



Wiri to Quay Park Project

Preliminary Site Investigation

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KiwiRail Holdings Limited

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Executive Summary

This report documents the findings of a high-level Preliminary Site Investigation (PSI) to support a Notice of Requirement (NOR) for Package 1 (Wiri to Westfield Junction) of the Wiri to Quay Park (W2QP) Auckland rail improvement project. It presents preliminary information on the contamination status of 25 sites outside the existing rail corridor that may be subject to soil disturbance activities associated with the rail improvement works under Package 1, based mainly on the review of aerial photographs to assess land use, augmented by contaminated site enquiry information from Auckland Council (AC) and review of the New Zealand Geotechnical Database (NZGD). This information will be updated and used to support resource consent applications as they apply to the disturbance of contaminated land and sites listed on the Ministry for the Environment (MfE) Hazardous Activities and Industries List (HAIL). HAIL sites are subject to controls under the Resource Management (National Environmental Standard for assessing and managing contaminants in soil to protect human health) Regulations 2011 (NESCS).

The properties comprise mainly residential properties in addition to informal reserve or undeveloped land and soft landscaped verges at Middlemore Hospital, on or close to the western side of the North Island Main Trunk (NIMT) rail corridor, over a distance of approx. 3.6 km. These include small strips of land immediately adjacent to the rail corridor, land for access routes for works vehicle and whole properties where more significant works are proposed.

The assessment indicates that the properties were generally in agricultural land use prior to about 1940, primarily grazing land, with increasing urbanisation over time. Localised horticultural land use is also possible, as evidenced by the presence of probable commercial scale greenhouses extending onto 74D Kenderdine Road.

It is interpreted that all of the residential properties, except 74D Kenderdine Road, are not likely to be HAIL. Horticultural activities identified at 74 Kenderdine Road are classified as HAIL A 10 – *Persistent pesticide bulk storage or use including sports turfs, market gardens, orchards, glass houses or spray sheds*.

In addition, no recreational areas/undeveloped land, landfills or the extensive use of level raising fill has been identified (HAIL G3. *Landfill sites*). In addition, although some pesticide/herbicide use is likely, use of persistent pesticide products as defined by HAIL A10. - *Persistent pesticide bulk storage or use including sports turfs, market gardens, orchards, glass houses or spray sheds*, is considered to be unlikely.

Hospitals are not listed as HAIL. However, some activities undertaken as part of hospital operations are HAIL and potentially include A3. - *Commercial analytical laboratory sites*, A17. - *Storage tanks or drums for fuel, chemicals or liquid waste* and B2. - *Electrical transformers including the manufacturing, repairing or disposing of electrical transformers or other heavy electrical equipment*. The land parcels potentially subject to soil disturbance close to Middlemore Hospital do not appear to be associated with these HAIL activities.

It is noted that given age of the many of the dwellings, lead from lead-based paint and asbestos from degradation of building materials could be present in soil above background levels, close to the buildings. The potential for the presence of fill associated with rail corridor activities is also noted.

It is recommended that this assessment is updated following confirmation of the properties subject to soil disturbance and soil disturbance activities to be undertaken. This update should include site walk over inspection.

Important note about your report

The sole purpose of this report prepared by Jacobs New Zealand Limited (Jacobs) is to document the findings of a preliminary site investigation in relation to the contamination potential along the Wiri to Quay Park railway alignment in Auckland. The contents of the report are in accordance with the scope of services detailed in the terms of engagement between Jacobs and KiwiRail Holdings Limited (the Client).

In assessing available information and preparing this report, Jacobs has relied upon and presumed accurate, all information provided by the Client and any third party. Unless otherwise stated in this report, Jacobs has not attempted to verify the accuracy or completeness of any such information and Jacobs accepts no liability to the client and/or any third party for any loss and/or damage incurred as a result of any inaccurate or incomplete information.

The information in this report is derived from data provided by the client, and a number of public domains, including Auckland Council and Retrolens.

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1. Introduction

1.1 Terms of Reference

This report has been prepared for KiwiRail Holdings Limited (KiwiRail) by Jacobs New Zealand Limited (Jacobs). It presents the findings of a Preliminary Site Investigation (PSI) to support a Notice of Requirement (NOR) for the amendment to the designation associated with Package 1 (Wiri to Westfield Junction) of the Wiri to Quay Park (W2QP) Auckland rail improvement project.

1.2 Objective

The objective of the PSI is to provide preliminary information on the contamination status of properties outside the existing rail corridor that may be subject to soil disturbance activities associated with the works under Package 1 and to support the NOR for the amendment to the designation. This information will also later be updated and used to support resource consent applications as they apply to the disturbance of contaminated land and sites listed on the Ministry for the Environment (MfE) Hazardous Activities and Industries List (HAIL), which are subject to controls under the Resource Management (National Environmental Standard for assessing and managing contaminants in soil to protect human health) Regulations 2011 (NESCS).

1.3 Scope of Work

This PSI is based mainly on the review of aerial photographs to assess land use activities of 25 properties adjacent to the rail corridor identified by Kiwi Rail as potentially affected by the Package 1 rail improvement works. The aerial photographs have been obtained from publicly available sources, chiefly Auckland Council (AC) GeoMaps and Retrolens Historical Image Resource. Further information was obtained on selected sites from AC records via a contaminated site enquiry to AC and from review of available borehole records from the New Zealand Geotechnical Database (NZGD).

1.4 Report Status

This report has been prepared by Kevin Tearney, CEnvP SC, a Suitably Qualified and Experienced Practitioner (SQEP) as described under the NESCS, in general accordance with MfE Contaminated Land management Guideline (CLMG) No 1 Reporting on Contaminated Sites in New Zealand.

2. Environmental Setting

2.1 Site Location & Description

The PSI covers properties located adjacent to the rail corridor between Rosella Road, Mangere East in the north and Bridge Street, Papatoetoe to the south, over a distance of approx. 3.6 km, as shown on Figure 2.1. The properties are listed and described in Table 2.1, broken down for ease of discussion into four parts (Part One, Part Two, Part Three, and Part Four). They largely comprise residential properties, in addition to some reserve land, on or close to the western side of the railway corridor. Information on the areas of land within each property potentially affected by the improvements is also presented, including land required for construction access, rail infrastructure and retaining walls.. Further information is provided in Appendix A.

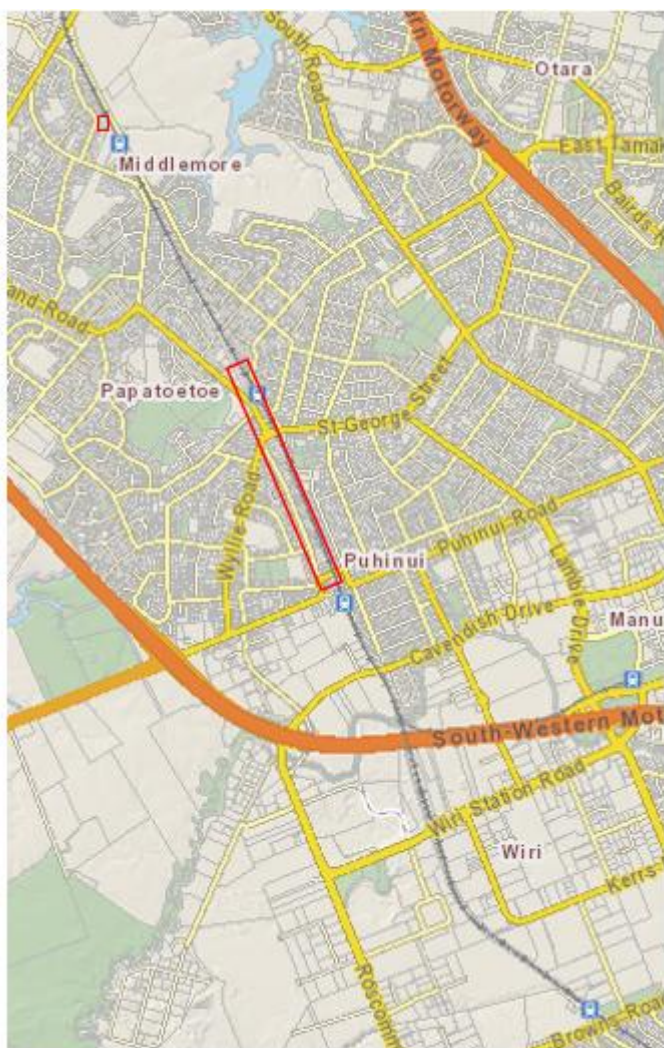


Figure 2.1: Site Location

Table 2.1 : Summary of the site location and description for the four parts comprising the works.

Property Address	Legal Description	Land Use/Zone	Description	Temporary/Permanent Acquisition
Part One				
64 Rosella Road	Lot 13 DP 19404	Existing land use is residential. Zoned as Business – Mixed Use	Entire land parcel of 1,014 m ² required to provide construction access and long-term maintenance access to the corridor	Permanent
100 Hospital Road (82 Gray Avenue)	Part Lot 13 DP 2989	Existing land use is mixed comprising car parks and buildings. Zoned as Special Purpose Zone	Land required to provide space for the third main, the extension of the pedestrian bridge and improved pedestrian connections to Orakau Road. Land required to provide space for the third main.	Permanent 2003m ² Temporary 591 m ²
100 Hospital Road (5 Orakau Road)	Allotment 237 of Parish of Manurewa	Existing land use is entrance to car park (road reserve)		Permanent 23 m ² Temporary 40 m ²
Part Two				
1 Station Road	Lot 7 DP 11628	Existing land use is residential. Zoned as Residential – Single House Zone	Small strip of land adjacent to the eastern boundary of the land parcel totalling 129 m ² required to support the works.	Temporary
5 Station Road	Lot 6 DP 11628		Small strip of land adjacent to the eastern boundary of the land parcel totalling 120 m ² required to support the works.	Permanent
9 Station Road	Lot 5 DP 11628		Entire land parcel of 781 m ² required to support the works.	Permanent
11 Station Road	Lot 4 DP 11628		Small strip of land adjacent to the eastern boundary of the land parcel totalling 139 m ² required to support the works.	Temporary
15 Station Road	Lot 3 DP 11628		Small strip of land adjacent to the eastern boundary of the land parcel totalling 129 m ² required to support the works.	Temporary
17 Station Road	Lot 2 DP 11628		Small strip of land adjacent to the eastern boundary of the land parcel totalling 116 m ² required to support the works.	Temporary

Property Address	Legal Description	Land Use/Zone	Description	Temporary/Permanent Acquisition
19 Station Road	Lot 1 DP 11628		Small strip of land adjacent to the eastern boundary of the land parcel totalling 134 m ² required to support the works.	Temporary
21R Station Road	Lot 9 DP 11628	Existing land use is recreational. Zoned as Open House – Informal Recreation Zone	Small area of land adjacent to the south-eastern boundary of the land parcel totalling 52 m ² required to support the works.	Partial permanent
18R Gordon Road	Lot 53 DP 20068, PT Allot 36 Parish of Manurewa	Informal recreational reserve (Gordon Park)	Construction access across Council reserve. May also be used as construction site yard	Temporary
Part Three				
12 Wylie Road	Lot 1 DP 152288	12 Wylie Road is an undeveloped site, while 14 Wylie Road is a church car park. Both are zoned as Residential – Terrace Housing and Apartment Buildings Zone.	Small strip of land adjacent to the eastern boundary of the land parcel totalling 1,160 m ² required to support the works. It is noted that the area identified as part of the works at 14 Wylie Road is extremely small Church carpark required for access during construction phase.	Partial permanent Car park temporary for access
14 Wylie Road	Lot 1 DP 136372			
Part Four¹				
74D Kenderdine Road	Lot 5 DP 327717	Existing land use is residential. Zoned as Residential – Mixed House Urban Zone	Small area of land totalling 41 m ² required to support the works	Temporary
76 Kenderdine Road	Part Lot 30 DP 16605		Small strip of land adjacent to the eastern boundary of the land parcel totalling 62 m ² required to support the works	Temporary
78 Kenderdine Road	Part Lot 31 DP 16605		Small strip of land adjacent to the eastern boundary of the land parcel totalling 64 m ² required to support the works	Permanent
80 Kenderdine Road	Part Lot 31 DP 16605		Small strip of land adjacent to the eastern boundary of the land parcel totalling 63 m ² required to support the works	Temporary

¹ This assessment also addresses the flats associated with the Kenderdine Road sites.

Property Address	Legal Description	Land Use/Zone	Description	Temporary/Permanent Acquisition
84 Kenderdine Road	Lot 1 DP 70381		Small strip of land adjacent to the eastern boundary of the land parcel totalling 97 m ² required to support the works	Temporary
88 Kenderdine Road	Lot 2 DP 70381		Small strip of land adjacent to the eastern boundary of the land parcel totalling 103 m ² required to support the works	Temporary
90 Kenderdine Road	Lot 34 DP 16605		Small strip of land adjacent to the eastern boundary of the land parcel totalling 103 m ² required to support the works	Temporary
92 Kenderdine Road	Lot 2 DP 82259		Small strip of land adjacent to the eastern boundary of the land parcel totalling 106 m ² required to support the works	Temporary
8 Bridge Street	Lot 21 DP 136372		Small strip of land across front yard to enable heavy vehicle access to 10 Bridge Street. (77 m ²)	Temporary
9 Bridge Street	Lot 27 DP 21411		Land required for retaining wall construction and occupation. (858 m ²)	Permanent
10 Bridge Street	Lot 22 DP 21411		Land required for retaining wall construction and occupation. (841 m ²)	Permanent

2.2 Zoning Description

Zoning descriptions as recorded in the Auckland Unitary Plan Operative in Part (AUP OP) are also shown in Table 2.1. They comprise the following:

- § Special Purpose – Healthcare Facility and Hospital (Middlemore Hospital)
- § Residential – Terrace Housing and Apartment (12 and 14 Wyllie Road)
- § Residential - Single House (Station Road properties)
- § Residential – Mixed Housing Urban (Kenderdine Road properties)
- § Open Space – Informal Recreation (21R Station Road and Gordon Park).
- § Business – Mixed Use (Rosella Road).

2.3 Geology and Hydrogeology

The properties are situated over Puketoka Formation of the Tauranga Group, which comprises pumiceous mud, sand and gravel, which overlies sandstones and mudstones of the Waitemata Group, as shown in Figure 2.1².

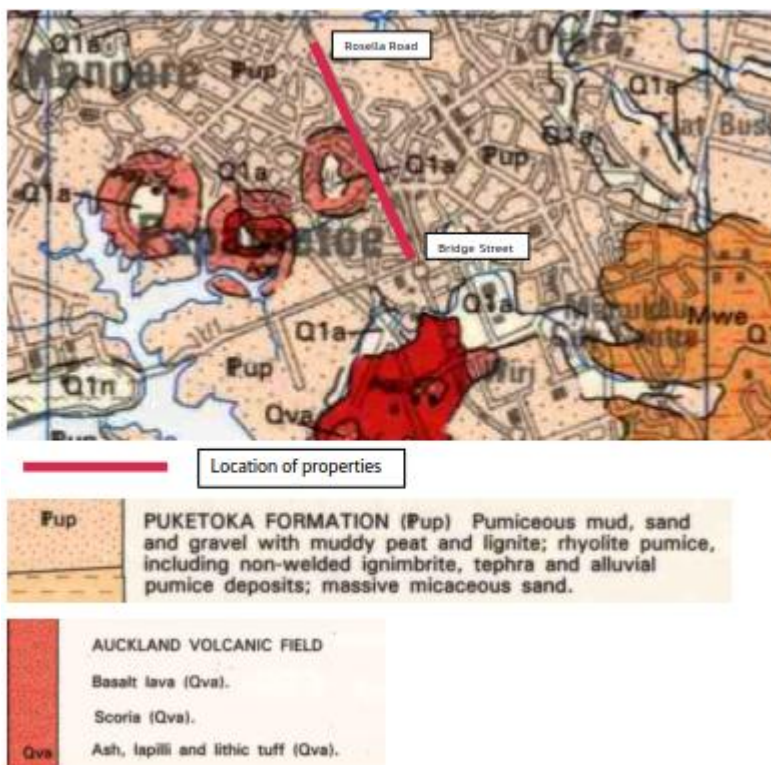


Figure 2.2: Geology¹

Shallow unconfined groundwater may be present within the Puketoka Formation. However, the Puketoka Formation does not constitute a usable aquifer for beneficial groundwater use.

The Waitemata Group forms a regionally important aquifer (Manukau Waitemata Aquifer) which is located in High-Use aquifer management area as defined by AC.

² Edbrooke, S.W. (compiler) 2001: Geology of the Auckland area: scale 1:250,000. Lower Hutt: Institute of Geological & Nuclear Sciences Limited. Institute of Geological & Nuclear Sciences 1:250,000 geological map 3. 74 p. + 1 folded map

3. Review of Available Information

3.1 Site Walkover

No site walkover has been undertaken to date as part of the PSI. Specific site inspections will be undertaken for update of the PSI to support resource consent applications (as required).

3.2 Review of Historical Aerial Imagery

A review of historical aerial imagery from AC GeoMaps³ and Retrolens⁴ was undertaken to identify historical land uses and the potential for associated soil contamination. The land parcels of interest are generally small strips of land mainly located within residential areas dating back to at least 1940. Selected historical aerial imagery only were reviewed given the limited change in land uses since 1940. Selections of the aerial imagery are presented in Appendix B. A summary of the review of historical land use is provided in Table 3.1.

Table 3.1 : Summary of historical land use based aerial imagery review.

Date	Source	General Description
Part One – 64 Rosella Road, 82 Gray Ave and 15 Orakau Road		
1940	Retrolens	64 Rosella Road and 15 Orakau Road are in grass, although some small structures, possibly beehives, are present at 64 Rosella Road. 82 Gray Avenue is comprised of a mixture of land uses; two residential dwellings with associated buildings (e.g., garage/shed) and possible vegetable gardens are present on the southern boundary and centre of the land parcel while the rest of the property is in grass (including the area of interest along the north-eastern boundary of the property). A railway track (including the North Island Main Trunk Line - NIMT) is located immediately to the northeast of all three land parcels (running northwest to southeast). Land use to the north, south, east, and west of the three properties is comprised of a mixture of residential dwellings and areas in grass, possibly agricultural grazing land.
1959	AC GeoMaps	No material change in land use within Part One, although residential dwellings have been constructed to the east and west of the of the three land parcels.
1980	Retrolens	No material change in land use at 64 Rosella Road. In the southern half of 82 Gray Avenue an additional building has been constructed and further earthworks are evident. In the northern part of 82 Gray Avenue one building has been demolished and four additional buildings (including one which extends into 15 Orakau Road) have been constructed as well as a car park. Some development has also occurred on 15 Orakau Road in the form of the aforementioned building and a driveway providing access to the buildings constructed on the northern part of 82 Gray Avenue. These developments are likely associated with Middlemore Hospital. Despite the developments on 82 Gray Avenue and 15 Orakau Road, land use within the area of interest does not appear to have changed.
1996	AC GeoMaps	A residential dwelling has been constructed on 64 Rosella Road. In the southern part of 82 Gray Avenue the residential dwelling along the southern boundary of the property has been demolished and a car park is been built. There is no material change in land use in the northern part of 82 Gray Avenue or 15 Orakau Road.
2001	AC GeoMaps	No material change in land use at 64 Rosella Road, the southern part of 82 Gray Avenue, and 15 Orakau Road. However, in the north part of 82 Gray Avenue the car park has been extended towards the northern boundary of the property, although the car park does not appear to extend in the area of interest adjacent to the northern boundary.
2006	AC GeoMaps	No material change in land use on any of the three land parcels.

³ <https://geomapspublic.aucklandcouncil.govt.nz/viewer/index.html>, accessed 21 May 2020.

⁴ <http://retrolens.nz/>, accessed 21 May 2020.

Date	Source	General Description
2008	AC GeoMaps	No material change in land use at 64 Rosella Road. A building which previously present on both 82 Gray Avenue or 15 Orakau Road has been demolished, although land use within the area of interest does not appear to have changed.
2010/11	AC GeoMaps	No material change in land use at 64 Rosella Road or 15 Orakau Road. Buildings present on the southern half of 82 Gray Avenue have been demolished and replaced with more car parks.
2015/16	AC GeoMaps	No material change in land use at 64 Rosella Road. A new car park has been constructed on the eastern boundary of 82 Gray Avenue which extends into 15 Orakau Road, although land use within the area of interest does not appear to have changed.
2017	AC GeoMaps	Concrete driveway is now present at 64 Rosella Road. No material change in land use on 82 Gray Avenue or 15 Orakau Road.
Part Two – 1 to 21R Station Road and 18R Gordon Road		
1939	Retrolens	Residential dwellings are present on 1 through 19 Station Road. 21 Station Road appears to be in grass. Surrounding land uses include Station Road to the west and south, the railway to the east, and grass to the north.
1959	AC GeoMaps	No material change in land use on 9-21 Station Road. Aerial imagery doesn't cover 1 and 5 Station Road or surrounding land uses. In the wider area residential dwellings have been constructed. 18R Gordon is appears to be tree covered reserve land adjacent to the rail corridor at the end of Gordon Road.
1980	Retrolens	No material change in land use within Part Two or surrounding area.
1996	AC GeoMaps	A garage/shed has been constructed on 17 and 19 Station Road. No material change in land use within Part Two or surrounding area. 21R Station Road may be part of a reserve.
2001	AC GeoMaps	No material change in land use within Part Two or surrounding area. 21R Station Road appears to be part of a reserve. 18R Gordon is appears to be grassed reserve land adjacent to the rail corridor at the end of Gordon Road. Carparking and hard courts and possible recreation centre building have been established to the southwest and south of the reserve (Gordon Park).
2006	AC GeoMaps	An additional residential dwelling has been constructed on 9 Station Road. No material change in land use within Part Two or surrounding area with the exception of construction of a footbridge over the railway line which extends into the northern half of 21 Station Road.
2008	AC GeoMaps	No material change in land use within Part Two or surrounding area.
2010/11	AC GeoMaps	No material change in land use within Part Two or surrounding area.
2015/16	AC GeoMaps	Garage/car port and possible extensions to the residential dwelling on 5 Station Road (Lot 6 DP 11628) have been built.
2017	AC GeoMaps	No material change in land use within Part Two or surrounding area.
Part Three – 12 and 14 Wyllie Road		
1939	Retrolens	Both 12 Wyllie Road and 14 Wyllie Road appear to be vacant land covered in grass, shrubs, and trees. Surrounding land uses include the St George Street road corridor to the north, grass and some residential dwelling to the west and south, and the railway to the east.
1959	AC GeoMaps	No material change in land use. Construction of residential dwellings to the west.
1980	Retrolens	No material change in land use on 12 Wyllie Road or surrounding areas with the exception of further construction of residential dwellings to the west and construction of the Presbyterian Church and car parks at 14 Wyllie Road.
1996	AC GeoMaps	No apparent change in land use within Part Three or surrounding area.
2001	AC GeoMaps	No apparent change in land use within Part Three or surrounding area.
2006	AC GeoMaps	No apparent change in land use within Part Three or surrounding area.
2008	AC GeoMaps	No apparent change in land use within Part Three or surrounding area.
2010/11	AC GeoMaps	Minor earthworks are evident at 12 Wyllie Road. No apparent change in land in the surrounding area.

Date	Source	General Description
2015/16	AC GeoMaps	No apparent change in land use within Part Three or surrounding area. Grass has grown back where the minor earthworks occurred.
2017	AC GeoMaps	No apparent change in land use within Part Three or surrounding area.
Part Four – 74-92 Kenderdine Road and 6 to 10 Bridge Street		
1939	Retrolens	Aerial imagery is difficult to decipher. It appears to be dwellings/buildings present or under construction at 74D Kenderdine Road and 90 Kenderdine Road. The other land parcels in Part Four appear to be in grass with some trees present. Surrounding land uses include the railway to the east and semi-rural land in grass to the north, south, and west. Kenderdine Road and Bridge Street are formed.
1959	AC GeoMaps	Residential dwellings have been constructed on all land parcels within Part Four, with the exception of 74D Kenderdine Road. 74D Kenderdine Road appears to have been planted in horticultural crops (vegetable/market garden). Glasshouses and/or poultry barns are present immediately north of 74D Kenderdine Road. Surrounding land uses do not appear to have changed significantly, although additional residential dwellings have been constructed in the general area.
1980	Retrolens	Terrace style housing has been constructed on a number of properties (e.g., 84-90 Kenderdine Road), replacing the residential dwellings previously present at these properties. 74D Kenderdine Road no longer appears to be planted in horticultural crops and now appears to be in grass. Glasshouses and/or poultry barns are still present immediately north of 74D Kenderdine Road. No material changes in the surrounding land uses beyond the continued construction of residential dwellings.
1996	AC GeoMaps	No material change in land use within Part Four with the exception of construction of additional residential dwellings on some properties, including at 74D Kenderdine Road. Houses have replaced the glasshouses and/or poultry barns to the north. No apparent changes in land use in the surrounding area.
2001	AC GeoMaps	No material change in land use within Part Four or surrounding area.
2006	AC GeoMaps	No material change in land use within Part Four or surrounding area.
2008	AC GeoMaps	No material change in land use within Part Four or surrounding area.
2010/11	AC GeoMaps	No material change in land use within Part Four or surrounding area.
2015/16	AC GeoMaps	No material change in land use within Part Four or surrounding area.
2017	AC GeoMaps	No material change in land use within Part Four or surrounding area.

3.3 Auckland Council Site Records

Based on an initial review of the historical aerial imagery, seven representative properties were identified where AC records could assist in identifying the potential for soil contamination and/or HAIL status. These properties comprised mainly reserve/park land in addition to 74 Kenderdine Road where horticultural activities were identified in early aerial photographs. Therefore, an enquiry was sent by Jacobs to AC (recontamination@aklc.govt.nz) on 21 May 2020 requesting council records or other information on the HAIL status of the properties.

AC's response is presented in Table 3.2 and is presented in Appendix C.

Table 3.2 : Summary of AC's response to Jacobs contamination enquiry.

Property Address	Legal Description	Auckland Council's Response
Part One		
64 Rosella Road	Lot 13 DP 19404	No contamination information held within AC records. However, due to the adjacent railway there is potential for uncertified/non-engineered fill to be present on site.

