Attachment 8

Preliminary Site Investigation and
Detailed Site Investigation
prepared by Beca Limited

DRAFT - Preliminary Site Investigation / Detailed Site Investigation - Contamination

Fergusson FN Wharf Extension and Bledisloe North Wharf

Prepared for Port of Auckland Ltd
Prepared by Beca Limited

28 August 2024

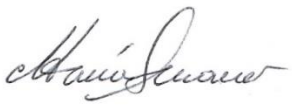
Contents

Appendices

Revision History

Revision N°	Prepared By	Description	Date
1	Maria Serrano	Draft for Client Review	

Document Acceptance

Action	Name	Signed	Date
Prepared by	Maria Serrano		
Reviewed by	Holly Scott Phillip Ware		
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on behalf of	Beca Limited		

Executive Summary

Beca Limited (Beca) was commissioned by Port of Auckland (PoAL) (the client) to undertake a combined Preliminary and Detailed Site Investigation – Contamination (PSI/DSI) for the proposed Fergusson North (FN) Wharf Extension and Bledisloe North (BN) Wharf areas, located within the Port of Auckland, in Auckland CBD.

The purpose of this PSI/DSI is to identify areas of soil contamination which may require management with respect to risks to human health and the environment and inform the contaminated land consent requirements under the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (NESCS) and the Auckland Unitary Plan – Operative in part (AUP(OP)).

The scope of this investigation included a desk-based review of selected historical background information and limited soil and groundwater sampling across accessible areas of the site.

Findings

The site is located within two areas of PoAL land. The first area (BN area) falls within the northern portion of present-day Bledisloe Wharf and includes a portion of land reclaimed between late 1970s and early 1980s which has been historically used for shipping container handling, with the presence of a substation building (built in the 1970s) a smaller building (built between 1996 and 2001 and removed by 2012) and two concrete structures for management of heavy containers. This site area is currently being used for miscellaneous storage and carparking and is the location of two portable office buildings and a yard for marine maintenance which includes storage of small volumes of hazardous substances. The substation building remains present.

The second area (FN area) falls within the north-eastern portion of present-day Fergusson Wharf and includes a portion of land reclaimed around 2017 which comprises a mudcrete bund and a portion of a crane maintenance yard.

Given port operations at the time of the investigation, the location of services lines, existing infrastructure, and the material encountered below asphalt only one sampling location was possible within the area proposed for soil disturbance at BN. Soil sampling was undertaken from four additional sampling locations as close as possible to the BN area and from one location from as close as possible to the FN area. It is anticipated that reclamation materials within the BN area will comprise mainly rock fill with less fines, presenting a lower risk for contamination. This is consistent with the observations made at the one borehole drilled within the BN area which noted gravel underneath concrete from 0.09m to 0.4m below ground level (bgl), and boulders encountered at 1m bgl (it wasn't possible to observe the interval from 0.4m to 1m because of hydro-vac excavation in this interval). As a result, given the method of reclamation and the site uses, this sampling approach is considered sufficient to determine the overall sitewide contamination risks.

Groundwater sampling was undertaken from two of the soil sampling locations. 14 soil samples (including one QA/QC soil sample) and four groundwater samples (including one QA/QC groundwater sample and one trip blank) were submitted for laboratory analysis including heavy metals, TPH, PAH and asbestos. In summary:

- All analyte concentrations were reported below the adopted human health guidelines.
- Seven soil samples reported concentrations of nickel above the AUP(OP) environmental criteria, however these nickel concentrations were reported below background concentrations for volcanic soils.
- TPH was detected in five of the soil samples analysed.
- PAHs was detected in six of the soil samples analysed

- Chrysolite (white asbestos) was detected in soil at one location with concentrations of combined Fibrous Asbestos and Asbestos Fines (FA/AF) below the laboratory limit of detection (<0.001% w/w) and below the human health criteria.
- Concentrations of all contaminants of concern in groundwater samples were below the laboratory limit of detection.

Potentially contaminating land uses/ activities as listed on the Ministry of the Environment (MfE) Hazardous Activities and Industries List (HAIL) identified on the site include:

BN area

- **G3:** Landfill Sites – Relating to land reclamation across the site
- **A17:** Storage tanks or drums for fuel, chemicals, or liquid waste – Relating to the small storage of hazardous chemicals identified in the eastern end of the BN area.
- **B2:** Electrical transformers including the manufacturing, repairing or disposing of electrical transformers or other heavy electrical equipment – Relating to a substation building located in the eastern portion of BN area.
- **F5:** Port activities, including dry docks or marine vessel maintenance facilities – Relating to general port activities on site and within the wider port area.

FN area

- **F5:** Port activities, including dry docks or marine vessel maintenance facilities – Relating to general port activities on site and within the wider port area.

Other Contamination Considerations

The FN area has been reclaimed more recently than the BN area and the majority of the Auckland Waterfront. The material used for the reclamation was marine dredged sediments (cement stabilised). The material was observed during deposition, and it is considered an 'engineered surface' and not an uncontrolled fill. There have been instances on the broader Auckland Waterfront (Viaduct Basin) where the mudcrete reclamations have been found to contain low level contamination including asbestos fibres thought to originate from stormwater discharges into the near shore sediment deposits used for their construction. The FN area used sediments from the main channel dredging and is therefore considered to be a much lower risk of containing contamination (when compared to near shore sediments. On this basis the FN area is not considered to reach the threshold of 'more likely than not' to contain Landfill Sites (G3) or any other (I) where there is a reasonable likelihood of a risk to human health or the environment.

Consenting, Recommendations and Disposal Options

Consenting

Based on the results of this investigation the land disturbance activities associated with the proposed development will likely require resource consent as a Controlled Activity under Regulation 9 of the NESCS and a Contaminated Soil Management Plan (CSMP) will be required to support the works.

While seven soil samples reported nickel concentrations above the AUP environmental criteria, the concentrations were reported below background concentrations for volcanic soils, and therefore can be attributed to the local soils rather than contamination from a historic activity held on site. As a result, the contaminated land provisions of AUP(OP) Chapter E.30 are unlikely to be triggered in this instance.

Recommendations

- Should the proposed development include soil disturbance within the currently operating areas of the substation building, storage of hazardous substances and former concrete structures for management of

heavy containers, soil sampling across these areas will be required. Based on the findings of this soil sampling, procedures within the CSMP may require updating.

- Prior to any refurbishment and/or demolition works occurring on site, in accordance with the Health and Safety at Work (Asbestos) Regulations 2016, an asbestos survey should be undertaken. If the survey recommends removal of asbestos containing materials (ACM), then asbestos removal should be undertaken, and subsequent clearance be obtained in accordance with WorkSafe's Approved Code of Practice Management and Removal of Asbestos (2016).

Disposal and Reuse Options

Soil sampling has revealed concentrations of contaminants of concern above the expected background concentrations and/or detection of PAH and/or TPH at nine locations, along with a single detection of asbestos. While risk for contamination is expected to be lower within the proposed disturbance areas (given it is anticipated that fill within the disturbance area will comprise mainly rock fill with less fines), further sampling and laboratory analysis will be required across the site (including the areas across the substation building and marine maintenance yard) to inform reuse, handling, and disposal options. Where additional laboratory analysis concludes that soils on site can be reused on site, reused soils will need to be fully stabilised to prevent erosion and discharge of sediment upon completion of the works. Additionally, there may be geotechnical limitations to reuse of soils on site.

The CSMP will detail further soil sampling requirements for areas not sampled as part of this investigation and to inform disposal requirements. Surplus spoil requiring off-site disposal will likely require disposal as managed fill or contaminated fill unless further sampling indicates otherwise. It is recommended that acceptance of soil be sought from any receiving facility prior to commencing works.

1 Introduction

Beca Limited (Beca) was commissioned by Port of Auckland (PoAL) to undertake a combined Preliminary and Detailed Site Investigation – Contamination (PSI / DSI) for the proposed Fergusson North (FN) Wharf Extension and Bledisloe North (BN) Wharf areas, located within the Port of Auckland, in the Auckland CBD.

1.1 Investigation Objectives

The purpose of the investigation was to:

- Identify areas of soil and groundwater contamination within proposed areas of work as a result of current or historical activities which may require management with respect to human health and the environment.
- Develop a Conceptual Site Model to outline the presence or absence of any contaminant source-receptor pathways.
- Inform contaminated land consent requirements for the proposed works under the:
  - Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (NESCS).
  - Auckland Council (AC)'s Auckland Unitary Plan (AUP) – Section E30 Contaminated Land.
- Provide initial assessment of management and disposal of excavated soil.

1.2 Scope of Works

The scope of works included a desktop phase (PSI) followed by an intrusive investigation phase (DSI). Further details of the scope of each phase are provided below. Following these two phases, this report was prepared to present the combined findings across the two phases for the site.

The PSI phase of the investigation comprised a site walk over and interview with personnel who have knowledge of the site history, and a desktop review of information. The following information sources were reviewed:

- Historical aerial photography for the site sourced from Retrolens, Auckland Council GEOMaps, and Nearmap.
- High level review of Auckland Council property files. Due to the volume of files related to the Port of Auckland this was not reviewed in its entirety.
- An Auckland Council Site Contamination Enquiry including discharge consent information
- Information on the environmental setting of the site

The findings of the PSI component informed a ground investigation (the DSI component) at the site, which comprised:

- The advancement of three boreholes in conjunction with the geotechnical investigation and the advancement of three additional environmental boreholes.
- The installation of two piezometers to a maximum depth of 7m below ground level (bgl).
- The collection of 47 soil samples (including one Quality Assurance/Quality Control (QA/QC) soil sample) and four groundwater samples (including one QA/QC and one trip blank).
- Analysis of 14 soil samples, including one QA/QC soil sample, for a combination of heavy metals (arsenic, cadmium, chromium, copper, mercury, lead, nickel, and zinc), polycyclic aromatic hydrocarbons (PAH), total petroleum hydrocarbons (TPH), and asbestos.
- Analysis of two groundwater samples, and one QA/QC sample and one trip blank for a combination of heavy metals, PAH and TPH.

This assessment has been undertaken and reported in general accordance with:

- Ministry for the Environment (MfE) Contaminated Land Management Guidelines No. 1 – Reporting on Contaminated Sites in New Zealand (2021)
- MfE Contaminated Land Management Guidelines No. 5 – Site Investigation and Analysis (2021).
- New Zealand Guidelines for Assessing and Managing Asbestos in Soils (2017) (GAMAS).

Intrusive investigation within two operational areas of the site where HAIL activities were identified was not possible as part of this investigation. Depending on final proposed works designs, further investigation might be required for this report to align with the above guidelines.

2 Site Description

2.1 Site Location and Area

The site comprises two areas designated for the proposed Bledisloe North (BN) Wharf and Fergusson North (FN) Wharf Extension, located within the wider PoAL property, Auckland (Figure 1). The areas of the site occupy approximately 15,700m² (BN wharf) and 2,600m² (FN wharf) for a combined site area of approximately 18,300m². The site falls across two land parcels associated with the Port of Auckland, legally described as:

- Part Lot 37 DP 131568
- Lot 13 DP 131563

The locations of the site in relation to these two land parcels is shown in Figure 1. The yellow lines represent the existing lot boundaries.

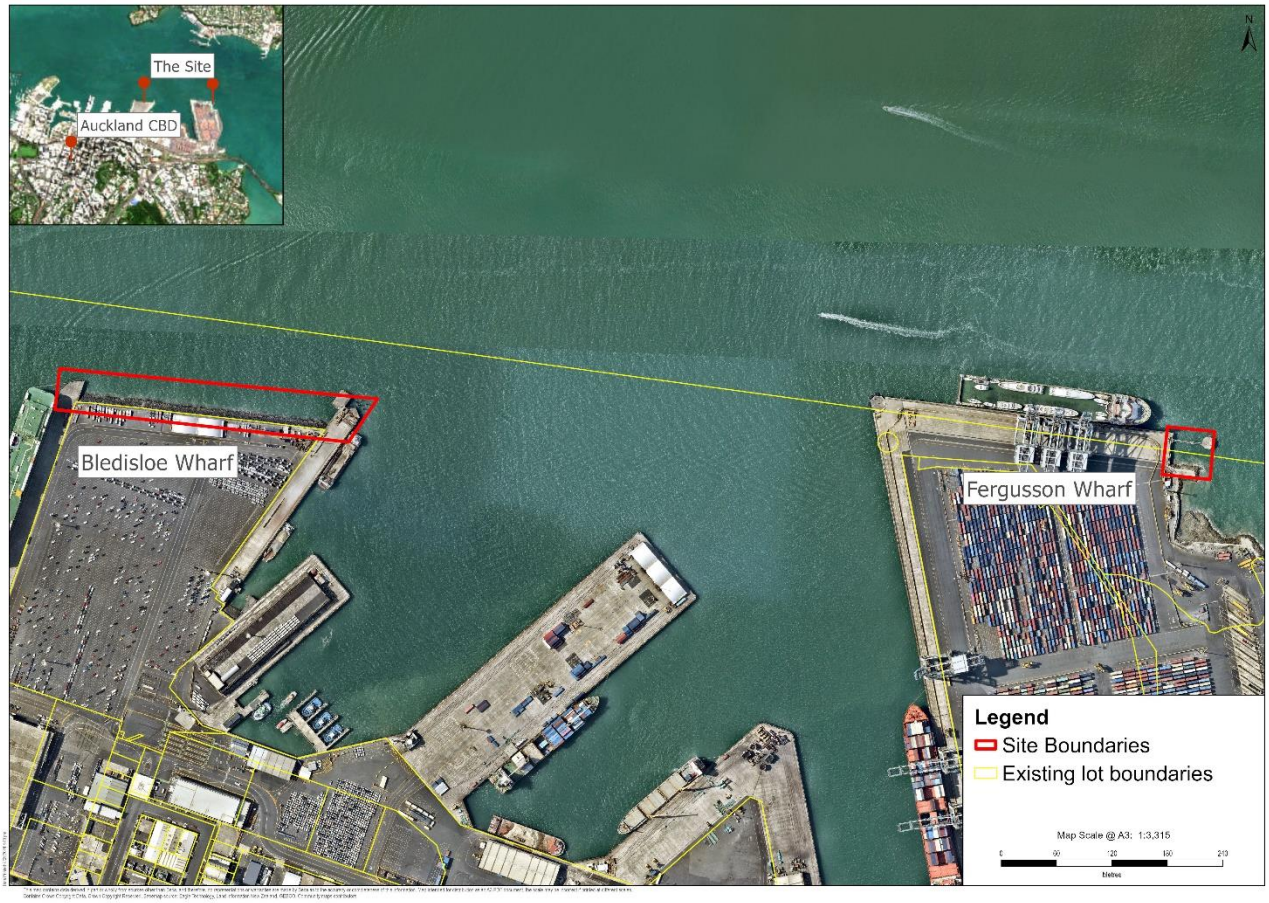

Figure 1. Site Location (outlined red) within PoAL Property

2.2 Proposed Works

PoAL intend to construct the following:

- An extension to the existing FN wharf to enable quay cranes to access the full length of the ship. The new wharf extension will be approximately 45m long and 34m wide plus a triangle infill wharf of approximately 15m by 15m dimension. The wharf will consist of a pile supported concrete structure comprising flat deck similar to the existing wharf. Piles will be steel encased reinforced concrete, socketed into the Waitematā rock that underlies the site.

- A new BN Wharf to provide new berth for cruise vessels and roll-on/roll off vessels. The new wharf will be approximately 330m long and 27.5m wide. The wharf will be a pile supported concrete structure comprising a combination of precast and in-situ concrete deck. Piles will be steel encased reinforced concrete, socketed into the Waitematā rock that underlies the site.

The proposed development will involve earthworks for the establishment of piles and retaining walls. Final earthworks areas and volumes are to be confirmed. However, it is currently understood that earthworks will be limited to the northernmost 6m of the Bledisloe Wharf (for an area of approximately 1,400m²) and northernmost 6m of the mudcrete bund located at Fergusson Wharf (forming an area of approximately 200m²). The proposed earthworks depth is currently understood to be around 6m bgl.

3 Environmental Setting

3.1 Current Land Use

BN area

The southern portion of the BN area falls within reclaimed land while the remainder falls within the Waitematā Harbour. The western portion of the land area is currently being used mainly for parking vehicles and miscellaneous storage. In the eastern portion are: a substation building, C3 Limited's office (cargo handling company), and Heron's Construction site for marine maintenance (which includes a yard and an office). Along the reclaimed land is a rock revetment with the Bledisloe B3 and Bledisloe B2 wharves to the west and east, respectively.

FN area

The south-western corner of the Fergusson Wharf site area falls within reclaimed land, which is the location of a portion of a workshop for crane maintenance. A mudcrete bund is located in the southern portion. The remainder of the Fergusson Wharf Site Area falls within the Waitematā Harbour with an existing mooring dolphin in the northern portion and with Ferguson Wharf to the west.

3.2 Surrounding Land Use

BN area

The areas to the west, north and east of the BN area fall within the Waitematā Harbour while the area to the south is the location of a multi-cargo facility for the handling of import vehicles.

FN area

The areas to the north, east and south-east of the FN area fall within the Waitematā Harbour. To the west of the site is the existing Fergusson North Wharf and to the south-west is a workshop for crane maintenance.

3.3 Topography

The topography of the site is generally flat as viewed using Auckland Council GEOMaps[1], at an elevation of approximately 4 m above mean sea level. All land within and surrounding the site is impervious concrete or asphalt surfaces.

3.4 Sensitive Receptors and Hydrology

BN area

Waitematā Harbour is located to the north of the land within the BN area. According to the Auckland Council GEOMaps, no overland flow paths pass through this site area.

FN area

Most of the FN area falls within the Waitematā Harbour. No overland flow paths are identified within this site area on the Auckland Council GEOMaps.

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3.5 Geology and Hydrogeology

Geological mapping[2] for the area indicates the site is underlain by Holocene engineered fill. This is recorded for the entirety of the waterfront as: "*consists of landfill areas containing re-compacted clay to gravel sized materials, sometimes including demolition debris*."

Additionally, a geotechnical factual report was undertaken in 2014 by Beca for the development of Tug Berth and the extensions of the Bledisloe B2 and B3 Wharves. The geotechnical report included the advancement of seven boreholes, of which two fall within the land portion of the BN area. The borehole logs at these two locations show a layer of fill material down to 16 m – 16.7 m below ground level (bgl) with the Waitematā Group - ECBF underlying fill material. Fill material was generally described in the report as sands and gravel with the presence of scoria. Basalt boulders were noted at one of the locations from 6m bgl to the bottom of the fill layer. No groundwater levels were recorded in the geotechnical report.

