sample Date & Time*	*Sample Type*	*Tests Required/COWL/Initial/Final flow/Total Time*
1	CI_TP01_0.3	10/07/2018	ES	~~Hold cold~~ (WA) ACM, metals
2	CI_TP01_0.6	10/07/2018	ES	~~Hold cold~~ HOLD COLD
3	CI_TP01_0.9	10/07/2018	ES	~~Hold cold~~ PAH, metals
4	CI_TP01_1.5	10/07/2018	ES	~~Hold cold~~ HOLD COLD
5	CI_TP01_2.0	10/07/2018	ES	~~Hold cold~~ metals
6	CI_TP01_2.5	10/07/2018	ES	~~Hold cold~~ HOLD COLD
7	CI_TP01_3.0	10/07/2018	ES	~~Hold cold~~ HOLD COLD
8	CI_TP01_3.5	10/07/2018	ES	~~Hold cold~~ HOLD COLD
9	CI_TP02_0.3	10/07/2018	ES	~~Hold cold~~ (WA) ACM, metals
10	CI_TP02_0.6	10/07/2018	ES	~~Hold cold~~ HOLD COLD

S.N

No.	Sample Name	Sample Date & Time	Sample Type	Tests Required/COWL/Initial/Final flow/Total Time
11	CI_TP02_0.9	10/07/2018	ES	Hold cold
12	CI_TP02_1.5	10/07/2018	ES	~~Hold cold~~ PAH, metals
13	CI_TP02_2.0	10/07/2018	ES	~~Hold cold~~ metals
14	CI_TP02_2.5	10/07/2018	ES	Hold cold
15	CI_TP0_	10/07/2018	ES	Hold cold
16	CI_TP0_	10/07/2018	ES	Hold cold
17	CI_TP0_	10/07/2018	ES	Hold cold
18	CI_TP0_	10/07/2018	S.N	
19	CI_TP0_	10/07/2018		
20	CI_TP0_	10/07/2018		
21	CI_TP0_	10/07/2018		
22	CI_TP0_	10/07/2018		
23	CI_TP0_	10/07/2018		
24	CI_TP0_	10/07/2018		
25	CI_TP0_	10/07/2018		
26	CI_TP0_	10/07/2018		
27	CI_TP0_	10/07/2018		
28	CI_TP0_	10/07/2018		
29	CI_TP0_	10/07/2018	S.N	
30	CI_TP0_	10/07/2018		
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				