Property Address	Legal Description	Auckland Council's Response
82 Gray Avenue	Part Lot 13 DP 2989	No contamination information held within AC records. However, due to the adjacent railway there is potential for uncertified/non-engineered fill to be present on site. Additionally, due to the age of the buildings on site the potential for asbestos and/or lead paint to be present may need to be considered.
5 Orakau Road	Allotment 237 of Parish of Manurewa	
Part Two		
1 Station Road	Lot 7 DP 11628	No contamination information held within AC records. However, due to the adjacent railway there is potential for uncertified/non-engineered fill to be present on site. Additionally, due to the age of the dwelling on site the potential for presence of asbestos and/or lead paint may need to be considered.
21R Station Road	Lot 9 DP 11628	No contamination information held within AC records. However, due to the adjacent railway there is potential for uncertified/non-engineered fill to be present on site.
Part Three		
12 Wyllie Road	Lot 1 DP 152288	No contamination information held within AC records. However, due to the adjacent railway there is potential for uncertified/non-engineered fill to be present on site.
Part Four		
74C/D Kenderdine Road	Lot 4 DP 327717 & Lot 5 DP 327717	No contamination information held within AC records. However, due to the adjacent railway there is potential for uncertified/non-engineered fill to be present on site. Due to the age of the dwelling on site the potential for presence of asbestos and/or lead paint may need to be considered. In addition to this, Council's GIS aerial records indicate possible horticultural activity on 74D Kenderdine Road and a glasshouse on 74C Kenderdine Road.

3.4 New Zealand Geotechnical Database Borehole Logs

The NZGD was interrogated for ground contamination information at the properties subject to the NOR. Screenshots of maps from NZGD along the alignment showing available borehole information is presented in Appendix D. Eighteen (18) records were identified that contained geotechnical information, including soil type and groundwater levels. In general, the borehole logs recorded natural ground below a thin layer of topsoil, with occasional surficial gravel fill also recorded. No information on soil or groundwater contamination was recorded.

3.5 Discussion

The assessment indicates that the properties were generally in agricultural land use prior to about 1940, with increasing urbanisation to the form the mainly residential suburb which characterises the area today. The agricultural land use appears to have been primarily grazing land, although localised horticultural land use is also possible, as evidenced by the presence of probable greenhouses and gardens at 74 Kenderdine Road, extending onto 74D Kenderdine Road, seen in the aerial images from 1959 and 1980. The size of the buildings on the property indicate commercial scale operations.

The NIMT rail corridor lies to east of the properties (present in 1940) and borders all of the properties except 8 Bridge Street. The properties also include two informal recreational parks and one piece of undeveloped land, which appear to have been formed from agricultural land in conjunction with the progressive residential development. No landfilling or level raising fill activities are evident.

The properties also include Middlemore Hospital, which was constructed between 1959 and 1980.

The pieces of land which could be subject to soil disturbance are currently mainly either part of residential lawns/garden or informal recreational parks and undeveloped land, or in the case of 100 Hospital Road, in soft landscaping adjacent to carparking at Middlemore Hospital and Middlemore station.

3.5.1 HAIL Assessment

On the basis of the aerial imagery and information obtained from AC, it is interpreted that all of the residential properties, except 74D Kenderdine Road, are not likely to be HAIL. It is noted however, that given the age of many of the dwellings, lead from lead based paint and asbestos from degradation of building materials could be present in soil, close to the buildings. The potential for the presence of fill associated with rail corridor activities is also noted.

In terms of the informal recreational areas, no evidence of landfill or the use level raising fill to form the parks has been identified (HAIL G3. *Landfill sites*). In addition, although some pesticide/herbicide use is likely, intensive use of these products as defined by HAIL A10. - *Persistent pesticide bulk storage or use including sports turfs, market gardens, orchards, glass houses or spray sheds*, is considered to be unlikely.

Horticultural activities are classified as HAIL A 10 – *Persistent pesticide bulk storage or use including sports turfs, market gardens, orchards, glass houses or spray sheds*. The potential for commercial scale horticultural activities to have occurred at 74 Kenderdine indicates that 74D Kenderdine Road is HAIL.

In relation to Middlemore Hospital, although hospitals are not listed as HAIL, some activities undertaken as part of hospital operations are HAIL. These potentially include:

- § A3. - *Commercial analytical laboratory sites*
- § A17. - *Storage tanks or drums for fuel, chemicals or liquid waste*
- § B2. - *Electrical transformers including the manufacturing, repairing or disposing of electrical transformers or other heavy electrical equipment.*

The land parcels potentially subject to soil disturbance close to Middlemore Hospital do not appear to be associated with these HAIL activities.

The HAIL list is presented in Appendix E.

4. Conclusions & Recommendations

4.1 Conclusions

The potential for commercial scale horticultural activities to have occurred at 74 Kenderdine indicates that 74D Kenderdine Road is HAIL. Horticultural activities are classified as HAIL A 10 – *Persistent pesticide bulk storage or use including sports turfs, market gardens, orchards, glass houses or spray sheds*. No other sites potentially subject to soil disturbance associated with the works under Package 1, which are mainly either part of residential lawns/garden or informal recreational parks and undeveloped land or in the case of 100 Hospital Road, in soft landscaping adjacent to carparking at Middlemore Hospital and Middlemore station, have been identified as HAIL.

Notwithstanding, the presence of contaminants in soil above background levels could be present at all or some locations, relating to specific activities not identified in the current PSI and/or related to lead-based paint and asbestos containing materials (ACM) associated with site buildings. Such contamination, if present, would be expected to be localised, for example, in case of lead and asbestos, located close to site buildings.

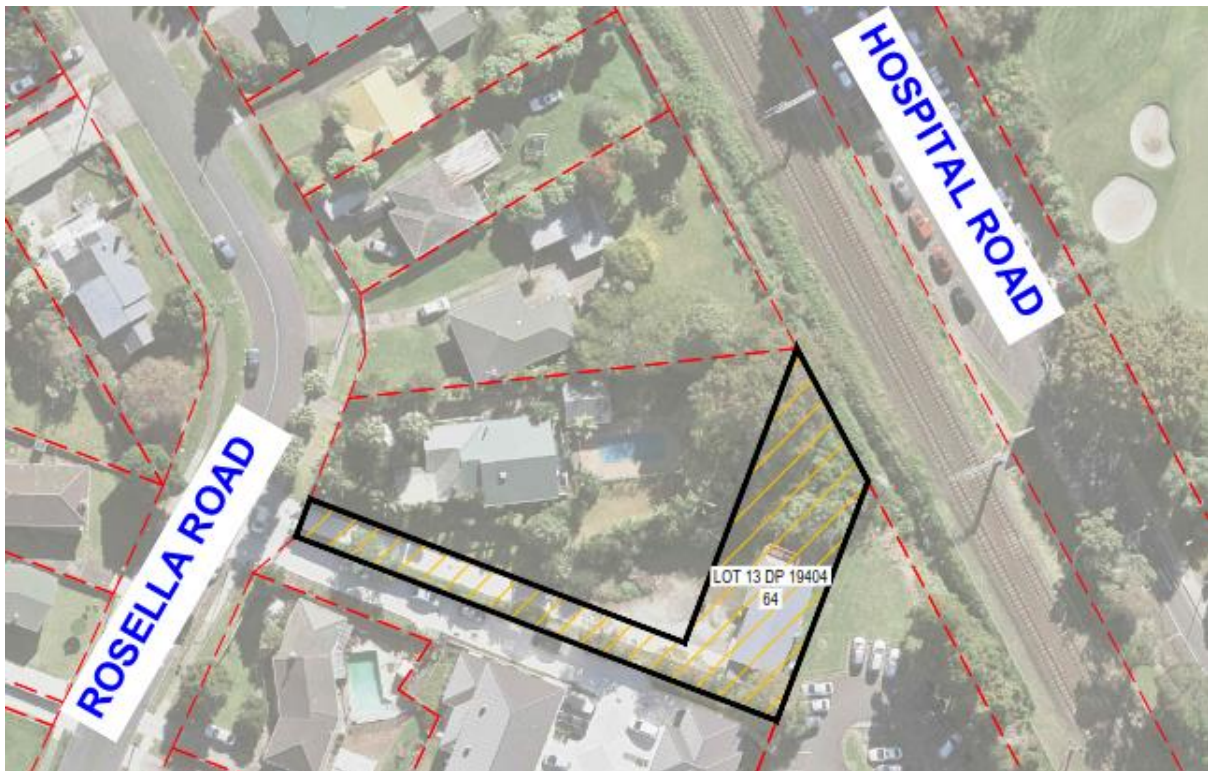
4.2 Recommendations

This PSI has assessed the contamination status of properties potentially affected by soil disturbance activities during the Package 1 works. It is recommended that this assessment is updated following confirmation of the properties subject to soil disturbance and soil disturbance activities to be undertaken. This update should include site walk over inspection.

It is also noted that the wider project will require a land use consent under the NESCS and a discharge permit under the AUP OP for contamination related matters. It is recommended that the sites discussed in this PSI are included within the scope of any site management plan (SMP) required by those resource consents

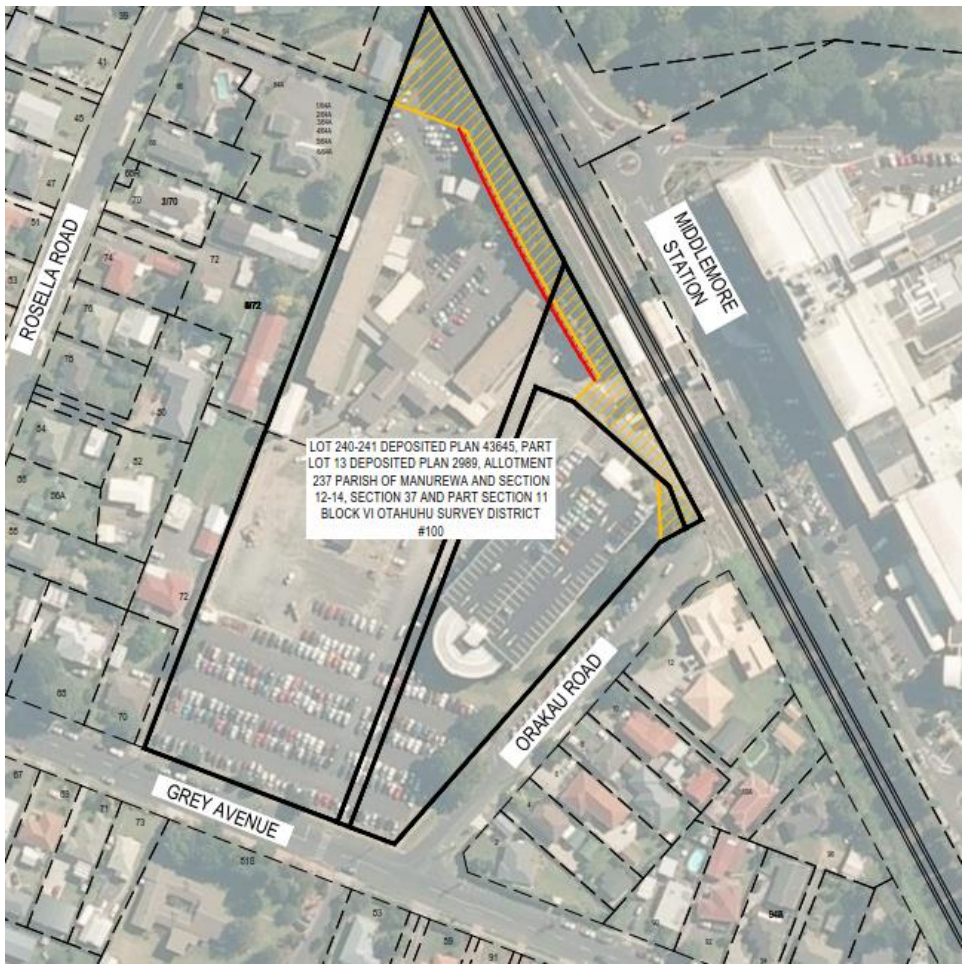
Appendix A. Site Information

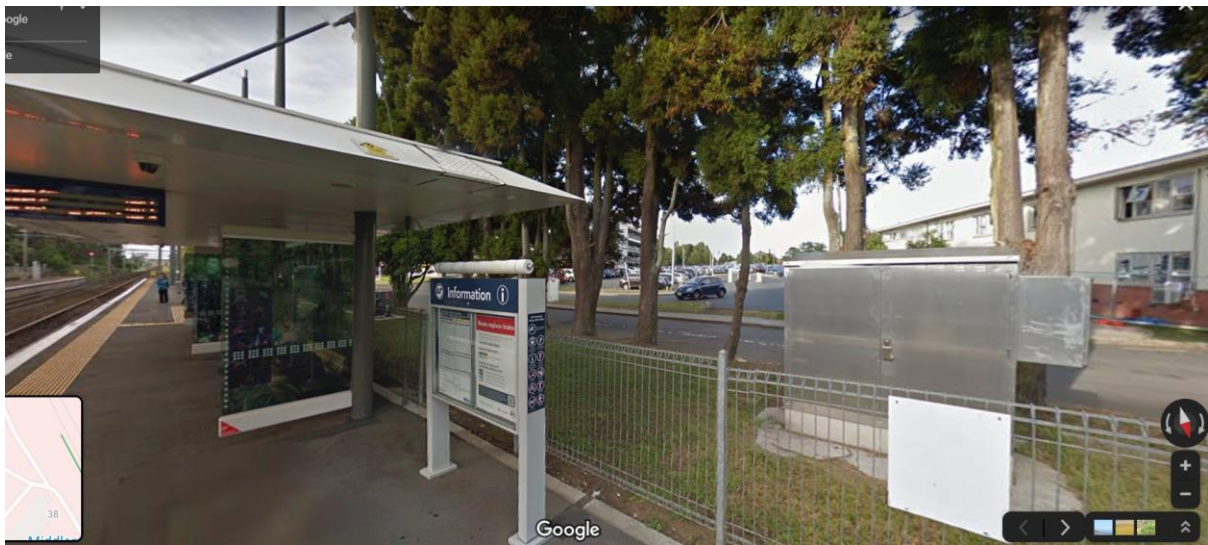
64 Rosella Road Mangere East



Property address	Legal Description	Land use	Area Required m2	Description	Temporary or Permanent Acquisition
64 Rosella Road, Mangere East	Lot 13 DP 19494	Residential	1,014	Whole Property	Full Permanent

100 Hospital Road (82 Gray Street and 15 Orakau Road)

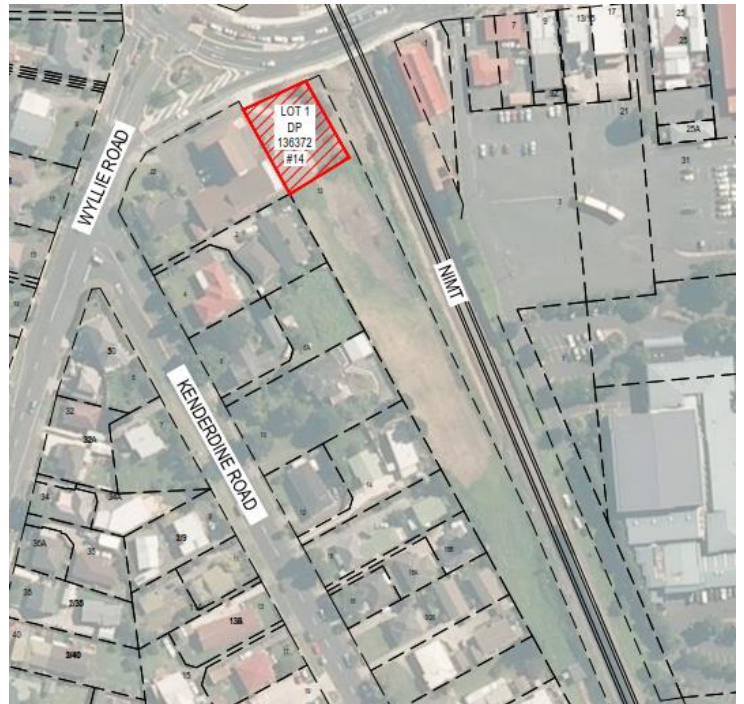




100 Hospital Road (82 Gray Ave and 15 Orakau Road)

Property address	Legal Description	Land use	Area Required m2	Description	Temporary or Permanent Acquisition
100 Hospital Road, Papatoetoe	Allotment 237 Parish of Manurewa (5 Orakau Rd), Part Lot 13 DP 2989 (83 Gray Ave)	Carpark	2,026	Soft landscaped entrance to hospital car park	Permanent
			631		Temporary

12 & 14 Wyllie Rd



12 Wyllie Rd -strip of land in background (Presbyterian Church not affected). Church car park/lawn at 14 Wyllie Road required for construction access.

Property address	Legal Description	Land use	Area Required m2	Description	Temporary or Permanent Acquisition
12 Wyllie Road, Papatoetoe	Lot 1 DP 152288	Park/reserve	1,165	Strip of parkland adjacent to rail corridor	Partial permanent
14 Wyllie Road	Lot 1 DP 136372	Church	924	Church car park	Temporary

18R Gordon Road



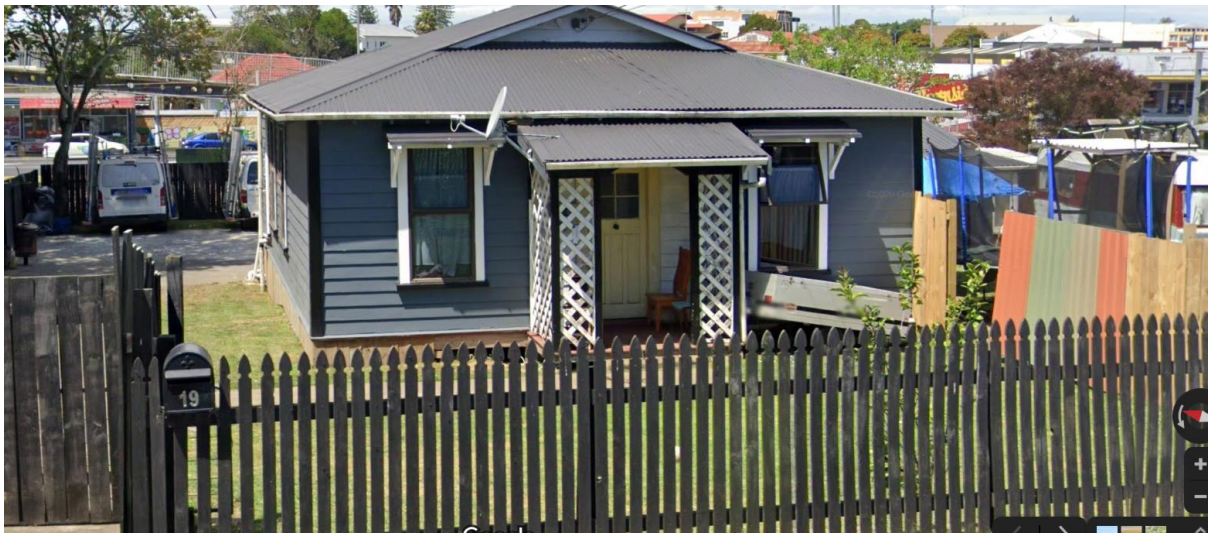
Property address	Legal Description	Land use	Area Required m2	Description	Temporary or Permanent Acquisition
18R Gordon Road	Lot 53 DP 20068, PT Allot 36 parish of Manurewa	Informal recreational reserve	2274	Construction access across Council reserve. May also be used as construction site yard	Temporary

21R Station Road



Property address	Legal Description	Land use	Area Required m2	Description	Temporary or Permanent Acquisition
21R Station Road, Papatoetoe	Lot 9 DP 111628	Park	52	SE corner of parkland adjacent to rail corridor	Partial permanent

19 Station Road



Property address	Legal Description	Land use	Area Required m2	Description	Temporary or Permanent Acquisition
19 Station Road, Papatoetoe	Lot 1 DP 111628	Residential	134	Strip to rear adjacent to rail corridor	Temporary lease

17 Station Road



Property address	Legal Description	Land use	Area Required m2	Description	Temporary or Permanent Acquisition
17 Station Road, Papatoetoe	Lot 2 DP 111628	Residential	116	Strip to rear adjacent to rail corridor	Temporary lease

15 Station Road



Property address	Legal Description	Land use	Area Required m2	Description	Temporary or Permanent Acquisition
15 Station Road, Papatoetoe	Lot 3 DP 111628	Residential	129	Strip to rear adjacent to rail corridor	Temporary lease

11 Station Road (no #13)



Property address	Legal Description	Land use	Area Required m2	Description	Temporary or Permanent Acquisition
11 Station Road, Papatoetoe	Lot 4 DP 111628	Residential	139	Strip to rear adjacent to rail corridor	Temporary lease

9 Station Road



Property address	Legal Description	Land use	Area Required m2	Description	Temporary or Permanent Acquisition
9 Station Road, Papatoetoe	Lot 5 DP 111628	Residential	781	Whole site	Full Permanent

5 Station Road



Property address	Legal Description	Land use	Area Required m2	Description	Temporary or Permanent Acquisition
5 Station Road, Papatoetoe	Lot 6 DP 111628	Residential	120	Not shown	Full Permanent

1 Station Road



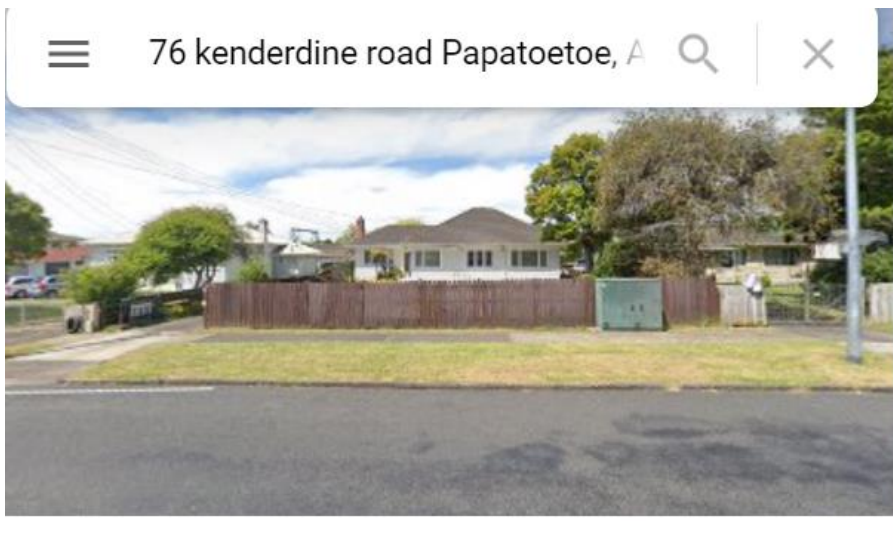
Property address	Legal Description	Land use	Area Required m2	Description	Temporary or Permanent Acquisition
1 Station Road, Papatoetoe	Lot 7 DP 111628	Residential	129	Strip to rear adjacent to rail corridor	Temporary lease

74D Kenderdine Road



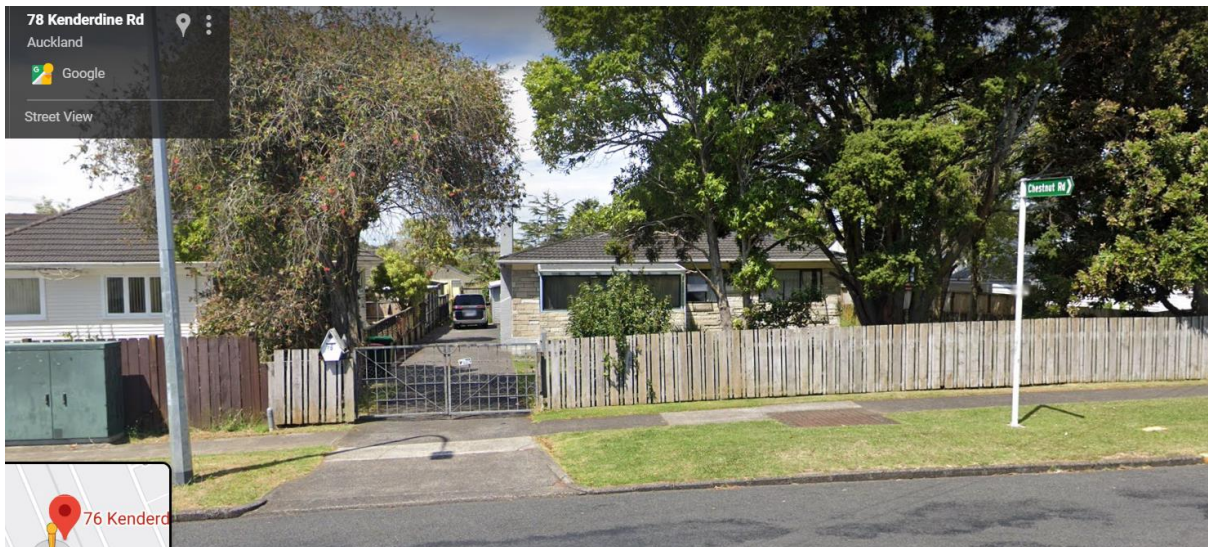
Property address	Legal Description	Land use	Area Required m2	Description	Temporary or Permanent Acquisition
74D Kenderdine Road, Papatoetoe	Lot 5 DP 327717 ¼ Lot 6 DP 327717	Residential	41	Contractor occupation	Temporary

76 Kenderdine Road



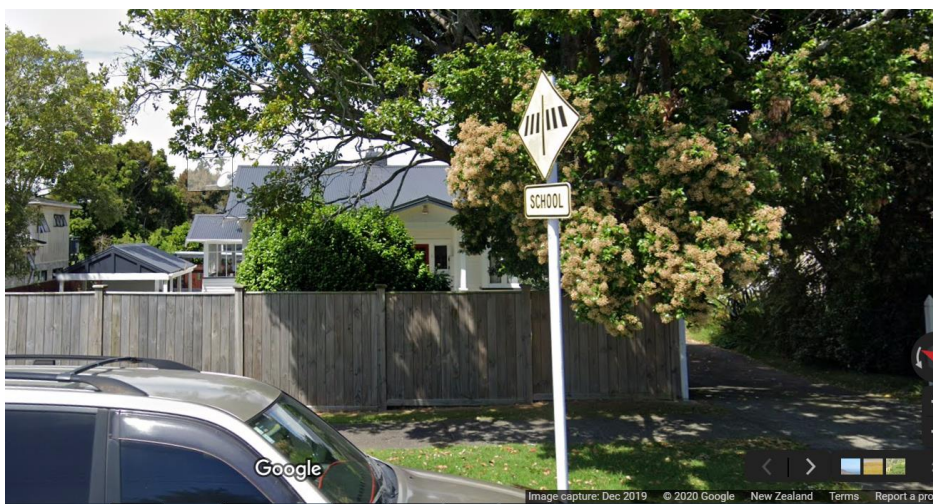
Property address	Legal Description	Land use	Area Required m2	Description	Temporary or Permanent Acquisition
76 Kenderdine Road, Papatoetoe	Pt Lot 30 DP 16605, Flat 1-4 DP 80955	Residential 4 No. dwellings	62	Strip to rear adjacent to rail corridor	Temporary Lease