[2] https://data.gns.cri.nz/geology/

Tug Berth, Bledisloe B2 & B3 Extensions – Geotechnical Factual Report, Beca, May 2014

4 Information Search

4.1 Historical Aerial Photographs

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Table 1 □i□oric□□□□ri□□□□o□o□r□□□ R□□i□□ S□□ □ □r□

Year	On Site		Surrounding Area
	BN Area	FN Area	
1940	• The site is largely within the Waitematā Harbour and has not yet undergone reclamation works. A small area of the northern end of former Kings Wharf encroaches within the southern portion of the site with no features observed within this area.	• The entirety of the site is within the Waitematā Harbour and has not yet undergone reclamation works.	• A breakwater is noted approximately 140m to the south-west of the Fergusson Wharf site area. • The former Kings Wharf is noted directly to the south-west of the BN area.
1950	• No significant changes observed	• No changes noted	• No significant changes observed
1959	• No significant changes observed	• No changes noted	• No significant changes observed
1963	• No significant changes observed	• No changes noted	• No significant changes observed
1975	• The site remains largely unchanged with a wharf like structure present off the former Kings Wharf and along the southern boundary of the site. • What appears to be a temporary structure for dredging activities is noted in the eastern portion of the site.	• No changes noted	• Reclamation works are being undertaken in the southern half of present-day Bledisloe Wharf and Terminal. • Reclamation has been undertaken in the southern portion of present-day Fergusson Wharf, where a number of buildings and shipping container storage is noted.
1987	• The majority of the site remains within he Waitematā Harbour. The southern portion has been reclaimed and is part of Bledisloe Wharf. • A building and what appears miscellaneous storage is noted within the land portion of the BN area.	• No changes noted	• An additional area of Bledisloe Wharf and Terminal has been reclaimed directly south of the site in the western portion. The northern portion of Bledisloe Wharf is being used largely as a shipping container yard with the presence of a large building approximately 30m to the south of the site Bledisloe Wharf site area. • Further land reclamation has been undertaken across present-day Fergusson Wharf approximately 130m to the south-

Year	On Site		Surrounding Area
	BN Area	FN Area	
	• A rectangular shaped feature can be seen to the east of the building; however, its nature cannot be discerned from the image. • An area to the west of the building is noted to have a lighter coloured surface. • Bledisloe B2 and B3 Wharfs have been established in the eastern and western portions of the site, respectively.		west of FN area. The Fergusson terminal is used for container storage.
1996	• No changes observed.	• No changes observed.	• No significant changes observed
2001	• The site remains unchanged. The land portion of the site has asphalt coverage and is the location of three lamp posts, a building and what appears to be a portable building. • The rectangular shaped feature noted in the 1987 photograph to the east of the building remains present. From the image, this feature appears to be a void divided in several sections/units in a vertical grid line arrangement. However, the exact nature of the feature cannot be identified. • A crane, a vehicle and miscellaneous storage is noted in and around the area with lighter coloured surface to the west of the building. • A rock revetment is noted along the edge of the land portion.	• No changes observed.	• No significant changes observed
2012	• No significant changes noted apart from the removal of the portable building noted in the previous aerial image. The land portion of the site is	• No changes observed.	• An additional area of the present-day Fergusson Terminal has been reclaimed and is being used as a shipping container yard. Additional Fergusson terminal reclamation activities are being undertaken

Year	On Site		Surrounding Area
	BN Area	FN Area	
	being used as a container yard.		approximately 80 m to the south-west of the Fergusson Wharf site area.
2017	• The rectangular void-like feature in the eastern end of the site appears to have a concrete surface. A container can be seen located on this feature. • The land portion of the site is being used for parking cars and trucks. No additional changes noted	• A concrete deck is noted across the site within the Waitematā Harbour which appears to be used for dredging activities in the vicinity of the site.	• Additional land reclamation has been undertaken in the Fergusson Terminal. Dredging activities are noted in the close vicinity of the Fergusson Wharf site area while the construction of the Fergusson North Wharf is being undertaken. A settlement pond is located directly to the southwest of the Fergusson Wharf site area. • The present-day Bledisloe Wharf and Terminal is now being used for parking cars.
2024	• Two large buildings/shelters have been established in the land portion of the site alongside a smaller building to the east of the shelters. • A number of what appear to be shipping/storage containers are noted in the eastern portion of the site where the rectangular void-like figure was previously located.	• The southern portion of the site has been reclaimed. The western portion of the reclaimed land area has an asphalt coverage while the eastern portion appears to be a rock bund with rock revetment noted. • A number of containers and a tent/shelter are noted in the south-western corner of the site within the paved area. • A mooring dolphin has been established with a small portion of the Fergusson North Wharf encroaching within the western portion of the site.	• Reclamation activities have ceased in the vicinity of the Fergusson Wharf site area. • The Fergusson North Wharf has been established directly to the west of the site with three container cranes noted.

4.2 Auckland Council Information

An enquiry was made to Auckland Council for information relating to contaminated land at or within 200m of the site. A response was received on 8 May 2024. A summary of the information is provided, and the full response included within **Appendix B**.

4.2.1 Site Contamination Enquiry

The ‘site contamination enquiry’ portion of the assessment indicated that there may be historic and/or current land use activities on or adjacent to the site that are listed on the Ministry for the Environment’s Hazardous Activities and Industries List (HAIL):

- HAIL Code F5 - Port activities including dry docks or marine vessel maintenance facilities.
- HAIL Code G3 - Landfill sites.

AC records confirm this area of the Port had been subject to reclamation filling and marine port activities. Additionally, AC have advised that the potential for asbestos and/or lead paint from historic buildings present on site may need to be considered.

4.2.2 HAIL activities.

The following properties have been identified by AC as subject to HAIL activities:

- 161-173 Quay Street (1km to the south-west of the Bledisloe Wharf site area)
- 3 Solent Street (located approximately 740m to the south of the Fergusson Wharf site area).

Specific information of these HAIL activities has not been included within the Site Contamination Enquiry report while the properties associated with these are not within the 200m radius of the site.

Additionally, AC information indicates the land parcel Part Lot 37 DP 131568 as the location of HAIL activities. However, no additional information had been included in the Site Contamination Enquiry report.

4.2.3 Discharge Consents

Table 2 presents a summary of AC issued discharge consents located near the site. Approximate distances are calculated based on AC provided co-ordinates.

Table 2. Closest discharge consent locations within the PoAL property (Information provided by Auckland Council).

Council Reference	Property Address	Distance from site	Activity	Status	Purpose
25187	1 Quay Street	Approximately 10m to the north-east of the Bledisloe Wharf site area, within the Waitematā Harbour	Industrial or Trade Process	Proposed	To authorise the discharge of contaminants from a wharf extension of approximately 2,900m^2.
24641	1 Quay Street	Approximately 330m to the south-east of the Bledisloe Wharf site area	Industrial or Trade Process	Issued	Discharge associated with the proposal to construct and operate a tug berth facility located between Bledisloe and Jellicoe Wharves.
15041	Fergusson Container Terminal	Approximately 280m to the south-west of the Fergusson Wharf site area	Coastal Structure	Expired	To authorise the discharge of contaminants consequential to the dredging activity, and to extend the existing rock rip-rap revetment in accordance with Sections 12(1) and 15(1) of the Resource Management Act 1991.
15265	Commercial Shipping Lane Rangitoto Channel	Within the Bledisloe Wharf site area, within the Waitematā Harbour	Dredging	Superseded	To authorise the disturbance of the seabed for the purpose of capital dredging, including the removal of the dredged material from, and the discharge of contaminants to the Coastal Marine Area, in accordance with Section

Council Reference	Property Address	Distance from site	Activity	Status	Purpose
					12(1) of the Resource Management A
15613	29 Quay St Auckland Central	Approximately 400m to the south of the Bledisloe Wharf site area	Industrial or Trade Process	Issued	To authorise the discharge of contaminants onto or into land or water from an industrial or trade process, namely the operation of the commercial ports by PoAL.
15265	1 Quay St Auckland Central	Within the Bledisloe Wharf site area, within the Waitematā Harbour	Coastal Other	Expired	To authorise the disturbance of the seabed for the purpose of maintenance dredging, including the removal of the dredged material from, and the discharge of contaminants to the Coastal Marine Area, in accordance with Section 12(1) of the Resource Management Act 1991

4.2.4 Pollution Incidents

Table 3 presents a summary of AC recorded pollution incidents located near the site. Approximate distances are calculated based on AC provided co-ordinates. Based on the nature of the pollution incidence information provided by AC, and the distance from the site, none of these activities are considered to have impacted the site.

Table 3. Reported pollution incidents closest to the site (Information provided by Auckland Council).

Council Reference	Location	Distance from the Site	Date	Pollutant Type	Description
13/2645	29 Quay St	Approximately 160m to the southwest of the Bledisloe Wharf site area	9/08/2013	Dust	Water/ Air Pollution
14/3063	Ports of Auckland	Approximately 330m to the south-west of the Fergusson Wharf site area	19/11/2014	Dust	Air Pollution
11/0633	Fergusson Wharf, Quay St	Approximately 240m to the west of the Fergusson Wharf site area	2/02/2011	Hydrocarbon - Oil	Lubricant oil spill to marine environment

Council Reference	Location	Distance from the Site	Date	Pollutant Type	Description
124823	Fergusson Wharf, Solent St	Approximately 300m to the south-west of the Fergusson Wharf site area	5/07/2010	Unidentified - Toxic	Spill
10/0266	Bledisloe Wharf	Approximately 250m to the southwest of the Bledisloe Wharf site area	3/12/2009	Not Found	Oil leak on ship in the harbour
197842	Jellicoe Wharf	Approximately 250m to the southwest of the Bledisloe Wharf site area	30/07/2009	Not Found	Leaking container - Class 3
556600	Queens Wharf	Coordinates show location approximately 150m to the south of the Bledisloe Wharf site area.	2/10/2012	Dirt / Inert Minerals / Sediment	Potential Water/Land Pollution

4.3 Property File

The property file for the site was provided to Beca by AC on 2 May 2024. Due to the size of the property file (over 3,000 documents) this review has been limited to a high-level review of documents which appeared relevant to the site under investigation, rather than an exhaustive property file review. Table 4 presents a summary of the reviewed documents considered of relevance. The full property file can be provided upon request.

Table 4. Summary of Reviewed Property File (File provided by Auckland Council)

Document Type	Date/Author	Summary of Information
Letter	July 1998, Auckland Regional Council	• A letter regarding a site visit undertaken by AC following a pollution incident report at the Bledisloe Container Terminal. The incident related to the discharge of wash water/contaminated water to the Waitematā Harbour because of the cleaning of the crane tracks on the wharf area. It was noted that the material that builds up in the track channels contains high concentrations of contaminants, including oils, associated with the wharf activities. • The letter also mentions a follow-up undertaken during the same site visit to a previous pollution incident related to the Bledisloe wash facility. The letter mentions that the officer *'was disappointed to discover the facility in a poor state with wastewater overflowing the collection pits and flowing into the harbour'*. Actions requested were discussed during the site inspection.

Document Type	Date/Author	Summary of Information
		• The exact location of the two pollutions incidents mentioned above was not provided in the property file.
Geotechnical Investigation	May 1997, Beca Carter Hollings & Fernetr Ltd	• A geotechnical investigation which comprised the advancement of several boreholes across the eastern portion of present-day Fergusson Wharf (to the south of the FN site area). A limited number of borehole logs were provided in the file, noting silt, and silt-clay soils in the uppermost horizons. Two boreholes were located close to the south-western boundary of the Fergusson site area; however, borehole logs for these were not provided in the file.
Drawing	1997, Beca Ltd	• A drawing showing a proposed reclamation across the eastern portion of present-day Fergusson Wharf. The drawings show a 'relocated substation' approximately 90m to the south-west of the FN site area.
Letter	June 2001, Auckland Regional Council	• A letter regarding a site visit undertaken by AC to Bledisloe Wharf in response to a '*call from Sandy Clark, Shift Manager at Axis Bledisloe regarding a spill of a white liquid from a container'*. The visit revealed that due to container damage, a bladder bag containing approximately 18,000 litres of synthetic latex had split, spilling its contents onto the wharf, and entering the stormwater system. The site visit also identified that the only method available for containment and clean up consisted of a skip bin of sawdust which was considered inappropriate given 'the nature of the operations on site and that this could have resulted in a very serious situation had the material been hazardous or toxic to the marine environment'. The exact location of this spill was not provided in the property file.
Letter	October 2014, Bentley & Co	• A letter addressing a request for further information pursuant to section 92 of the Resource Management Act 1991, in relation to Bledisloe B2 Wharf extension (within and off the north-eastern portion of the BN site area) • The letter mentions that activities that would be undertaken on the B2 extension relate to cargo loading and unloading, and access by light commercial vehicles and providoring trucks. It mentions that there was no storage of environmentally hazardous substances, nor would there be any servicing of trucks at this location. • Additionally, the letter notes a stormwater 360 device with an associated manually operated shut off valve which would be closed in the event of a spill. • It is mentioned that the B2 wharf extension would be utilised in a manner that reflects the typical nature of the wider port operations with no handling of petroleum products or similar (which was noted to be undertaken at Wynyard Wharf, located approximately 1.3km to the west of the BN area), or cement to be undertaken. In addition, ilt was noted that it was possible that cargo might contain potentially environmentally hazardous substances, however these cargos were appropriately packed and contained for transport.

Document Type	Date/Author	Summary of Information
Report	May 2015, Beca Ltd	• A geotechnical detailed design report for the Fergusson FN Wharf. The report includes a drawing of the northern portion of Fergusson Wharf which notes that along the northern and eastern edges of the wharf is a mudcrete bund. To the west of the bund (across the newer reclaimed area within the Fergusson Wharf) is an area of mudcrete reclamation which is located directly south-west of the FN site area.
Site Inspection Report	March 2023, ENRUS	• A site inspection report for a temporary smart shelter located within the BN site area. The smart shelter was noted to be installed on top of containers and to be used to support construction works on Port of Auckland.
Legal Submissions related to an application for resource consent	June 2020, B S Carruthers / P G Senior, Counsel for PoAL	• Legal submissions related to an application for resource consent to undertake capital dredging activities within the Waitematā Navigation Channel Precinct and Port Precinct under the Auckland Unitary Plan. • The submissions included evidence from '*Mr Stephen Priestley (Coastal Processes – Consultant with Beca Limited), Mr Paul Kennedy (Ecology, Sediment and Water Quality – Principal Environmental Consultant with Kennedy Environmental Limited), Mr Nigel Ironside (Corporate – Senior Environmental advisor for PoAL), Mr Mark Arbuthnot (Planning – Director at Bentley & Co Limited)*'. The legal submissions include the following statement of evidence: – Statement of evidence from Mr Stephen Priestley which includes a submission undertaken by Nicholas Mansfield and Nicholas Beveridge (for Royal Forest and Bird Protection Society of New Zealand) concerned with disturbance of seabed sediment by the dredging activity. A part of the submission states: '*Mr Kennedy addresses Mr Mansfield's and Mr Beveridge's further points regarding contaminants in dredged sediments. I endorse Mr Kennedy's assessment and* ***note that the majority of the dredging is of native seabed sediments, which have very low levels of contaminants'*** – An additional statement of evidence of Nigel Ironside is included which includes a summary of engagement and outcomes with submitters. The summary notes the following: *'PoAL provided a copy of a report detailing the results of the additional surface sediment testing undertaken in December 2019 to support the capital dredging application. Testing confirmed* ***surface sediments in the navigation channel, Fergusson North berth and approaches (the areas to be dredged during capital dredging campaign) were not contaminated and contaminated levels had not changed significantly since the last campaign in 2001'.*** Additional information regarding the testing mentioned in this statement of evidence was not included in this document. – Statement of evidence of Mark Arbuthnot which includes effects on water quality including the release of contaminated material and estates: **'*sediments are of high quality and have low contaminant values. There will be no effects on water quality from contaminants from dredged materials'*.** – The statement of evidence of Mark Arbuthnot also mentions that *'any dredged material in excess of the 2 million cubic meters that is approved under Permit EEZZ400011 will either be:* ***utilised to***

Document Type	Date/Author	Summary of Information
		***complete the Fergusson reclamation (there is a small amount of reclamation to be completed**; provided to third parties who may require small volumes of material; disposed of at an alternative approved disposal facility; or subject to a variation to Permit EEZ400011* [marine dumping consent] *under the EEZ* [Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012] *act'.*
Decision following the hearing of an application for resource consent	June 2020, Auckland Council	• The document is related to the decision following the hearing of an application for resource consent under the Resource Management Act (RMA) 1991 for the capital works dredging within the Rangitoto channel and the Fergusson approaches, and the maintenance dredging in the Waitematā Navigation Channel Precinct and a part of the Port Precinct that is occupied by the Fergusson North berth. • The document noted that '*Mr Paul Kennedy a Principal Environmental Consultant with Kennedy Environmental Limited provided expert evidence on the marine environment'.* The document also mentions that: '*With respect of the potential release of contaminants into the water column during dredging, Mr Kennedy stated that previous elutriate testing for nickel and tributyl-tin (TBT) did not indicate the presence of those contaminants in elutriate. He concludes that the elutriate testing carried out to date has not shown adverse changes to water quality and future testing related to the disposal of dredged material required under the disposal permit provides the necessary protection. Dr Sivaguru (Council's Coastal Specialist) agrees with Mr Kennedy's assessment with respect to the release of contaminants during dredging not being likely to cause significant adverse effects'* • The document mentions Mr Alistair Kirk was the General Manager of Infrastructure and Property for PoAL at the time of the document preparation, and notes: *'he* [Mr Kirk] *stated that approximately 150,000m^3 would be needed to complete an approved reclamation at Fergusson Wharf'*

4.4 Site Walkover

A site walkover was carried out by a Beca Environmental Scientist accompanied by Mr. David Ting (Infrastructure Engineer at PoAL) on 23 May 2024. Site photos are included in **Appendix C**, and the following provides a summary of observations:

4.4.1 FN Area

- The majority of the proposed wharf extension falls within the Waitematā Harbour.
- The FN Wharf partially encroaches within the western portion of the site. The wharf structure is supported by a retaining wall panel structure on the edge of the reclaimed land and piles into the rock revetment (Photo 1)
- A gangway connects the wharf to a pile mooring located in the northern portion of the site (within the Waitematā Harbour).
- The south-western corner of the site falls within reclaimed land. The area is paved and generally was in good condition with an area towards the eastern edge of the land noted to have a gravelled surface.
- Two shipping containers were located within the gravel surface area (Photo 2). The containers were observed to be a part of a crane maintenance workshop.

- A shipping container (Photo 3 and 4) located 10m to the south of the site was marked as a 'Hazardous Area' associated to the crane maintenance activities.
- Two paint storage boxes with approximate dimensions of 2m by 0.5m were located along the eastern face of the northernmost container and within the FN area (Photo 5), no bulk storage of paints was noted at the time of the site visit.
- The crane maintenance personnel were on site at the time of the site visit who indicated that only crane maintenance works are undertaken within this area, and that there was no bulk storage of hazardous substances.
- Miscellaneous storage was noted to the south of the crane maintenance containers/workshop.
- A reclaimed bund of 8m with and 25m length was noted in the southern portion of the site, with rock revetment noted to the north and south of the bund (Photos 6 and 7).
- Mr Ting mentioned that the reclamation of the area closest to the site was undertaken with materials dredged from the Rangitoto Channel.
- On the FN wharf to the west of the site were three port cranes offloading cargo ships. Mr Ting indicated that imports are offloaded onto the wharf where they get picked up by container trucks to be taken to their final destination off the port. Mr Ting also indicated that any containers containing hazardous substances are taken offsite in a window of 24 hours maximum and that appropriate spill kits are in place on site for any event.
- Mr Ting mentioned they were not aware of any records of incidents on the FN wharf area.
- A walk around the area to the south of the site identified the presence of an electrical transformer approximately 100m to the south-east of the site.

4.4.2 BN Area

- The northern portion of the site falls within the Waitematā Harbour while the southern portion is reclaimed land.
- The surface of the land portion of the development area was paved and generally was in good condition. Along the northern edge was a rock revetment (Photo 8).
- The western portion of the reclaimed land portion was being used mainly for parking vehicles.
- Towards the center of the site were two shelter buildings supported by shipping containers. Mr. Ting indicated that these are used for general storage for the port operations and parking vehicles (Photo 9).
- To the east of the shelter buildings was C3 Limited's portable office building.
- To the east of the C3 Limited's office was a substation building constructed of brick and metal roofing. Mr. Ting indicated that the substation was recently renovated and that he is not aware of any incidents relating to the substation (Photo 10 and 11). The sealed surface around the building was observed to be in good condition with no signs of spillage or staining noted during the site inspection.
- To the east of the substation were three small containers corresponding to Heron Construction Co Ltd yard for marine maintenance. These containers were located on top of the void-like structure (Photo 12) noted in aerial imagery which was filled with basecourse-like material at the time of the inspection. One of the containers indicated dangerous goods storage (Photo 13).
- A HAZCHEM sign noting hydrogen peroxide was present on the B3 wharf in the western portion of the site area (Photo 14).

4.4.3 Additional Information Provided by Mr. David Ting

Following the site walkover, PoAL provided the following information:

- The void-like feature noted in the eastern portion of the BN Wharf site area and the area to the west of the substation building with lighter coloured surface corresponded to concrete structures for management of heavy containers when Bledisloe B3 Wharf was operated as a container wharf. However, PoAL indicated that no further information regarding these features is available.
- No further information on the pollution incidents was available.
- HAZCHEM sign for hydrogen peroxide at the B3 wharf corresponds to a historic sign from when Bledisloe was a container terminal and is no longer relevant to the current operations on site.
- The dangerous good storage in the container in the eastern portion of BN wharf site includes storage of paints for the marine maintenance yard. The container was bought last year (2023) with zero incidents reported, while it has a built-in bund to contain any spills if there were to be one.
- The substation building was built in the 1970s.

5 Summary and Discussion

5.1 Summary of Information Search

The site is located within two areas of PoAL land. The first area (BN area) falls within the northern portion of present-day Bledisloe Wharf and includes a portion of land reclaimed between late 1970s and early 1980s which has been historically used for shipping container handling, with the presence of a substation building (built in the 1970s), a smaller building (built between 1996 and 2001 and removed by 2012), and two concrete structures for management of heavy containers. This area is currently being used for miscellaneous storage and carparking. It is also the location of two portable office buildings and a yard for marine maintenance which includes small storage of hazardous substances. The substation building remains present at the time of this investigation.

The second area (FN area) falls within the north-eastern portion of present-day Fergusson Wharf and includes a portion of land reclaimed around 2017 which comprises a mudcrete bund and a portion of a crane maintenance yard.

Review of the site historical information has identified a number of HAIL activities which may have resulted in the contamination at the site on a more likely than not basis. These HAIL activities are summarised in Table 5 and Figure 2 and Figure 3 presents the HAIL plan for the site.

The FN area has been reclaimed more recently than the BN area and the majority of the Auckland Waterfront. The material used for the reclamation was marine dredged sediments (cement stabilised). The material was observed during deposition and it is considered an ‘engineered surface’ and not an uncontrolled fill. There have been instances on the broader Auckland Waterfront (Viaduct Basin) where the mudcrete reclamations have been found to contain low level contamination including asbestos fibres thought to originate from stormwater discharges into the near shore sediment deposits used for their construction. The FN area used sediments from the main channel dredging and is therefore considered to be a much lower risk of containing contamination (when compared to near shore sediments. On this basis the FN area is not considered to reach the threshold of ‘more likely than not’ to contain Landfill Sites (G3) or any other (I) where there is a reasonable likelihood of a risk to human health or the environment.

Additionally, several environmental incidents were noted in Bledisloe Wharf during the information review. The exact nature and locations of some of these incidents could not be identified. PoAL indicated that they are not aware of any environmental incident having taken place within any of the site areas. Based on information available, these are not considered to meet the ‘more likely than not’ threshold to be HAIL I for the purposes of this investigation.

Table 5. Identified HAIL Activities and Potential Contaminants of Concern.

Activity	HAIL Code	Rationale	Locality	Contaminants of Potential Concern
Reclamation across the BN area	**Potential G3** – Landfill Sites	Aerial imagery revealed that the land portions of the site have been reclaimed since 1970s-1980s for BN area and around 2017 for FN area.	BN area only	• Heavy metals (arsenic, cadmium, chromium, copper, mercury, lead, nickel and zinc) • Hydrocarbons • Asbestos • Various others may be considered pending observations of material as source of reclaimed materials has not been confirmed.
Historical buildings	**Potential I** – any other land that has been subject to the intentional or accidental release of a hazardous substance in enough quantity that it could be a risk to human health or the environment.	Desktop study identified that the substation building present within the BN area was constructed in the 1970s. AC Contaminated Site Enquiry report noted the potential for asbestos and/or lead paint from historic buildings present on site may need to be considered.	In proximity to the pre-2000 building in the BN Area	• Asbestos • Lead
Hazardous substances storage and handling	**A17** – storage tanks or drums for fuel, chemicals, or liquid waste.	The site walkover and information provided by PoAL revealed the presence of a small chemical storage including paints in the eastern portion of the BN area.	The location of the small hazardous substance storage container in the eastern portion of the BN area.	• Heavy metals (arsenic, lead, copper, chromium, mercury, nickel, and zinc) • PAHs • TPHs •
Substation building	**B2** – Electrical transformers including the manufacturing, repairing, or disposing of electrical	A single storey substation was observed during the site inspection in the eastern portion of the Bledisloe Wharf site area.	In proximity to the substation building in the BN area.	• Heavy metals (lead, mercury, zinc, cadmium, and nickel) • Polychlorinated biphenyls (PCBs)

Activity	HAIL Code	Rationale	Locality	Contaminants of Potential Concern
	transformers or other heavy electrical equipment.			• Solvents • Hydrocarbons
Port Activities	**F5** – Port activities including dry docks or marine vessel maintenance facilities.	Land portions of both BN and FN areas fall within the PoAL property, including the concrete structures for management of heavy containers in the eastern portion of BN area	Land portions of both site areas	• Heavy metals • TPH • PAH

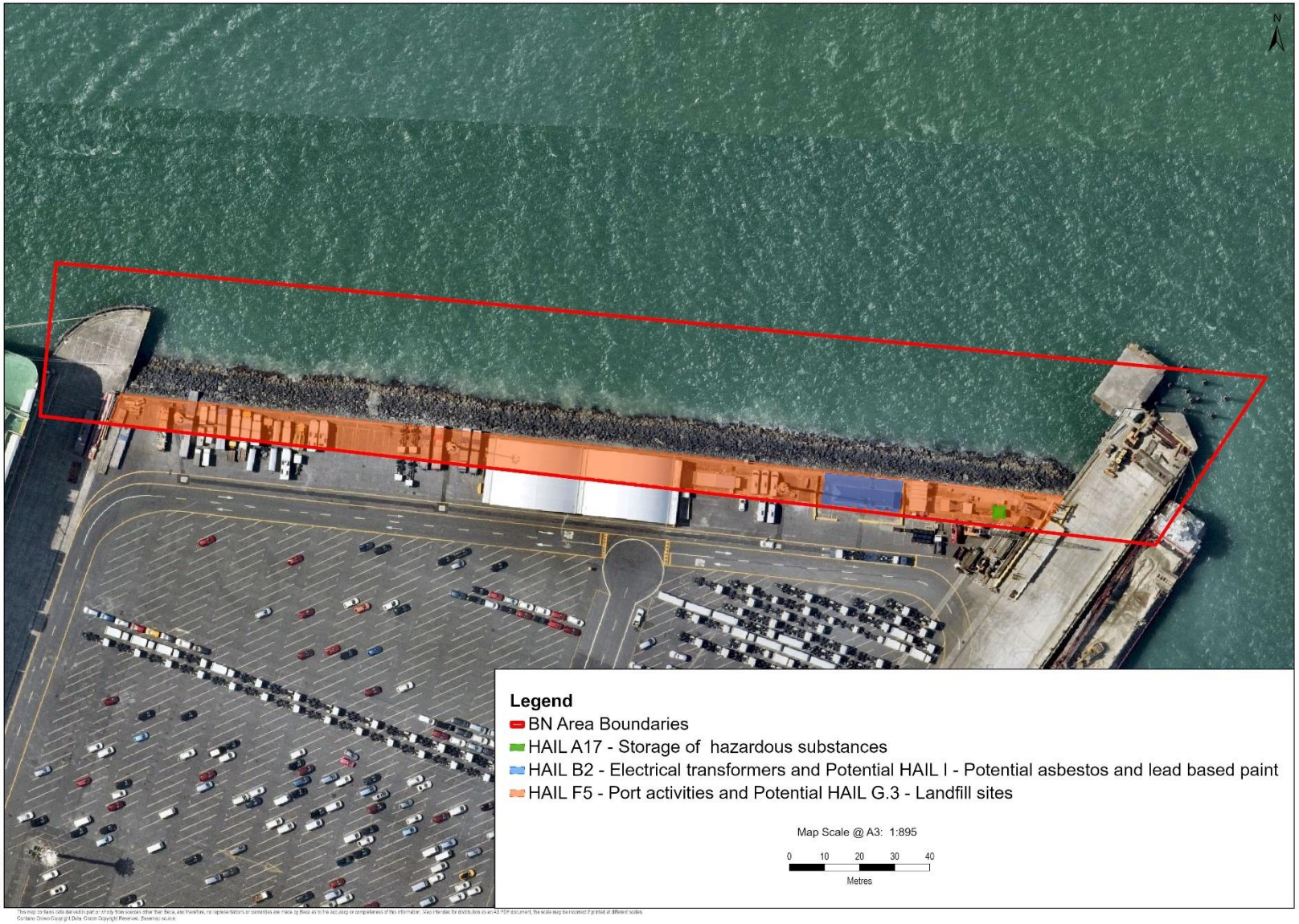

Figure 2. Preliminary BN area HAIL Plan

Figure 3. Preliminary FN area HAIL Plan

5.2 Preliminary Exposure Pathway Assessment

A preliminary Conceptual Site Model (CSM) (see Table 6 below) was developed to inform the investigation and to describe the relationship between potential sources of contamination on site, the human and environmental receptors that may be exposed to those contaminants in the context of the commercial/industrial use of the site, and the pathways by which those receptors may be exposed.

Table 6: Preliminary Conceptual Site Model

Potential Source	Receptor	Pathway	Pathway Complete?
• Reclamation across the site • Historical buildings • Hazardous substances storage and handling • Substation building • Port Activities	Construction workers	Exposure of workers to contaminants in soils during site redevelopment – dermal contact, ingestion, or inhalation of dust/vapours.	**Potentially Complete Pathway** – Potentially contaminating activities have been identified at the site. Further investigation is recommended to understand this pathway. Noting the excavation/maintenance worker is not an exposure scenario covered by the NESCS. Worker exposure is managed by controls required under health and safety legislation[1].
	Future site users	Exposure of future site users to contaminants in soils – dermal contact, ingestion, or inhalation of dust/vapours.	**Incomplete Pathway** – Upon completion of the proposed works, the site will be fully sealed therefore there is no pathway for future site users to come in contact with soil.
	General public	Exposure of general public to contaminants in soils – dermal contact, ingestion, or inhalation of dust/vapours.	**Incomplete Pathway** – General public will not have access to the site during construction works or in the future.
	Groundwater resources for public consumption	Leaching and migration of soil contaminants into groundwater	**Incomplete Pathway** - No groundwater abstraction wells identified within 200m of the site.
	Surface water and groundwater	Sediment and runoff directly into surface water.	**Potentially Complete Pathway** – Potentially contaminating activities have been identified across the site. Further investigation is required to understand any potential risk to environmental receptors.
		Migration of soil contaminants into surface water through shallow groundwater discharging into the Waitematā Harbour.	

[1] MfE. 2011. Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health. Refer to Section 3.2.1 Maintenance / excavation scenario

		Contamination present in groundwater due to wider area activities and hydrogeological flows with potential to enter surface water depending on dewatering methodology	

6 Sampling and Analysis Plan

6.1 Soil and Groundwater Sampling Rationale

Based on the potential contamination sources identified during the desk-based phase of this investigation, a soil and groundwater sampling plan was developed. As asbestos was identified as a potential contaminant of concern the soil sampling density was based on the recommended investigation approach set out in Table 3 of the GAMAS.

Given that the substation building and the yard for marine maintenance (in the eastern portion of BN area) were operational at the time of this investigation, soil sampling to assess any potential for contamination within these areas was not possible. Similarly, given the operational nature of FN area and given that drilling for sampling was not viable on the mudcrete bund, sampling locations were reduced from two to one in the FN area.

Additionally, given port operations at the time of the investigation, location of services lines, and existing infrastructure, only one sampling location was possible within the BN area. As a result, remaining actual investigation locations were set as close as possible to the proposed disturbance areas. These locations were also combined with the geotechnical investigation locations for field work efficiency and to minimise disruptions to the port operational area.

The installation of two piezometers to facilitate groundwater sampling was undertaken following the termination of boreholes and collection of soil samples. These piezometers were installed at 2024_NMB9, and BH02 to obtain spatial coverage of the site.

The overall data objective of the investigation was to provide an indication if gross widespread contamination is present. If so, the subsequent objective was to identify the type of contamination present and the high-level distribution. The investigation was not designed to delineate each contaminant or pre classify soils. Further soil and groundwater testing will be required to further define management controls.

6.2 Summary of Field Work

The site investigation was carried out by Beca Environmental Scientists between 19 and 27 June 2024 and between 15 and 16 July 2024. This investigation comprised of groundwater sampling from the two installed piezometers, and soil sampling using a hand auger, hydro vacuuming excavation truck, and drill rig. A total of six boreholes (five in the BN area and one in the FN area) were advanced to a maximum of 24.12m bgl. Soil sampling was limited to the top 7.6m based on the approximate proposed earthworks depth (currently understood to be around 6m bgl). Borehole termination depths in boreholes deeper than 7.6m bgl were set based on geotechnical requirements.

Sampling locations are shown in

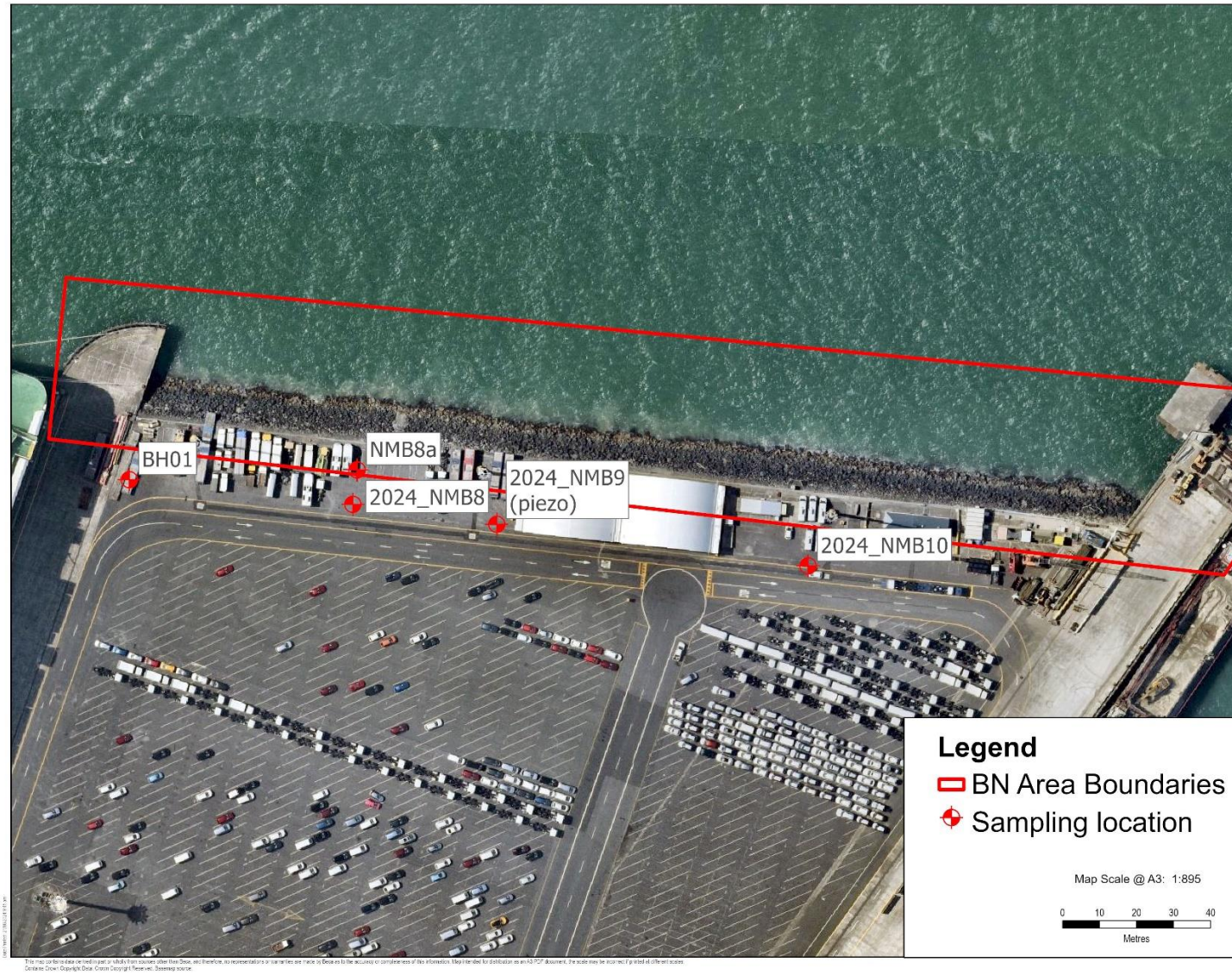

Figure 4 Sampling locations at BN area

and Figure 5.