78 Kenderdine Road



Property address	Legal Description	Land use	Area Required m2	Description	Temporary or Permanent Acquisition
78 Kenderdine Road, Papatoetoe	Pt Lot 30 DP 16605, Pt Lot 31 DP 16605	Residential	64	Strip to rear adjacent to rail corridor	Permanent

80 Kenderdine Road



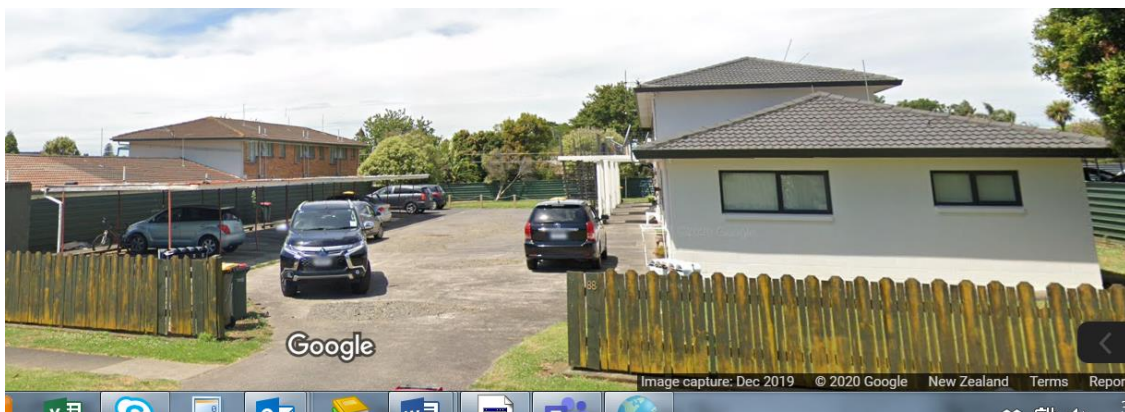
Property address	Legal Description	Land use	Area Required m2	Description	Temporary or Permanent Acquisition
80 Kenderdine Road, Papatoetoe	Part Lot 31 DP 16605	Residential 2? No. dwellings	63	Strip to rear adjacent to rail corridor	Temporary lease

84 Kenderdine Road



Property address	Legal Description	Land use	Area Required m2	Description	Temporary or Permanent Acquisition
84 Kenderdine Road, Papatoetoe	Lot 1 DP 70381	Residential Flats 9 No.	97	Strip to rear adjacent to rail corridor	Temporary lease

88 Kenderdine Road



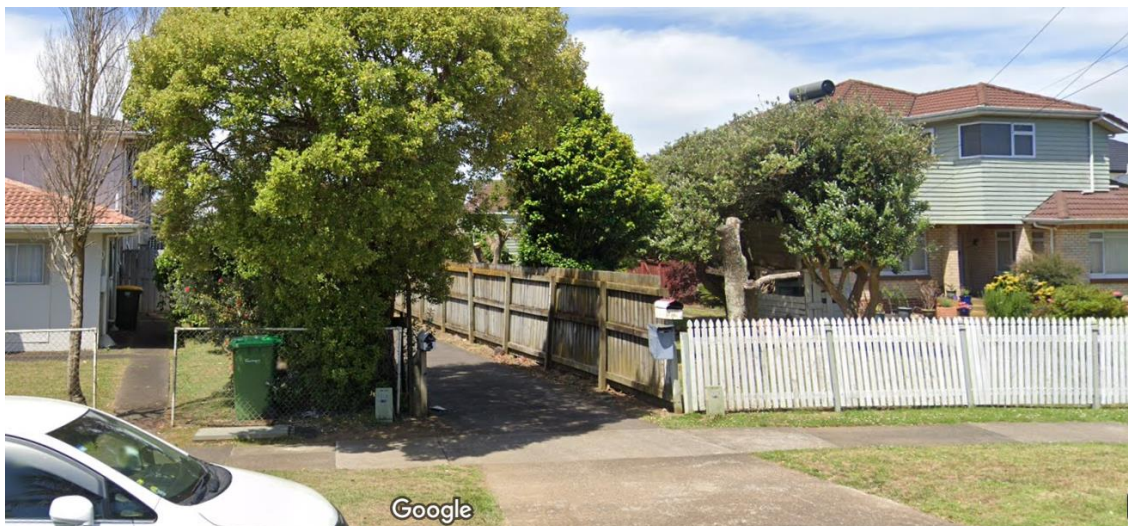
Property address	Legal Description	Land use	Area Required m2	Description	Temporary or Permanent Acquisition
88 Kenderdine Road, Papatoetoe	Lot 2 DP 70381	Residential	103	Strip to rear adjacent to rail corridor	Temporary lease

90 Kenderdine Road



Property address	Legal Description	Land use	Area Required m2	Description	Temporary or Permanent Acquisition
90 Kenderdine Road, Papatoetoe	Lot 34 DP 16605	Residential Flats (11 No.)	103	Strip adjacent to rail corridor	Temporary Lease

92 Kenderdine Road



Property address	Legal Description	Land use	Area Required m2	Description	Temporary or Permanent Acquisition
92 Kenderdine Road, Papatoetoe	Lot 2 DP 82259	Residential 3 No. dwellings	106	Strip to rear adjacent to rail corridor	Temporary lease

10 Bridge Street



Property address	Legal Description	Land use	Area Required m2	Description	Temporary or Permanent Acquisition
10 Bridge Street, Papatoetoe	Lot 22 DP 21411	Residential	841	Strip adjacent to rail corridor	Permanent

9 Bridge Street



Property address	Legal Description	Land use	Area Required m2	Description	Temporary or Permanent Acquisition
9 Bridge Street, Papatoetoe	Lot 27 DP 21411	Residential	858	Strip adjacent to rail corridor	Full Permanent

8 Bridge Street



☰ 8 Bridge Street, Papatoetoe, Auckland 🔍 ✕



Property address	Legal Description	Land use	Area Required m2	Description	Temporary or Permanent Acquisition
8 Bridge Street	Lot 21 DP 136372	Residential	77	Small strip of land across front yard to enable heavy vehicle access to 10 Bridge Street.	Temporary

Appendix B. Historical Aerial Imagery

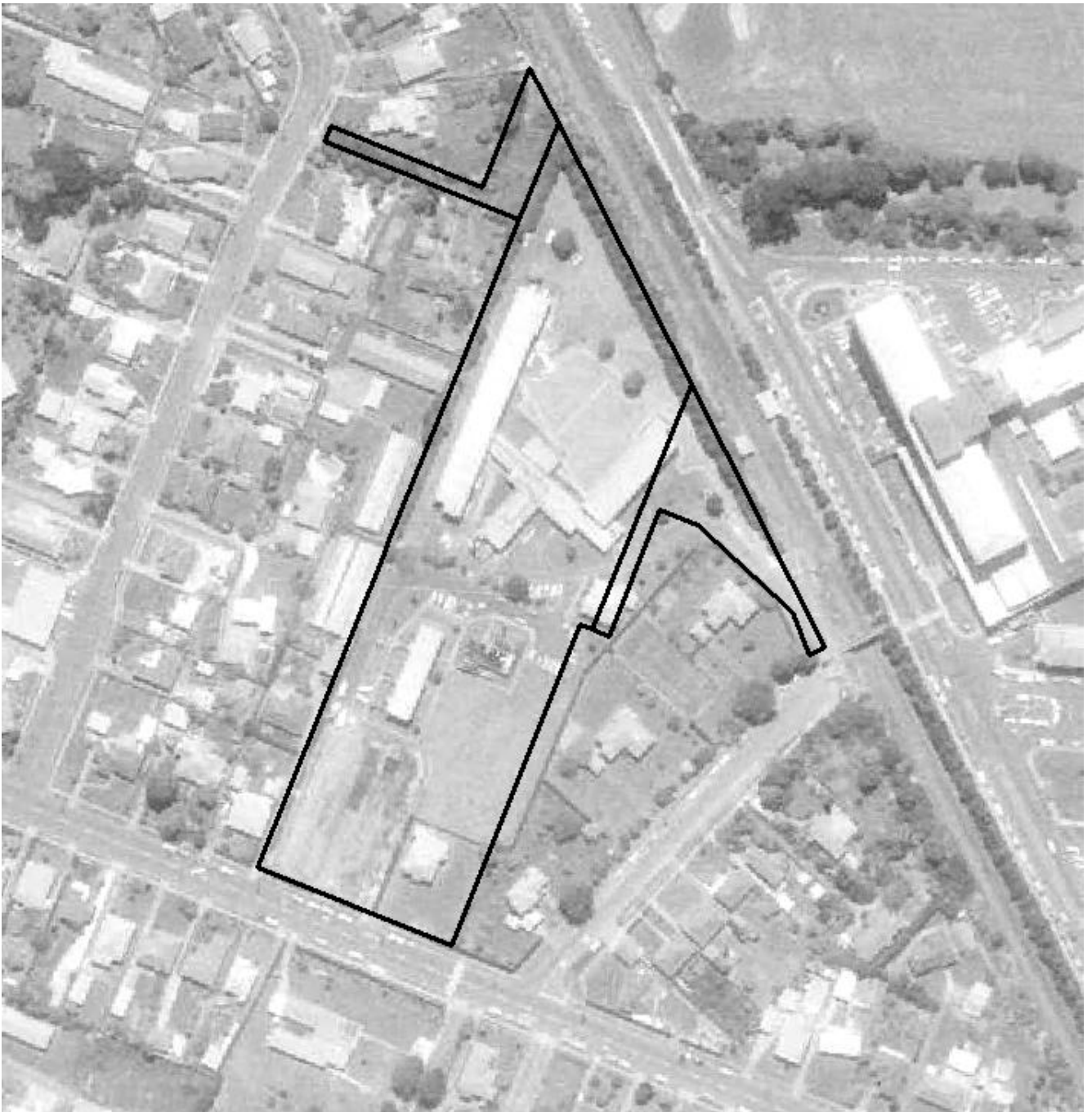
Part One – 64 Rosella Road, 82 Gray Avenue, and 15 Orakau Road



Historical aerial imagery from 1940 (Sourced from Retrolens). Approximate boundary of land parcels of interest is shown in black.



Historical aerial imagery from 1959 (Sourced from Auckland Council GEOMAPS). Approximate boundary of land parcels of interest is shown in black.



Historical aerial imagery from 1980 (Sourced from Retrolens). Approximate boundary of land parcels of interest is shown in black.



Historical aerial imagery from 1996 (Sourced from Auckland Council GEOMAPS). Approximate boundary of land parcels of interest is shown in black.

Part Two – 1-21 Station Road



Historical aerial imagery from 1939 (Sourced from Retrolens). Approximate boundary of land parcels of interest is shown in black.



Historical aerial imagery from 1959 (Sourced from Auckland Council GEOMAPS). Approximate boundary of land parcels of interest is shown in black.



Historical aerial imagery from 1959 (Sourced from Auckland Council GEOMAPS). Approximate boundary of 18R Gordon Road shown.



Historical aerial imagery from 1980 (Sourced from Retrolens). Approximate boundary of land parcels of interest is shown in black.



Historical aerial imagery from 2001 (Sourced from Auckland Council GEOMAPS). Approximate boundary of land parcels of interest is shown in black.



Historical aerial imagery from 2001 (Sourced from Auckland Council GEOMAPS). Approximate boundary of 18R Gordon Road shown.

Part Three – 12 & 14 Wyllie Road



Historical aerial imagery from 1939 (Sourced from Retrolens). Approximate boundary of land parcels of interest is shown in black.



Historical aerial imagery from 1956 (Sourced from Auckland Council GEOMAPS). Approximate boundary of land parcels of interest is shown in black.

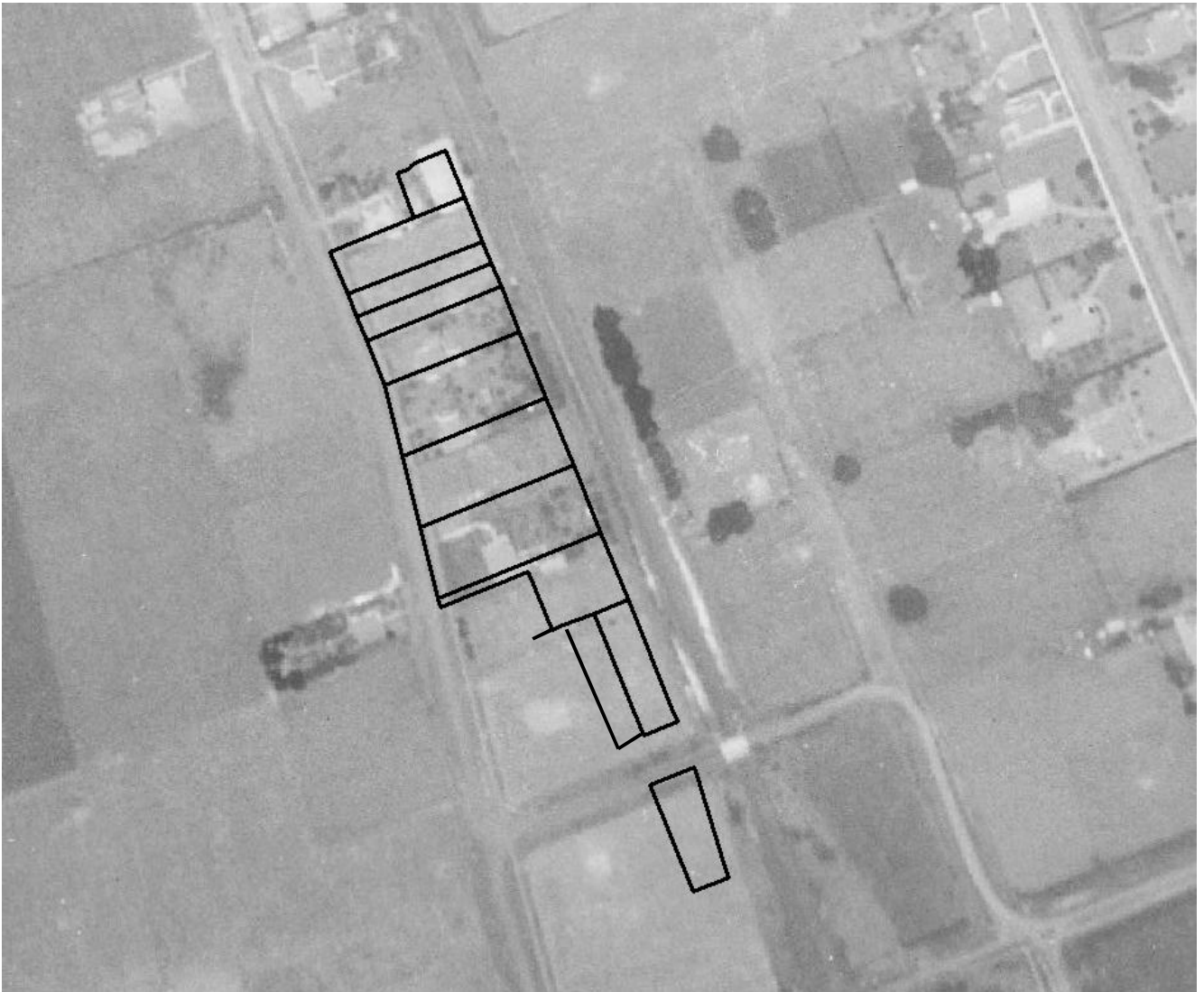


Historical aerial imagery from 1980 (Sourced from Retrolens). Approximate boundary of land parcels of interest is shown in black.



Historical aerial imagery from 2001 (Sourced from Auckland Council GEOMAPS). Approximate boundary of land parcels of interest is shown in black.

Part Four –Kenderdine Road & Bridge Street



Historical aerial imagery from 1939 (Sourced from Retrolens). Approximate boundary of land parcels of interest is shown in black.



Historical aerial imagery from 1959 (Sourced from Auckland Council GEOMAPS). Approximate boundary of land parcels of interest is shown in black.



Historical aerial imagery from 1980 (Sourced from Retrolens). Approximate boundary of land parcels of interest is shown in black.



Historical aerial imagery from 2001 (Sourced from Auckland Council GEOMAPS). Approximate boundary of land parcels of interest is shown in black.

Appendix C. AC Contamination Enquiry Response

From: Rachel Terlinden <rachel.terlinden@aucklandcouncil.govt.nz> **On Behalf Of**
RECContamination
Sent: Friday, 29 May 2020 4:26 PM
To: Tearney, Kevin <Kevin.Tearney@jacobs.com>
Subject: [EXTERNAL] RE: Contaminated Land/HAll status query

Hi Kevin,

This email is in response to your recent enquiry requesting available site contamination information that was held within the Environmental Health Unit of the Licensing and Compliance Services Department (LCS).

There is no contamination information held within our records for the site 64 Rosella Road, Mangere East. However, due to the adjacent railway there is potential for uncertified/non-engineered fill to be present on site.

There is no contamination information held within our records for the site 100 Hospital Road, Papatoetoe. However, due to the adjacent railway there is potential for uncertified/non-engineered fill to be present on site. Additionally, due to the age of the buildings on site the potential for asbestos and/or lead paint to be present may need to be considered.

There is no contamination information held within our records for the site 12 Wyllie Road, Papatoetoe. However, due to the adjacent railway there is potential for uncertified/non-engineered fill to be present on site.

There is no contamination information held within our records for the site 21R Station Road, Papatoetoe. However, due to the adjacent railway there is potential for uncertified/non-engineered fill to be present on site.

There is no contamination information held within our records for the site 1 Station Road, Papatoetoe. However, due to the adjacent railway there is potential for uncertified/non-engineered fill to be present on site. Additionally, due to the age of the dwelling on site the potential for presence of asbestos and/or lead paint may need to be considered.

There is no contamination information held within our records for the site 74D Kenderdine Road, Papatoetoe. However, due to the adjacent railway there is potential for uncertified/non-engineered fill to be present on site. Due to the age of the dwelling on site the potential for presence of asbestos and/or lead paint may need to be considered. In addition to this, Council's GIS aerial records indicate possible horticultural activity on site.



There is no contamination information held within our records for the site 74C Kenderdine Road, Papatoetoe. However, due to the adjacent railway there is potential for uncertified/non-engineered fill to be present on site. Due to the age of the dwelling on site the potential for presence of asbestos and/or lead paint may need to be considered. In addition to this, Council's GIS aerial records indicate possible horticultural activity on site in the form of a potential glasshouse.



Please note that only council's soil contamination records within the LCS department and GIS map have been checked. There may be other soil contamination information held within:

1. A Contaminated Sites Enquiry report, which contains the following information only:

(A search area of radius 200m is applied by default)

- Pollution Incidents (incl. air discharges, oil or diesel spills)
- Bores
- Contaminated site, air discharge and industrial trade process consents
- Closed Landfills (council- owned closed landfill sites only)
- Air quality permitted activities

How to apply for a Contaminated Sites Enquiry Response: DO NOT apply for this as part of a Property File request. Please follow this link -->

<https://www.aucklandcouncil.govt.nz/building-and-consents/types-resource-consents/earthworks/Pages/order-site-contamination-enquiry-report.aspx>

Please take note of the following when applying:

- Apply under the Company Name if request is on behalf of the company.
- Legal Description(s) of the physical site(s) is/are stated clearly. This is to ensure accurate representation of data.
- Enter preferred Postal Address or PO Box instead of physical address of company.
- Contact Person: Please enter your full name, including e-mail address.

2. Property File for viewing reports or all relevant information relating to the property -Requested from the local service centre, by phone, 09 3010101.

Please note:

If you are demolishing any building that may have asbestos containing materials (ACM) in it:

1. *You have obligations under the relevant regulations for the management and removal of asbestos, including the need to engage a Competent Asbestos Surveyor to confirm the presence or absence of any ACM.*
2. *Work may have to be carried out under the control of the person holding a WorkSafe NZ Certificate of Competence (CoC) for restricted works.*
3. *If any ACM is found, removal or demolition will have to meet the requirements of the Health and Safety at Work (Asbestos) Regulations 2016.*
4. *Information on asbestos containing materials and your obligations can be found at www.worksafe.govt.nz.*

If ACM is found on site following the demolition or removal of the existing buildings, you may be required to remediate the site and carry out validation sampling. Dependent on the amount of soil disturbance a further consent application may be required.

Paints used on external parts of properties up until the mid-1970's routinely contained lead, a poison and a persistent environmental pollutant. Older paints dating from before 1945 often contained extremely high levels of lead. Dust and flakes from painted surfaces in poor condition are a major cause of lead poisoning in both adults and children.

You are advised to ensure that soils affected by old, peeling or flaking paint are assessed in relation to the proposed use of the property. Very sensitive uses such as residential with young children, childcare centres, play areas or recreational land should be considered as high risk. In services or working environments other regulatory requirements may require risk assessment and mitigation.

Ngā mihi,
Rachel

**Rachel Terlinden | Technical Officer – Contamination, Air & Noise
Specialist Input | Resource Consents**

Mob 021956763

Auckland Council, Level 2, 35 Graham Street, Auckland

Visit our website: www.aucklandcouncil.govt.nz

From: Tearney, Kevin <Kevin.Tearney@jacobs.com>
Sent: Thursday, 21 May 2020 2:03 PM
To: RECContamination <reccontamination@aklc.govt.nz>
Subject: Contaminated Land/HAIL status query

Kia ora,

I am enquiring as to whether there are any council records or information held by Auckland Council that indicates the land parcels listed below, which are all located between Middlemore Hospital and Puhinui Station, are HAIL sites or have the potential to be HAIL sites?

- 64 Rosella Road Mangere East, Lot 13 DP 19494;
- 100 Hospital Road Papatoetoe, Allotment 237 Parish of Manurewa, Part Lot 13 DP 2989 Lot 10 DP 19627;
- 12 Wyllie Road Papatoetoe, Lot 1 DP 152288
- 21R Station Road Papatoetoe, Lot 9 DP 111628
- 1 Station Road Papatoetoe, Lot 7 DP 111628
- 74D Kenderdine Road Papatoetoe LOT 5 DP 327717, 1/4 SH LOT 6 DP 327717
- 74 C Kenderdine Road Papatoetoe LOT 4 DP 327717, 1/4 SH LOT 6 DP 327717

A response by Friday 29 May would be appreciated.

Thank you

Nga Mihi

Regards

Kevin Tearney, MSc, CEnvP SC | Jacobs | Principal Consultant - Environmental Solutions
+64 4 914 8472 | +64 29 496 3765 | kevin.tearney@jacobs.com
Level 8, 1 Grey Street Wellington 6011, New Zealand www.jacobs.com

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Have your say on Auckland's Emergency Budget 2020/2021.

*Together we can
recover stronger.*

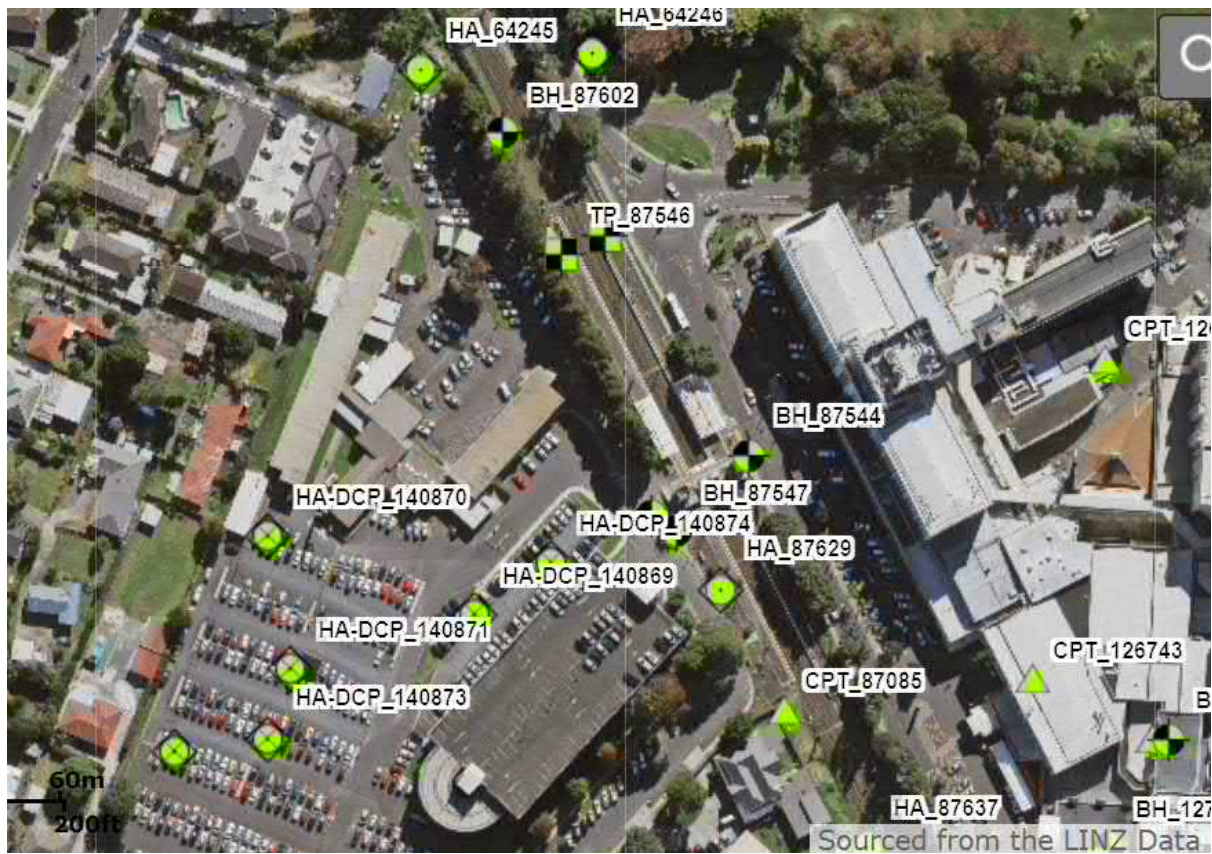
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Appendix D. NZGD Records

Part 1 Rosella Road and Hospital Road





PROJECT: **Middlemore Station**
 CLIENT: **ARTNL**
 LOCATION: **Western platform Middlemore Station**
 JOB No.: **51/20265/05**
 LOGGED BY: **SL**
 CHECKED BY: **TD**
 COMMENCED: **14/11/05**
 COMPLETED: **14/11/05**

Borehole No.: BH 1

Page: 1 of 3

CONTRACTOR: **Pro Drill**
 EQUIPMENT: **Small Kubota Tractor**
 INCLINATION (deg): - DIAMETER (mm): -
 X-COORDINATE: - Y-COORDINATE: -
 R.L. SURFACE (m): - TOTAL DEPTH (m): **23m**