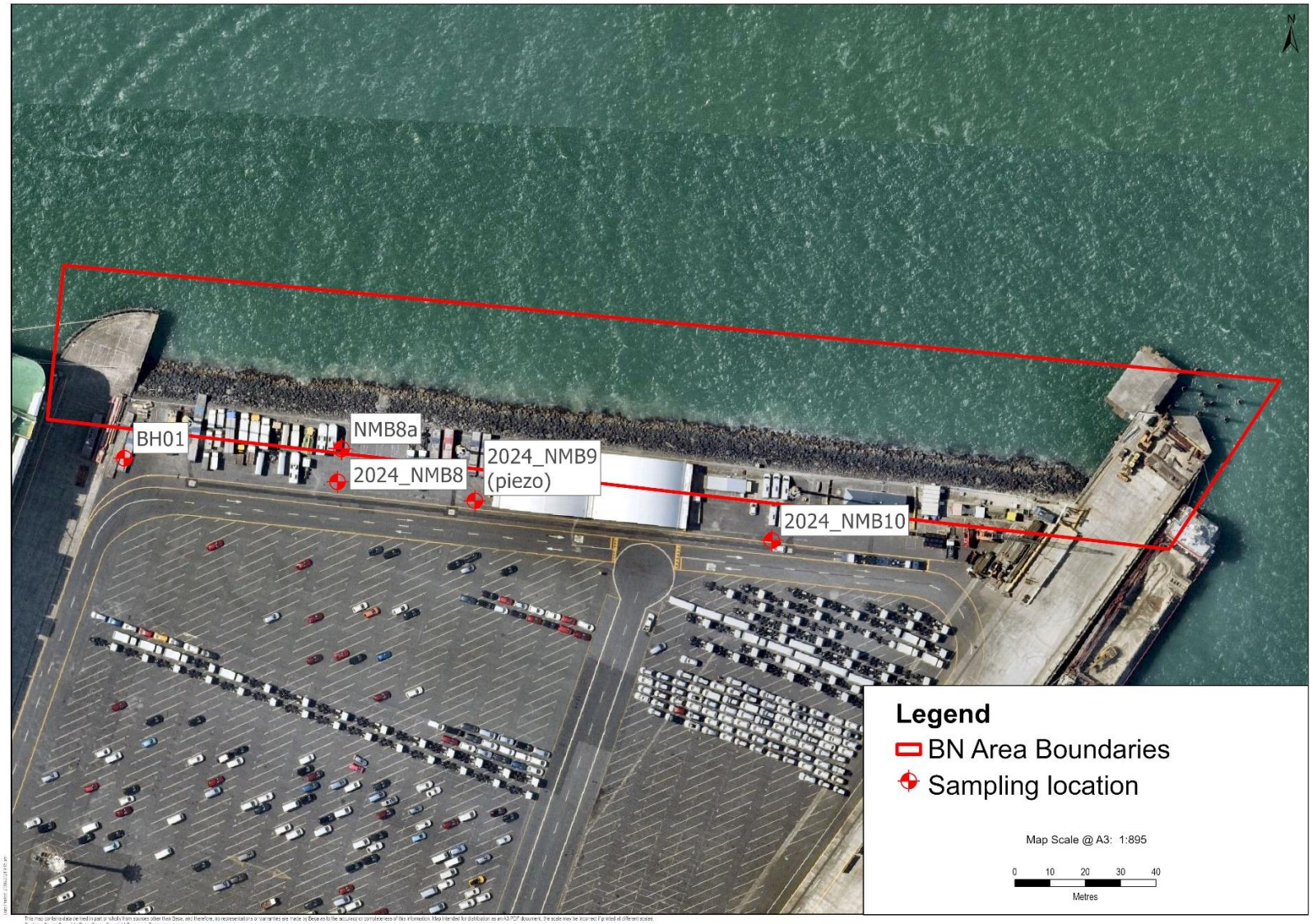

Figure 4 Sampling locations at BN area

Figure 5. Sampling locations at FN area

6.3 Sampling Methodology

Field sampling and relevant sampling management procedures were undertaken in general accordance with:

- MfE Contaminated Land Management Guidelines No. 5 – Site Investigation and Analysis (2011).
- Guidelines for Assessing and Managing Asbestos in Soils (GAMAS) (2017).
- Health and Safety (Asbestos) Regulations (2016).

6.3.1 Soil Sampling Methodology

Six boreholes were advanced through hydro vacuum excavation down to 1.5m bgl (where materials encountered allowed) and drilled using a sonic drill rig from the bottom of the hydro vacuum excavation to the final borehole depths. Material at a depth of 1m bgl at location NMB8a was too hard for hydro vacuum excavation, and therefore, this borehole was terminated at this depth and borehole 2024_NMB8 was set 8m to the south of NMB8a.

Boreholes 2024_NMB9 and BH02 were advanced to depths of 21.09m and 6.7m bgl, respectively, and piezometers installed to facilitate the groundwater sampling phase of investigation. The piezometer installation depth at borehole 2024_NMB9 was 7m bgl (to cover the understood proposed earthworks depth of around 6m). The borehole was backfilled from 7m bgl to the borehole target depth. Piezometer installation depth at BH02 was undertaken to borehole target depth (6.7m bgl). The remaining boreholes were advanced to up to 24.12m bgl to enable soil sampling and/or geotechnical investigation (as applicable).

Soil samples were collected at regular intervals based on observations made on-site. Sampling at the different locations was subject to the material encountered which at some depths was too hard to crush and unable to be collected into a sample jar. One QA/QC (duplicate) sample was also collected for analysis.

Soil samples were collected using a hand auger at different depths within the hydro vacuum excavation interval, and directly by hand from drilled materials recovered from the drill core (retrieved from the open barrel and placed on clean PVC splits). A clean pair of nitrile gloves was worn for each sample to prevent cross contamination. Equipment used to collect the soil samples was decontaminated prior to sampling and between each sample location (including the drilling equipment where possible) with a brush and Decon-90 cleaning solution and then rinsed with clean water. Samples were placed in laboratory supplied asbestos tubs or glass jars and chilled as appropriate prior to dispatch to R J Hill Laboratories Ltd (Hill Laboratories).

All chemical laboratory analyses were undertaken by Hill Laboratories. All samples were accompanied by a Chain of Custody form, which detail the required handling and testing instructions. Selected soil samples were analysed for heavy metals, PAHs, TPHs and asbestos semi-quantitative. A range of soil samples across the soil profile were analysed as a general screening exercise to provide an indication of the potential vertical extent of any contamination within the expected areas of land disturbance. Soil samples not selected for analysis were held cold at the laboratory. Copies of the Hill Laboratory reports, and chain of custody information are included in **Appendix D**. A data summary sheet of the results is presented in **Appendix E**.

6.3.2 Groundwater Sampling Methodology

Samples were collected from piezometers installed at two sampling locations (2024_NMB9 and BH02) using a peristaltic pump. Field parameters were recorded during the purging of each well prior to sampling, and samples collected only upon stabilisation of these parameters in general accordance with MfE guidelines.

Samples were collected in laboratory provided plastic or glass containers as appropriate, and chilled prior to dispatch to Hill Laboratories for analysis. Two duplicate samples and a trip blank using Type 1 water were also collected. Groundwater samples were analysed for heavy metals (total and dissolved), PAHs and TPHs.

7 Assessment Criteria

7.1 Soil Criteria

7.1.1 Assessment of Human Health Risk

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- For priority contaminants, National Environmental Standards for Assessing and Managing Contaminants in Soil to Protect Human Health (2011).
- For hydrocarbons, the MfE Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand (2011).
- For asbestos, the BRANZ New Zealand Guidelines for Assessing and Managing Asbestos in Soil (2017).
- □or con□□□ in□n□□ no□co□□r□d □□ □ □□ □□□□□nd □□id□in□□ □□□□□nic□□□□nd □inc□□□□ National Environment Protection (Assessment of Site Contamination) Measure 1999 (amended 2013).

7.1.1 Assessment of Environmental Risk

The following environmental discharge risk criteria have been adopted:

- AUP Permitted Activity Soil Acceptance Criteria
- For hydrocarbons, the MfE Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand (2011) for protection of groundwater quality.

7.1.2 Background Concentrations

The non-volcanic soil background heavy metal concentrations derived from Auckland Regional Council Technical Publication 153, Background Ranges of Trace Elements in Auckland Soils 2002 have been applied to the site.

7.2 Groundwater Criteria

7.2.1 Assessment of Human Health Risk

The adopted assessment criteria for the groundwater investigation have been selected from the Ministry of Health (MoH) Drinking-water Standards for New Zealand (MoH, Revised 2022).

7.2.2 Assessment of Environmental Risk

The adopted assessment criteria for the groundwater investigation have been from the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC, 2018) for the protection of 80% of marine species.

8 Results

8.1 Fieldwork Observations

Soil logging for the boreholes at BH01, NMB8a, and BH02 was undertaken by the Beca environmental team. Soil logging for the remaining boreholes was undertaken by the Beca geotechnical team. Machine borehole logs are provided in **Appendix F**. The following observations were made during the field investigation:

- Weather conditions ranged from sunny with calm winds to minor cloud cover and fog.
- The groundwater sampling at location 2024_NMB9 was undertaken during fine weather, following a period of heavy rain in the Auckland region (12.6mm/hour earlier in the day). Groundwater sample from BH02 was undertaken during fine weather with rain after the collection of the sample.
- All sampling locations were in areas of hardstand asphalt groundcover.
- The depth of concrete below the asphalt layer varied from 0.1m bgl to 1m bgl between borehole locations at BN area.
- The fill material below the asphalt and concrete varied across locations and with depths. However, fill material consisted mainly of gravel and sand, with silt, cobbles and boulders encountered at several locations. Soils from the Tauranga Group were reached at three locations at depths between 11m and 15.3m bgl. Depth of fill material was not encountered at the borehole target depths in any of the remaining locations.
- Mudcrete material was found directly below concrete at the borehole advanced in the FN area (BH02).
- A dark/black coloured soil with no odour was noted in the following sampling locations and depths:
  - 2024_NMB9 at 2m bgl
  - 2024_NMB10 at 3m bgl
- NMB8a was terminated at 1m bgl as boulders were encountered and hydro vacuuming was not possible. This borehole was relocated 8m south and named 2024_NMB8.
- Groundwater was encountered in BH01, and BH02 at 2.6m bgl and 0.5m bgl, respectively.
- Standing water levels at these groundwater sampling locations ranged from 2.89 to 4.59m bgl during groundwater sampling.

8.2 Soil Analytical Results

Refer to the Result Assessment Summary Tables provided as **Appendix E** when reviewing this section.

8.2.1 Heavy Metals

12 samples were analysed for the presence of heavy metals. In summary:

- Seven samples contained concentrations of at least one heavy metal above the adopted background levels.
- Exceedances of the adopted environmental risk criteria for nickel were recorded at seven locations.
- No recorded concentrations of heavy metals exceeded the adopted human health criteria.

Table 6: Summary of environmental criteria exceedances for Nickel in soil.

Sample Location	Depth (m bgl)	Concentration (mg/kg)	Compound	Environmental Protection Criteria (mg/kg)
NMB8a_0.4m	0.4	240	Nickel	105
2024_NMB8_0.1m	0.1	230		
2024_NMB8_1.5m	1.5	168		
2024_NMB9_2m	2.0	131		
2024_NMB9_5m	5.0	173		
BH01_0.7m	0.7	220		
BH01_2.8m	2.8	109		

-

8.2.2 Polycyclic Aromatic Hydrocarbons (PAHs)

12 samples were analysed for the presence PAHs. In summary:

- Six samples contained PAHs at concentrations above the laboratory limit of detection.
- No recorded concentrations of PAH compounds exceeded the adopted human health or environmental risk criteria.

8.2.3 Total Petroleum Hydrocarbons (TPHs)

13 samples were analysed for petroleum hydrocarbons. In summary:

- TPH was detected in five of the samples analysed.
- No recorded concentrations of TPH compounds exceeded the adopted human health or environmental risk criteria.

8.2.4 Asbestos

10 samples were analysed for asbestos. In summary:

- Chrysolite (white asbestos) was detected at location BH01 in the sample collected at 2.8m bgl. The combined Fibrous Asbestos and Asbestos Fines (FA/AF) concentration was recorded below the laboratory limit of detection (<0.001% w/w) for this sample. This result is below the adopted human health criteria for asbestos in soil.
- Asbestos was not detected in any of the remaining samples.

8.3 Groundwater Analytical Results

The two groundwater samples were analysed for heavy metals, PAHs and TPHs. All contaminants in the two samples returned results that were below the laboratory detection limit. Hill laboratories indicated that groundwater samples were saline, which results in a higher detection limit for saline samples in comparison with non-saline groundwater samples.

8.4 Quality Assurance and Quality Control

One duplicate soil sample was analysed for heavy metals, PAHs and TPHs to allow the relative percentage difference (RPD) to be calculated. The RPD values ranged from 3.7 to 105.9%. The higher RPDs (>30%) noted is likely due to the heterogeneity of the samples analysed and the relatively small concentrations detected, rather than a result of cross contamination within the field or laboratory. This RPD suggests a sufficient level of

confidence in the soil sampling methods employed on site and the results gathered to be used for this assessment given the Data Objectives.

8.5 Limitations of Site Characterisation

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

Additionally, it is noted that only one sampling location was possible within the area proposed for soil disturbance at BN while remaining actual investigation locations were set as close as possible to the proposed disturbance areas. While the use of samples outside of the areas of disturbance to represent the areas that will be disturbed is considered appropriate given their likely similar depositional history, this introduces an additional level of site characterisation limitation.

9 Discussion and Risk Assessment

9.1 Discussion

Concentrations of the screening contaminants analysed for in all samples analysed were below the human health criteria. Therefore, based on the intrusive investigation, the risk to human health due to widespread gross contamination within the site fill material is considered to be low. It is however noted that the soil sampled as part of this investigation is from the area adjacent the works area as opposed to the actual soil proposed to be disturbed as part of the project.

Concentrations of nickel above the AUP(OP) permitted activity soil acceptance criteria were encountered in seven samples. However, the concentrations were reported below background concentrations for volcanic soils, and therefore can likely be attributed to the local soils rather than contamination form a historic activity held on site. As a result, the environmental discharge risk from these nickel concentrations is considered to be low.

Regarding groundwater, for human health and environmental the results indicate the risk to receptors due to screening contaminants within the groundwater at the site is low.

9.1.1 Areas Not Investigated

As mentioned in section 6.1 above, soil sampling in the areas of the substation building and the yard for marine maintenance (in the eastern portion of BN area) to assess any potential for contamination within these areas was not possible. HAIL activities identified within these areas are outlined in Table 5. These areas of the site are asphalt or concrete hardstand. Therefore, human exposure to any contaminated soils and groundwater via direct contact (ingestion, dermal contact, and inhalation of dust) would be limited, reducing the likelihood that site occupiers would be exposed to subsurface contaminants under normal working conditions. However, if future soil disturbance is proposed within these areas, further investigation would likely be required to inform consenting requirements, material handling and/or disposal procedures.

9.2 Exposure Pathway Assessment

The CSM (**Error! Reference source not found.**) was refined post-investigation to describe the relationship between sources of contamination on site, the human and environmental receptors that may be exposed to those contaminants in the context of the use of the site, and the pathways by which those receptors may be exposed. Pathways identified as incomplete within the preliminary CSM were not brought forward for assessment in this revised CSM.

Table 7. Exposure Pathway Assessment

Potential Source	Receptor	Pathway	Pathway Complete?
• Reclamation across the site • Historical buildings • Hazardous substances storage and handling • Substation building	Construction workers	Exposure of workers to contaminants in soils during site redevelopment – dermal contact, ingestion, or inhalation of dust/vapours.	**Potentially complete Pathway** Contaminant concentrations identified in this investigation were recorded below the human health screening criteria. However, soil sampling within two HAIL areas identified on site was not possible as part of this investigation. While in the current state of these areas the risk to human health from these two HAIL activities is

• Port Activities			considered very low, should disturbance works within this areas are proposed, further sampling will be required to undertake a full assessment of this pathway.
	Surface water and groundwater	Sediment and runoff directly into surface water.	**Potentially complete Pathway** Concentrations of contaminants of concern are below environmental discharge criteria. Nickel concentrations have been reported above the adopted environmental criteria, however, these concentrations were below background concentrations for volcanic soils. Additionally, analysis of groundwater sampling did not return concentrations of contaminants above the laboratory limit of detection. While this investigation revealed that risk to environmental receptors is low, soil sampling within two HAIL areas identified on site was not possible as part of this investigation. In the current state of these areas the risk to environmental receptors from these two HAIL activities is considered very low. However, should disturbance works within this areas are proposed, further sampling will be required to undertake a full assessment of this pathway.
		Migration of soil contaminants into surface water through shallow groundwater discharging into the Waitematā Harbour.	
		Contamination present in groundwater due to wider area activities and hydrogeological flows with potential to enter surface depending on dewatering methodology.	

10 Development Implications

10.1 Consents

10.1.1 National Environmental Standard

The NESCS applies to land as per clause 5(7):

(7) "Land covered:

The piece of land is a piece of land that is described by 1 of the following:

a. an activity or industry described in the HAIL is being undertaken on it;

b. an activity or industry described in the HAIL has been undertaken on it;

c. it is more likely than not that an activity or industry described in the HAIL is being or has been undertaken on it."

Based on the observations during the intrusive investigation and laboratory results:

- HAIL code **I** (Any other land that has been subject to the intentional or accidental release of hazardous substance in enough quantity that it could be a risk to human health or the environment) is considered **not applicable** to the site given that: it is considered highly unlikely that potential historical use of lead-based paints and asbestos containing materials in the 1970s buildings, and that reclamation materials within the FN area could have resulted in concentrations of contaminants in soil that could be a risk to human health or the environment.

The following HAIL activities have been identified as either currently or historically having been undertaken on site, with both site areas being identified as a 'piece of land' under the NESCS, and therefore the NESCS is applicable to the site. Figure 6 and Figure 7 present the HAIL plan for the site:

BN area

- **HAIL G3** - Landfill Sites
- **HAIL A17 -** Storage tanks or drums for fuel, chemicals, or liquid waste.
- **HAIL B2 -** Electrical transformers including the manufacturing, repairing, or disposing of electrical transformers or other heavy electrical equipment
- **HAIL F5 -** Port activities, including dry docks or marine vessel maintenance facilities.

FN area

- **HAIL F5 -** Port activities, including dry docks or marine vessel maintenance facilities.

Figure 6. HAIL Plan BN area, HAIL activities considered applicable to the site on a ‘more likely than not’ basis.

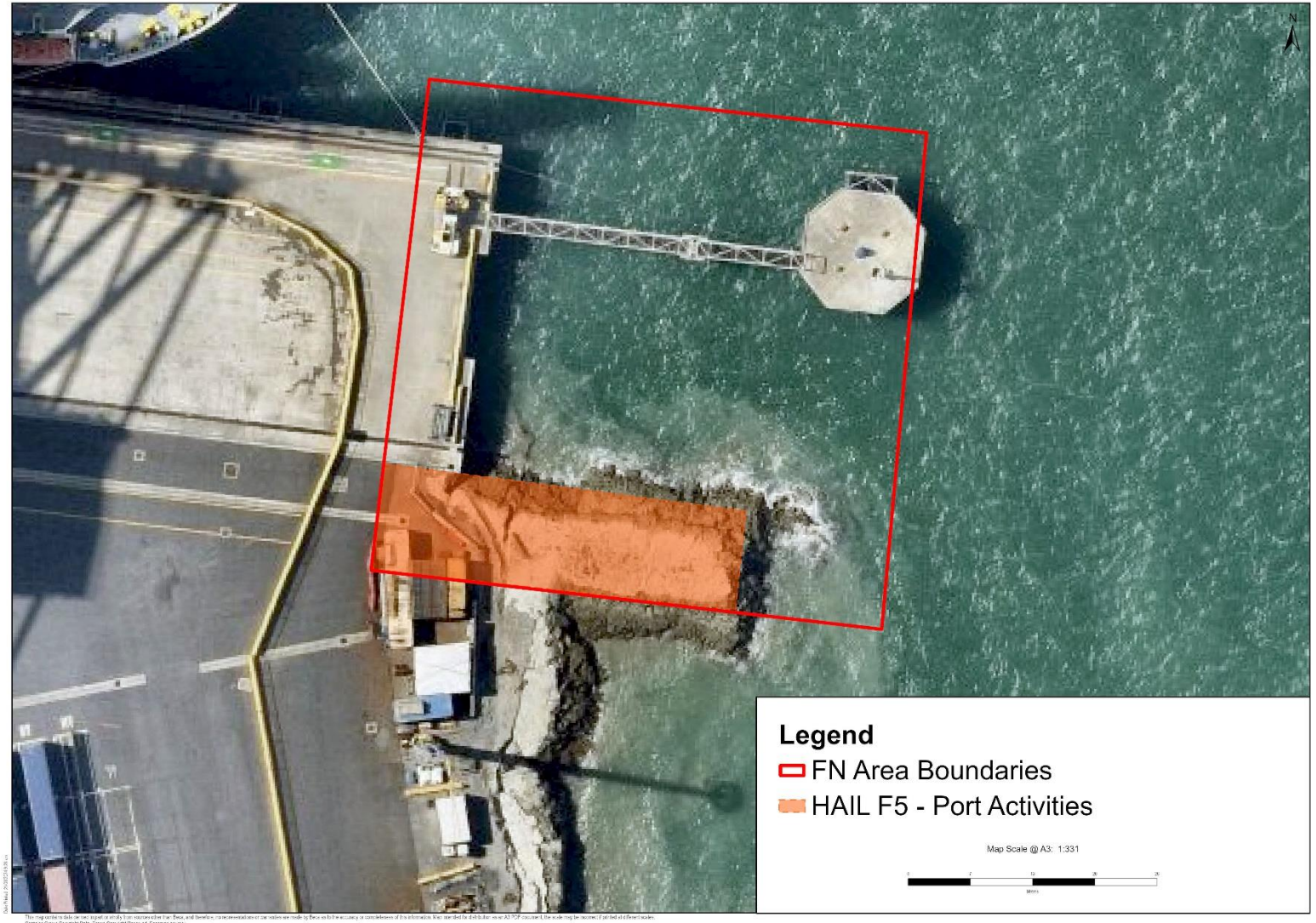

Figure 7. HAIL Plan FN area, HAIL activities considered applicable to the site on a ‘more likely than not’ basis.

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

- Soil disturbance.

Soil Disturbance

The NESCS applies to areas of proposed soil disturbance on site. Under Regulation 8(3) of the NESCS, soil disturbance of up to 25m^3 per 500m^2 and disposal of up to 5m^3 per 500m^2 is allowed as a Permitted Activity (PA). Additional PA conditions include:

- Controls to minimise the exposure of humans to mobilised contaminants must:
  - be in place when the activity begins:
  - be effective while the activity is done:
  - be effective until the soil is reinstated to an erosion-resistant state.
- The soil must be reinstated to an erosion-resistant state within 1 month after serving the purpose for which the activity was undertaken.
- Soil must not be taken away in the course of the activity, except that,
  - for the purpose of laboratory analysis, any amount of soil may be taken away as samples:
  - for all other purposes combined, a maximum of 5m^3 per 500m^2 of soil may be taken away per year.
- Soil taken away in the course of the activity must be disposed of at a facility authorised to receive soil of that kind:
- The duration of the activity must be no longer than 2 months:
- The integrity of a structure designed to contain contaminated soil, or other contaminated materials must not be compromised.

Due to the extent of the construction works and nature of the site the PA criteria will likely not be met. Resource consent as a controlled activity under Regulation 9 of the NESCS will likely be required as the investigation has found that contaminants in soil do not exceed the Soil Contaminant Standards. As a result, a contaminated site management plan (CSMP) will also be required to support the consent application.

It is noted that given the restrictions to conduct sampling in the areas proposed for soil disturbance there is a possibility that Auckland Council will consider sampling undertaken as part of this investigation not sufficient to be a Detailed Site Investigation for all areas being consented. If this is the case, consent as a discretionary activity will be needed.

Given that the substation building (HAIL B2) and marine maintenance yard (HAIL A17) in BN area remain operational at the time of writing this report, soil sampling at these locations was not possible as part of this investigation. If the proposed works include soil disturbance within these two areas, additional soil sampling at these locations and laboratory analysis will be required. The CSMP may require updating depending on laboratory results from this additional sampling.

10.1.2 Auckland Unitary Plan

Seven soil samples reported nickel concentrations above the AUP environmental criteria, however the concentrations were reported below background concentrations for volcanic soils, and therefore can be attributed to the local soils rather than contamination form a historic activity held on site. As a result, the contaminated land provisions of AUP(OP) Chapter E.30 are unlikely to be triggered in this instance.

Given that the substation building (HAIL B2) and marine maintenance yard (potential HAIL A17) in BN area remain operational at the time of writing this report, soil sampling at these locations was not possible to be undertaken as part of this investigation. If the proposed works include soil disturbance within these two areas, additional soil sampling at these locations and laboratory analysis will be required. The CSMP recommended

in Section 10.1.1 will require updating depending on laboratory results from this additional sampling to cover any potential risks to the environment from this additional sampling.

10.2 Material Handling and Disposal

10.2.1 Definitions

Cleanfill

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- *"Means natural material such as clay, gravel, sand, soil and rock which has been excavated or quarried from areas that are not contaminated with manufactured chemicals or chemical residues as a result of industrial, commercial, mining or agricultural activities"*

Excludes:

- *hazardous substances and material (such as municipal solid waste) likely to create leachate by means of biological breakdown;*
- *product and materials derived from hazardous waste treatment, stabilisation and disposal practices;*
- *materials such as medical and veterinary waste, asbestos, and radioactive substances;*
- *soil and fill material which contain any trace element specified in Table E30.6.1.4.2 at a concentration greater than the background concentration in Auckland soils specified;*
- *sulfidic ores and soils;*
- *combustible components;*
- *more than 5% by volume of inert manufactured materials (e.g. concrete, brick, tiles); and*
- *more than 2% by volume of attached biodegradable material (e.g. vegetation).*

Controlled Fill

Controlled fill is predominantly cleanfill material that may also contain inert construction and demolition materials and soils from sites that may have contaminant concentrations in excess of local background concentrations, but with specified maximum total concentrations that will not restrict future land use.

Managed Fill

Managed fill is soil containing contaminants that are below the maximum admissible concentrations for managed fill at local landfill sites, but above published background soil concentrations.

Contaminated Fill

Contaminated fill is soil containing concentrations above the maximum acceptance criteria for managed fill at local landfill sites, and below any maximum acceptability thresholds.

10.2.2 Disposal and Reuse Options

Soil sampling has revealed concentrations of contaminants of concern above the expected background concentrations and/or detection of PAH and/or TPH at nine locations, along with a single detection of asbestos. While risk for contamination is expected to be lower within the proposed disturbance areas (given it is anticipated that fill within the disturbance area will comprise mainly rock fill with less fines), further sampling and laboratory analysis will be required across the site (including the areas across the substation building and marine maintenance yard) to inform reuse, handling, and disposal options. Where additional laboratory analysis concludes that soils on site can be reused on site, reused soils will need to be fully stabilised to prevent erosion

and discharge of sediment upon completion of the works. Additionally, There may be geotechnical limitations to reuse of soils on site.

The CSMP will detail further soil sampling requirements for areas not sampled as part of this investigation and to inform disposal requirements. Surplus spoil requiring off-site disposal will likely require disposal as managed fill or contaminated fill unless further sampling indicates otherwise. It is recommended that acceptance of soil be sought from any receiving facility prior to commencing works.

11 Conclusions and Recommendations

11.1 Conclusions

The site is located within two areas of PoAL land. The first area falls within the northern portion of present-day Bledisloe Wharf and includes a portion of land reclaimed between late 1970s and early 1980s which has been historically used for shipping containers handling, with the presence of a substation building (built in the 1970s) a smaller building (built between 1996 and 2001 and removed by 2012) and two concrete structures for management of heavy containers. This site area is currently being used for miscellaneous storage and carparking and is the location of two office portable buildings and a yard for marine maintenance which includes small storage of hazardous substances. The substation building remains present.

The second area falls within the north-eastern portion of present-day Fergusson Wharf and includes a portion of land reclaimed around 2017 which comprises a mudcrete bund and a portion of a crane maintenance yard.

The FN area has been reclaimed more recently than the BN area and the majority of the Auckland Waterfront. The material used for the reclamation was marine dredged sediments (cement stabilised). The material was observed during deposition and it is considered an 'engineered surface' and not an uncontrolled fill. There have been instances on the broader Auckland Waterfront (Viaduct Basin) where the mudcrete reclamations have been found to contain low level contamination including asbestos fibres thought to originate from stormwater discharges into the near shore sediment deposits used for their construction. The FN area used sediments from the main channel dredging and is therefore considered to be a much lower risk of containing contamination (when compared to near shore sediments. On this basis the FN area is not considered to reach the threshold of 'more likely than not' to contain Landfill Sites (G3) or any other (I) where there is a reasonable likelihood of a risk to human health or the environment.

HAIL areas identified on the site are shown on Figure 6 and Figure 7**Error! Reference source not found.** and include:

BN area

- **G3**: Landfill Sites – related to the reclamation across the site.
- **A17:** Storage tanks or drums for fuel, chemicals, or liquid waste – Relating to the hazardous chemical's storage identified in the eastern end of the BN area.
- **B2:** Electrical transformers including the manufacturing, repairing or disposing of electrical transformers or other heavy electrical equipment – Relating to a substation building located in the eastern portion of BN area.
- **F5:** Port activities, including dry docks or marine vessel maintenance facilities – Relating to general port activities on site and within the wider port area.

FN area

- **F5:** Port activities, including dry docks or marine vessel maintenance facilities – Relating to general port activities on site and within the wider port area.

Soil sampling was undertaken between 19 and 27 June 2024 and groundwater sampling was undertaken on 15 and 16 July 2024. 14 soil samples (including one QA/QC soil sample) and four groundwater samples (including one QA/QC groundwater sample and one trip blank) were submitted for laboratory analysis including heavy metals, TPH, PAH and asbestos. In summary:

- All analyte concentrations were reported below the adopted human health guidelines.

- Seven soil samples reported concentrations of nickel above the AUP(OP) environmental criteria, however these nickel concentrations were reported below background concentrations for volcanic soils and are considered to represent a risk analogus to natural background volcanic soil and are not considered further.
- TPH was detected in five of the soil samples analysed.
- PAHs was detected in six of the soil samples analysed
- Chrysolite (white asbestos) was detected in soil at one location with concentrations of combined Fibrous Asbestos and Asbestos Fines (FA/AF) below the human health criteria.
- Concentrations of all contaminants of concern in groundwater samples were below the laboratory limit of detection.

11.2 Consenting and Recommendations

11.2.1 Consenting

The NESCS regulations apply to the full extent of the site where HAIL activities have been identified as illustrated on Figure 6 and Figure 7. Due to the extent of the construction works and nature of the site the PA criteria will likely not be met. Resource consent as a controlled activity under Regulation 9 of the NESCS will likely be required.

Seven soil samples reported nickel concentrations above the AUP environmental criteria, however the concentrations were reported below background concentrations for volcanic soils, and therefore can be attributed to the local soils rather than contamination from a historic activity held on site. As a result, the contaminated land provisions of AUP(OP) Chapter E.30 are unlikely to be triggered in this instance.

11.2.2 Recommendations

- Under controlled activity criteria of the NESCS, preparation of a CSMP to identify management procedures for the proposed soil disturbance is recommended.
- Should disturbance works be proposed within the currently operating areas of the substation building, storage of hazardous substances and former concrete structures for management of heavy containers as part of the proposed development, soil sampling across these areas will be required. Based on the findings of this soil sampling, procedures within the CSMP may require updating.
- Prior to any refurbishment and/or demolition works of current structures (e.g buildings) occurring on site, in accordance with the Health and Safety at Work (Asbestos) Regulations 2016, an asbestos survey should be undertaken. If the survey recommends removal of ACM, then asbestos removal should be undertaken, and subsequent clearance be obtained in accordance with WorkSafe's Approved Code of Practice Management and Removal of Asbestos (2016).

12 Reviewing Statement

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□□ Limitations

This report has been prepared by Beca Ltd (Beca) solely for Port of Auckland (PoAL) (Client). Beca has been requested by the Client to provide a Preliminary Site Investigation (Contamination for the proposed Fergusson North and Bledisloe North Wharf extensions areas at Port of Auckland. This report is prepared solely for the purpose of the assessment of potential soil and groundwater contamination (Scope). The contents of this report may not be used by PoAL for any purpose other than in accordance with the stated Scope.

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

In preparing this report Beca has relied on key information including the following: information provided by Auckland Council, historical aerial photography reviewed from Retrolens, Google Maps and Nearmap.

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

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

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

A

Appendix A – Historic Aerial Photographs

N

Revision	Drawer	Verified	Approved	Date
1	MS	□S	PW	10.05.24

Title: **1940 Aerial Photography**

Client: Port of Auckland

Project: BN and FN Wharves Extension

Beca

Discipline: ENVIRONMENTAL

Drawing No. 1

N

Revision	Drawer	Verified	Approved	Date
1	MS	MS	PW	10.05.24

Title: **1950 Aerial Photography**

Client: Port of Auckland

Project: BN and FN Wharves Extension

Beca

Discipline: ENVIRONMENTAL

Drawing No. 1

Revision	Drawer	Verified	Approved	Date
1	MS	□S	PW	10.05.24

N

Title: **1959 Aerial Photography**

Client: Port of Auckland

Project: BN and FN Wharves Extension

Beca

Discipline: ENVIRONMENTAL

Drawing No. 1

N	Revision	Drawer	Verified	Approved	Date	Title:	Client:		Discipline:
	1	MS	□S	PW	10.05.24	**1963 Aerial Photography**	Port of Auckland	Beca	ENVIRONMENTAL
							Project: BN and FN Wharves Extension		Drawing No. 1