Depth (m)	Geological Group	DESCRIPTION OF CORE Geological Formation: (name, weathering, relative strength, colour, cement, defect type, lithological features, bedding, foliation, mineralogy, etc)	SPT Blow Count	Test Result SPT 'N' Value Shear Strength (kPa)	Core Loss (%)	Spacing of Natural Defects (m)	Graphic Log	DEFECT DESCRIPTION (defect type, attitude, spacing, continuity, roughness, infilling etc) SOIL DESCRIPTION (minor MAJOR subordinate, consistency, water content, plasticity/relative density, grading, etc)	Piezometer Details and Water Levels	Water Loss (%)	Drilling Method
0								Ground Surface			
0.1	Fill	Railway platform						Asphalt			
0.2		Fill: Embankment for platform						GRAVEL with some sand and silt, well packed, dry, medium density, grey brown			
0.3		Fill: Engineered fill						silty CLAY, soft to firm, moist, slightly plastic, mottled orange brown			
0.4	Tauranga Group	Puketoka Formation- Fine grained pumiceous and micaceous sands, silts and muds with interbedded peats	1	N = 3	[REDACTED]	[REDACTED]	[REDACTED]	CLAY with some silt, firm, moist, moderately to highly plastic, alternating grey yellow orange brown bands	Standing @ 15/11/05	[REDACTED]	[REDACTED]
1.2			1					clayey SILT, firm to stiff, moist, slightly plastic, mottled yellow grey with medium grey SILT inclusions			
2.1			1	N = 1				fine pumiceous SAND with some clay, soft, moist to wet, mottled grey yellow light brown			
2.2			0					CLAY with a trace of silt, soft to firm, moist, moderately to highly plastic, brown orange with black streaks			
3.1			0	N = 1				SILT with some clay, firm to stiff, moist, black, organic staining, frequent fibrous inclusions- peaty material			
3.2			1					organic CLAY with some silt, soft to firm, moist to wet, moderately plastic, dark grey with black streak, occasional very thin pumiceous fine SAND layers			
4.1			1	N = 5				silty CLAY with some sand, soft to firm, moist, slightly to moderately plastic, medium grey			
4.2			3					pumiceous SAND with some silt, firm to stiff, wet, dark brown yellow grey			
5.1			1	N = 4				CLAY with some silt, soft to firm, slightly to moderately plastic, wet, light grey green alternating with fine layers of micaceous fine SAND with some silt, firm to stiff, wet, medium grey			
5.2			2					CLAY, soft, moist, moderately plastic, brown grey			
6.1	4	N = 37	CLAY with some silt, soft to firm, moderately plastic, wet, light grey green alternating with fine layers of micaceous fine SAND with some silt, firm to stiff, wet, medium grey								
6.2	17		CLAY, soft, moist, moderately plastic, brown grey								
6.3	20	fine SAND, firm to stiff, wet, medium density, light to medium grey									

Core Boxes -
 Shear Vane -
 Factor (as per NZGS Guideline)
 Core will be stored for 3 months only unless alternative arrangements are made



PROJECT: **Middlemore Station**
 CLIENT: **ARTNL**
 LOCATION: **Western platform Middlemore Station**
 JOB No.: **51/20265/05**
 LOGGED BY: **SL**
 CHECKED BY: **TD**
 COMMENCED: **14/11/05**
 COMPLETED: **14/11/05**

Borehole No.: BH 1

Page: 2 of 3

CONTRACTOR: **Pro Drill**
 EQUIPMENT: **Small Kubota Tractor**
 INCLINATION (deg): - DIAMETER (mm): -
 X-COORDINATE: - Y-COORDINATE: -
 R.L. SURFACE (m): - TOTAL DEPTH (m): **23m**

Depth (m)	Geological Group	DESCRIPTION OF CORE Geological Formation: (name, weathering, relative strength, colour, cement, defect type, lithological features, bedding, foliation, mineralogy, etc)	SPT Blow Count	Test Result SPT 'N' Value Shear Strength (kPa)	Core Loss (%)	Spacing of Natural Defects (m)	Graphic Log	DEFECT DESCRIPTION (defect type, attitude, spacing, continuity, roughness, infilling etc) SOIL DESCRIPTION (minor MAJOR subordinate, consistency, water content, plasticity/relative density, grading, etc)	Piezometer Details and Water Levels	Water Loss (%)	Drilling Method
11	Tauranga Group		2 2	N = 5				SILT with some clay and sand, firm to soft, wet, medium density, light grey with medium grey bands of SAND with some silt and clay, soft to firm, wet, medium density			Open barrel
12			1 2	N = 5							
13											
14			1 3 1	N = 4							
15											
15			1 1 0	N = 1		clayey SILT, soft to firm, moist to wet, slightly to moderately plastic, light grey brown					
16						SILT with trace fine sand, stiff, moist, medium density, light brown					
17			3 3 4	N = 7		CLAY with some silt, firm to stiff, moist, moderately plastic, light grey brown					
18						CLAY with some silt, soft, moderately plastic, medium grey green					
19			4 4 5	N = 9		CLAY with trace silt, soft, moist, moderately to highly plastic, dark grey brown, obvious banding					
19				silty CLAY, firm to stiff, moist, moderately plastic, light grey green, occasional organic inclusions- tree bark and branches							
20	10 20 24	N = 44		silty SAND, stiff to very stiff, well packed, high density, green grey							

Core Boxes -
 Shear Vane -
 Factor (as per NZGS Guideline)
 Core will be stored for 3 months only unless alternative arrangements are made



PROJECT: **Middlemore Station**
 CLIENT: **ARTNL**
 LOCATION: **Western platform Middlemore Station**
 JOB No.: **51/20265/05**
 LOGGED BY: **SL**
 CHECKED BY: **TB**
 COMMENCED: **14/11/05**
 COMPLETED: **14/11/05**

Borehole No.: BH 1

Page: 3 of 3

CONTRACTOR: **Pro Drill**
 EQUIPMENT: **Small Kubota Tractor**
 INCLINATION (deg): - DIAMETER (mm): -
 X-COORDINATE: - Y-COORDINATE: -
 R.L. SURFACE (m): - TOTAL DEPTH (m): **23m**

Depth (m)	Geological Group	DESCRIPTION OF CORE Geological Formation: (name, weathering, relative strength, colour, cement, defect type, lithological features, bedding, foliation, mineralogy, etc)	SPT Blow Count	Test Result SPT 'N' Value Shear Strength (kPa)	Core Loss (%)	Spacing of Natural Defects (m)	Graphic Log	DEFECT DESCRIPTION (defect type, attitude, spacing, continuity, roughness, infilling etc) SOIL DESCRIPTION (minor MAJOR subordinate, consistency, water content, plasticity/relative density, grading, etc)	Piezometer Details and Water Levels	Water Loss (%)	Drilling Method
21	Tauranga Group		7 10 10	N = 20				micaceous SAND with some silt and clay, firm to stiff, moist, very slightly plastic, medium density, dark grey green			Washdrilling
22										Washdrilling	
23				14 25 25 for 100mm	N = 50+						SPT
24								End of Borehole @ 23m. Target Depth			
25											
26											
27											
28											
29											
30											

Core Boxes -
 Shear Vane -
 Factor (as per NZGS Guideline)
 Core will be stored for 3 months only unless alternative arrangements are made



RECORD OF BOREHOLE

Job Name : **Middlemore Station**

Client : **GHD**

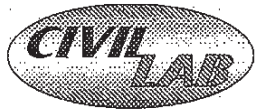
Date of Order : **23.7.04**

Location : **As per client's marks**

Borehole No. : **BH 3**

SHEAR STRENGTH (kPa)	REMOULDED STRENGTH (kPa)	SENSITIVITY	OTHER TESTS	DEPTH (m)	GRAPHIC LOG	SAMPLE DESCRIPTION	GROUNDWATER	CORE RECOVERY %	SAMPLE TYPE	MOISTURE CONTENT %	COMMENTS
				0.0		TOPSOIL					
216+	-			0.5		Firm to stiff, moderately plastic, orange/brown silty CLAY, moist					
183	90			1.0							
159	33			1.5		Firm to stiff, moderately plastic, orange/brown streaked yellow/brown clayey SILT and moist					
135	42			2.0							
96	30			2.5		- becoming firm, moderately plastic, yellow/brown flecked grey	▽				
27	21			3.0		- becoming soft and wet					
						- becoming soft, highly plastic, dark grey/black clayey SILT and wet					
48	36			3.5							
81	30			4.0							
39	30			4.5							
69	30			5.0							
						E.O.B. at 5.0 metres Scala carried out in base of borehole					
				5.5							

DRILLED BY: KH	SAMPLE TYPES	CHECKED BY: TB
DATE: 26.7.04	SS Small Sample	DATE: 29.07.04
LOGGED BY: ZH	LS Large Sample	
DATE: 26.7.04	SH Undisturbed Shelby Tube Sample	



DETERMINATION OF THE PENETRATION RESISTANCE OF A SOIL
NZS 4402 : 1988 TEST 6.5.2 - HAND METHOD USING A DYNAMIC CONE PENETROMETER
EQUIVALENT CBR VALUES TO CRB 402.1 - CRB AUSTRALIA

(Conversion to CBR values are not IANZ endorsed as part of this report)

Job Name: **Middlemore Station**
 Date of Order : 23.7.04
 Location : Base of borehole 3

Layer Tested : -

DEPTH	NO. OF BLOWS	EQUIV. CBR	DEPTH	NO. OF BLOWS	EQUIV. CBR	DEPTH	NO. OF BLOWS	EQUIV. CBR	DEPTH	NO. OF BLOWS	EQUIV. CBR
Borehole 3											
5100	1	2									
5200	2	3.5									
5300	2	3.5									
5400	4	8									
5500	4	8									
5600	4	8									
5700	5	10									
5800	5	10									
5900	3	5.5									
6000	3	5.5									

Comments:

Tested By:	ZH and KH	Date:	26.7.04
Checked By:	TB	Date:	29.07.04
Approved Signatory:		Date:	29.07.04



LOG OF MACHINE AUGER

HOLE IDENTIFICATION **MA59**

Client **KiwiRail**
 Project **Third Main**
 Project number **60044549**

Co-ordinates **406614.08mE 790840.47mN**
 Orientation **-90° Elevation 9.65m**
 Location **Papatoetoe**
 Feature **UM 662.336km**

Depth	GEOLOGICAL DESCRIPTION <small>Weathering, Colour, Fabric, Rock Name, Strength, Discontinuities, Lithological Features (bedding, foliation, mineralogy, cement, etc)</small>	Test Records Shear Vane (kPa) <small>Residual - Peak</small> 0 kPa 100 kPa 200 kPa	Sampling	Dynamic Cone Penetrometer (Blows per 100 mm) 2 4 6 8	MATERIAL DESCRIPTION <small>Subordinate MAJOR minor; colour; structure. Strength; moisture condition; grading; bedding; plasticity; sensitivity; major fraction description; subordinate fraction description; minor fraction description etc</small> Depth Related Remarks	Graphic Log	Instrumentation	
1	Railway Ballast			6	Medium to coarse GRAVEL with some TOPSOIL.			
	FILL	UTP		7	Fine to medium GRAVEL; grey. Loose, dry, rounded to subrounded.			
				10				
	1 to 1.4m: some sand.	UTP		8	Silty CLAY with minor sand; dark brown. Very stiff, dry, moderate plasticity.			
				9				
	2	Fine grained alluvium	UTP		10	GRAVEL; basalt.		
					8			
					4			
					5			
	3	TAURANGA GROUP			104/27	Silty CLAY; orange brown grading to light grey. Stiff to very stiff, moist, moderate to high plasticity.		
66/27								
41/27								
186*								
4				109/46	Sandy clayey SILT; dark grey and brown. Stiff, wet, high plasticity.			
					Sandy SILT with minor gravel and some organic fibres; dark grey. Very stiff, wet.			
					3.5 to 4m: some wood fragments.			
					MA59 terminated at 4m Target Depth			
<p><i>For explanation of symbols and observations, see key sheet</i></p> <p>GROUNDWATER OBSERVATIONS Depth (m) Date Post strike observations</p>				<p>Remarks Location surveyed by CKL. No ground water encountered 186 kPa is the shear vane limit</p>		<p>Started 13/12/2011 Finished 13/12/2011 Date logged 13/12/2011 Logged NG Checked RBG</p>		
<p>Hand held Shear Vane DR4280: 19mm blade: Correction Factor = 1.367 Vane shear strength per NZGS guideline</p>						<p>Page 1 of 1</p>		

MACHINE AUGERHOLE LOG WITH DCP COMPILED LOGS.GPJ BASE.GDT 14/03/12

Hand Auger No. **HA01**
 Sheet 1 of 1
 Project No: **GENZAUCK16136AA**
 Date started: **13.12.2013**
 Date completed: **13.12.2013**
 Logged by: **PP**
 Checked by: **RF**

Engineering Log - Hand Auger

Client: **AUCKLAND COUNCIL**
 Principal:
 Project: **ROSELLA ROAD STORMWATER CULVERT UPGRADE**
 Hand Auger Location: **Refer to site plan**

VanE No: 1356 Easting: 406590.31 m Slope: -90° R.L. Surface: 8.71 m
 Hole diameter: 50 mm Northing: 790857.86 m Bearing: Datum:

drilling information				material substance								
stratigraphy	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	Material Description	moisture condition	consistency/density index	vane shear (remoulded /peak) kPa	structure and additional observations	
Fill	▼ 13/12/2013		8.5	0.5			TOPSOIL	D	H			
			8.0				Clayey SILT; low plasticity, orange-brown, mottled dark brown, trace fine subangular gravel. Moist, hard, minor fine rootlets.	M				
			7.5				Silty CLAY; medium plasticity, dark brown, mottled dark brown/orange. Moist, very stiff - hard, trace fine rootlets.	VSt		>>>X		
			7.0				buried TOPSOIL; medium plasticity, dark grey, flecked black/orange. Moist, very stiff to hard, with trace fine rootlets.					
			6.5				CH Silty CLAY; medium to high plasticity, light grey streaked orange. Moist, very stiff, trace fine rootlets.					
			6.0				1.4m: becoming high plasticity, wet 1.5m: minor organic staining	W				
			5.5				1.8m: becoming saturated	S				
			5.0				PT PEAT; fibrous, spongy, dark brown, minor fine grained sand. Saturated, firm, organic odour, minor plant inclusions.	F				
			4.5				3.5m: becoming firm with some fibres compressed					
			4.0				CH Sandy CLAY; grey, some silt. Saturated, very stiff.	VSt				
3.5	4.8m: becoming medium dense - dense	D-Md										
3.5						Borehole HA01 terminated at 5 metres.						

classification symbols and soil description based on Field Description of Soil and Rock, New Zealand Geotechnical Society Inc 2005	vane shear (kPa) ● remoulded × peak >>>X peak greater than 200kPa UTP unable to penetrate	water ▼ 10/1/98 water level on date shown ▲ water inflow ◀ water outflow	moisture D dry M moist W wet S saturated	consistency/ density index VS very soft VL very loose S soft L loose F firm MD medium dense St stiff D dense VSt very stiff VD very dense H hard
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HAND AUGER HA1-2 13122013.GPJ COFFEY.GDT 3.2.14
 Form GEO 5.1 Rev.6
 Tauranga Group Alluvium



LOG OF AUGERHOLE

HOLE IDENTIFICATION

HA6

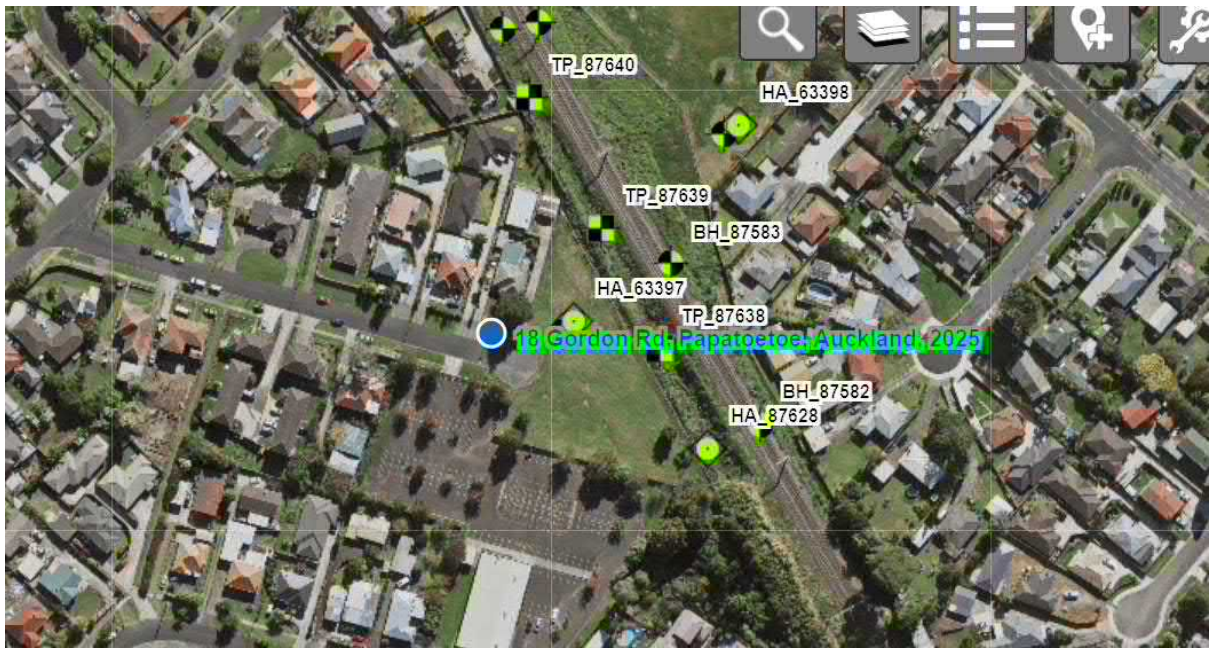
Client **KiwiRail**
 Project **Third Main**
 Project number **60044549**

Co-ordinates **406679.19mE 790710.03mN**
 Orientation **-90° Elevation 11.14m**
 Location **Papatoetoe**
 Feature **UM 662.220km**

Depth	GEOLOGICAL DESCRIPTION		Test Records Shear Vane (kPa) Residual - Peak 0 kPa 100 kPa 200 kPa	Sampling	Dynamic Cone Penetrometer (Blows per mm) 6 12 18 24	MATERIAL DESCRIPTION Subordinate MAJOR minor; colour; structure. Strength; moisture condition; grading; bedding; plasticity; sensitivity; major fraction description; subordinate fraction description; minor fraction description etc Depth Related Remarks	Graphic Log	Instrumentation						
	Weathering, Colour, Fabric, Rock Name, Strength, Discontinuities, Lithological Features (bedding, foliation, mineralogy, cement, etc)	Fine grained Alluvium comprising estuarine, reworked ignimbrite and organic swamp deposits.												
1	FILL.		120/63			Clayey SILT; brown. Firm, moist, low plasticity. Gravel with some SILT; brown. Medium dense, moist. Gravel is poorly graded. Silty CLAY with minor sand; dark brown. Very stiff, moist, slightly to moderately plastic, partly friable. 0.3 m Light brown.								
			186*			Silty CLAY; orange brown. Very stiff, moist, highly plastic. Some friable clasts of silt. 1.2m: light grey mottles with some rootlets.								
			156/74			Clayey SILT with minor sand; orange brown. Very stiff, moist, slightly plastic. Wood fragments 40mm maximum.								
2			131/38			Silty CLAY; pale orange brown with orange brown mottles. Moist, moderately plastic. Wood fragments.								
			161/68			2.1m: grades to sensitive.								
			123/38			Clayey SILT with minor sand; pale brown. Very stiff, moist, slightly plastic. Sand is pumiceous. 2.4m: minor gravel, gravel is angular basalt gravel.								
			68/38			2.6m: grades to light brown, wet. 2.7m: grades to whitish brown, dilatant.								
3			107/82			Peaty SILT with some pumice sand; dark brown to black. Stiff to very stiff, wet, slightly plastic, moderately sensitive.								
			107/55											
4			128/96											
			116/87			4.8m: Hole squeezing HA6 terminated at 5m Target Depth								
<p><i>For explanation of symbols and observations, see key sheet</i></p> <p>GROUNDWATER OBSERVATIONS</p> <table border="1"> <thead> <tr> <th>Depth (m)</th> <th>Date</th> <th>Post strike observations</th> </tr> </thead> <tbody> <tr> <td>1.85m.</td> <td>20/02/2012</td> <td></td> </tr> </tbody> </table> <p>Hand held Shear Vane DR4280: 19mm blade: Correction Factor = 1.367 Vane shear strength per NZGS guideline</p>				Depth (m)	Date	Post strike observations	1.85m.	20/02/2012		<p>Remarks</p> <p>No DCP undertaken due to location of nearby services. Location surveyed by CKL.</p> <p>186 kPa is the shear vane limit</p>			<p>Started 20/02/2012</p> <p>Finished 20/02/2012</p> <p>Date logged 20/02/2012</p> <p>Logged HM</p> <p>Checked RBG</p>	
Depth (m)	Date	Post strike observations												
1.85m.	20/02/2012													
							Page 1 of 1							

AUGERHOLE LOG UP TO 30# BLOW COUNTS COMPILED LOGS.GPJ BASE.GDT 14/03/12

Part 2 Gordon Road



Part 2 Station Road





LOG OF DRILLHOLE

HOLE IDENTIFICATION **DH3**

Client **KiwiRail**
 Project **Third Main**
 Project number **60044549**

Co-ordinates **407698.39mE 788898.12mN**
 Orientation **-90° Elevation 22.01m**
 Location **Papatoetoe**
 Feature **UM 660.14km**

GEOLOGICAL DESCRIPTION <small>Weathering, Colour, Fabric, Rock Name, Strength, Discontinuities, Lithological Features (bedding, foliation, mineralogy, cement, etc)</small>	Test Records		Drilling Method <small>Casing remarks</small>	Core Loss/Lift <small>0 - 100%</small>	Depth	Graphic Log	MATERIAL DESCRIPTION <small>Subordinate MAJOR minor; colour; structure. Strength; moisture condition; grading; bedding; plasticity; sensitivity; major fraction description; subordinate fraction description; minor fraction description etc</small>	Instrumentation
	Shear Vane <small>residual - peak 0 - 200 kPa</small>	N Values <small>0 - 50</small>						
FILL Topsoil Completely to highly weathered volcanic TUFF, extremely weak.			OB				SILT, dark brown. Soft, moist.	
	AUCKLAND VOLCANIC FIELD	UTP/		OB		1	Gravelly SILT with some fine to coarse sand; dark brown. Very stiff, moist, low plasticity. Gravel; fine to medium.	
		80/20		OB			Fine to coarse sandy GRAVEL with some silt; dark brown. Loose, wet, well graded. Gravel; fine to medium.	
		34/17		OB			Fine to coarse sandy SILT with some gravel; dark brown. Stiff to firm, moist, moderate plasticity. Gravel; fine to coarse.	
		6,4,3,6,12 N=25		SPT		2	Gravelly fine to coarse SAND with some silt; brown. Medium dense, moist, well graded. Gravel; fine to coarse.	
		UTP/		OB			Clayey SILT with some fine to coarse sand and minor gravel; brownish grey. Soft to firm, wet, low plasticity, sensitive. Gravel; fine to medium.	
		17/8		OB				
		67/17		OB		3		
		3,0,1,1,1 N=3		SPT			3m: Grades to light brown, stiff.	
				OB			CORELOSS	
TAURANGA GROUP Mixed Alluvium, comprising estuarine, swamp and reworked ignimbrite deposits	42/25		OB		4	Clayey SILT; light brownish grey. Firm, moist, high plasticity.		
	64/17		OB			Silty PEAT; dark brown. Firm, moist, plastic, amorphous.		
	1,1,0,0,2 N=3		SPT		5	Clayey SILT; light brownish grey. Stiff, moist, high plasticity.		
	40/10		OB			Clayey SILT; brownish grey with some black laminae and trace white streaks (pumiceous). Firm to stiff, moist, low plasticity, moderately sensitive.		
	50/7		OB		6	5.7m: Grades to light brownish grey with some white streaks (pumiceous).		
	1,1,1,1,2 N=5		SPT			PEAT; dark brown to black. Firm, moist, moderate plasticity, amorphous.		
	151/42		OB		7	7m: Stiff		
	151/67		OB					
	2,2,1,1,2 N=6		SPT		8	Clayey SILT; greyish brown with black streaks and lenses. Firm, moist, high plasticity.		
	75/17		OB			Grades to sandy SILT with some clay; grey. Stiff, moist, high plasticity.		
70/10		OB		9	Grades to silty fine to medium SAND with trace muscovite flecks; grey with trace black beds. Loose, moist, poorly graded.			
1,1,1,2,3 N=7		SPT			9.8m: Grades to fine to coarse sand.			
GROUNDWATER OBSERVATIONS Depth Piezometer Reading Date 7.31m 26/12/2011		Date logged 16/12/2011 Logged ÁMcC Checked RBG	Remarks Location surveyed by CKL. 235 kPa is the shear vane limit		Driller Pro-Drill Drill Rig Kubota Core Boxes	Started 16/12/2011 Finished 16/12/2011		
Casing Details Depth Diameter		Hand held Shear Vane GEO160: 19mm blade: Correction Factor = 1.676 <i>vane shear strength per NZGS guideline</i>		Page 1 of 2				

LOG SOIL FOR 3RD MAIN ONLY COMPILED LOGS.GPJ BASE.GDT 14/03/12



LOG OF DRILLHOLE

HOLE IDENTIFICATION **DH3**

Client **KiwiRail**
 Project **Third Main**
 Project number **60044549**

Co-ordinates **407698.39mE 788898.12mN**
 Orientation **-90° Elevation 22.01m**
 Location **Papatoetoe**
 Feature **UM 660.14km**

GEOLOGICAL DESCRIPTION <small>Weathering, Colour, Fabric, Rock Name, Strength, Discontinuities, Lithological Features (bedding, foliation, mineralogy, cement, etc)</small>	Test Records		Drilling Method <small>Casing remarks</small>	Core Loss/Lift <small>0 - 100%</small>	Depth	Graphic Log	MATERIAL DESCRIPTION <small>Subordinate MAJOR minor; colour; structure. Strength; moisture condition; grading; bedding; plasticity; sensitivity; major fraction description; subordinate fraction description; minor fraction description etc</small>	Instrumentation	
	Shear Vane <small>residual - peak 0 - 200 kPa</small>	N Values <small>0 - 50</small>							
Mixed Alluvium, comprising estuarine, swamp and reworked ignimbrite deposits			OB		11		Silty fine to coarse SAND with trace muscovite flecks; grey with trace black beds. Loose, moist, poorly graded.		
			SPT						
			OB		12				Sandy SILT with some clay and trace muscovite flecks; grey. Firm to stiff, moist, non plastic, sensitive.
		60/10 2,1,1,1,2 N=5	SPT						
			OB		13				Silty SAND with some gravel, minor muscovite flecks and trace rootlets; grey with dark orange brown organics. Loose, wet, well graded. Gravel is fine to medium, pumice.
		134/34 2,2,1,2,1 N=6	SPT						
			OB		14				Sandy SILT with some clay and trace muscovite flecks; grey with trace orange staining, black specks and dark brown laminae. Firm to stiff, moist, moderate plasticity.
		84/17 8,5,8,9,12 N=34	SPT						
			OB		15				Silty fine to coarse SAND; grey. Medium dense to dense, wet, well graded.
			SPT						
		OB		16					
		SPT							
		OB		17		CORE LOSS			
		SPT							
		OB		18			DH3 terminated at 18m Unable to advance due to hole collapse		
		SPT							
		OB		19					