N

Revision	Drawer	Verified	Approved	Date
1	MS	□S	PW	10.05.24

Title: **1975 Aerial Photography**

Client: Port of Auckland

Project: BN and FN Wharves Extension

Beca

Discipline: ENVIRONMENTAL

Drawing No. 1

Revision	Drawer	Verified	Approved	Date
1	MS	□S	PW	10.05.24

N

Title: **1987 Aerial Photography**

Client: Port of Auckland

Project: BN and FN Wharves Extension

Beca

Discipline: ENVIRONMENTAL

Drawing No. 1

N

Revision	Drawer	Verified	Approved	Date
1	MS	□S	PW	10.05.24

Title: **1996 Aerial Photography**

Client: Port of Auckland

Project: BN and FN Wharves Extension

Beca

Discipline: ENVIRONMENTAL

Drawing No. 1

Revision	Drawer	Verified	Approved	Date
1	MS	□S	PW	10.05.24

N

Title: **2001 Aerial Photography**

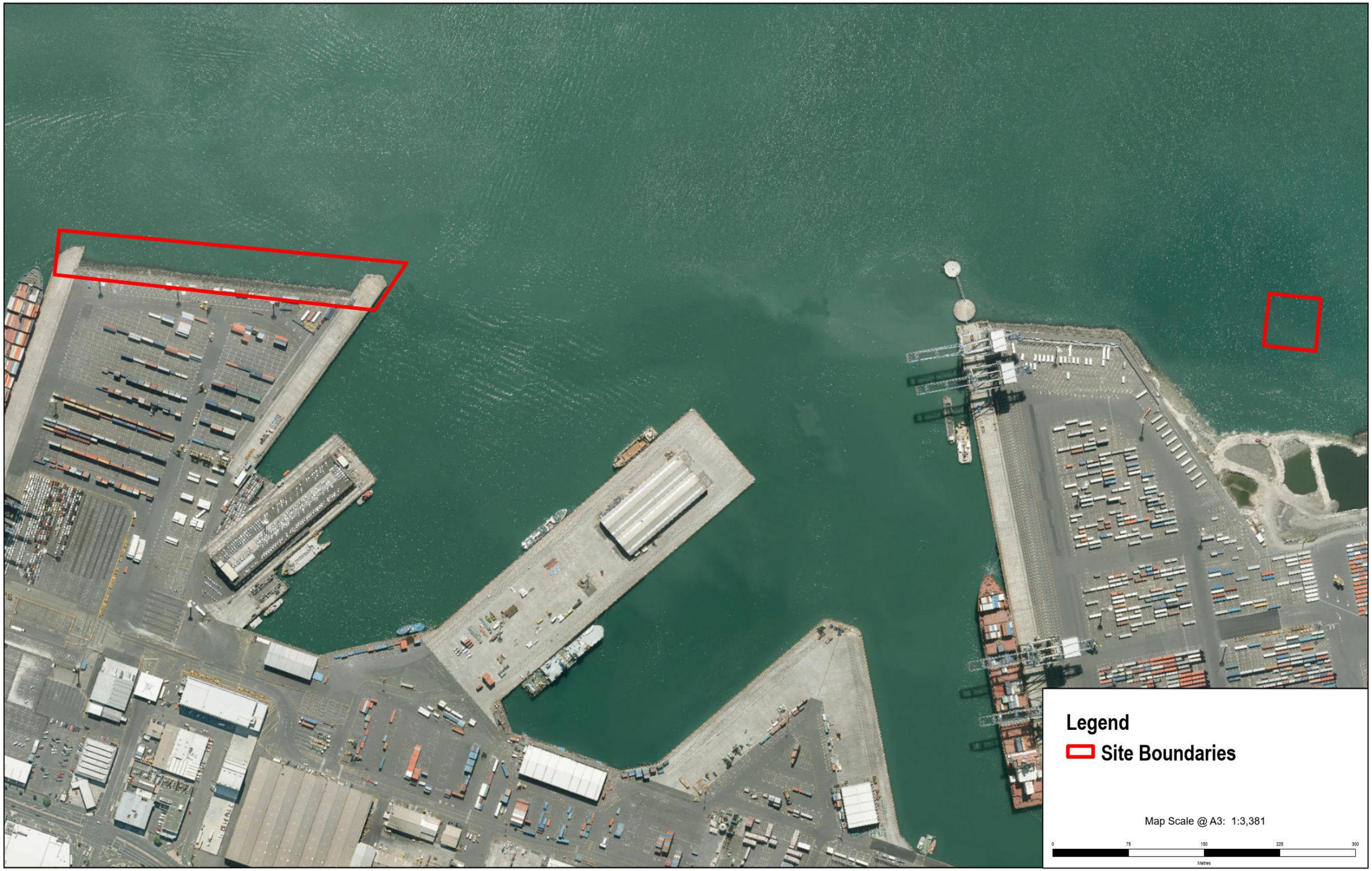
Client: Port of Auckland

Project: BN and FN Wharves Extension

Beca

Discipline: ENVIRONMENTAL

Drawing No. 1



Revision	Drawer	Verified	Approved	Date
1	MS	☐S	PW	10.05.24

N

Title: **2012 Aerial Photography**

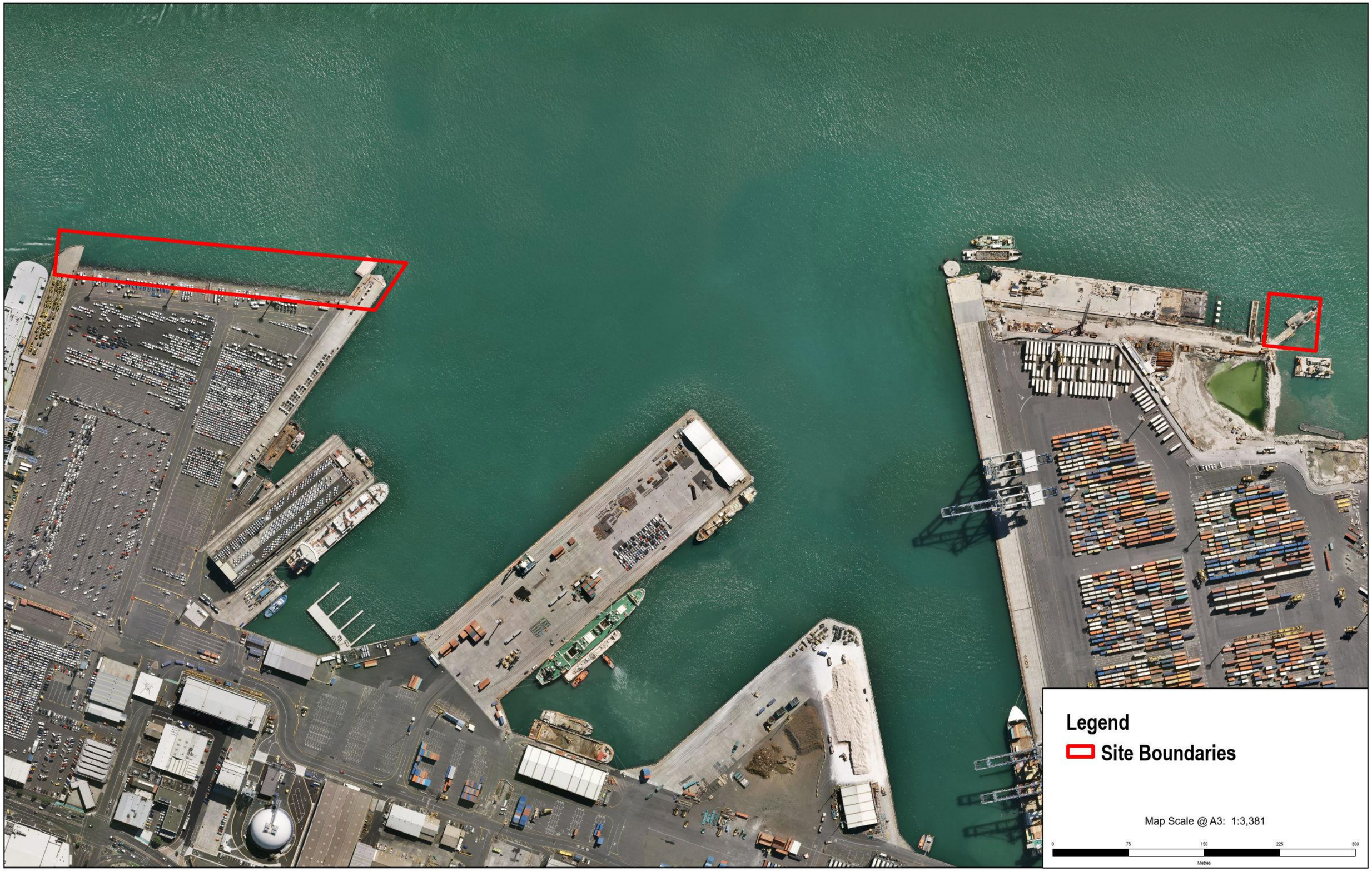
Client: Port of Auckland

Project: BN and FN Wharves Extension

Beca

Discipline: ENVIRONMENTAL

Drawing No. 1



N

Revision	Drawer	Verified	Approved	Date
1	MS	☐S	PW	10.05.24

Title: **2012 Aerial Photography**

Client: Port of Auckland

Project: BN and FN Wharves Extension

Beca

Discipline: ENVIRONMENTAL

Drawing No. 1

Legend

Site Boundaries

Map Scale @ A3: 1:3,381

0 75 150 225 300

Metres

Revision	Drawer	Verified	Approved	Date
1	MS	□S	PW	10.05.24

Title: **2024 Aerial Photography**

Client: Port of Auckland

Project: BN and FN Wharves Extension

Beca

Discipline: ENVIRONMENTAL

Drawing No. 1

B

Appendix B – Auckland Council Contaminated Land Enquiry

08/05/2024

Beca Limited
PO Box Number: 6345
Auckland

Attention: Maria Serrano

Dear Maria,

Site Contamination Enquiry – *Part of Ports of Auckland, Sunderland Street, Parnell*

This letter is in response to your enquiry requesting available site contamination information within Auckland Council records for the above site. Please note this report does not constitute a site investigation report; such reports are required to be prepared by a (third-party) Suitably Qualified and Experienced Practitioner.

The following details are based on information available to the Contamination, Air & Noise Team in the Resource Consent Department. The details provided may be from former regional council information, as well as property information held by the former district/city councils. For completeness the relevant property file should also be requested to obtain all historical records and reports via 09 3010101 or online at:

https://www.aucklandcouncil.govt.nz/buying-property/order-property-report/Pages/order-property-file.aspx.

1. Hazardous Activities and Industries List (HAIL) Information

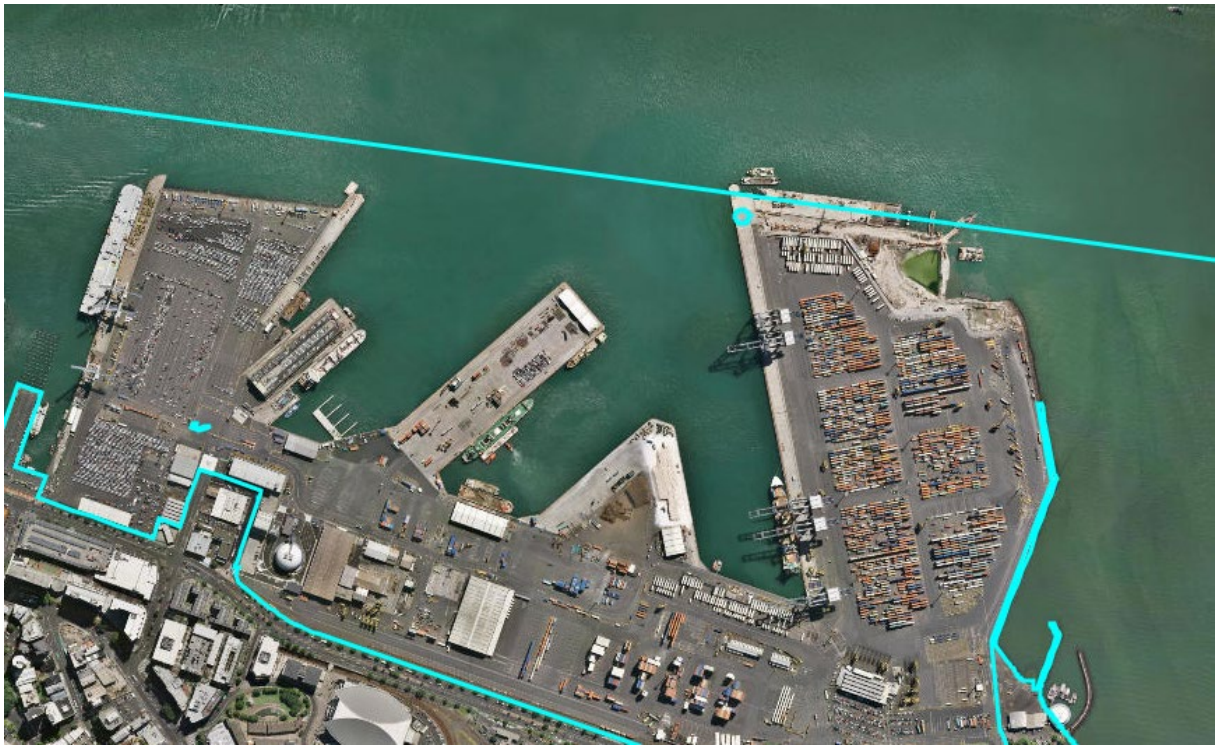
This list published by the Ministry for the Environment (MfE) comprises activities and industries that are considered likely to cause land contamination as a result of hazardous substance use, storage, and/or disposal.

Council's records indicate this site has possibly been subject to the following activities that fall within the HAIL:

- HAIL Item (F5) - Port activities including dry docks or marine vessel maintenance facilities.
- HAIL Item (G3) - Landfill sites.

The aerial image below dated 2017 indicates the sites have been subject to marine port activities.

The aerial image below dated 1940 indicates the site has been subject to reclamation filling.



2017 Aerial image

1940 Aerial image.

Please note:

- *If you are demolishing any building that may have asbestos containing materials (ACM) in it, you have obligations under the Health and Safety at Work (Asbestos) Regulations 2016 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.*
- *Paints used on external parts of properties up until the mid-1970's routinely contained lead, a poison and a persistent environmental pollutant. 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, including high risk use by young children.*

2. Consents and Incidents Information (200m radius of the selected site)

The Council database was searched for records of the following activities within approximately 200 metres of the site and results are displayed in Figure 1 below:

- Pollution Incidents (including air discharges, oil or diesel spills)
- Bores
- Contaminated site and air discharges, and industrial trade process consents
- Closed Landfills
- Air quality permitted activities
- Identified HAIL activities

Figure 1: Selected Consents, Incidents and HAIL activities within approximately 200m of the subject site

Legend:

Relevant details of any pollution incidents and consents and HAIL activities are appended to this letter (Attachment A). Please refer to the column titled 'Property Address' on the spreadsheet to aid in identifying corresponding data on the map.

For any identified HAIL sites, please refer to the tab "HAIL activities" for more information (Column C and D include HAIL activity details where these are available).

Please note:

The HAIL activity hatching in Figure 1 only reflects whether a site has been identified as a HAIL site (both verified and non-verified) by the Council and the type of HAIL associated with the site. This does not confirm whether the site has been formally investigated or the contamination status of the property (e.g. contaminated, remediated etc.). Additionally, due to limitations within Council's records, the specific HAIL activity is not included in the data for all properties. For further information on any of these known HAIL sites, a subsequent site contamination enquiry can be lodged for the specific property (up to 5 adjacent properties can be covered in one request).

While the Auckland Council has carried out the above search using its best practical endeavours, it does not warrant its completeness or accuracy and disclaims any responsibility or liability in respect of the information. If you or any other person wishes to act or to rely on this information, or make any financial commitment based upon it, it is recommended that you seek appropriate technical and/or professional advice.

If you wish to clarify anything in this letter that relates to this site, please contact contaminatedsites@aucklandcouncil.govt.nz. Any follow up requests for information on other sites must go through the online order process.

Should you wish to request any of the files referenced above and/or listed in the attached spreadsheet for viewing, please contact the Auckland Council Call Centre on 301 0101 and note you are requesting former Auckland Regional Council records (the records department requires three working days' notice to ensure the files will be available).

Please note Auckland Council cost recovers officer's time for all site enquiries. As such an invoice for the time involved in this enquiry will follow shortly.

Yours Sincerely,

Contamination, Air and Noise Team
Specialist Unit | Resource Consents
Auckland Council

C

Appendix C – Site Inspection Photographs

Photo 1 – Fergusson North Wharf (looking south-west)

Photo 2 – South-western portion of the site (looking south)

Photo 3 – 'Hazardous Area' container approximately 10m to the south of the site

Photo 4 – 'Hazardous Area' container approximately 10m to the south of the site

Photo 5 – Paint Storage Boxes

Photo 6 – Reclamation bund with rock revetment (looking east)

Photo 7 – Reclamation bund with rock revetment (looking south)

Photo 8 – Bledisloe site area and rock revetment (looking east).

Photo 9 – General storage shelter buildings

Photo 10 – Electrical substation BN

Photo 11 – Electrical substation BN

Photo 12 – ‘Hazardous Area’ container approximately 10m to the south of the site

Photo 13 – ‘Hazardous Area’ container approximately 10m to the south of the site

Photo 14 – HAZCHEM sign on Bledisloe B3 wharf

D

Appendix D – Laboratory Reports and Chain of Custody Information

R J Hill Laboratories Limited
1/17 Print Place
Middleton
Christchurch 8024 New Zealand

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

Certificate of Analysis

Client:	Beca Limited	**Lab No:**	3611988	A2Pv2
Contact:	Maria Serrano	**Date Received:**	21-Jun-2024	
	C/- Beca Limited	**Date Reported:**	20-Aug-2024	**(Amended)**
	PO Box 6345	**Quote No:**	96766	
	Wellesley Street	**Order No:**		
	Auckland 1141	**Client Reference:**	3237885/400/400	
		Submitted By:	Maria Serrano	

Sample Type: Soil

Sample Name:		NMB8a_0.4m 19-Jun-2024	2024_NMB8_1.5 m 19-Jun-2024	2024_NMB9_2m 20-Jun-2024	2024_NMB9_5m 20-Jun-2024	2024_NMB10_0.4 5m 21-Jun-2024
Lab Number:		3611988.2	3611988.4	3611988.13	3611988.16	3611988.19
Asbestos Presence / Absence		Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.
Description of Asbestos Form		-	-	-	-	-
Asbestos in ACM as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Asbestos as Fibrous Asbestos as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Asbestos as Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
As Received Weight	g	1,244.0	1,164.1	1,113.1	1,277.4	855.5
Dry Weight	g	1,187.0	1,067.4	946.2	1,192.9	770.7
Moisture*	%	5	8	15	7	10
Sample Fraction >10mm	g dry wt	640.3	245.8	88.5	598.4	277.4
Sample Fraction <10mm to >2mm	g dry wt	344.5	455.2	326.6	388.2	284.6
Sample Fraction <2mm	g dry wt	201.5	363.9	529.5	204.9	207.7
<2mm Subsample Weight	g dry wt	52.1	56.7	54.0	56.1	54.6
Weight of Asbestos in ACM (Non-Friable)	g dry wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Weight of Asbestos as Fibrous Asbestos (Friable)	g dry wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Weight of Asbestos as Asbestos Fines (Friable)*	g dry wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001

Sample Name:		2024_NMB10_3m 21-Jun-2024	2024_NMB10_5.3m 21-Jun-2024	2024_NMB8_0.1m
Lab Number:		3611988.24	3611988.27	3611988.29
Asbestos Presence / Absence		Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.
Description of Asbestos Form		-	-	-
Asbestos in ACM as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001
Asbestos as Fibrous Asbestos as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001
Asbestos as Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001
As Received Weight	g	886.7	1,002.2	1,155.5
Dry Weight	g	752.6	797.9	1,094.4
Moisture*	%	15	20	5
Sample Fraction >10mm	g dry wt	251.4	166.1	561.2

Sample Type: Soil				
Sample Name:		2024_NMB10_3m 21-Jun-2024	2024_NMB10_5.3m 21-Jun-2024	2024_NMB8_0.1m
Lab Number:		3611988.24	3611988.27	3611988.29
Sample Fraction <10mm to >2mm	g dry wt	233.4	237.4	383.0
Sample Fraction <2mm	g dry wt	267.4	392.8	149.0
<2mm Subsample Weight	g dry wt	56.4	56.4	52.2
Weight of Asbestos in ACM (Non-Friable)	g dry wt	< 0.00001	< 0.00001	< 0.00001
Weight of Asbestos as Fibrous Asbestos (Friable)	g dry wt	< 0.00001	< 0.00001	< 0.00001
Weight of Asbestos as Asbestos Fines (Friable)*	g dry wt	< 0.00001	< 0.00001	< 0.00001

Glossary of Terms

• Loose fibres (Minor) - One or two fibres/fibre bundles identified during analysis by stereo microscope/PLM.
• Loose fibres (Major) - Three or more fibres/fibre bundles identified during analysis by stereo microscope/PLM.
• ACM Debris (Minor) - One or two small (<2mm) pieces of material attached to fibres identified during analysis by stereo microscope/PLM.
• ACM Debris (Major) - Large (>2mm) piece, or more than three small (<2mm) pieces of material attached to fibres identified during analysis by stereo microscope/PLM.
• Unknown Mineral Fibres - Mineral fibres of unknown type detected by polarised light microscopy including dispersion staining. The fibres detected may or may not be asbestos fibres. To confirm the identities, another independent analytical technique may be required.
• Trace - Trace levels of asbestos, as defined by AS4964-2004.
For further details, please contact the Asbestos Team.

Please refer to the BRANZ New Zealand Guidelines for Assessing and Managing Asbestos in Soil.
https://www.branz.co.nz/asbestos

The following assumptions have been made:

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

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

Analyst's Comments

Amended Report: This certificate of analysis replaces report '3611988-A2Pv1' issued on 02-Jul-2024 at 7:14 am.
Reason for amendment: Sample names amended as per clients request.

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively simple matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request.
Unless otherwise indicated, analyses were performed at Hill Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
New Zealand Guidelines Semi Quantitative Asbestos in Soil			
As Received Weight	Measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g	2, 4, 13, 16, 19, 24, 27, 29
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g	2, 4, 13, 16, 19, 24, 27, 29
Moisture*	Sample dried at 100 to 105°C. Calculation = (As received weight - Dry weight) / as received weight x 100.	1 %	2, 4, 13, 16, 19, 24, 27, 29
Sample Fraction >10mm	Sample dried at 100 to 105°C, 10mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	2, 4, 13, 16, 19, 24, 27, 29
Sample Fraction <10mm to >2mm	Sample dried at 100 to 105°C, 10mm and 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	2, 4, 13, 16, 19, 24, 27, 29
Sample Fraction <2mm	Sample dried at 100 to 105°C, 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	2, 4, 13, 16, 19, 24, 27, 29
Asbestos Presence / Absence	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0.01%	2, 4, 13, 16, 19, 24, 27, 29

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Description of Asbestos Form	Description of asbestos form and/or shape if present.	-	2, 4, 13, 16, 19, 24, 27, 29
Weight of Asbestos in ACM (Non-Friable)	Measurement on analytical balance, from the >10mm Fraction. Weight of asbestos based on assessment of ACM form. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	2, 4, 13, 16, 19, 24, 27, 29
Asbestos in ACM as % of Total Sample*	Calculated from weight of asbestos in ACM and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	2, 4, 13, 16, 19, 24, 27, 29
Weight of Asbestos as Fibrous Asbestos (Friable)	Measurement on analytical balance, from the >10mm Fraction. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	2, 4, 13, 16, 19, 24, 27, 29
Asbestos as Fibrous Asbestos as % of Total Sample*	Calculated from weight of fibrous asbestos and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	2, 4, 13, 16, 19, 24, 27, 29
Weight of Asbestos as Asbestos Fines (Friable)*	Measurement on analytical balance, from the <10mm Fractions. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	2, 4, 13, 16, 19, 24, 27, 29
Asbestos as Asbestos Fines as % of Total Sample*	Calculated from weight of asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	2, 4, 13, 16, 19, 24, 27, 29
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	Calculated from weight of fibrous asbestos plus asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	2, 4, 13, 16, 19, 24, 27, 29

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

Testing was completed between 30-Jun-2024 and 01-Jul-2024. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

Dexter Paguirigan Dip Chem Engineering Tech
Laboratory Technician - Asbestos

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Private Bag 3205
Hamilton 3240 New Zealand

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www.hill-labs.co.nz

Certificate of Analysis

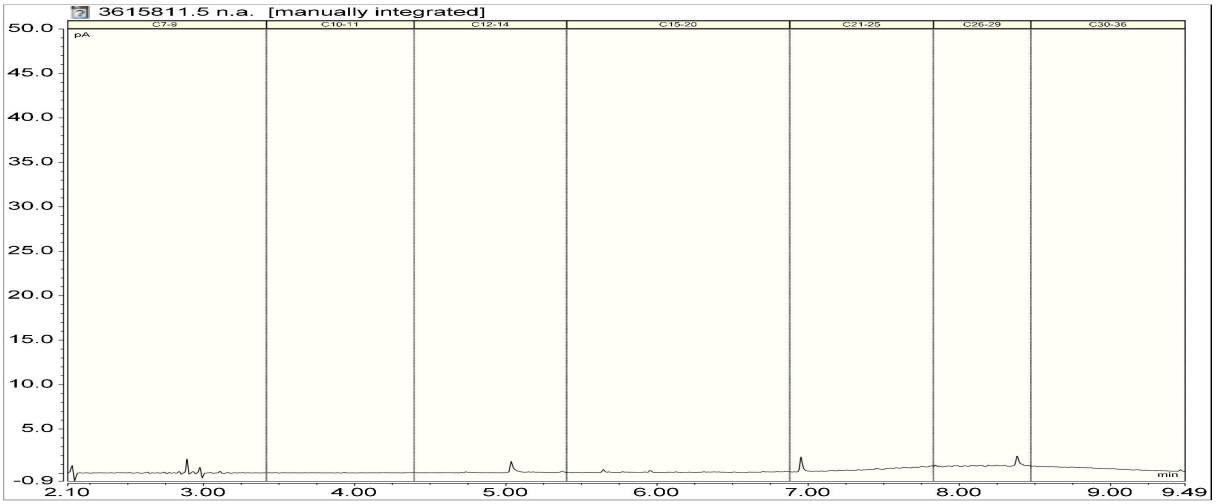
Client:	Beca Limited	**Lab No:**	3615811 SPv1
Contact:	Maria Serrano C/- Beca Limited PO Box 6345 Wellesley Street Auckland 1141	**Date Received:**	27-Jun-2024
		Date Reported:	03-Jul-2024
		Quote No:	96766
		Order No:	
		Client Reference:	3237885/400/400
		Submitted By:	Maria Serrano