GROUNDWATER OBSERVATIONS Depth Piezometer Reading Date	Date logged	16/12/2011	Remarks Location surveyed by CKL. 235 kPa is the shear vane limit	Driller	Started
	Logged	AMcC		Pro-Drill	16/12/2011
	Checked	RBG	Hand held Shear Vane GEO160: 19mm blade: Correction Factor = 1.676 vane shear strength per NZGS guideline	Drill Rig	Finished
	Casing Details Depth Diameter			Kubota	16/12/2011
			Core Boxes		
Page 2 of 2					

LOG SOIL FOR 3RD MAIN ONLY COMPILED LOGS.GPJ BASE.GDT 14/03/12

Kiwi Rail Ltd
Third Main – Puhinui Station to Otahuhu Station
Drillhole Photos (DH03)



DH03- 0.0 – 1.7m



DH03- 1.7 – 5.0m

Kiwi Rail Ltd
Third Main – Puhinui Station to Otahuhu Station
Drillhole Photos (DH03)



DH03- 5.0 – 8.0m



DH03- 8.0 - 11.0m

Kiwi Rail Ltd
Third Main – Puhinui Station to Otahuhu Station
Drillhole Photos (DH03)



DH03- 11.0 – 14.0m



DH03- 14.0 - 16.5m

Kiwi Rail Ltd
Third Main – Puhinui Station to Otahuhu Station
Drillhole Photos (DH03)



DH03- 16.5 - 18.0m



DH03- Site



LOG OF MACHINE AUGER

HOLE IDENTIFICATION **MA85**

Client **KiwiRail**
 Project **Third Main**
 Project number **60044549**

Co-ordinates **407679.97mE 788955.31mN**
 Orientation **-90° Elevation 18.79m**
 Location **Papatoetoe**
 Feature **UM 660.2km**

Depth	GEOLOGICAL DESCRIPTION <small>Weathering, Colour, Fabric, Rock Name, Strength, Discontinuities, Lithological Features (bedding, foliation, mineralogy, cement, etc)</small>	Test Records Shear Vane (kPa) <small>Residual - Peak</small> 0 kPa 100 kPa 200 kPa	Sampling	Dynamic Cone Penetrometer (Blows per mm) 2 4 6 8	MATERIAL DESCRIPTION <small>Subordinate MAJOR minor; colour; structure. Strength; moisture condition; grading; bedding; plasticity; sensitivity; major fraction description; subordinate fraction description; minor fraction description etc</small> Depth Related Remarks	Graphic Log	Instrumentation
0 - 1.0	Railway Ballast.	UTP			GRAVEL; grey. Loose, medium to coarse, subangular to angular basalt.		
1.0 - 1.3	Fine grained alluvial sediments including reworked ignimbrite deposits and organic swamp deposits.	130/38			Silty CLAY; grey. Very stiff, saturated, highly plastic.		
1.3 - 1.57		157/82			Clayey SILT; dark brown. Very stiff, saturated, low plasticity, sensitive, dilatant. 1.4m: Very light brown grey. 1.6m: light grey, flows on shaking, feels sensitive (shear vane not showing sensitivity).		
1.57 - 1.76		126/89					
1.76 - 1.86		186*			Organic SILT; dark brown. Very stiff, saturated, non plastic, sensitive, dilatant.		
1.86 - 1.96		96/38			Clayey SILT; light grey brown. Very stiff, saturated, low plasticity, sensitive, dilatant.		
1.96 - 2.15		186*			Silty CLAY; light yellow grey. Very stiff, saturated, highly plastic.		
2.15 - 2.34		186*			Poor recovery of pumiceous clayey SILT; whitish yellow with green mottles. Very stiff, saturated, non plastic, sensitive, dilatant. 3.7m: sandy.		
2.34 - 2.53		186*			Silty PEAT; dark brown to black. Very stiff, saturated, non plastic (or too wet to work to plastic limit), amorphous. 4m: clayey.		
2.53 - 2.72		186*					
2.72 - 2.91		186*			MA85 terminated at 4.5m Target Depth		
<p><i>For explanation of symbols and observations, see key sheet</i></p> <p>GROUNDWATER OBSERVATIONS Depth (m) Date Post strike observations 0m. 18/02/2012</p> <p>Hand held Shear Vane DR4280: 19mm blade: Correction Factor = 1.367 Vane shear strength per NZGS guideline</p>			<p>Remarks No DCP due to gravel from surface. Location surveyed by CKL. 186 kPa is the shear vane limit</p>		<p>Started 18/02/2012 Finished 18/02/2012 Date logged 18/02/2012 Logged RBG Checked HH</p> <p>Page 1 of 1</p>		

MACHINE AUGERHOLE LOG WITH DCP. COMPILED LOGS.GPJ BASE.GDT 14/03/12



Engineering Log - Hand Auger

Hand Auger No. **HA01**
 Sheet 1 of 1
 Project No: **GENZAUCK16152AA**
 Date started: **18.12.2013**
 Date completed: **18.12.2013**
 Logged by: **JJ**
 Checked by: **RF**

Client: **AUCKLAND COUNCIL**
 Principal:
 Project: **SWAFFIELD RD NIMT RAILWAY CULVERT UPGRADE**
 Hand Auger Location: **Refer to site plan**

Vane No: 591 Easting: m Slope: -90° R.L. Surface: 9.93 m
 Hole diameter: 50 mm Northing: m Bearing: Datum:

drilling information				material substance								
stratigraphy	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	Material Description	moisture condition	consistency/ density index	vane shear (remoulded / peak) kPa	structure and additional observations	
Fill	▼	18/12/2013	9.5	0.5			TOPSOIL; trace fine gravels	M	VSt			
			9.0	1.0		CL	Silty CLAY; low plasticity, brown, mottled orange and red, trace fine gravels up to 10mm in size. Moist, very stiff				UTP	
Tauranga Group Alluvium	▼		8.5	1.5			0.9m: contains minor sand inclusions				UTP	
			8.0	2.0			1.5m: fine scoria gravels up to 20mm in size					
			7.5	2.5		CL	CLAY; medium plastic, dark green/grey, speckled orange, with trace organic fragments and pieces of glass. Moist to wet, very stiff	M-W				
			7.0	3.0			2.5m: trace gravels and wood fragments, black/brown					
			6.5	3.5			2.8m: becomes wet	W	St			
			6.0	4.0		CH	Silty CLAY; medium plasticity, pale green/green, trace limonite flecks. Wet, stiff					
			5.5	4.5			4.2m: becomes light grey, speckled orange					
			5.0	5.0		SW	SAND; fine to medium grained, grey/green. Saturated, loose	S	L			
			4.5	5.5			Target Depth. Borehole HA01 terminated at 5 metres.					

classification symbols and soil description based on Field Description of Soil and Rock, New Zealand Geotechnical Society Inc 2005	vane shear (kPa) ● remoulded × peak >>× peak greater than 200kPa UTP unable to penetrate	water ▼ 10/1/98 water level on date shown ▲ water inflow ◀ water outflow	moisture D dry M moist W wet S saturated	consistency/ density index VS very soft VL very loose S soft L loose F firm MD medium dense St stiff D dense VSt very stiff VD very dense H hard
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Form GEO 5.1 Rev.6
 HAND AUGER HA01-HA02.GPJ COFFEY, GDT 26.2.14



LOG OF AUGERHOLE

HOLE IDENTIFICATION **HA1**

Client **KiwiRail**
 Project **Third Main**
 Project number **60044549**

Co-ordinates **407182.55mE 789770.44mN**
 Orientation **-90° Elevation 10.62m**
 Location **Papatoetoe**
 Feature **Gordon Park**

Depth	GEOLOGICAL DESCRIPTION		Test Records	Sampling	Dynamic Cone Penetrometer (Blows per 100 mm)	MATERIAL DESCRIPTION <small>Subordinate MAJOR minor; colour; structure. Strength; moisture condition; grading; bedding; plasticity; sensitivity; major fraction description; subordinate fraction description; minor fraction description etc</small>	Graphic Log	Instrumentation
	<small>Weathering, Colour, Fabric, Rock Name, Strength, Discontinuities, Lithological Features (bedding, foliation, mineralogy, cement, etc)</small>							
1	FILL	Fill	Shear Vane (kPa) <small>Residual - Peak</small> 0 kPa 100 kPa 200 kPa		1 1 2 2 3 3 3 6 5 6	SILT with some clay and minor sand; dark brown. Firm, moist, low plasticity.		
		Mixed sand and fine grained alluvium				187/28 228* 68/7		
2	TAURANGA GROUP		UTP			SAND with some silt; dark grey. Tightly packed, saturated.		
3			UTP			Organic clayey SILT; dark brown. Stiff, saturated, low plasticity. Wood piece 15cm length.		
4			UTP			HA1 terminated at 3.5m Unable to advance due to squeezing		
For explanation of symbols and observations, see key sheet GROUNDWATER OBSERVATIONS Depth (m) Date Post strike observations 1.1m. 1/02/2012						Remarks Location surveyed by CKL. 228 kPa is the shear vane limit		Started 01/02/2012 Finished 01/02/2012 Date logged 01/02/2012 Logged SLR Checked RBG
Hand held Shear Vane DR1980: 19mm blade: Correction Factor = 1.837 Vane shear strength per NZGS guideline						Page 1 of 1		

AUGERHOLE LOG UP TO 30# BLOW COUNTS COMPILED LOGS.GPJ BASE.GDT 14/03/12



LOG OF AUGERHOLE

HOLE IDENTIFICATION **HA8**

Client **KiwiRail**
 Project **Third Main**
 Project number **60044549**

Co-ordinates **407671.68mE 788957.91mN**
 Orientation **-90° Elevation 21.34m**
 Location **Papatoetoe**
 Feature **UM 660.2 km**

Depth	GEOLOGICAL DESCRIPTION		Test Records		Sampling	Dynamic Cone Penetrometer (Blows per mm)	MATERIAL DESCRIPTION <small>Subordinate MAJOR minor; colour; structure. Strength; moisture condition; grading; bedding; plasticity; sensitivity; major fraction description; subordinate fraction description; minor fraction description etc</small>	Graphic Log	Instrumentation	
	Weathering, Colour, Fabric, Rock Name, Strength, Discontinuities, Lithological Features (bedding, foliation, mineralogy, cement, etc)	Fill	Shear Vane (kPa) <small>Residual - Peak</small>	0 kPa 100 kPa 200 kPa						
1	FILL	Fill					SILT; brown. Firm to stiff, dry, friable, many rootlets, some gravel (Fill).			
	AVF	Completely weathered grey brown volcanic Tuff, extremely weak.	79/22				Silty CLAY with trace gravel; light grey brown with light yellow brown and orange mottles. Stiff, moist, low plasticity. Fine to medium gravel.			
			185/27				Clayey SILT with some gravel; grey brown. Stiff, wet, non plastic, sensitive. Medium to coarse gravel of black volcanics (Basalt) and trace sand including muscovite flecks. Many plant fragments. 0.6m: sandy 0.8m: grades to very sandy SILT, saturated. 1m: Very stiff, light brown grey, dilatant, with trace coarse sand to fine gravel sized rounded volcanic lapilli.			
							HA8 terminated at 1.1m Unable to advance as too difficult to auger			
2							Hard layer at 1.1 m depth corresponds to hard layer encountered in cut slope 20m south of handauger hole. Described as 15cm layer of weak, moderately weathered, coarse volcanic TUFF comprised of fine to coarse sand sized, angular, light grey brown pieces of scoria. Underlain by 20cm layer of very weak, grey brown, SILTSTONE, probably baked volcanic airfall tephra. Overlying sandy SILT, grey brown, stiff, moist.			
3										
4										
<p><i>For explanation of symbols and observations, see key sheet</i></p> <p>GROUNDWATER OBSERVATIONS Depth (m) Date Post strike observations 0.8m. 21/02/2012</p> <p>Hand held Shear Vane DR4280: 19mm blade: Correction Factor = 1.367 Vane shear strength per NZGS guideline</p>					<p>Remarks Location surveyed by CKL. 191 kPa is the shear vane limit</p>			<p>Started 21/02/2012 Finished 21/02/2012 Date logged 21/02/2012 Logged RBG Checked HH</p>		
								Page 1 of 1		

AUGERHOLE LOG UP TO 30# BLOW COUNTS COMPILED LOGS.GPJ BASE.GDT 14/03/12

Part 3 12/14 Wyllie Road





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Client: **ONTRACK**
Project: **Auckland Electrification Project**
Location: **St George St Church, Papatoetoe**
Project Reference: **203299**

DH101

Sheet 1 of 8

DRILLING INFORMATION		CO-ORDINATES [ME2000]		Date Started: 25/06/2010	
Drilling Method: Truck Mounted Drill Rig		Easting: 407703.86		Date Completed: 30/06/2010	
Diameter Core: HQ (60mm)		Northing: 788855.54		Inclination: 90°	
Flush: Water		Ground Level: 23.59m		Orientation:	
Contractor: Boart Longyear		[Auckland 1946 ms]			

Drilling Method	R.L. (m)	Depth (m)	Sample Type	Water Level (m)	Graphic Log	Geological Name	Layer Code	Description of Materials	Weathering/USCS	TCR (%)	SCR (%)	RQD (%)	Fracture Index	Standard Penetration Tests [SPT]		Additional Information (Defect Description)	Installation Details
														Peak/Residual 'Su' or Blows	'N' Value		
	23.5					Fill	F	0m: Clayey SILT with minor fine sand, dark brown. Soft, wet, high plasticity. Frequent rootlets. [TOPSOIL]. 0.1m: Silty GRAVEL, dark brown. Loose, wet. Angular, 10-30mm in size. Frequent rootlets. [FILL]. 0.35m: Clayey SILT with some fine sand, mottled orange brown and light grey. Firm to stiff, wet, high plasticity. Frequent rootlets. (TUFF).	GM							0m: FILL Representative samples taken from hand auger cuttings.	
	23.0					Auckland Volcanic Field	VT	1.5m: ...50mm band of medium SAND, orange brown. Medium dense, wet, non plastic. 1.55m: Fine sandy SILT, medium brown. Firm to stiff, wet, low plasticity.	MH	50				3/1,1,1,1	4	0.35m: AUCKLAND VOLCANIC FIELD	
	22.5							2.2m: ...increase in sand content, some fine gravels (<0.5mm). 2.25m: Sandy clayey SILT, banded orange brown and light grey. Firm to stiff, wet, low plasticity.	ML	67							
	22.0							2.6m: Very clayey SILT, orange brown. Firm to stiff, wet, high plasticity. 2.7m: ...light brownish grey with discrete orange brown streaks and brown organic streaks.	MH	89				0/0,1,1,2	4		
	21.5							3.3m: ...light to medium grey.	MH	86							
	21.0								MH	100							
	20.5								MH	33							
	20.0																
	19.5																
	19.0					Paleosol	T	4.5m: Very clayey SILT, medium grey with dark brown organic staining. Very soft, wet, high plasticity. 4.7m: Very clayey SILT, light to medium grey with dark brown organic staining. Very soft, wet, high plasticity. minor medium to coarse white pumiceous sand. [TAURANGA GROUP].						1/0,0,0,0	0	4.5m: PALEOSOL 4.7m: TAURANGA GROUP	

Remarks:														Logged: HH	
1. Hand Auger to 1.2mbgl for service check.														Input: HH	
2. Casing to 24.0mbgl.														Checked: PKC	
3. No groundwater measured on the day of drilling.														Verified: AJB	
4. Hole backfilled with gravel and bentonite.															

Last Generated: 12/07/2010 2:10:29 p.m.



Client: **ONTRACK**
Project: **Auckland Electrification Project**
Location: **St George St Church, Papatoetoe**
Project Reference: **203299**

DH101

Sheet 2 of 8

DRILLING INFORMATION Drilling Method: Truck Mounted Drill Rig Diameter Core: HQ (60mm) Flush: Water Contractor: Boart Longyear		CO-ORDINATES [ME2000] Easting: 407703.86 Northing: 788855.54 Ground Level: 23.59m [Auckland 1946 msl]		Date Started: 25/06/2010 Date Completed: 30/06/2010 Inclination: 90° Orientation:	
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Drilling Method	R.L. (m)	Depth (m)	Sample Type	Water Level (m)	Graphic Log	Geological Name	Layer Code	Description of Materials	Weathering/USCS	TCR (%)	SCR (%)	RQD (%)	Fracture Index	Standard Penetration Tests [SPT]		Additional Information (Defect Description)	Installation Details
														Peak/Residual 'Su' or Blows	'N' Value		
HQ3	18.5				X			4.7m: Very clayey SILT, light to medium grey with dark brown organic staining. Very soft, wet, high plasticity. minor medium to coarse white pumiceous sand. [TAURANGA GROUP].		67						4.95m: Core loss likely between 4.95 to 5.3m.	
HQ3	18.0	6			X		ATI	5.8m: ...medium to dark brown (organic stained). Some thin interbeds (<30mm) of PEAT, black. Very soft, wet. Amorphous.	MH							6m: Attempted push tube - sample slipped out.	
HQ3	17.5	7			X		ATI	7.2m: ...100mm band of fine sandy SILT, light grey with dark brown organic staining. Firm, wet, low plasticity.		100							
SPT	17.0				X		Tauranga Group	7.35m: Organic clayey SILT/ PEAT, black. Very soft, wet, high plasticity. Plastic, amorphous and discrete wood fragments.						2/1,2,2,2	7		
HQ3	16.5				X												
SPT	16.0	8			X		ATo		OH							8.41m: Core loss likely between 8.41 to 9.0m.	
HQ3	15.5				X												
SPT	15.0				X									0/0,0,0,0	0	9m: Zero SPT values resulting from hammer weight.	
HQ3	14.5	9			X												
SPT	14.0				X												
HQ3	14.0	10			X		ATc		CH								

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- Remarks:**
1. Hand Auger to 1.2mbgl for service check.
 2. Casing to 24.0mbgl.
 3. No groundwater measured on the day of drilling.
 4. Hole backfilled with gravel and bentonite.

Logged: HH
 Input: HH
 Checked: PKC
 Verified: AJB



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Client: **ONTRACK**
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Location: **St George St Church, Papatoetoe**
Project Reference: **203299**

DH101

Sheet 3 of 8

DRILLING INFORMATION Drilling Method: Truck Mounted Drill Rig Diameter Core: HQ (60mm) Flush: Water Contractor: Boart Longyear		CO-ORDINATES [ME2000] Easting: 407703.86 Northing: 788855.54 Ground Level: 23.59m [Auckland 1946 msl]		Date Started: 25/06/2010 Date Completed: 30/06/2010 Inclination: 90° Orientation:	
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Drilling Method	R.L. (m)	Depth (m)	Sample Type	Water Level (m)	Graphic Log	Geological Name	Layer Code	Description of Materials	Weathering/USCS	TCR (%)	SCR (%)	RQD (%)	Fracture Index	Standard Penetration Tests [SPT]		Additional Information (Defect Description)	Installation Details			
														Peak/Residual 'Su' or Blows	'N' Value					
HQ3	13.5					Tauranga Group	ATc	9.75m: CLAY with some silt, light to medium brownish grey. Very soft, wet, high plasticity. Frequent dark brown amorphous organic streaks.	CH	100							10.5m: Attempted push tube -sample slipped out.			
	13.0			ATI			10.4m: Clayey SILT with trace fine sand, medium grey. Soft, wet, high plasticity. Discrete dark brown organic fragments.	MH												
	11						ML	10.65m: Fine sandy SILT, light to medium grey. Soft to firm, wet, low plasticity. Some mica specks. Some greyish green lenses and discrete dark brown organic fragments.												
	12.5							SM	11.05m: Silty fine SAND with trace clay, medium grey. Medium dense, wet, low plasticity. Some mica specks. 11.15m: to 11.35m... brown (organic stained) with discrete black organic streaks.		100									
	12.0								PT	12m: PEAT, black. Firm to stiff, wet. Amorphous and fibrous.					5/4,8,9,8	29				
	11.5									12.3m: Silty fine SAND, medium grey. Medium dense, wet, non plastic. Some mica specks. 12.45m: ...very loose.										
	12									13.5m: ...trace clay.										
	11.0									13.9m: Clayey SILT with trace fine sand, medium grey. Firm, wet, high plasticity. Some mica specks. Discrete sandy lenses.	MH	90								
	10.5									14.6m: Fine SAND, medium grey. Loose, wet, non plastic. Some mica specks. Discrete lenses of CLAY, medium grey. Soft, wet, high plasticity. Trace siltstone gravels, firm, rounded (<15mm).	SW	90								
	10.0															3/0,0,0,2			2	

Remarks: 1. Hand Auger to 1.2mbgl for service check. 2. Casing to 24.0mbgl. 3. No groundwater measured on the day of drilling. 4. Hole backfilled with gravel and bentonite.												Logged: HH Input: HH Checked: PKC Verified: AJB
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Client: **ONTRACK**
Project: **Auckland Electrification Project**
Location: **St George St Church, Papatoetoe**
Project Reference: **203299**

DH101

DRILLING INFORMATION Drilling Method: Truck Mounted Drill Rig Diameter Core: HQ (60mm) Flush: Water Contractor: Boart Longyear		CO-ORDINATES [ME2000] Easting: 407703.86 Northing: 788855.54 Ground Level: 23.59m [Auckland 1946 msl]		Date Started: 25/06/2010 Date Completed: 30/06/2010 Inclination: 90° Orientation:	
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Drilling Method	R.L. (m)	Depth (m)	Sample Type	Water Level (m)	Graphic Log	Geological Name	Layer Code	Description of Materials	Weathering/USCS	TCR (%)	SCR (%)	RQD (%)	Fracture Index	Standard Penetration Tests [SPT]		Additional Information (Defect Description)	Installation Details	
														Peak/Residual 'Su' or Blows	'N' Value			
SPT	8.5						ATs	14.6m: Fine SAND, medium grey. Loose, wet, non plastic. Some mica specks. Discrete lenses of CLAY, medium grey. Soft, wet, high plasticity. Trace siltstone gravels, firm, rounded (<15mm).	SW	0				2/1,0,1,2	4			
HQ3	8.0						ATI	15.45m: Clayey SILT with some fine sand, medium grey. Firm, wet, low plasticity. Some mica specks.	ML									
HQ3	7.5							15.88m: Clayey SILT with some fine sand, medium grey. Soft to firm, wet, high plasticity. Some mica specks and discrete sandy lenses.		95								
SPT	7.0							16.3m: Sandy clayey SILT, medium grey. Soft, wet, high plasticity. Some mica specks.	MH						1/0,0,1,2	3		
HQ3	6.5						Tauranga Group	16.8m: Silty SAND with some clay, medium grey. Very loose, wet, low plasticity. Some mica specks.	SM									
HQ3	6.0							17.45m: Fine to medium SAND, medium grey. Loose, wet, non plastic. Some mica specks.		90								
SPT	5.5						ATs	18m: ...medium dense.		100				2/1,3,5,8	17			
HQ3	5.0																	
SPT	4.5																	
SPT	4.0							19.5m: ...very dense.		100				10/12,14,19,5	64			
	20																	

Remarks:
 1. Hand Auger to 1.2mbgl for service check.
 2. Casing to 24.0mbgl.
 3. No groundwater measured on the day of drilling.
 4. Hole backfilled with gravel and bentonite.

Logged: HH
 Input: HH
 Checked: PKC
 Verified: AJB

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Client: **ONTRACK**
Project: **Auckland Electrification Project**
Location: **St George St Church, Papatoetoe**
Project Reference: **203299**

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Sheet 5 of 8

DRILLING INFORMATION				CO-ORDINATES [ME2000]				Date Started: 25/06/2010 Date Completed: 30/06/2010									
Drilling Method: Truck Mounted Drill Rig Diameter Core: HQ (60mm) Flush: Water Contractor: Boart Longyear				Easting: 407703.86 Northing: 788855.54 Ground Level: 23.59m [Auckland 1946 msl]				Inclination: 90° Orientation:									
Drilling Method	R.L. (m)	Depth (m)	Sample Type	Water Level (m)	Graphic Log	Geological Name	Layer Code	Description of Materials	Weathering/USCS	TCR (%)	SCR (%)	RQD (%)	Fracture Index	Standard Penetration Tests [SPT]		Additional Information (Defect Description)	Installation Details
														Peak/Residual 'Su' or Blows	'N' Value		
HQ3	3.5							17.45m: Fine to medium SAND, medium grey. Loose, wet, non plastic. Some mica specks.		100						19.885m: <i>Drillers Note</i> change to extended catcher. Add quick mud.	
HQ3	3.0									0						20.5m: <i>Drillers Note</i> change to normal catcher. Material washed out.	
SPT	2.5	21						21m: ...dense.		100			12/7,9,12,14	42		21.45m: <i>Drillers Note</i> change bit to a clay coring bit. Applying 800psi to core material.	
HQ3	2.0									47						21.45m: <i>Drillers Note</i> change bit to a clay coring bit. Applying 800psi to core material.	
HQ3	1.5	22								67							
SPT	1.0							22.5m: ...very dense.	SW	100			20/18,22,10,1	86		22.5m: SPT - 50 blows for 175mm.	
HQ3	0.5	23								53						22.825m: <i>Drillers Note</i> add quick mud.	
HQ3	0.0									56						23.2m: <i>Drillers Note</i> add quick mud.	
SPT	-0.5	24						24m: ...dense.		67			22/16,14,9,10	49			
HQ3	-1.0									8						24.45m: <i>Drillers Note</i> change bit and ream casing to 16.0mbgl.	
Remarks: 1. Hand Auger to 1.2mbgl for service check. 2. Casing to 24.0mbgl. 3. No groundwater measured on the day of drilling. 4. Hole backfilled with gravel and bentonite.																	
															Logged:	HH	
															Input:	HH	
															Checked:	PKC	
															Verified:	AJB	

Last Generated: 12/07/2010 2:10:30 p.m.



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Client: **ONTRACK**
Project: **Auckland Electrification Project**
Location: **St George St Church, Papatoetoe**
Project Reference: **203299**

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Sheet 6 of 8

DRILLING INFORMATION				CO-ORDINATES [ME2000]				Date Started: 25/06/2010 Date Completed: 30/06/2010									
Drilling Method: Truck Mounted Drill Rig Diameter Core: HQ (60mm) Flush: Water Contractor: Boart Longyear				Easting: 407703.86 Northing: 788855.54 Ground Level: 23.59m [Auckland 1946 msl]				Inclination: 90° Orientation:									
Drilling Method	R.L. (m)	Depth (m)	Sample Type	Water Level (m)	Graphic Log	Geological Name	Layer Code	Description of Materials	Weathering/USCS	TCR (%)	SCR (%)	RQD (%)	Fracture Index	Standard Penetration Tests [SPT]		Additional Information (Defect Description)	Installation Details
														Peak/Residual 'Su' or Blows	'N' Value		
HQ3	-1.5						ATs	17.45m: Fine to medium SAND, medium grey. Loose, wet, non plastic. Some mica specks.	SW	8							
SPT	-2.0						ATc	25.42m: CLAY/ organic CLAY, medium to dark brown (organic staining). Soft, wet, high plasticity. Some mica specks.	CH	100			0/2,1,3,2	8	25.5m: Zero SPT values resulting from hammer weight.		
	-2.6							25.95m: ...some silt and fine sand. 25.98m: to 26.02m... some dark brown fibrous organic fragments.									
HQ3	-3.0						ATs	26.18m: Silty fine SAND with some clay, light greenish grey. Medium dense, wet, low plasticity. Some mica specks and discrete black organic specks.	SM	90							
SPT	-3.5						ATs			100			5/4,5,6,7	22	27.45m: Core loss likely from 27.45 to 27.8m.		
HQ3	-4.5						ATI	27.85m: Clayey SILT with some fine sand, light greyish brown. Firm, wet, low plasticity. Some dark brown amorphous organic flecks. 28.05m: ...medium greyish brown (organic staining). 28.1m: Fine SAND with some silt, medium grey. Dense, wet, non plastic. Some mica specks.	ML	67							
SPT	-5.0						ATs			100			7/7,8,10,12	37			
HQ3	-6.0						ATs			92							

Last Generated: 12/07/2010 2:10:30 p.m.

- Remarks:**
1. Hand Auger to 1.2mbgl for service check.
 2. Casing to 24.0mbgl.
 3. No groundwater measured on the day of drilling.
 4. Hole backfilled with gravel and bentonite.

Logged: HH
Input: HH
Checked: PKC
Verified: AJB



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Location: **St George St Church, Papatoetoe**
Project Reference: **203299**

DH101

Sheet 7 of 8

DRILLING INFORMATION Drilling Method: Truck Mounted Drill Rig Diameter Core: HQ (60mm) Flush: Water Contractor: Boart Longyear		CO-ORDINATES [ME2000] Easting: 407703.86 Northing: 788855.54 Ground Level: 23.59m [Auckland 1946 msl]		Date Started: 25/06/2010 Date Completed: 30/06/2010 Inclination: 90° Orientation:	
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Drilling Method	R.L. (m)	Depth (m)	Sample Type	Water Level (m)	Graphic Log	Geological Name	Layer Code	Description of Materials	Weathering/USCS	TCR (%)	SCR (%)	RQD (%)	Fracture Index	Standard Penetration Tests [SPT]		Additional Information (Defect Description)	Installation Details
														Peak/Residual 'Su' or Blows	'N' Value		
SPT	-6.5							28.1m: Fine SAND with some silt, medium grey. Dense, wet, non plastic. Some mica specks.		100				8/6,9,10,13	38		
HQ3	-7.0	31								2						30.45m: Core loss likely from 30.45 to 31.48m. <i>Drillers Note</i> inner stuck down hole.	
SPT	-8.0						ATs		SW	100				6/7,6,8,8	29		
HQ3	-8.5	32						33m: ...dense.		2						31.95m: Core loss likely from 31.95 to 32.98m.	
SPT	-9.5									56				6/3,4,6,5	18		
HQ3	-10.0						ATp	33.45m: PEAT, dark brown to black. Firm to stiff, wet, non plastic. Amorphous, fibrous and some wood fragments.	PT							33.45m: <i>Drillers Note</i> change bit and ream casing to 24.0mbgl.	
HQ3	-10.5	34						33.89m: Inferred boundary. Fine SAND, medium greenish grey. Dense, wet, non plastic. Some mica specks.	SW	42						33.89m: Core loss likely from 33.89 to 34.5m.	
SPT	-11.0						ATs							8/9,11,12,16	48		
SPT	-11.5							34.6m: Silty fine SAND with trace clay, light greenish grey. Dense, wet, low plasticity to non plastic. Some mica specks.	SM	100							
	-12.0									38							

Remarks: 1. Hand Auger to 1.2mbgl for service check. 2. Casing to 24.0mbgl. 3. No groundwater measured on the day of drilling. 4. Hole backfilled with gravel and bentonite.												Logged: HH Input: HH Checked: PKC Verified: AJB	
---	--	--	--	--	--	--	--	--	--	--	--	--	--

Last Generated: 12/07/2010 2:10:30 p.m.



Client: **ONTRACK**
Project: **Auckland Electrification Project**
Location: **St George St Church, Papatoetoe**
Project Reference: **203299**

DH101

DRILLING INFORMATION	CO-ORDINATES [ME2000]	Date Started: 25/06/2010 Date Completed: 30/06/2010
Drilling Method: Truck Mounted Drill Rig Diameter Core: HQ (60mm) Flush: Water Contractor: Boart Longyear	Easting: 407703.86 Northing: 788855.54 Ground Level: 23.59m [Auckland 1946 msl]	Inclination: 90° Orientation:

Drilling Method	R.L. (m)	Depth (m)	Sample Type	Water Level (m)	Graphic Log	Geological Name	Layer Code	Description of Materials	Weathering/USCS	TCR (%)	SCR (%)	RQD (%)	Fracture Index	Standard Penetration Tests [SPT]		Additional Information (Defect Description)	Installation Details	
														Peak/Residual 'Su' or Blows	'N' Value			
HQ3	-11.5							34.6m: Silty fine SAND with trace clay, light greenish grey. Dense, wet, low plasticity to non plastic. Some mica specks.	SM							34.95m: Core loss likely from 34.95 to 35.5m.		
	-12.0							35.5m: Inferred boundary. Medium SAND, medium grey. Very dense, wet, non plastic. Some mica specks.		38								
SPT	-12.5	36												3/3,11,22,21	63	35.9m: Core loss likely from 35.9 to 36.0m. 36m: SPT - 57 blows for 270mm.		
	-13.0							36.5m: ...30mm band of silty CLAY, grey. Very stiff, wet, high plasticity. 36.58m: ...10mm band of silty CLAY, grey. Very stiff, wet, high plasticity.									36.62m: Core loss likely from 36.62 to 37.5m.	
HQ3	-13.5	37				Tauranga Group ATs												
	-14.0							37.5m: ...medium dense.	SW									
SPT	-14.5	38						37.95m: ...some lenses of silty CLAY (<5mm).										
	-15.0							38.2m: ...discrete shell inprints.										
HQ3	-15.5	39						38.85m: ...5mm lens of medium brown fibrous organics. 39m: ...dense.										
SPT																		
								DH101 terminated at 39.45m depth - Target Depth.										

Remarks:	1. Hand Auger to 1.2mbgl for service check. 2. Casing to 24.0mbgl. 3. No groundwater measured on the day of drilling. 4. Hole backfilled with gravel and bentonite.	Logged: HH Input: HH Checked: PKC Verified: AJB
-----------------	--	--

Last Generated: 12/07/2010 2:10:30 p.m.



Auckland Electrification Project
St George St and Bridge St, Papatoetoe



DH Reference: DH101 Date Drilled: 25/06/10 - 30/06/10
Photographed By: HH Date Photographed: 25/06/10 - 30/06/10



Box 1. - Depth: 0.00m to 4.50m.



Box 2. - Depth: 4.50m to 8.35m.



Auckland Electrification Project
St George St and Bridge St, Papatoetoe



DH Reference: DH101 Date Drilled: 25/06/10 - 30/06/10
Photographed By: HH Date Photographed: 25/06/10 - 30/06/10



Box 3 - Depth: 8.35m to 12.45m.



Box 4 - Depth: 12.45m to 15.95m.



Auckland Electrification Project
St George St and Bridge St, Papatoetoe



DH Reference: DH101

Date Drilled: 25/06/10 - 30/06/10

Photographed By: HH

Date Photographed: 25/06/10 - 30/06/10



Box 5. - Depth: 15.95m to 20.25m.



Box 6. - Depth: 20.25m to 25.95m.



Auckland Electrification Project
St George St and Bridge St, Papatoetoe



DH Reference:	DH101	Date Drilled:	25/06/10 - 30/06/10
Photographed By:	HH	Date Photographed:	25/06/10 - 30/06/10



Box 7. - Depth: 25.95m to 29.50m.



Box 8. - Depth: 29.50m to 36.00m.



Auckland Electrification Project
St George St and Bridge St, Papatoetoe



DH Reference:	DH101	Date Drilled:	25/06/10 - 30/06/10
Photographed By:	HH	Date Photographed:	25/06/10 - 30/06/10



Box 9. - Depth: 36.0m to 39.45m.



LOG OF DRILLHOLE

HOLE IDENTIFICATION **DH2**

Client **KiwiRail**
 Project **Third Main**
 Project number **60044549**

Co-ordinates **407746.18mE 788784.35mN**
 Orientation **-90°** Elevation **23.06m**
 Location **Papatoetoe**
 Feature **UM 660.015km**

GEOLOGICAL DESCRIPTION <small>Weathering, Colour, Fabric, Rock Name, Strength, Discontinuities, Lithological Features (bedding, foliation, mineralogy, cement, etc)</small>	Test Records		Drilling Method <small>Casing remarks</small>	Core Loss/Lift <small>0-100%</small>	Depth	Graphic Log	MATERIAL DESCRIPTION <small>Subordinate MAJOR minor; colour; structure. Strength; moisture condition; grading; bedding; plasticity; sensitivity; major fraction description; subordinate fraction description; minor fraction description etc</small>	Instrumentation
	Shear Vane <small>residual - peak 0 - 200 kPa</small>	N Values <small>0 - 50</small>						
AUCKLAND VOLCANIC FIELD Completely weathered to highly weathered volcanic TUFF, extremely weak. 1.5m: Tuff possibly alluvially reworked.			OB		0		Sandy SILT; orange brown. Stiff, moist, low plasticity.	
		222*	OB		1			
		222*	OB		1			
		177/116	SPT		2		Silty fine SAND; greyish brown. Loose, moist, low plasticity.	
		1.0,1,2,3 N=6			2		Clayey SILT with minor sand; greyish brown. Firm to stiff, moist, non plastic, friable.	
		42/3	OB		3			
		77/10	SPT		3		Silty sandy CLAY; light grey. Soft to firm, moist, moderate plasticity.	
		1.0,0,1,0 N=1			3			
		71/10	OB		4		4m: Grades to silty CLAY.	
	TAURANGA GROUP Mixed Alluvium, comprising estuarine, swamp and reworked ignimbrite deposits		103/19	SPT		5		Clayey SILT with trace sand, dark brown with white veinlets. Stiff, moist, non plastic, sensitive.
		1.0,1,0,0 N=1			5		4.5m: Grades to light brown.	
		26/3	OB		6		Silty CLAY; dark grey with white pumiceous flecks of fine to coarse sand. Stiff, dry to moist, low plasticity, sensitive.	
		0.0,0,0,0 N=0 SUOW	SPT		6		PEAT; black. Hard, dry, non plastic.	
			OB		6		Clayey SILT, light grey. Firm, moist to wet, non plastic, sensitive.	
					6		5.7 m Grades to white, possibly pumiceous.	
			SPT		7		Pumiceous sandy SILT, light white grey. Firm, saturated, dilatant, non plastic.	
			OB		7		Silty fine to coarse SAND, light grey grading to yellow grey and light green grey. Medium dense, saturated, trace carbonised organic fragments.	
		UTP/ 1.0,1,1,1 N=3	SPT		8		PEAT; black with brown flecks. Stiff, dry to moist, non plastic, brittle but smears between fingers, strong anoxic odour.	
			OB		8			
	96/29	SPT		9		Silty CLAY; light grey with streaks of black peat. Stiff, moist, moderate plasticity.		
	2.2,2,2,3 N=9			9				
				9		Sandy SILT, medium to dark grey with muscovite specks. Stiff, moist, sensitive.		

LOG SOIL FOR 3RD MAIN ONLY COMPILED LOGS.GPJ BASE.GDT 14/03/12

GROUNDWATER OBSERVATIONS Depth Piezometer Reading Date 7.31m 16/12/2011 7.93m 26/12/2011		Date logged 16/12/2011 Logged NG Checked RBG	Remarks Location surveyed by CKL. 222 kPa is the shear vane limit	Driller Pro-Drill Drill Rig Kubota Core Boxes	Started 16/12/2011 Finished 16/12/2011
Casing Details Depth Diameter		Hand held Shear Vane GEO141: 19mm blade: Correction Factor = 1.608 <i>vane shear strength per NZGS guideline</i>		Page 1 of 2	



LOG OF DRILLHOLE

HOLE IDENTIFICATION **DH2**

Client **KiwiRail**
 Project **Third Main**
 Project number **60044549**

Co-ordinates **407746.18mE 788784.35mN**
 Orientation **-90° Elevation 23.06m**
 Location **Papatoetoe**
 Feature **UM 660.015km**

GEOLOGICAL DESCRIPTION <small>Weathering, Colour, Fabric, Rock Name, Strength, Discontinuities, Lithological Features (bedding, foliation, mineralogy, cement, etc)</small>	Test Records		Drilling Method <small>Casing remarks</small>	Core Loss/Lift <small>0 - 100%</small>	Depth	Graphic Log	MATERIAL DESCRIPTION <small>Subordinate MAJOR minor; colour; structure. Strength; moisture condition; grading; bedding; plasticity; sensitivity; major fraction description; subordinate fraction description; minor fraction description etc.</small>	Instrumentation
	Shear Vane <small>residual - peak 0 - 200 kPa</small>	N Values <small>0 - 50</small>						
Mixed Alluvium, comprising estuarine, swamp and reworked ignimbrite deposits			OB					
		129/23 1,1,0,1,2 N=4	SPT		11		Fine to coarse SAND with minor silt; medium to dark grey. Loose, moist, trace specks of muscovite. 11m: Saturated.	
		64/5 4,2,3,2,1 N=8	SPT		12			
			OB		13		Clayey SILT with trace fine sand and muscovite specks, grey. Stiff, moist, extra sensitive.	
		84/10 2,2,3,3,6 N=14	SPT		14		13.4m: Grades to medium dense. Fine to coarse SAND with minor silt; medium to dark grey. Loose, moist, trace specks of muscovite.	
			OB		15		14.5 to 16.5m: Minor black organic traces/ streaks.	
		124/13 1,1,0,1,1 N=3	SPT		15		Clayey SILT with trace fine sand and muscovite specks, grey. Stiff, moist, non plastic, extra sensitive. Fine to coarse SAND with minor silt; medium to dark grey. Loose, moist, trace specks of muscovite.	
			OB		16			
		100/18 1,1,1,1,0 N=3	SPT		17		16.5 to 18m: No black organic streaks.	
			OB		18			
	51/19 4,4,6,6,9 N=25	SPT		18		18m: Grades to medium dense.		
		OB		19		18.5 to 19.5m: Flows on shaking, dilatant.		
	39/6 2,15,16,21 for 65mm N=50	SPT		19		19.5m: Grades to very dense. DH2 terminated at 20m Target Depth		

GROUNDWATER OBSERVATIONS Depth Piezometer Reading Date	Date logged	16/12/2011	Remarks Location surveyed by CKL.	Driller	Started
	Logged	NG		Pro-Drill	16/12/2011
	Checked	RBG	222 kPa is the shear vane limit	Drill Rig	Finished
	Casing Details Depth Diameter		Hand held Shear Vane GEO141: 19mm blade: Correction Factor = 1.608 vane shear strength per NZGS guideline	Kubota	16/12/2011
				Core Boxes	
					Page 2 of 2

LOG SOIL FOR 3RD MAIN ONLY COMPILED LOGS.GPJ BASE.GDT 14/03/12

TAURANGA GROUP

Kiwi Rail Ltd
Third Main – Puhinui Station to Otahuhu Station
Drillhole Photos (DH02)



DH02- 0.0 - 3.5m



DH02- 3.5 - 6.8m

Kiwi Rail Ltd
Third Main – Puhinui Station to Otahuhu Station
Drillhole Photos (DH02)



DH02- 6.8 - 10.0m



DH02- 10.0 - 13.3m

Kiwi Rail Ltd
Third Main – Puhinui Station to Otahuhu Station
Drillhole Photos (DH02)



DH02- 13.3 – 16.5m



DH02- 16.5 – 19.95m



LOG OF MACHINE AUGER

HOLE IDENTIFICATION **MA16**

Client **KiwiRail**
 Project **Third Main**
 Project number **60044549**

Co-ordinates 407794.78mE 788686.39mN
 Orientation -90° Elevation 17.84m
 Location **Papatoetoe**
 Feature **UM 659.833km**

Depth	GEOLOGICAL DESCRIPTION <small>Weathering, Colour, Fabric, Rock Name, Strength, Discontinuities, Lithological Features (bedding, foliation, mineralogy, cement, etc)</small>	Test Records Shear Vane (kPa) <small>Residual - Peak</small>	Sampling	Dynamic Cone Penetrometer (Blows per 100 mm)	MATERIAL DESCRIPTION <small>Subordinate MAJOR minor; colour; structure. Strength; moisture condition; grading; bedding; plasticity; sensitivity; major fraction description; subordinate fraction description; minor fraction description etc</small>	Graphic Log	Instrumentation	
								Depth Related Remarks
1 2 3 4	FILL	175/29	[Symbol]	1	Clayey SILT; brown with orange mottling. Stiff, dry, low plasticity.	[Graphic Log Pattern]		
				2	Silty CLAY; orange brown with black flecks. Very stiff, low to moderate plasticity.			
	TAURANGA GROUP	Fine grained alluvial sediments with minor amounts of carbonised organic material and comminuted country rock fragments either implaced during the initial eruption or transported from tuff cone.	83/19	[Symbol]	2			Silty CLAY; orange brown with black and orange flecks. Stiff, moist, high plasticity.
			114/48	[Symbol]	2			Silty CLAY with fine gravel sized (4mm Ø) fragments; brown with light grey, brownish white, dark grey and orange flecks. Stiff, moist, high plasticity.
			156/76	[Symbol]	2			CLAY; medium to dark grey with some dark brown silty pockets. Very stiff, moist, high plasticity.
			206/22	[Symbol]	2			Silty coarse SAND with some organic flecks. Medium dense, wet, non plastic, extra sensitive.
			222*	[Symbol]	2			SILT with minor gravel; light brown. Very stiff, wet, sensitive. Gravel; fine to medium (5-10mm diameter), black.
			67/51	[Symbol]	2			Silty SAND; dark grey to black. Medium dense, saturated, moderately sensitive.
			130/67	[Symbol]	2			MA16 terminated at 4m Target Depth

MACHINE AUGERHOLE LOG WITH DCP COMPILED LOGS.GPJ BASE.GDT 14/03/12

For explanation of symbols and observations, see key sheet

GROUNDWATER OBSERVATIONS
 Depth (m) Date Post strike observations

Hand held Shear Vane
 1253: 19mm blade: Correction Factor = 1.587
 Vane shear strength per NZGS guideline

Remarks
 Location surveyed by CKL.
 No ground water encountered
 222 kPa is the shear vane limit

Started
 15/12/2011
Finished
 15/12/2011
Date logged
 15/12/2011
Logged
 KW
Checked
 RBG

Page 1 of 1



LOG OF MACHINE AUGER

HOLE IDENTIFICATION **MA18**

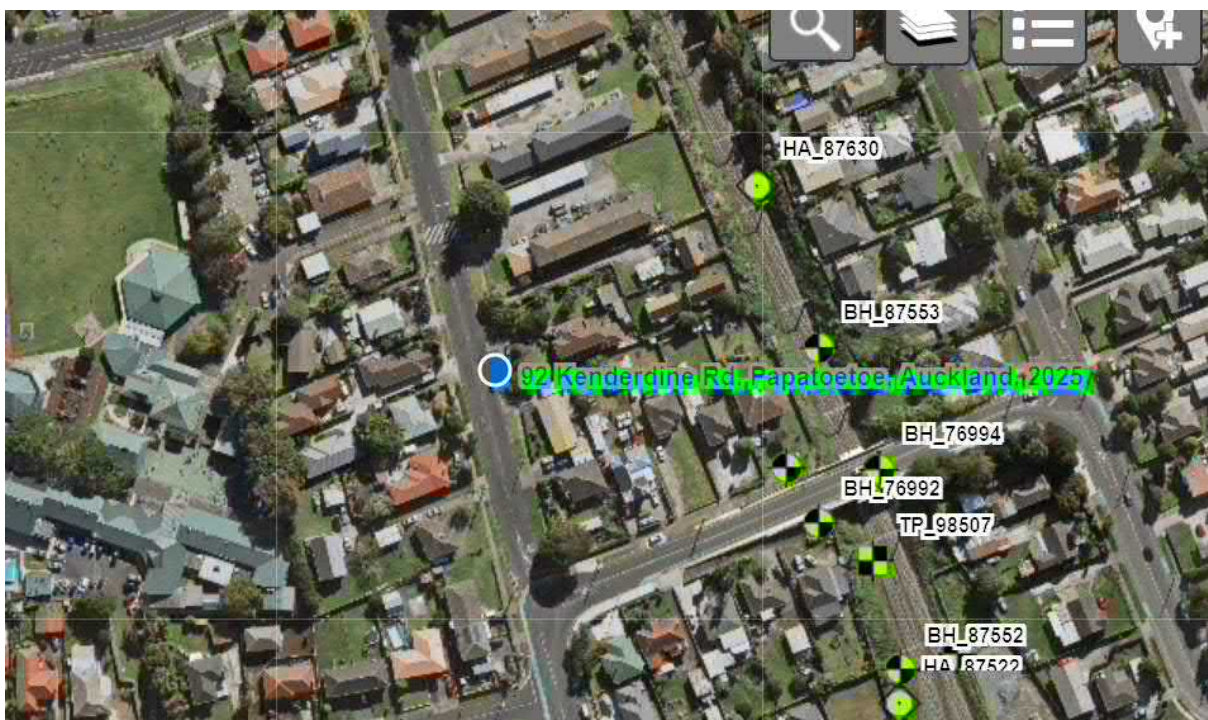
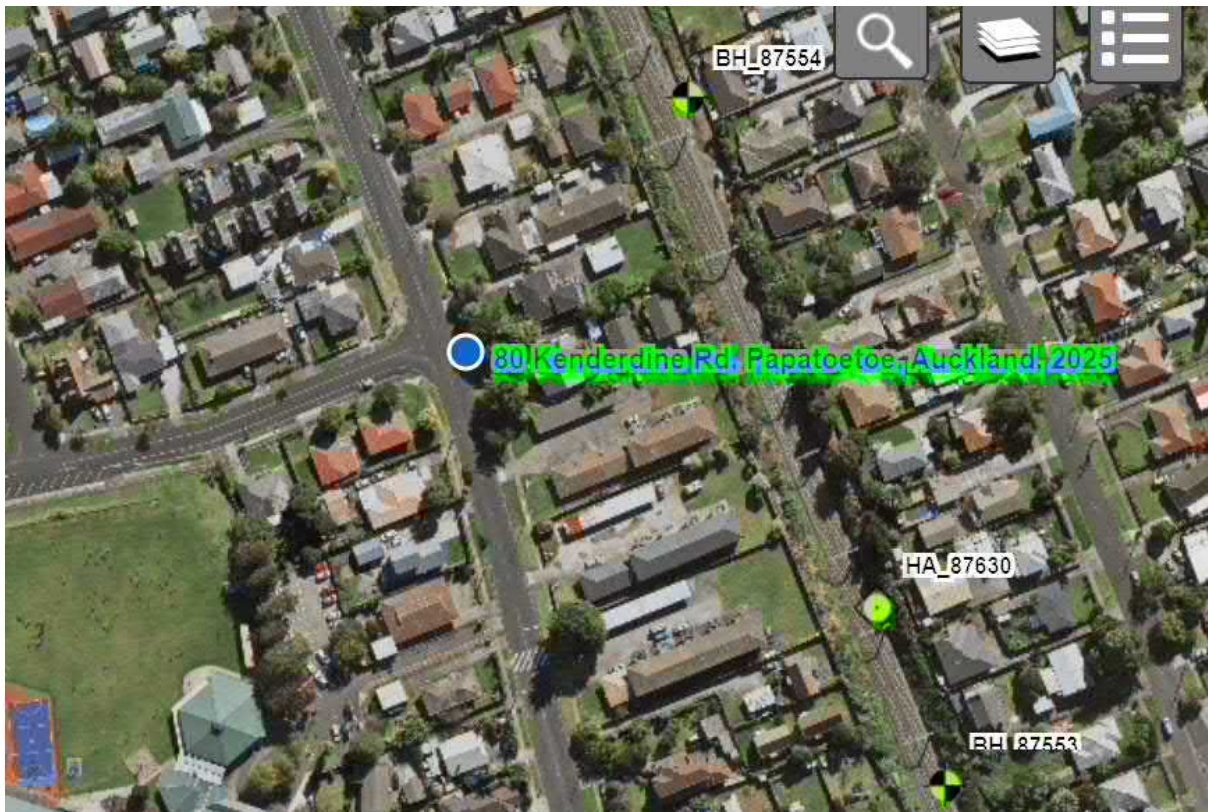
Client **KiwiRail**
 Project **Third Main**
 Project number **60044549**

Co-ordinates 407780.98mE 788723.47mN
 Orientation -90° Elevation 18.45m
 Location Papatoetoe
 Feature UM 659.891km