Sample Type: Soil

		Sample Name:	BH02_1.8m 27-Jun-2024	BH02_5.8m 27-Jun-2024
		Lab Number:	3615811.1	3615811.5
Individual Tests				
Dry Matter	g/100g as rcvd		66	62
Heavy Metals with Mercury, Screen Level				
Total Recoverable Arsenic	mg/kg dry wt		7	4
Total Recoverable Cadmium	mg/kg dry wt		< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt		10	17
Total Recoverable Copper	mg/kg dry wt		9	14
Total Recoverable Lead	mg/kg dry wt		8.8	11.8
Total Recoverable Mercury	mg/kg dry wt		0.12	< 0.10
Total Recoverable Nickel	mg/kg dry wt		9	10
Total Recoverable Zinc	mg/kg dry wt		34	42
Polycyclic Aromatic Hydrocarbons Screening in Soil*				
Total of Reported PAHs in Soil	mg/kg dry wt		< 0.4	< 0.4
1-Methylnaphthalene	mg/kg dry wt		< 0.015	< 0.016
2-Methylnaphthalene	mg/kg dry wt		< 0.015	< 0.016
Acenaphthylene	mg/kg dry wt		< 0.015	< 0.016
Acenaphthene	mg/kg dry wt		< 0.015	< 0.016
Anthracene	mg/kg dry wt		< 0.015	< 0.016
Benzo[a]anthracene	mg/kg dry wt		< 0.015	< 0.016
Benzo[a]pyrene (BAP)	mg/kg dry wt		< 0.015	< 0.016
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt		< 0.036	< 0.039
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt		< 0.036	< 0.039
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt		< 0.015	< 0.016
Benzo[e]pyrene	mg/kg dry wt		< 0.015	< 0.016
Benzo[g,h,i]perylene	mg/kg dry wt		< 0.015	< 0.016
Benzo[k]fluoranthene	mg/kg dry wt		< 0.015	< 0.016
Chrysene	mg/kg dry wt		< 0.015	< 0.016
Dibenzo[a,h]anthracene	mg/kg dry wt		< 0.015	< 0.016
Fluoranthene	mg/kg dry wt		< 0.015	< 0.016
Fluorene	mg/kg dry wt		< 0.015	< 0.016
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt		< 0.015	< 0.016
Naphthalene	mg/kg dry wt		< 0.08	< 0.08
Perylene	mg/kg dry wt		0.033	< 0.016
Phenanthrene	mg/kg dry wt		< 0.015	< 0.016
Pyrene	mg/kg dry wt		< 0.015	< 0.016

Sample Type: Soil			
Sample Name:		BH02_1.8m 27-Jun-2024	BH02_5.8m 27-Jun-2024
Lab Number:		3615811.1	3615811.5
Total Petroleum Hydrocarbons in Soil			
C7 - C9	mg/kg dry wt	< 30	< 30
C10 - C14	mg/kg dry wt	< 20	< 20
C15 - C36	mg/kg dry wt	< 40	93
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 90	95

3615811.5
BH02_5.8m 27-Jun-2024
Client Chromatogram for TPH by FID



Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively simple matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request.
Unless otherwise indicated, analyses were performed at Hill Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Individual Tests			
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	1, 5
Total of Reported PAHs in Soil	Sonication extraction, GC-MS/MS analysis. In-house based on US EPA 8270.	0.03 mg/kg dry wt	1, 5
Dry Matter	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	1, 5
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	BaP Potency Equivalence calculated from; Benzo(a)anthracene x 0.1 + Benzo(b)fluoranthene x 0.1 + Benzo(j)fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Benzo(a)pyrene x 1.0 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Fluoranthene x 0.01 + Indeno(1,2,3-c,d)pyrene x 0.1. Ministry for the Environment. 2011. Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health. Wellington: Ministry for the Environment.	0.024 mg/kg dry wt	1, 5
Benzo[a]pyrene Toxic Equivalence (TEF)*	Benzo[a]pyrene Toxic Equivalence (TEF) calculated from; Benzo[a]pyrene x 1.0 + Benzo(a)anthracene x 0.1 + Benzo(b) fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Indeno(1,2,3-c,d)pyrene x 0.1. Guidelines for assessing and managing contaminated gasworks sites in New Zealand (GMG) (MfE, 1997).	0.024 mg/kg dry wt	1, 5
TPH Oil Industry Profile + PAHscreen	Sonication extraction, GC-FID and GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8015 and US EPA 8270.	0.010 - 70 mg/kg dry wt	1, 5

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1, 5
Total Petroleum Hydrocarbons in Soil			
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	5
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	1, 5
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	1, 5
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	1, 5
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	1, 5

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

Testing was completed between 01-Jul-2024 and 03-Jul-2024. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

Martin Cowell - BSc
Client Services Manager - Environmental

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1/17 Print Place
Middleton
Christchurch 8024 New Zealand

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

Certificate of Analysis

Client:	Beca Limited	**Lab No:**	3614782	A2Pv1
Contact:	Nikki Sandercock	**Date Received:**	26-Jun-2024	
	C/- Beca Limited	**Date Reported:**	04-Jul-2024	
	PO Box 448	**Quote No:**	96766	
	Hamilton 3240	**Order No:**		
		Client Reference:	3237885/400/400	
		Submitted By:	Maria Serrano	

Sample Type: Soil

Sample Name:		BH01_1m 26-Jun-2024	BH01_2.8m 26-Jun-2024
Lab Number:		3614782.1	3614782.4
Asbestos Presence / Absence		Asbestos NOT detected.	Chrysotile (White Asbestos) detected.
Description of Asbestos Form		-	Loose fibres
Asbestos in ACM as % of Total Sample*	% w/w	< 0.001	< 0.001
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001
Asbestos as Fibrous Asbestos as % of Total Sample*	% w/w	< 0.001	< 0.001
Asbestos as Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001
As Received Weight	g	5,002	5,002
Dry Weight	g	943.2	829.9
Moisture*	%	81	83
Sample Fraction >10mm	g dry wt	248.7	406.8
Sample Fraction <10mm to >2mm	g dry wt	338.2	251.3
Sample Fraction <2mm	g dry wt	354.7	168.7
<2mm Subsample Weight	g dry wt	52.5	53.7
Weight of Asbestos in ACM (Non-Friable)	g dry wt	< 0.00001	< 0.00001
Weight of Asbestos as Fibrous Asbestos (Friable)	g dry wt	< 0.00001	< 0.00001
Weight of Asbestos as Asbestos Fines (Friable)*	g dry wt	< 0.00001	0.00007

Glossary of Terms

- Loose fibres (Minor) - One or two fibres/fibre bundles identified during analysis by stereo microscope/PLM.
- Loose fibres (Major) - Three or more fibres/fibre bundles identified during analysis by stereo microscope/PLM.
- ACM Debris (Minor) - One or two small (<2mm) pieces of material attached to fibres identified during analysis by stereo microscope/PLM.
- ACM Debris (Major) - Large (>2mm) piece, or more than three small (<2mm) pieces of material attached to fibres identified during analysis by stereo microscope/PLM.
- Unknown Mineral Fibres - Mineral fibres of unknown type detected by polarised light microscopy including dispersion staining. The fibres detected may or may not be asbestos fibres. To confirm the identities, another independent analytical technique may be required.
- Trace - Trace levels of asbestos, as defined by AS4964-2004.

For further details, please contact the Asbestos Team.

Please refer to the BRANZ New Zealand Guidelines for Assessing and Managing Asbestos in Soil.
https://www.branz.co.nz/asbestos

The following assumptions have been made:

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

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

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively simple matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request. Unless otherwise indicated, analyses were performed at Hill Labs, 28 Duke Street, Frankton, Hamilton 3204.

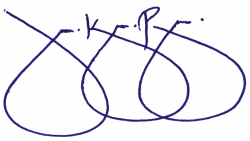
Sample Type: Soil

Test	Method Description	Default Detection Limit	Sample No
New Zealand Guidelines Semi Quantitative Asbestos in Soil			
As Received Weight	Measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g	1, 4
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g	1, 4
Moisture*	Sample dried at 100 to 105°C. Calculation = (As received weight - Dry weight) / as received weight x 100.	1 %	1, 4
Sample Fraction >10mm	Sample dried at 100 to 105°C, 10mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1, 4
Sample Fraction <10mm to >2mm	Sample dried at 100 to 105°C, 10mm and 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1, 4
Sample Fraction <2mm	Sample dried at 100 to 105°C, 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1, 4
Asbestos Presence / Absence	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0.01%	1, 4
Description of Asbestos Form	Description of asbestos form and/or shape if present.	-	1, 4
Weight of Asbestos in ACM (Non-Friable)	Measurement on analytical balance, from the >10mm Fraction. Weight of asbestos based on assessment of ACM form. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 4
Asbestos in ACM as % of Total Sample*	Calculated from weight of asbestos in ACM and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1, 4
Weight of Asbestos as Fibrous Asbestos (Friable)	Measurement on analytical balance, from the >10mm Fraction. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 4
Asbestos as Fibrous Asbestos as % of Total Sample*	Calculated from weight of fibrous asbestos and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1, 4
Weight of Asbestos as Asbestos Fines (Friable)*	Measurement on analytical balance, from the <10mm Fractions. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 4
Asbestos as Asbestos Fines as % of Total Sample*	Calculated from weight of asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1, 4
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	Calculated from weight of fibrous asbestos plus asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1, 4

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

Testing was completed on 03-Jul-2024. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.



John Keneth Paglingayen BApSc
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Certificate of Analysis

Client:	Beca Limited	**Lab No:**	3614776 SPv1
Contact:	Nikki Sandercock C/- Beca Limited PO Box 448 Hamilton 3240	**Date Received:**	26-Jun-2024
		Date Reported:	04-Jul-2024
		Quote No:	96766
		Order No:	
		Client Reference:	3237885/400/400
		Submitted By:	Maria Serrano

Sample Type: Soil

		Sample Name:	BH01_0.7m 26-Jun-2024	BH01_2.8m 26-Jun-2024	QA01 26-Jun-2024
		Lab Number:	3614776.1	3614776.5	3614776.10
Individual Tests					
Dry Matter	g/100g as rcvd		87	90	96
Heavy Metals with Mercury, Screen Level					
Total Recoverable Arsenic	mg/kg dry wt		< 2	3	< 2
Total Recoverable Cadmium	mg/kg dry wt		< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt		40	28	43
Total Recoverable Copper	mg/kg dry wt		55	38	53
Total Recoverable Lead	mg/kg dry wt		3.9	15.7	1.2
Total Recoverable Mercury	mg/kg dry wt		< 0.10	< 0.10	< 0.10
Total Recoverable Nickel	mg/kg dry wt		220	109	240
Total Recoverable Zinc	mg/kg dry wt		73	81	48
Polycyclic Aromatic Hydrocarbons Screening in Soil*					
Total of Reported PAHs in Soil	mg/kg dry wt		< 0.3	0.3	< 0.3
1-Methylnaphthalene	mg/kg dry wt		< 0.012	< 0.012	< 0.011
2-Methylnaphthalene	mg/kg dry wt		< 0.012	< 0.012	< 0.011
Acenaphthylene	mg/kg dry wt		< 0.012	< 0.012	< 0.011
Acenaphthene	mg/kg dry wt		< 0.012	< 0.012	< 0.011
Anthracene	mg/kg dry wt		< 0.012	< 0.012	< 0.011
Benzo[a]anthracene	mg/kg dry wt		< 0.012	0.019	< 0.011
Benzo[a]pyrene (BAP)	mg/kg dry wt		< 0.012	0.029	< 0.011
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt		< 0.027	0.040	< 0.025
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt		< 0.027	0.040	< 0.025
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt		< 0.012	0.029	< 0.011
Benzo[e]pyrene	mg/kg dry wt		< 0.012	0.017	< 0.011
Benzo[g,h,i]perylene	mg/kg dry wt		< 0.012	0.018	< 0.011
Benzo[k]fluoranthene	mg/kg dry wt		< 0.012	< 0.012	< 0.011
Chrysene	mg/kg dry wt		< 0.012	0.019	< 0.011
Dibenzo[a,h]anthracene	mg/kg dry wt		< 0.012	< 0.012	< 0.011
Fluoranthene	mg/kg dry wt		< 0.012	0.038	< 0.011
Fluorene	mg/kg dry wt		< 0.012	< 0.012	< 0.011
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt		< 0.012	0.019	< 0.011
Naphthalene	mg/kg dry wt		< 0.06	< 0.06	< 0.06
Perylene	mg/kg dry wt		< 0.012	< 0.012	< 0.011
Phenanthrene	mg/kg dry wt		< 0.012	< 0.012	< 0.011
Pyrene	mg/kg dry wt		< 0.012	0.042	< 0.011

Sample Type: Soil				
Sample Name:		BH01_0.7m 26-Jun-2024	BH01_2.8m 26-Jun-2024	QA01 26-Jun-2024
Lab Number:		3614776.1	3614776.5	3614776.10
Total Petroleum Hydrocarbons in Soil				
C7 - C9	mg/kg dry wt	< 20	< 20	< 20
C10 - C14	mg/kg dry wt	< 20	< 20	< 20
C15 - C36	mg/kg dry wt	< 40	< 40	< 40
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 80	< 80	< 80

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively simple matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request.
Unless otherwise indicated, analyses were performed at Hill Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Individual Tests			
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	1, 5, 10
Total of Reported PAHs in Soil	Sonication extraction, GC-MS/MS analysis. In-house based on US EPA 8270.	0.03 mg/kg dry wt	1, 5, 10
Dry Matter	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	1, 5, 10
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	BaP Potency Equivalence calculated from; Benzo(a)anthracene x 0.1 + Benzo(b)fluoranthene x 0.1 + Benzo(j)fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Benzo(a)pyrene x 1.0 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Fluoranthene x 0.01 + Indeno(1,2,3-c,d)pyrene x 0.1. Ministry for the Environment. 2011. Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health. Wellington: Ministry for the Environment.	0.024 mg/kg dry wt	1, 5, 10
Benzo[a]pyrene Toxic Equivalence (TEF)*	Benzo[a]pyrene Toxic Equivalence (TEF) calculated from; Benzo[a]pyrene x 1.0 + Benzo(a)anthracene x 0.1 + Benzo(b) fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Indeno(1,2,3-c,d)pyrene x 0.1. Guidelines for assessing and managing contaminated gasworks sites in New Zealand (GMG) (MfE, 1997).	0.024 mg/kg dry wt	1, 5, 10
TPH Oil Industry Profile + PAHscreen	Sonication extraction, GC-FID and GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8015 and US EPA 8270.	0.010 - 70 mg/kg dry wt	1, 5, 10
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1, 5, 10
Total Petroleum Hydrocarbons in Soil			
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	1, 5, 10
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	1, 5, 10
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	1, 5, 10
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	1, 5, 10

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

Testing was completed between 01-Jul-2024 and 04-Jul-2024. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

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

Ara Heron BSc (Tech)
Client Services Manager - Environmental

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Certificate of Analysis

Client:	Beca Limited	**Lab No:**	3611983 SPv3
Contact:	Nikki Sandercock C/- Beca Limited PO Box 448 Hamilton 3240	**Date Received:** **Date Reported:** **Quote No:** **Order No:** **Client Reference:** **Submitted By:**	21-Jun-2024 20-Aug-2024 **(Amended)** 96766 3237885/400/400 - BN Maria Serrano

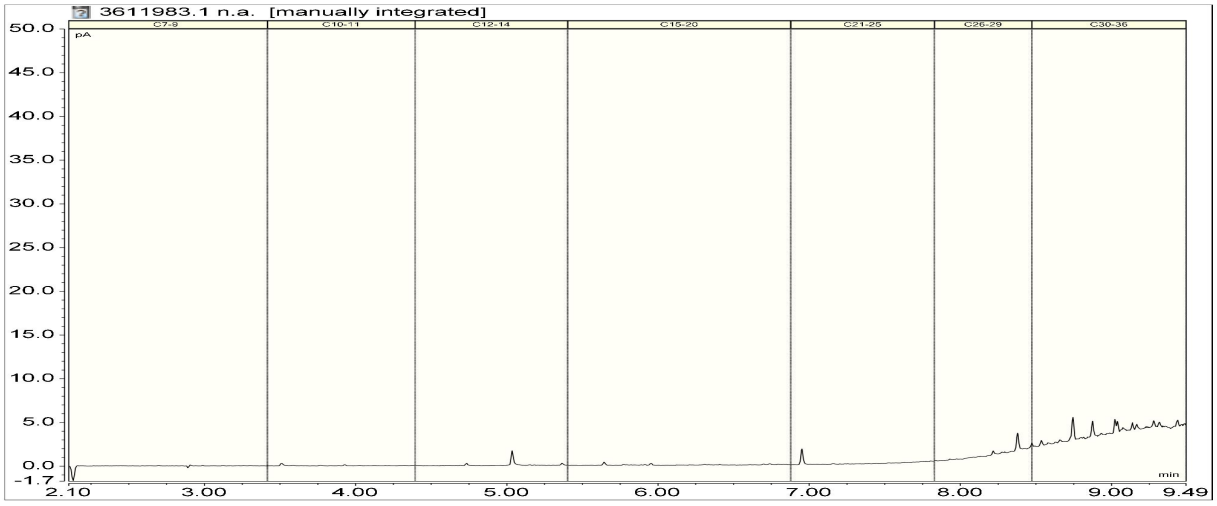
Sample Type: Soil

Sample Name:		2024_NMB8_0.1 m 19-Jun-2024	2024_NMB8_1.5 m 19-Jun-2024	2024_NMB9_2m 20-Jun-2024	2024_NMB9_5m 20-Jun-2024	2024_NMB10_0.4 5m 21-Jun-2024
Lab Number:		3611983.1	3611983.4	3611983.13	3611983.16	3611983.19
Individual Tests						
Dry Matter	g/100g as rcvd	94	91	84	93	88
Heavy Metals with Mercury, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	< 2	< 2	2	< 2	5
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	49	30	34	33	23
Total Recoverable Copper	mg/kg dry wt	70	43	46	48	23
Total Recoverable Lead	mg/kg dry wt	1.6	1.6	4.6	1.3	7.4
Total Recoverable Mercury	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Nickel	mg/kg dry wt	230	168	131	173	66
Total Recoverable Zinc	mg/kg dry wt	67	39	88	38	42
Polycyclic Aromatic Hydrocarbons Screening in Soil*						
Total of Reported PAHs in Soil	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
1-Methylnaphthalene	mg/kg dry wt	< 0.011	< 0.011	< 0.012	< 0.011	< 0.012
2-Methylnaphthalene	mg/kg dry wt	< 0.016	< 0.016	< 0.018	< 0.016	< 0.017
Acenaphthylene	mg/kg dry wt	< 0.011	< 0.011	< 0.012	< 0.011	< 0.012
Acenaphthene	mg/kg dry wt	< 0.011	< 0.011	< 0.012	< 0.011	< 0.012
Anthracene	mg/kg dry wt	< 0.011	< 0.011	< 0.012	< 0.011	< 0.012
Benzo[a]anthracene	mg/kg dry wt	< 0.011	< 0.011	< 0.012	< 0.011	< 0.012
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.011	< 0.011	< 0.012	< 0.011	< 0.012
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	< 0.025	< 0.026	< 0.029	< 0.026	< 0.028
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	< 0.025	< 0.026	< 0.028	< 0.026	< 0.027
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.011	< 0.011	< 0.012	< 0.011	< 0.012
Benzo[e]pyrene	mg/kg dry wt	0.012	< 0.011	< 0.012	< 0.011	0.014
Benzo[g,h,i]perylene	mg/kg dry wt	0.013	< 0.011	< 0.012	< 0.011	0.015
Benzo[k]fluoranthene	mg/kg dry wt	< 0.011	< 0.011	< 0.012	< 0.011	< 0.012
Chrysene	mg/kg dry wt	< 0.011	< 0.011	< 0.012	< 0.011	< 0.012
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.011	< 0.011	< 0.012	< 0.011	< 0.012
Fluoranthene	mg/kg dry wt	< 0.011	< 0.011	< 0.012	< 0.011	< 0.012
Fluorene	mg/kg dry wt	< 0.011	< 0.011	< 0.012	< 0.011	< 0.012
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.011	< 0.011	< 0.012	< 0.011	< 0.012
Naphthalene	mg/kg dry wt	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06
Perylene	mg/kg dry wt	< 0.011	< 0.011	< 0.012	< 0.011	< 0.012
Phenanthrene	mg/kg dry wt	< 0.011	< 0.011	< 0.012	< 0.011	< 0.012
Pyrene	mg/kg dry wt	< 0.011	< 0.011	< 0.012	< 0.011	0.012