Depth	GEOLOGICAL DESCRIPTION <small>Weathering, Colour, Fabric, Rock Name, Strength, Discontinuities, Lithological Features (bedding, foliation, mineralogy, cement, etc)</small>	Test Records Shear Vane (kPa) <small>Residual - Peak</small>	Sampling	Dynamic Cone Penetrometer (Blows per 100 mm)	MATERIAL DESCRIPTION <small>Subordinate MAJOR minor; colour; structure. Strength; moisture condition; grading; bedding; plasticity; sensitivity; major fraction description; subordinate fraction description; minor fraction description etc</small>	Graphic Log	Instrumentation
0 - 0.5	Fill			1	Clayey SILT; yellowish brown with trace black flecks. Firm, dry, friable.		
0.5 - 1.0	Completely to highly weathered volcanic TUFF, extremely weak.	181/38		4 5 6	Silty CLAY; orange brown with orange, light grey and black flecks. Very stiff, dry, moderate plasticity.		
1.0 - 1.5		159/13		5 6	Sandy SILT; greyish brown with orange flecks. Very stiff, wet, extra sensitive.		
1.5 - 2.0	Fine grained alluvial sediments with minor amounts of carbonised organic material and comminuted country rock fragments either implaced during the initial eruption or transported from tuff cone.	32/10		5	Silty CLAY; orange brown with black flecks. Firm grading to very stiff, moist, moderate plasticity.		
2.0 - 2.5		178/114		5	Clayey sandy SILT; greyish brown with coarse black flecks. Very stiff, wet to saturated, low plasticity.		
2.5 - 3.0		189/111			CLAY; dark grey. Very stiff grades to stiff, saturated, high plasticity.		
3.0 - 3.5		130/84					
3.5 - 4.0		84/29			MA18 terminated at 4m Target Depth		
<p><i>For explanation of symbols and observations, see key sheet</i></p> <p>GROUNDWATER OBSERVATIONS Depth (m) Date Post strike observations</p> <p>Hand held Shear Vane 1253: 19mm blade: Correction Factor = 1.587 Vane shear strength per NZGS guideline</p>				<p>Remarks Location surveyed by CKL. No ground water encountered 222 kPa is the shear vane limit</p>		<p>Started 15/12/2011 Finished 15/12/2011 Date logged 15/12/2011 Logged KW Checked RBG</p>	
						<p>Page 1 of 1</p>	

MACHINE AUGERHOLE LOG WITH DCP COMPILED LOGS.GPJ BASE.GDT 14/03/12

Part 4 Kenderdine Road



Part 4 Bridge Street





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Client: **ONTRACK**
Project: **Auckland Electrification Project**
Location: **10 Bridge St, Papatoetoe**
Project Reference: **203299**

DH105

Sheet 1 of 6

DRILLING INFORMATION		CO-ORDINATES [ME2000]		Date Started: 10/06/2010	
Drilling Method: Truck Mounted Drill Rig		Easting: 408087.05		Date Completed: 11/06/2010	
Diameter Core: HQ (60mm)		Northing: 787971.39		Inclination: 90°	
Flush: Water		Ground Level: 23.84m		Orientation:	
Contractor: Boart Longyear		[Auckland 1946 msl]			

Drilling Method	R.L. (m)	Depth (m)	Sample Type	Water Level (m)	Graphic Log	Geological Name	Layer Code	Description of Materials	Weathering/USCS	TCR (%)	SCR (%)	RQD (%)	Fracture Index	Standard Penetration Tests [SPT]		Additional Information (Defect Description)	Installation Details									
														Peak/Residual 'Su' or Blows	'N' Value											
HA	23.5					Fill	F	0m: Silty GRAVEL, dark grey and brown. Medium dense, moist. Poorly sorted, angular to subangular, medium sized. [FILL].	GP-GM								0m: FILL Representative samples taken from hand auger cuttings.									
						Auckland Volcanic Field	Vt	0.3m: Clayey SILT, brown. Very stiff, moist, high plasticity. Some angular gravels.	MH								0.6m: AUCKLAND VOLCANIC FIELD									
						Paleosol	T	0.6m: Clayey SILT with some fine sand, dark orange brown and brown. Firm to stiff, wet, high plasticity. [TUFF].	MH								1.75m: PALEOSOL									
						Tauranga Group	ATc	1.75m: Inferred boundary. Very clayey SILT, dark brown. Firm to stiff, moist, high plasticity. [PALEOSOL].	CH								2.05m: TAURANGA GROUP									
							ATI	2.05m: Silty CLAY, light grey with some orange mottling and brown interbeds. Firm to stiff, moist, high plasticity. Trace white pumiceous specks. [TAURANGA GROUP].	ML								3m: Attempted push tube - sample slipped out.									
HQ3	22.5					Tauranga Group	ATc	3m: ...orange brown.	CH						1/1,1,2,2	6										
TW	22.0					Tauranga Group	ATI	3.15m: ...dark brown with some very light brown interbeds.	ML																	
SPT	21.5					Tauranga Group	ATI	3.5m: ...dark brown (organic stained).	SM																	
HQ3	21.0					Tauranga Group	ATI	3.6m: SILT, light grey. Stiff, moist, low plasticity.	SM																	
SPT	20.5					Tauranga Group	ATI	3.75m: Silty fine SAND, light greyish brown. Loose, wet, non plastic.	PT																	
HQ3	20.0					Tauranga Group	ATI	4.03m: PEAT, dark brown to black. Stiff, wet. Amorphous and fibrous.	PT																	
TW	19.5					Tauranga Group	ATI	4.85m: ...band of wood at base of push tube.	PT																	

Remarks:														Logged: HH	
1. Hand Auger to 1.2mbgl for service check.														Input: HH	
2. No groundwater measured on the day of drilling.														Checked: PKC	
3. Hole backfilled with gravel and bentonite.														Verified: AJB	

Last Generated: 12/07/2010 2:11:11 p.m.



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Tel: +64 9 520 6019
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Client: **ONTRACK**
Project: **Auckland Electrification Project**
Location: **10 Bridge St, Papatoetoe**
Project Reference: **203299**

DH105

Sheet 2 of 6

DRILLING INFORMATION		CO-ORDINATES [ME2000]		Date Started: 10/06/2010 Date Completed: 11/06/2010													
Drilling Method: Truck Mounted Drill Rig Diameter Core: HQ (60mm) Flush: Water Contractor: Boart Longyear		Easting: 408087.05 Northing: 787971.39 Ground Level: 23.84m [Auckland 1946 msl]		Inclination: 90° Orientation:													
Drilling Method	R.L. (m)	Depth (m)	Sample Type	Water Level (m)	Graphic Log	Geological Name	Layer Code	Description of Materials	Weathering/USCS	TCR (%)	SCR (%)	RQD (%)	Fracture Index	Standard Penetration Tests [SPT]		Additional Information (Defect Description)	Installation Details
														Peak/Residual 'Su' or Blows	'N' Value		
SPT	18.5					ATp	4.03m: PEAT, dark brown to black. Stiff, wet. Amorphous and fibrous.	PT						0/2,4,4,4	14	5m: SPT reading possibly affected by wood fragments from previous push tube.	
HQ3	18.0					ATs	5.2m: Silty fine SAND, light brownish grey. Medium dense, moist, non plastic. Dilatent when wet. 5.45m: ...medium brown with discrete dark brown streaks. 5.75m: ...light brown and saturated (drilling induced).	SM	70					1/0,0,0,0	0	5.45m: Attempted push tube -sample slipped out. <i>Drillers Note</i> change to extended catcher. Returned core is very disturbed.	
SPT	17.5	6				ATp	6.08m: PEAT, dark brown to black. Very soft, wet. Amorphous. 6.45m: ...firm.					100				6.45m: Core loss likely from 6.45 to 6.9m.	
HQ3	17.0	7				ATp	7.28m: ...two thin (<10mm) bands of silty CLAY, medium brown. Firm, moist, high plasticity.					100					
TW	16.0	8		TW54		ATp		PT									
HQ3	15.5					ATp											
HQ3	15.0					ATp											
SPT	14.5	9				ATp								2/1,2,2,2	7		
HQ3	14.0					ATc	9.3m: CLAY, light grey. Firm, wet, high plasticity.	CH									
HQ3	14.0					ATs	9.7m: Gradational boundary. Silty CLAY with some fine sand, light grey with some black specks. Firm, wet, high plasticity.	SM									
	10					ATs		SM									

Last Generated: 12/07/2010 2:11:11 p.m.

- Remarks:**
1. Hand Auger to 1.2mbgl for service check.
 2. No groundwater measured on the day of drilling.
 3. Hole backfilled with gravel and bentonite.

Logged: HH
Input: HH
Checked: PKC
Verified: AJB



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Client: **ONTRACK**
Project: **Auckland Electrification Project**
Location: **10 Bridge St, Papatoetoe**
Project Reference: **203299**

DH105

Sheet 3 of 6

DRILLING INFORMATION		CO-ORDINATES [ME2000]		Date Started: 10/06/2010	
Drilling Method: Truck Mounted Drill Rig		Easting: 408087.05		Date Completed: 11/06/2010	
Diameter Core: HQ (60mm)		Northing: 787971.39		Inclination: 90°	
Flush: Water		Ground Level: 23.84m		Orientation:	
Contractor: Boart Longyear		[Auckland 1946 ms]			

Drilling Method	R.L. (m)	Depth (m)	Sample Type	Water Level (m)	Graphic Log	Geological Name	Layer Code	Description of Materials	Weathering/USCS	TCR (%)	SCR (%)	RQD (%)	Fracture Index	Standard Penetration Tests [SPT]		Additional Information (Defect Description)	Installation Details
														Peak/Residual 'Su' or Blows	'N' Value		
HQ3	13.5							9.85m: Silty fine SAND with trace clay, grey. Medium dense, wet, non plastic.		100							
SPT	13.0	11						10.5m: Silty fine SAND, medium grey. Medium dense, wet, low plasticity. Discrete black specks and some mica specks.		44				2/1,3,3,4	11		
HQ3	12.5							11.1m: ...10mm band of clayey SILT, medium grey. Firm, wet, high plasticity.									
SPT	12.0	12						12.45m: ...discrete brown organic flecks.	SM					3/2,3,3,4	12	12m: SPT sample slipped out.	
HQ3	11.0					Tauranga Group	ATs										
SPT	10.5									0							
HQ3	10.0																
SPT	9.5	14						13.95m: ...some thin interbeds of clayey SILT with some fine sand, medium grey. Soft, wet, high plasticity.						5/4,2,1,1	8	12.5m: Drillers Note loss of circulation.	
HQ3	9.0																
D	15																

Remarks:												Logged: HH	
1. Hand Auger to 1.2mbgl for service check.												Input: HH	
2. No groundwater measured on the day of drilling.												Checked: PKC	
3. Hole backfilled with gravel and bentonite.												Verified: AJB	

Last Generated: 12/07/2010 2:11:11 p.m.



Client: **ONTRACK**
 Project: **Auckland Electrification Project**
 Location: **10 Bridge St, Papatoetoe**
 Project Reference: **203299**

DH105

DRILLING INFORMATION		CO-ORDINATES [ME2000]		Date Started: 10/06/2010	
Drilling Method: Truck Mounted Drill Rig		Easting: 408087.05		Date Completed: 11/06/2010	
Diameter Core: HQ (60mm)		Northing: 787971.39		Inclination: 90°	
Flush: Water		Ground Level: 23.84m		Orientation:	
Contractor: Boart Longyear		[Auckland 1946 msl]			

Drilling Method	R.L. (m)	Depth (m)	Sample Type	Water Level (m)	Graphic Log	Geological Name	Layer Code	Description of Materials	Weathering/USCS	TCR (%)	SCR (%)	RQD (%)	Fracture Index	Standard Penetration Tests [SPT]		Additional Information (Defect Description)	Installation Details
														Peak/Residual 'Su' or Blows	'N' Value		
SPT	8.5	8.5				ATs		10.5m: Silty fine SAND, medium grey. Medium dense, wet, low plasticity. Discrete black specks and some mica specks. 15m: to 15.6m... dilatent.	SM	100				2/2,2,3,4	11	15.45m: Core loss likely from 15.45 to 15.9m.	
HQ3	8.0	16				ATs		16.5m: Gradational boundary. Silty fine SAND, medium grey with some dark grey bands. Very loose, wet, non plastic. Some mica specks.	SM	38				1/0,0,0,0	0	16.5m: SPT reading possibly affected by previous core run.	
SPT	7.0	17				ATc		16.95m: Silty CLAY with trace fine sand, medium grey with some brown organic staining. Soft to firm, wet, high plasticity. Some thin bands of amorphous organics (<2mm). Some mica specks.	CH							16.95m: Core loss likely from 16.95 to 17.2m.	
HQ3	6.5	17				ATc		17.5m: Silty fine SAND with some clay, medium grey. Medium dense, wet, low plasticity. Some thin bands of amorphous organics (<2mm). Some mica specks.	SM	76							
SPT	6.0	18				ATs		17.75m: Fine SAND with some silt, medium grey. Medium dense, wet, non plastic. Some mica specks. 17.8m: ...3mm band of brown amorphous organics with some mica specks.	SW	100				2/0,0,1,2	3		
HQ3	5.0	19				ATs		18.4m: Silty fine SAND, medium grey with dark grey bands and some brown organic staining. Medium dense, wet, non plastic. Some interbeds of silty CLAY (20-30mm), medium grey. Soft to firm, wet, high plasticity. Discrete thin brown amorphous organic bands (<2mm). 19m: ...decrease in organics and silty CLAY interbeds.	SM	86							
SPT	4.0	20						19.5m: Fine SAND with some silt, medium grey. Medium dense, wet, non plastic. Some mica specks.	SW	100				2/0,2,1,1	4		

Remarks:																
1. Hand Auger to 1.2mbgl for service check.													Logged:		HH	
2. No groundwater measured on the day of drilling.													Input:		HH	
3. Hole backfilled with gravel and bentonite.													Checked:		PKC	
													Verified:		AJB	

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Client: **ONTRACK**
Project: **Auckland Electrification Project**
Location: **10 Bridge St, Papatoetoe**
Project Reference: **203299**

DH105

Sheet 5 of 6

DRILLING INFORMATION		CO-ORDINATES [ME2000]		Date Started: 10/06/2010	
Drilling Method: Truck Mounted Drill Rig		Easting: 408087.05		Date Completed: 11/06/2010	
Diameter Core: HQ (60mm)		Northing: 787971.39		Inclination: 90°	
Flush: Water		Ground Level: 23.84m		Orientation:	
Contractor: Boart Longyear		[Auckland 1946 msl]			

Drilling Method	R.L. (m)	Depth (m)	Sample Type	Water Level (m)	Graphic Log	Geological Name	Layer Code	Description of Materials	Weathering/USCS	TCR (%)	SCR (%)	RQD (%)	Fracture Index	Standard Penetration Tests [SPT]		Additional Information (Defect Description)	Installation Details	
														Peak/Residual 'Su' or Blows	'N' Value			
HQ3	3.5							19.5m: Fine SAND with some silt, medium grey. Medium dense, wet, non plastic. Some mica specks.										
SPT		21				ATs		21m: ...very dense.	SW	44			10/10,11,14,15	50				
HQ3	2.0							21.45m: ...wet to saturated (drilling induced).										
SPT		22				Tauranga Group		22.5m: Very clayey SILT with minor fine sand, medium to dark brownish grey. Firm to stiff, moist to wet, high plasticity. Discrete black organic flecks and some mica specks.					1/1,1,3,3	8			21.45m: Drillers Note SPT rods stuck down hole - add drilling mud. Applying 1000psi with extended catcher - change to normal catcher - material washed out.	
HQ3	1.5							23.02m: Very clayey SILT with trace fine sand, light blueish grey. Stiff, wet, high plasticity.										
SPT		23				ATI		24.4m: Fine sandy SILT, light blueish grey. Medium dense, wet, low plasticity to non plastic. Some white specks/ fine gravels (<1mm). Some thin interbeds of clayey SILT, light blueish grey. Stiff, wet, high plasticity. Some mica specks.	MH	100							22.95m: Drillers Note change to extended catcher.	
HQ3	0.5							24.8m: to 25.1m... loose.	ML	100								

Remarks:													Logged: HH	
1. Hand Auger to 1.2mbgl for service check.													Input: HH	
2. No groundwater measured on the day of drilling.													Checked: PKC	
3. Hole backfilled with gravel and bentonite.													Verified: AJB	

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Client: **ONTRACK**
Project: **Auckland Electrification Project**
Location: **10 Bridge St, Papatoetoe**
Project Reference: **203299**

DH105

DRILLING INFORMATION				CO-ORDINATES [ME2000]				Date Started: 10/06/2010 Date Completed: 11/06/2010									
Drilling Method: Truck Mounted Drill Rig Diameter Core: HQ (60mm) Flush: Water Contractor: Boart Longyear				Easting: 408087.05 Northing: 787971.39 Ground Level: 23.84m [Auckland 1946 msl]				Inclination: 90° Orientation:									
Drilling Method	R.L. (m)	Depth (m)	Sample Type	Water Level (m)	Graphic Log	Geological Name	Layer Code	Description of Materials	Weathering/USCS	TCR (%)	SCR (%)	RQD (%)	Fracture Index	Standard Penetration Tests [SPT]		Additional Information (Defect Description)	Installation Details
														Peak/Residual 'Su' or Blows	'N' Value		
						Tauranga Group	ATI	24.4m: Fine sandy SILT, light blueish grey. Medium dense, wet, low plasticity to non plastic. Some white specks/ fine gravels (<1mm). Some thin interbeds of clayey SILT, light blueish grey. Stiff, wet, high plasticity. Some mica specks.	ML	100				4/4,5,8,10	27		
								DH105 terminated at 25.95m depth - Target Depth.									

Last Generated: 12/07/2010 2:11:12 p.m.

Remarks:
 1. Hand Auger to 1.2mbgl for service check.
 2. No groundwater measured on the day of drilling.
 3. Hole backfilled with gravel and bentonite.

Logged: HH
 Input: HH
 Checked: PKC
 Verified: AJB



Auckland Electrification Project
St George St and Bridge St, Papatoetoe



DH Reference: DH105 Date Drilled: 10/06/10 – 11/06/10
Photographed By: HH Date Photographed: 10/06/10 – 11/06/10



Box 1. - Depth: 0.00m to 5.20m.



Box 2. - Depth: 5.20m to 8.60m.



Auckland Electrification Project
St George St and Bridge St, Papatoetoe



DH Reference: DH105 Date Drilled: 10/06/10 – 11/06/10
Photographed By: HH Date Photographed: 10/06/10 – 11/06/10



Box 3. - Depth: 8.60m to 11.90m.



Box 4. - Depth: 11.90m to 15.45m.



Auckland Electrification Project
St George St and Bridge St, Papatoetoe



DH Reference: DH105

Date Drilled: 10/06/10 – 11/06/10

Photographed By: HH

Date Photographed: 10/06/10 – 11/06/10



Box 5. - Depth: 15.45m to 19.50m.



Box 6. - Depth: 19.50m to 23.60m.



Auckland Electrification Project
St George St and Bridge St, Papatoetoe



DH Reference:	DH105	Date Drilled:	10/06/10 – 11/06/10
Photographed By:	HH	Date Photographed:	10/06/10 – 11/06/10



Box 7. - Depth: 23.60m to 25.95m.



Babbage Geotechnical Laboratory
 Level 4
 68 Beach Road
 Auckland 1010
 Telephone
 Fax
 Email

P O Box 2027
 New Zealand
 64-9-367 4954
 64-9-377 0554
wec@babbage.co.nz

Please reply to: W.E. Campton

Aurecon Ltd
 PO Box 9762
 Newmarket
 Auckland 1149, New Zealand



Job Number: 44326

Checked by:
 WEC
 9th July 2010

Attention: PAUL CARTER

Dear Sir,

**Re: AEP Bridges
 Hydrometer Particle-Size Distribution Testing
 Report Number: 44326/HYD**

The following report presents the results of hydrometer particle-size distribution testing of core box soil samples collected from your office on the 7th July 2010. Test results are summarised below, with the following pages showing graphs and detailed results.

Test standards used were:

Water Content: NZS4402:1986:Test 2.1
Hydrometer Test: NZS4402:1986:Test 2.8.4

Borehole Number	Sample Number	Depth (m)	Hydrometer Grading (% of Dry Mass)		
			SAND (%)	SILT FRACTION (%)	CLAY FRACTION (%)
DH102	1	14.0 – 14.1	69	19	12
DH105	2	14.9 – 15.0	59	27	14
DH106	3	16.25 – 16.35	70	18	12
DH106	4	11.6 – 11.7	53	32	15

The whole soil was used for these tests.

Please note that the test results relate only to the samples under test.


Thank you for the opportunity to carry out this testing. If you have any queries regarding the content of this report, please contact the undersigned at your convenience.

Yours faithfully,

Wayne Campton
Signatory (Laboratory Manager)
Babbage Geotechnical Laboratory



All tests reported herein have been performed in accordance with the laboratory's scope of accreditation. This report may not be reproduced except in full & with written approval from BGL.

 B G L BABBAGE GEOTECHNICAL LABORATORY	Job Number:	44326	Sheet 1 of 1	Page 3 of 5
	Reg. Number:	1787	Revision No:	1
	Report No:		Issue Date:	August 2003
	Project:	AEP Bridges		

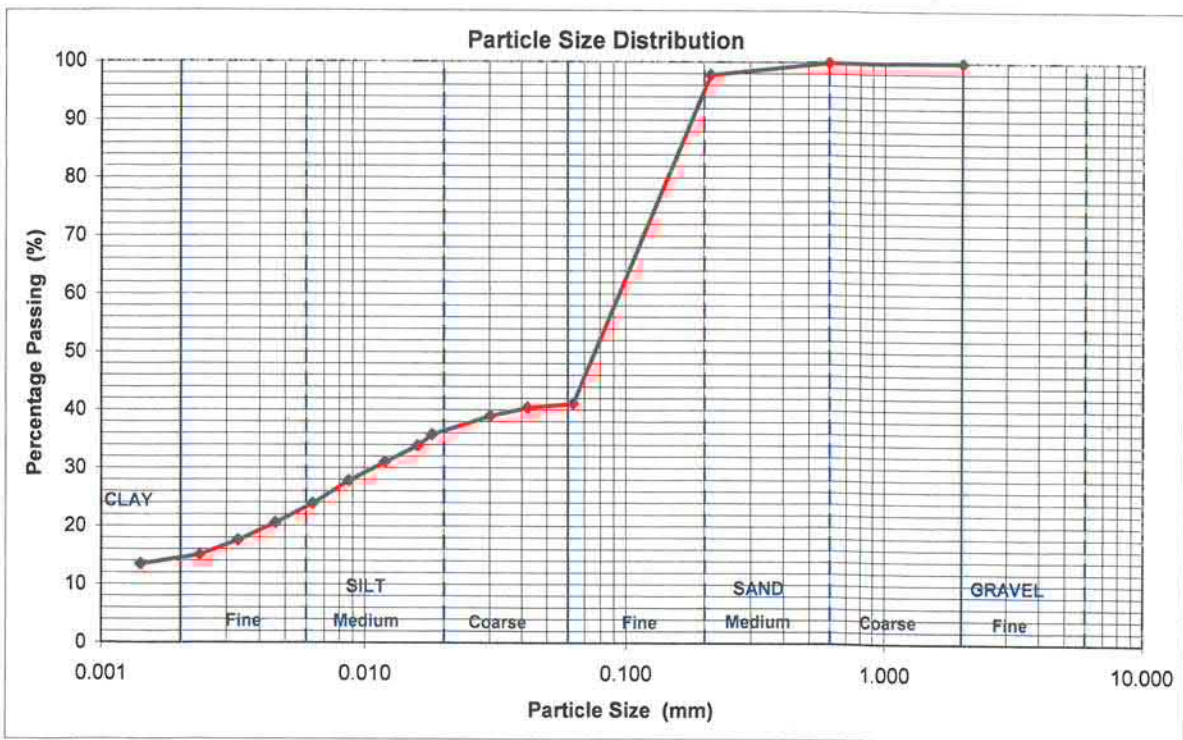
PARTICLE SIZE DETERMINATION Distribution by Hydrometer Test Method: NZS4402:1986:Test 2.8.4	Tested By:	wec	Jul-10
	Compiled By:	comp	Jul-10
	Checked By:	wec	9/07/2010

Borehole Number: DH105
Sample Number: 2
Depth: 14.9 - 15.0m
Water Content (%): 34.3

Sample History: Natural / Air-Dried / Oven-Dried / Unknown

Particle Size (mm)	% Finer Than
9.50	100
6.70	100
4.75	100
2.00	100
0.600	100
0.212	98
0.063	41
0.042	40
0.030	39
0.018	36
0.016	34
0.012	31
0.0087	28
0.0063	24
0.0046	21
0.0033	18
0.0024	15
0.0014	13

HYDROMETER ANALYSIS (% of dry mass)			Total
GRAVEL:	(Coarse) 60 - 20mm	0	0 %
	(Medium) 20 - 2mm	0	
	(Fine) 6 - 2mm	0	
SAND:	(Coarse) 2.0 - 0.6mm	0	59 %
	(Medium) 0.6 - 0.2mm	2	
	(Fine) 0.2 - 0.06mm	57	
SILT FRACTION:	(Coarse) 0.06 - 0.02mm	4	27 %
	(Medium) 0.02 - 0.006mm	14	
	(Fine) 0.006 - 0.002mm	9	
CLAY FRACTION:	< 0.002mm		14 %
			100%





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Client: **ONTRACK**
Project: **Auckland Electrification Project**
Location: **9 Bridge St, Papatoetoe**
Project Reference: **203299**

DH106

Sheet 1 of 7

DRILLING INFORMATION		CO-ORDINATES [ME2000]		Date Started: 17/06/2010	
Drilling Method: Truck Mounted Drill Rig		Easting: 408097.37		Date Completed: 21/06/2010	
Diameter Core: HQ (60mm)		Northing: 787953.97		Inclination: 90°	
Flush: Water		Ground Level: 22.90m		Orientation:	
Contractor: Boart Longyear		[Auckland 1946 msl]			

Drilling Method	R.L. (m)	Depth (m)	Sample Type	Water Level (m)	Graphic Log	Geological Name	Layer Code	Description of Materials	Weathering/USCS	TCR (%)	SCR (%)	RQD (%)	Fracture Index	Standard Penetration Tests [SPT]		Additional Information (Defect Description)	Installation Details	
														Peak/Residual 'Su' or Blows	'N' Value			
HA	22.5	1			[Graphic Log]	Auckland Volcanic Field	Vt	0m: Clayey SILT with some trace fine sand, medium orange brown. Firm to stiff, wet, high plasticity. Some rootlets at top. [TUFF].	MH	50				1/1,1,1,2	5	0m: TUFF Representative samples taken from hand auger cuttings.	[Installation Details]	
	21.5							1.5m: ...light orange brown.								1.95m: Core loss likely between 1.95 to 2.45m.		
	21.0							2								2.45m: Clayey SILT with some trace fine sand, medium to dark brown. Firm to stiff, wet, high plasticity. Some rootlets at top. [PALEOSOL].		2.45m: PALEOSOL
	20.5							3								2.55m: CLAY with some silt, light grey with discrete orange streaks. Firm to stiff, wet, high plasticity. Some white pumiceous gravels (<1mm). [TUFF]		2.55m: TUFF
	20.0							3								3m: Clayey SILT with trace medium sand, medium grey. Firm to stiff, wet, low plasticity. Frequent compressed pumice fragments, light grey. Firm to stiff, wet, high plasticity.		3m: TAURANGA GROUP
HQ3	19.5	2			Auckland Volcanic Field Paleosol	T	2.45m: Clayey SILT with some trace fine sand, medium to dark brown. Firm to stiff, wet, high plasticity. Some rootlets at top. [PALEOSOL].	CH	52				2/2,3,3,2	10	2.45m: PALEOSOL	[Installation Details]		
	20.0						2.55m: CLAY with some silt, light grey with discrete orange streaks. Firm to stiff, wet, high plasticity. Some white pumiceous gravels (<1mm). [TUFF]								2.55m: TUFF			
	19.5						3								3m: Clayey SILT with trace medium sand, medium grey. Firm to stiff, wet, low plasticity. Frequent compressed pumice fragments, light grey. Firm to stiff, wet, high plasticity.		3m: TAURANGA GROUP	
	19.0						4								3.45m: SILT with some fine sand, light greyish brown. Stiff, wet, low plasticity to non plastic. [TAURANGA GROUP]. 3.55m: ...10mm band of CLAY, dark brown (organic stained). Stiff, wet, high plasticity. 3.65m: ...20mm band of dilatent SILT. 3.85m: ...medium greyish brown. 3.95m: ...dark brown (organic stained).		3.45m: TAURANGA GROUP	
HQ3	18.5	3			Tauranga Group	ATI	4.3m: Organic silty CLAY with trace fine sand, dark brown. Very soft, saturated, high plasticity. Discrete black amorphous organic pockets.	OH	90						4.5m: Attempted push tube - sample slipped out.	[Installation Details]		
	18.0						4.75m: Fine sandy SILT with some clay, medium orange brown. Soft becoming firm, wet, low plasticity.								4.5m: Attempted push tube - sample slipped out.			
	18.0						5								4.75m: Fine sandy SILT with some clay, medium orange brown. Soft becoming firm, wet, low plasticity.		4.5m: Attempted push tube - sample slipped out.	

Remarks:

1. Hand Auger to 1.2m bgl for service check.
2. No groundwater measured on the day of drilling.
3. Hole backfilled with gravel and bentonite.

Logged: HH
Input: HH
Checked: PKC
Verified: AJB

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Client: **ONTRACK**
Project: **Auckland Electrification Project**
Location: **9 Bridge St, Papatoetoe**
Project Reference: **203299**

DH106

Sheet 2 of 7

DRILLING INFORMATION				CO-ORDINATES [ME2000]				Date Started: 17/06/2010 Date Completed: 21/06/2010									
Drilling Method: Truck Mounted Drill Rig Diameter Core: HQ (60mm) Flush: Water Contractor: Boart Longyear				Easting: 408097.37 Northing: 787953.97 Ground Level: 22.90m [Auckland 1946 ms]				Inclination: 90° Orientation:									
Drilling Method	R.L. (m)	Depth (m)	Sample Type	Water Level (m)	Graphic Log	Geological Name	Layer Code	Description of Materials	Weathering/USCS	TCR (%)	SCR (%)	RQD (%)	Fracture Index	Standard Penetration Tests [SPT]		Additional Information (Defect Description)	Installation Details
														Peak/Residual 'Su' or Blows	'N' Value		
HQ3	17.5					Tauranga Group	ATp	4.95m: PEAT, black. Firm to stiff, wet, high plasticity. Amorphous and plastic with some brown fibrous wood fragments.	PT	90				1/0,1,1,1	3	9.45m: Core loss likely between 9.45 to 9.7m.	
SPT	17.0	6															
HQ3	16.5																
HQ3	16.0	7															
TW	15.5				TWS4		ATc	8m: CLAY, light brownish grey. Firm, moist, high plasticity. Some dark brown amorphous organic flecks.	CH	105							
HQ3	15.0	8															
HQ3	14.5				ATI		8.65m: Fine sandy SILT with some clay, medium brownish grey. Firm, wet, low plasticity. Discrete fibrous wood/ rootlet streaks. Frequent mica specks.	ML						1/2,2,1,2	7		
SPT	14.0	9															
SPT	13.5				ATs		9m: Gradational boundary. Silty fine SAND, medium grey. Very loose, wet, non plastic.	SM									
HQ3	13.0	10															

Last Generated: 12/07/2010 2:11:23 p.m.

- Remarks:**
1. Hand Auger to 1.2mbgl for service check.
 2. No groundwater measured on the day of drilling.
 3. Hole backfilled with gravel and bentonite.

Logged: HH
Input: HH
Checked: PKC
Verified: AJB



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Project Reference: **203299**

DH106

Sheet 3 of 7

DRILLING INFORMATION		CO-ORDINATES [ME2000]		Date Started: 17/06/2010	
Drilling Method: Truck Mounted Drill Rig		Easting: 408097.37		Date Completed: 21/06/2010	
Diameter Core: HQ (60mm)		Northing: 787953.97		Inclination: 90°	
Flush: Water		Ground Level: 22.90m		Orientation:	
Contractor: Boart Longyear		[Auckland 1946 ms]			

Drilling Method	R.L. (m)	Depth (m)	Sample Type	Water Level (m)	Graphic Log	Geological Name	Layer Code	Description of Materials	Weathering/USCS	TCR (%)	SCR (%)	RQD (%)	Fracture Index	Standard Penetration Tests [SPT]		Additional Information (Defect Description)	Installation Details
														Peak/Residual 'Su' or Blows	'N' Value		
HQ3	12.5	11						9m: Gradational boundary. Silty fine SAND, medium grey. Very loose, wet, non plastic.	SM	76				4/3,4,6,5	18		
SPT	12.0	11						10.5m: ...medium dense.		100						10.95m: Core loss likely between 10.95 to 11.3m.	
HQ3	11.5	12	D					11.6m: to 12.45m... dilatent.		67				6/4,4,4,3	15		
SPT	11.0	12								100						12.45m: Drillers Note change to normal catcher - no recovery. Change to extended catcher - material has washed out. Add drilling mud.	
HQ3	10.0	13								0							
SPT	9.5	13												2/2,2,3,3	10		
HQ3	9.0	14															
SPT	9.0	14								100							
HQ3	8.5	15								46							

Remarks:														Logged: HH	
1. Hand Auger to 1.2mbgl for service check.														Input: HH	
2. No groundwater measured on the day of drilling.														Checked: PKC	
3. Hole backfilled with gravel and bentonite.														Verified: AJB	

Last Generated: 12/07/2010 2:11:23 p.m.



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Client: **ONTRACK**
Project: **Auckland Electrification Project**
Location: **9 Bridge St, Papatoetoe**
Project Reference: **203299**

DH106

Sheet 4 of 7

DRILLING INFORMATION				CO-ORDINATES [ME2000]				Date Started: 17/06/2010 Date Completed: 21/06/2010									
Drilling Method: Truck Mounted Drill Rig Diameter Core: HQ (60mm) Flush: Water Contractor: Boart Longyear				Easting: 408097.37 Northing: 787953.97 Ground Level: 22.90m [Auckland 1946 msl]				Inclination: 90° Orientation:									
Drilling Method	R.L. (m)	Depth (m)	Sample Type	Water Level (m)	Graphic Log	Geological Name	Layer Code	Description of Materials	Weathering/USCS	TCR (%)	SCR (%)	RQD (%)	Fracture Index	Standard Penetration Tests [SPT]		Additional Information (Defect Description)	Installation Details
														Peak/Residual 'Su' or Blows	'N' Value		
SPT	7.5	7.5				ATs	ATs	15m: ...very loose.	SM					1/0,0,0,2	2		
TW		7.0				ATI	ATI	15.15m: Clayey SILT with trace fine sand, medium grey. Very soft, wet, high plasticity. Some mica specks.	MH	100	76						
HQ3		6.5	D			ATs	ATs	16.12m: Fine SAND with some silt, medium grey. Loose, wet to saturated, non plastic. Some mica specks.	SW	100				1/0,1,1,2	4		
SPT		6.0				ATI	ATI	16.9m: Fine sandy SILT with some clay, medium grey. Soft, wet, low plasticity. Some mica specks. Some thin (<5mm) SAND interbeds.		100							16.95m: Core loss likely between 16.95 to 17.25m.
HQ3		5.5				ATI	ATI	17.2m: ...5mm band of amorphous organic flecks.	ML								
SPT		5.0				ATI	ATI	17.55m: ...50mm band of amorphous organic flecks.		71							
HQ3		4.5				ATs	ATs	17.9m: Silty fine SAND, medium grey. Loose, wet, non plastic. Some mica flecks.	SM	100				0/2,2,2,2	8		18.45m: Core loss likely between 18.45 to 19.0m.
SPT		4.0				ATs	ATs	19.5m: ...very dense.	SM	48				14/11,12,15,12	56		19.5m: SPT - 50 blows for 270mm.
SPT		3.5								100							
SPT		3.0								10							

Last Generated: 12/07/2010 2:11:24 p.m.

- Remarks:**
1. Hand Auger to 1.2mbgl for service check.
 2. No groundwater measured on the day of drilling.
 3. Hole backfilled with gravel and bentonite.

Logged: HH
Input: HH
Checked: PKC
Verified: AJB



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Client: **ONTRACK**
Project: **Auckland Electrification Project**
Location: **9 Bridge St, Papatoetoe**
Project Reference: **203299**

DH106

Sheet 5 of 7

DRILLING INFORMATION		CO-ORDINATES [ME2000]		Date Started: 17/06/2010	
Drilling Method: Truck Mounted Drill Rig		Easting: 408097.37		Date Completed: 21/06/2010	
Diameter Core: HQ (60mm)		Northing: 787953.97		Inclination: 90°	
Flush: Water		Ground Level: 22.90m		Orientation:	
Contractor: Boart Longyear		[Auckland 1946 msl]			

Drilling Method	R.L. (m)	Depth (m)	Sample Type	Water Level (m)	Graphic Log	Geological Name	Layer Code	Description of Materials	Weathering/USCS	TCR (%)	SCR (%)	RQD (%)	Fracture Index	Standard Penetration Tests [SPT]		Additional Information (Defect Description)	Installation Details	
														Peak/Residual 'Su' or Blows	'N' Value			
HQ3	2.5	21				ATs		17.9m: Silty fine SAND, medium grey. Loose, wet, non plastic. Some mica flecks.	SM	10						19.92m: Drillers Note change to normal catcher - material has washed out.		
SPT								21m: ...medium dense.						5/5,5,7,7	24			
HQ3	1.0	22				ATc		21.65m: CLAY, dark brown (organic stained). Very stiff, wet, high plasticity. Some mica specks.	CH							21.45m: Drillers Note change to extended catcher -drilling is not advancing - change back to normal catcher. Core loss likely between 21.45 to 21.65m.		
SPT								21.98m: Clayey SILT with minor fine sand, light to medium grey. Very stiff, moist, high plasticity. Frequent white pumiceous gravels (<1mm). Some mica specks and discrete brown amorphous organic streaks.	MH	81								
SPT								22.4m: ...decrease in gravels. 22.5m: ...increase in sand content.						4/2,3,4,4	13			
HQ3	-0.5	23				ATI		22.95m: Fine SAND with some silt, medium grey. Medium dense, wet, non plastic. Some mica flecks. Some thin (<5mm) lenses of CLAY, medium grey. Firm, moist, high plasticity.	SW									
SPT								23.9m: Silty fine SAND, medium grey. Medium dense, moist to wet, low plasticity to non plastic. Some mica specks.	SM	100					3/4,5,4,5	18		
HQ3	-2.0	25				ATs		24.7m: Medium SAND, green. Dense, wet, non plastic. Some very light brown fragments (calcareous?).	SW	33						24.8m: Core loss likely between 24.8 to 25.5m.		

Remarks:												Logged: HH	
1. Hand Auger to 1.2m bgl for service check.												Input: HH	
2. No groundwater measured on the day of drilling.												Checked: PKC	
3. Hole backfilled with gravel and bentonite.												Verified: AJB	

Last Generated: 12/07/2010 2:11:24 p.m.



139 Carlton Gore Road
PO Box 9762
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Auckland, New Zealand
Tel: +64 9 520 6019
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Client: **ONTRACK**
Project: **Auckland Electrification Project**
Location: **9 Bridge St, Papatoetoe**
Project Reference: **203299**

DH106

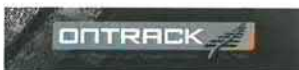
Sheet 7 of 7

DRILLING INFORMATION				CO-ORDINATES [ME2000]				Date Started: 17/06/2010 Date Completed: 21/06/2010									
Drilling Method: Truck Mounted Drill Rig Diameter Core: HQ (60mm) Flush: Water Contractor: Boart Longyear				Easting: 408097.37 Northing: 787953.97 Ground Level: 22.90m [Auckland 1946 msl]				Inclination: 90° Orientation:									
Drilling Method	R.L. (m)	Depth (m)	Sample Type	Water Level (m)	Graphic Log	Geological Name	Layer Code	Description of Materials	Weathering/USCS	TCR (%)	SCR (%)	RQD (%)	Fracture Index	Standard Penetration Tests [SPT]		Additional Information (Defect Description)	Installation Details
														Peak/Residual 'Su' or Blows	'N' Value		
SPT		-7.5				Tauranga Group	ATp	30.2m: Silty medium SAND, light grey. Dense, wet, non plastic. Frequent fine white pumiceous gravels (<1mm).	PT	100				7/7,7,9,9	32		
HQ3		-8.0					ATp	30.42m: PEAT/ WOOD, dark brown. Firm to stiff, wet. Fibrous and amorphous.	PT								
HQ3		-8.5					ATI	30.55m: Clayey SILT, light greyish brown. Very stiff to hard, moist, high plasticity. Discrete black and dark orange brown amorphous organic fragments.	MH								
HQ3		-9.0					ATs	30.65m: ...becomes light to medium grey.									
SPT		-9.5					ATs	31.05m: Gradational boundary. Silty fine SAND, medium grey. Dense, wet, non plastic.						12/8,11,13,16	48	31.5m: Drillers Note SPT rods stuck down hole - need to drill over them.	
HQ3		-10.0					ATs	31.95m: ...decrease in silt.								31.95m: Core loss likely throughout run - material is worn down (drilling induced).	
SPT		-10.5					ATs	32.3m: ...wood fragment, dark brown (<10mm). 32.37m: ...wood fragment, dark orange brown (<10mm).	SM								
		-11.0					ATs							5/5,8,14,16	43		
		-11.5					ATs										
DH106 terminated at 33.45m depth - Hole terminated due to equipment failure.																	

Remarks:
 1. Hand Auger to 1.2mbgl for service check.
 2. No groundwater measured on the day of drilling.
 3. Hole backfilled with gravel and bentonite.

Logged: HH
 Input: HH
 Checked: PKC
 Verified: AJB

Last Generated: 12/07/2010 2:11:24 p.m.



Auckland Electrification Project
St George St and Bridge St, Papatoetoe



DH Reference: DH106

Date Drilled: 17/06/10 – 21/06/10

Photographed By: HH

Date Photographed: 17/06/10 – 21/06/10



Box 1. - Depth: 0.00m to 4.15m.



Box 2. - Depth: 4.15m to 7.20m.



Auckland Electrification Project
St George St and Bridge St, Papatoetoe



DH Reference: DH106

Date Drilled: 17/06/10 – 21/06/10

Photographed By: HH

Date Photographed: 17/06/10 – 21/06/10



Box 3 - Depth: 7.20m to 10.40m.



Box 4 - Depth: 10.40m to 15.45m.



Auckland Electrification Project
St George St and Bridge St, Papatoetoe



DH Reference: DH106

Date Drilled: 17/06/10 – 21/06/10

Photographed By: HH

Date Photographed: 17/06/10 – 21/06/10



Box 5. - Depth: 15.45m to 19.70m.



Box 6. - Depth: 19.70m to 23.80m.



Auckland Electrification Project
St George St and Bridge St, Papatoetoe



DH Reference: DH106
Photographed By: HH

Date Drilled: 17/06/10 – 21/06/10
Date Photographed: 17/06/10 – 21/06/10



Box 7. - Depth: 23.80m to 27.45m.



Box 8. - Depth: 27.45m to 30.55m.



Auckland Electrification Project
St George St and Bridge St, Papatoetoe



DH Reference: DH106

Date Drilled: 17/06/10 – 21/06/10

Photographed By: HH

Date Photographed: 17/06/10 – 21/06/10



Box 9. - Depth: 30.55m to 33.45m.



Babbage Geotechnical Laboratory
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 68 Beach Road
 Auckland 1010
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 64-9-367 4954
 64-9-377 0554
wec@babbage.co.nz

Please reply to: W.E. Campton

Aurecon Ltd
 PO Box 9762
 Newmarket
 Auckland 1149, New Zealand



Job Number: 44326

Checked by:
 WEC
 9th July 2010

Attention: PAUL CARTER

Dear Sir,

**Re: AEP Bridges
 Hydrometer Particle-Size Distribution Testing
 Report Number: 44326/HYD**

The following report presents the results of hydrometer particle-size distribution testing of core box soil samples collected from your office on the 7th July 2010. Test results are summarised below, with the following pages showing graphs and detailed results.

Test standards used were:

Water Content: NZS4402:1986:Test 2.1
Hydrometer Test: NZS4402:1986:Test 2.8.4

Borehole Number	Sample Number	Depth (m)	Hydrometer Grading (% of Dry Mass)		
			SAND (%)	SILT FRACTION (%)	CLAY FRACTION (%)
DH102	1	14.0 – 14.1	69	19	12
DH105	2	14.9 – 15.0	59	27	14
DH106	3	16.25 – 16.35	70	18	12
DH106	4	11.6 – 11.7	53	32	15

The whole soil was used for these tests.

Please note that the test results relate only to the samples under test.


Thank you for the opportunity to carry out this testing. If you have any queries regarding the content of this report, please contact the undersigned at your convenience.

Yours faithfully,

Wayne Campton
Signatory (Laboratory Manager)
Babbage Geotechnical Laboratory



All tests reported herein have been performed in accordance with the laboratory's scope of accreditation. This report may not be reproduced except in full & with written approval from BGL.

 B G L BABBAGE GEOTECHNICAL LABORATORY	Job Number:	44326	Sheet 1 of 1	Page 4 of 5
	Reg. Number:	1787	Revision No:	1
	Report No:		Issue Date:	August 2003
	Project:	AEP Bridges		

PARTICLE SIZE DETERMINATION Distribution by Hydrometer Test Method: NZS4402:1986:Test 2.8.4	Tested By:	wec	Jul-10
	Compiled By:	comp	Jul-10
	Checked By:	wec	9/07/2010

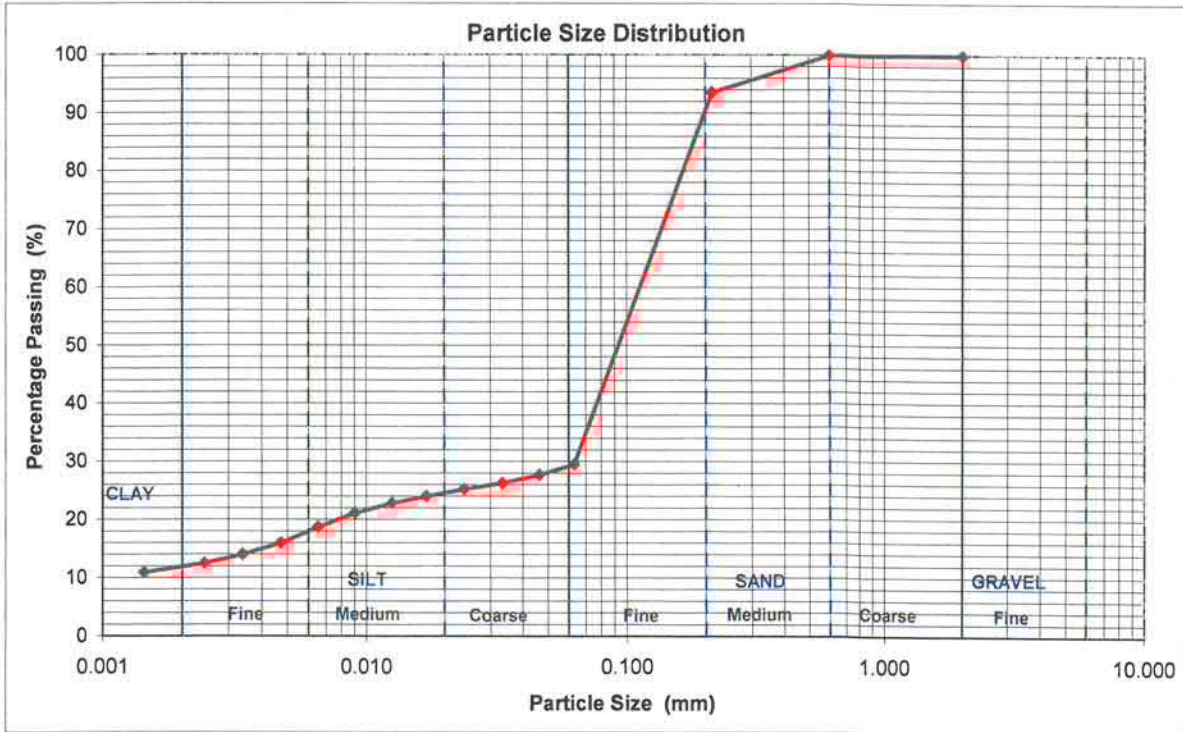
Borehole Number: DH106
Sample Number: 3
Depth: 16.25 - 16.35m
Water Content (%): 25.5


Sample History: Natural / Air-Dried / Oven-Dried / Unknown

Particle Size (mm)	% Finer Than
9.50	100
6.70	100
4.75	100
2.00	100
0.600	100
0.212	94
0.063	30
0.046	28
0.033	26
0.024	25
0.017	24
0.013	23
0.0091	21
0.0066	19
0.0047	16
0.0034	14
0.0024	12
0.0014	11

HYDROMETER ANALYSIS (% of dry mass)

			Total	
GRAVEL:	(Coarse)	60 - 20mm	0	0 %
	(Medium)	20 - 2mm	0	
	(Fine)	6 - 2mm	0	
SAND:	(Coarse)	2.0 - 0.6mm	0	70 %
	(Medium)	0.6 - 0.2mm	6	
	(Fine)	0.2 - 0.06mm	64	
SILT FRACTION:	(Coarse)	0.06 - 0.02mm	5	18 %
	(Medium)	0.02 - 0.006mm	7	
	(Fine)	0.006 - 0.002mm	6	
CLAY FRACTION: < 0.002mm			12	100%



 B G L BABBAGE GEOTECHNICAL LABORATORY	Job Number:	44326	Sheet 1 of 1	Page 5 of 5
	Reg. Number:	1787	Revision No:	1
	Report No:		Issue Date:	August 2003
	Project:	AEP Bridges		

PARTICLE SIZE DETERMINATION

Distribution by Hydrometer
 Test Method: NZS4402:1986:Test 2.8.4

Tested By:	wec	Jul-10
Compiled By:	comp	Jul-10
Checked By:	wec	9/07/2010

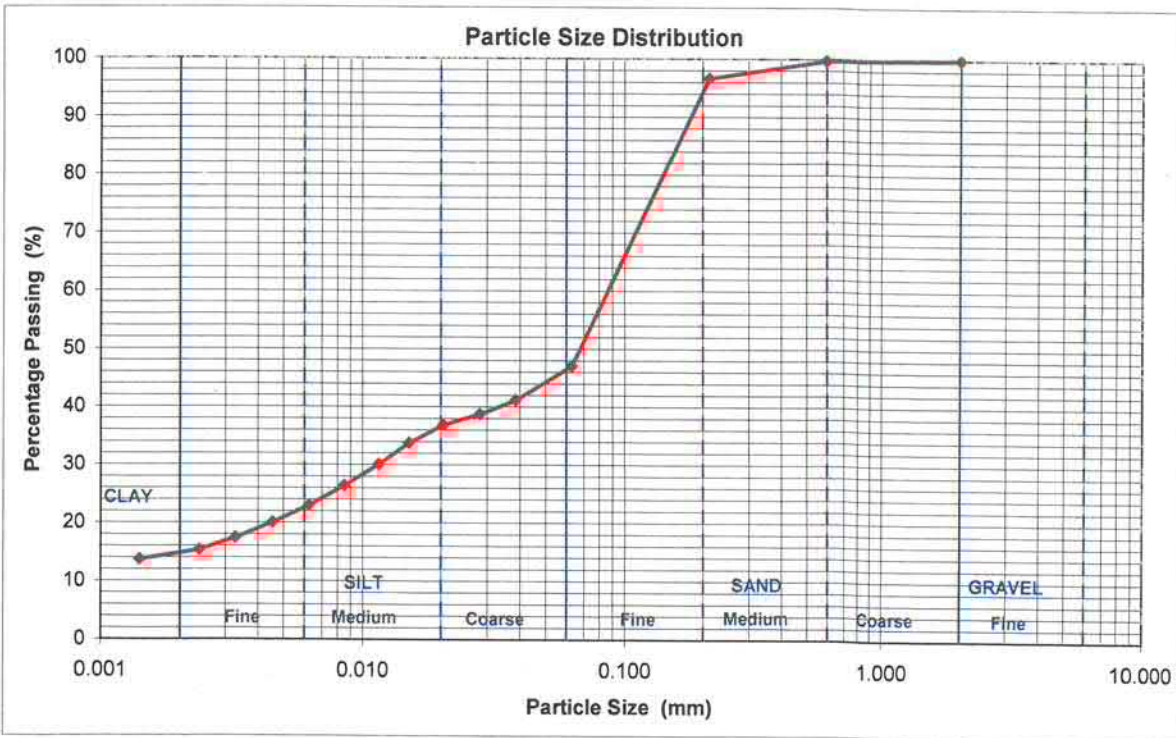
Borehole Number: DH106
Sample Number: 4
Depth: 11.6 - 11.7m
Water Content (%): 46.9

Sample History: Natural / Air-Dried / Oven-Dried / Unknown

Particle Size (mm)	% Finer Than
9.50	100
6.70	100
4.75	100
2.00	100
0.600	100
0.212	97
0.063	47
0.038	41
0.028	39
0.020	37
0.015	34
0.012	30
0.0085	26
0.0062	23
0.0045	20
0.0033	17
0.0024	15
0.0014	14

HYDROMETER ANALYSIS (% of dry mass)

				Total	
GRAVEL:	(Coarse)	60 - 20mm	0	0	%
	(Medium)	20 - 2mm	0		
	(Fine)	6 - 2mm	0		
SAND:	(Coarse)	2.0 - 0.6mm	0	53	%
	(Medium)	0.6 - 0.2mm	3		
	(Fine)	0.2 - 0.06mm	50		
SILT FRACTION:	(Coarse)	0.06 - 0.02mm	10	32	%
	(Medium)	0.02 - 0.006mm	14		
	(Fine)	0.006 - 0.002mm	8		
CLAY FRACTION: < 0.002mm				15	%
				100%	



Appendix E. Hazardous Activities and Industries List (HAIL)