Sample Type: Soil						
Sample Name:		2024_NMB8_0.1 m 19-Jun-2024	2024_NMB8_1.5 m 19-Jun-2024	2024_NMB9_2m 20-Jun-2024	2024_NMB9_5m 20-Jun-2024	2024_NMB10_0.4 5m 21-Jun-2024
Lab Number:		3611983.1	3611983.4	3611983.13	3611983.16	3611983.19
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	< 20	< 20	< 20	< 20	< 20
C10 - C14	mg/kg dry wt	< 20	< 20	< 20	< 20	< 20
C15 - C36	mg/kg dry wt	230	< 40	< 40	< 40	189
Total hydrocarbons (C7 - C36)	mg/kg dry wt	230	< 80	< 80	< 80	192

Sample Name:		2024_NMB10_1.5m 21-Jun-2024	2024_NMB10_3m 21-Jun-2024	2024_NMB10_5.3m 21-Jun-2024	NMB8a_0.4m 19-Jun-2024
Lab Number:		3611983.22	3611983.24	3611983.27	3611983.30
Individual Tests					
Dry Matter	g/100g as rcvd	88	81	75	93
Heavy Metals with Mercury, Screen Level					
Total Recoverable Arsenic	mg/kg dry wt	-	13	8	< 2
Total Recoverable Cadmium	mg/kg dry wt	-	0.23	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	-	26	22	55
Total Recoverable Copper	mg/kg dry wt	-	68	20	78
Total Recoverable Lead	mg/kg dry wt	-	161	12.1	2.6
Total Recoverable Mercury	mg/kg dry wt	-	0.72	< 0.10	< 0.10
Total Recoverable Nickel	mg/kg dry wt	-	50	25	240
Total Recoverable Zinc	mg/kg dry wt	-	220	63	55
Polycyclic Aromatic Hydrocarbons Screening in Soil*					
Total of Reported PAHs in Soil	mg/kg dry wt	-	2.0	< 0.4	< 0.3
1-Methylnaphthalene	mg/kg dry wt	-	< 0.013	< 0.013	< 0.011
2-Methylnaphthalene	mg/kg dry wt	-	< 0.019	< 0.02	< 0.016
Acenaphthylene	mg/kg dry wt	-	0.019	< 0.013	< 0.011
Acenaphthene	mg/kg dry wt	-	< 0.013	< 0.013	< 0.011
Anthracene	mg/kg dry wt	-	0.036	< 0.013	< 0.011
Benzo[a]anthracene	mg/kg dry wt	-	0.145	0.015	< 0.011
Benzo[a]pyrene (BAP)	mg/kg dry wt	-	0.187	0.017	< 0.011
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	-	0.27	< 0.031	< 0.026
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	-	0.27	< 0.031	< 0.026
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	-	0.194	0.018	< 0.011
Benzo[e]pyrene	mg/kg dry wt	-	0.110	< 0.013	< 0.011
Benzo[g,h,i]perylene	mg/kg dry wt	-	0.137	< 0.013	< 0.011
Benzo[k]fluoranthene	mg/kg dry wt	-	0.068	< 0.013	< 0.011
Chrysene	mg/kg dry wt	-	0.141	< 0.013	< 0.011
Dibenzo[a,h]anthracene	mg/kg dry wt	-	0.022	< 0.013	< 0.011
Fluoranthene	mg/kg dry wt	-	0.32	0.029	< 0.011
Fluorene	mg/kg dry wt	-	< 0.013	< 0.013	< 0.011
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	-	0.135	< 0.013	< 0.011
Naphthalene	mg/kg dry wt	-	< 0.07	< 0.07	< 0.06
Perylene	mg/kg dry wt	-	0.052	0.018	< 0.011
Phenanthrene	mg/kg dry wt	-	0.120	0.014	< 0.011
Pyrene	mg/kg dry wt	-	0.30	0.028	< 0.011
Total Petroleum Hydrocarbons in Soil					
C7 - C9	mg/kg dry wt	< 20	< 20	< 20	< 20
C10 - C14	mg/kg dry wt	< 20	< 20	< 20	< 20
C15 - C36	mg/kg dry wt	< 40	66	47	< 40
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 80	< 80	< 80	< 80

3611983.1
2024_NMB8_0.1m 19-Jun-2024
Client Chromatogram for TPH by FID



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2024_NMB10_0.45m 21-Jun-2024
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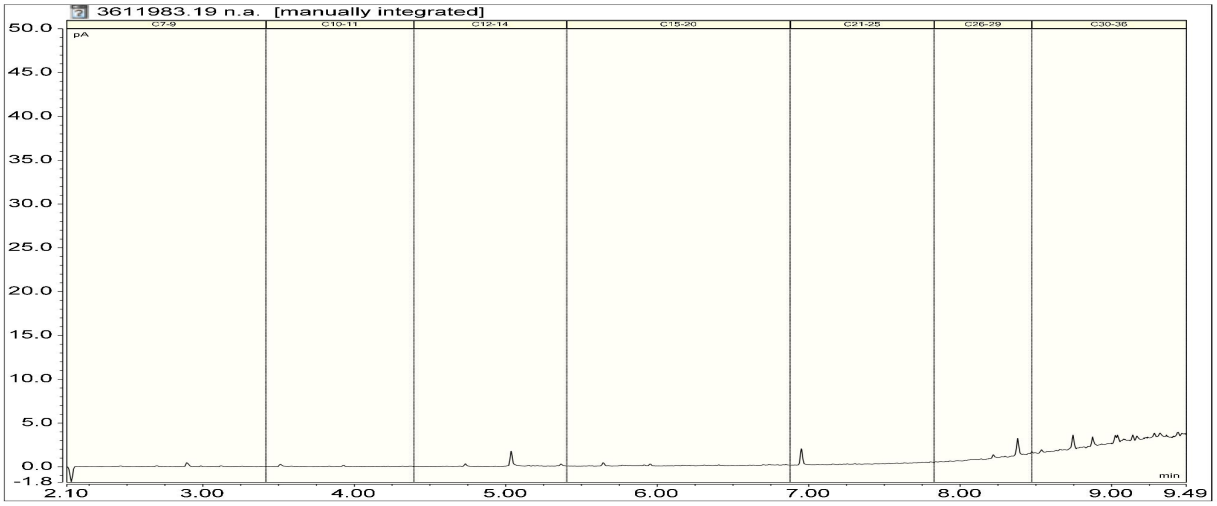

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2024_NMB10_3m 21-Jun-2024
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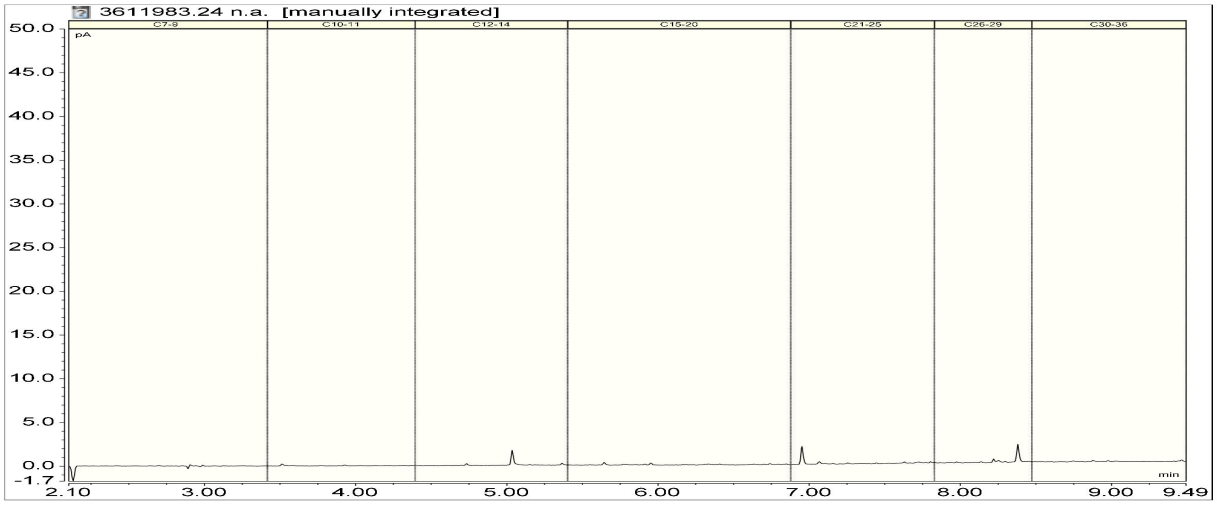

3611983.27
2024_NMB10_5.3m 21-Jun-2024
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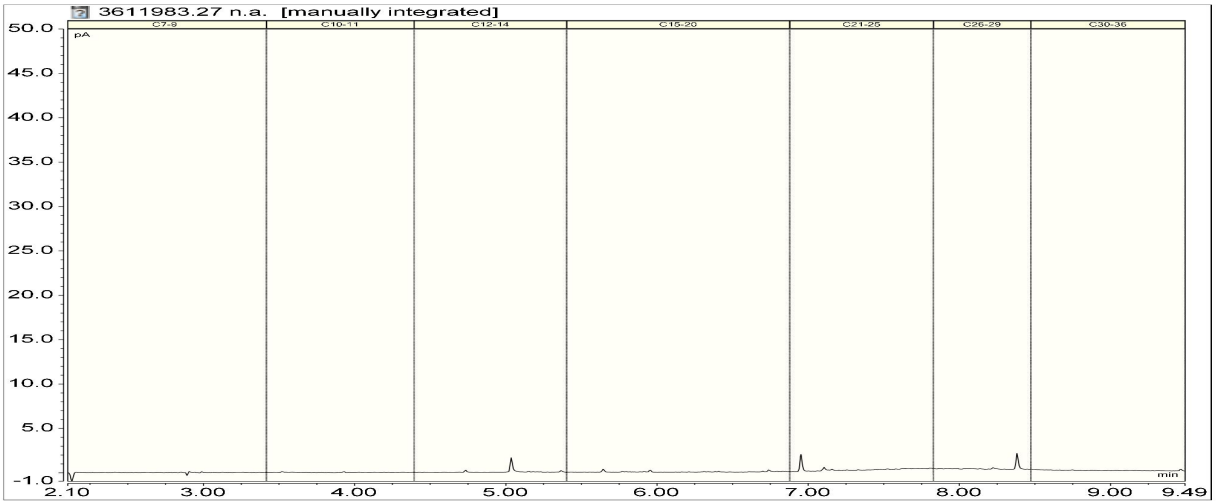

Analyst's Comments

Amended Report: This certificate of analysis replaces report '3611983-SPv2' issued on 05-Aug-2024 at 11:40 am.
Reason for amendment: Sample names amended as per clients request.

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively simple matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request.
Unless otherwise indicated, analyses were performed at Hill Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Soil

Test	Method Description	Default Detection Limit	Sample No
Individual Tests			
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	1, 4, 13, 16, 19, 24, 27, 30
Total of Reported PAHs in Soil	Sonication extraction, GC-MS/MS analysis. In-house based on US EPA 8270.	0.03 mg/kg dry wt	1, 4, 13, 16, 19, 24, 27, 30
Dry Matter	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	1, 4, 13, 16, 19, 22, 24, 27, 30
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	BaP Potency Equivalence calculated from; Benzo(a)anthracene x 0.1 + Benzo(b)fluoranthene x 0.1 + Benzo(j)fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Benzo(a)pyrene x 1.0 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Fluoranthene x 0.01 + Indeno(1,2,3-c,d)pyrene x 0.1. Ministry for the Environment. 2011. Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health. Wellington: Ministry for the Environment.	0.024 mg/kg dry wt	1, 4, 13, 16, 19, 24, 27, 30
Benzo[a]pyrene Toxic Equivalence (TEF)*	Benzo[a]pyrene Toxic Equivalence (TEF) calculated from; Benzo[a]pyrene x 1.0 + Benzo(a)anthracene x 0.1 + Benzo(b) fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Indeno(1,2,3-c,d)pyrene x 0.1. Guidelines for assessing and managing contaminated gasworks sites in New Zealand (GMG) (MfE, 1997).	0.024 mg/kg dry wt	1, 4, 13, 16, 19, 24, 27, 30
TPH Oil Industry Profile + PAHscreen	Sonication extraction, GC-FID and GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8015 and US EPA 8270.	0.010 - 70 mg/kg dry wt	1, 4, 13, 16, 19, 24, 27, 30
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1, 4, 13, 16, 19, 24, 27, 30
Total Petroleum Hydrocarbons in Soil			

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	1, 19, 24, 27
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	1, 4, 13, 16, 19, 22, 24, 27, 30
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	1, 4, 13, 16, 19, 22, 24, 27, 30
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	1, 4, 13, 16, 19, 22, 24, 27, 30
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	1, 4, 13, 16, 19, 22, 24, 27, 30

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

Testing was completed between 25-Jun-2024 and 27-Jun-2024. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

Ara Heron BSc (Tech)
Client Services Manager - Environmental

E

Appendix E – Summary of Analytical Results

PoAL BN and FN Wharves Extension - Soil Analytical Results

Sample Name	NMB8a_0.4m	2024_NMB8_0.1m	2024_NMB8_1.5m	2024_NMB9_2m	2024_NMB9_5m	2024_NMB10_0.45m	2024_NMB10_1.5m	2024_NMB10_3m	2024_NMB10_5.3m	Background Concentration (mg/kg)	Human Health Criteria	Environmental Criteria (mg/kg)
Sample Date	19-Jun-24	19-Jun-24	19-Jun-2024	20-Jun-24	20-Jun-24	21-Jun-24	21-Jun-2024	21-Jun-24	21-Jun-24		Commercial/ Industrial (mg/kg)	
Lab Number	3611983.3	3611983.1	3611983.4	3611983.13	3611983.16	3611983.19	3611983.22	3611983.24	3611983.27			
Sample Depth (in m below ground level)	0.4	0.1	1.5	2.0	5.0	0.5	1.5	3.0	5.3			
Dry Matter (g/100g as rcvd)	93	94	91	84	93	88	88	81	75	-	-	-
Heavy metals (mg/kg dry wt)												
Total Recoverable Arsenic	< 2	< 2	< 2	2	< 2	5	-	13	8	12 [1]	70 [2]	100 [4]
Total Recoverable Cadmium	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	-	0.23	< 0.10	0.65 [1]	1,300 [2]	7.5 [4]
Total Recoverable Chromium	55	49	30	34	33	23	-	26	22	55[1]	6,300 [2]	400 [4]
Total Recoverable Copper	78	70	43	46	48	23	-	68	20	45 [1]	> 10,000 [2]	325 [4]
Total Recoverable Lead	2.6	1.6	1.6	4.6	1.3	7.4	-	161	12.1	65 [1]	3,300 [2]	250 [4]
Total Recoverable Mercury	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	-	0.72	< 0.10	0.45 [1]	4,200 [2]	0.75 [4]
Total Recoverable Nickel	240	230	168	131	173	66	-	50	25	35 [1]	6,000 [3]	105 [4]
Total Recoverable Zinc	55	67	39	88	38	42	-	220	63	180 [1]	400,000 [3]	400 [4]
Polycyclic Aromatic Hydrocarbons (mg/kg dry wt)												
Total of Reported PAHs in Soil	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	-	2	< 0.4	-	-	-
Acenaphthylene	< 0.011	< 0.011	< 0.011	< 0.012	< 0.011	< 0.012	-	0.019	< 0.013	-	-	-
Anthracene	< 0.011	< 0.011	< 0.011	< 0.012	< 0.011	< 0.012	-	0.036	< 0.013	-	-	-
Benzo[a]anthracene	< 0.011	< 0.011	< 0.011	< 0.012	< 0.011	< 0.012	-	0.145	0.015	-	-	-
Benzo[a]pyrene (BAP)	< 0.011	< 0.011	< 0.011	< 0.012	< 0.011	< 0.012	-	0.187	0.017	-	-	-
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	< 0.026	< 0.025	< 0.026	< 0.029	< 0.026	< 0.028	-	0.27	< 0.031	-	35 [2]	-
Benzo[a]pyrene Toxic Equivalence (TEF)	< 0.026	< 0.025	< 0.026	< 0.028	< 0.026	< 0.027	-	0.27	< 0.031	-	-	20 [4]
Benzo[b]fluoranthene + Benzo[j]fluoranthene	< 0.011	< 0.011	< 0.011	< 0.012	< 0.011	< 0.012	-	0.194	0.018	-	-	-
Benzo[e]pyrene	< 0.011	0.012	< 0.011	< 0.012	< 0.011	0.014	-	0.11	< 0.013	-	-	-
Benzo[g,h,i]perylene	< 0.011	0.013	< 0.011	< 0.012	< 0.011	0.015	-	0.137	< 0.013	-	-	-
Benzo[k]fluoranthene	< 0.011	< 0.011	< 0.011	< 0.012	< 0.011	< 0.012	-	0.068	< 0.013	-	-	-
Chrysene	< 0.011	< 0.011	< 0.011	< 0.012	< 0.011	< 0.012	-	0.141	< 0.013	-	-	-
Dibenzo[a,h]anthracene	< 0.011	< 0.011	< 0.011	< 0.012	< 0.011	< 0.012	-	0.022	< 0.013	-	-	-
Fluoranthene	< 0.011	< 0.011	< 0.011	< 0.012	< 0.011	< 0.012	-	0.32	0.029	-	-	-
Indeno(1,2,3-c,d)pyrene	< 0.011	< 0.011	< 0.011	< 0.012	< 0.011	< 0.012	-	0.135	< 0.013	-	-	-
Perylene	< 0.011	< 0.011	< 0.011	< 0.012	< 0.011	< 0.012	-	0.052	0.018	-	-	-
Phenanthrene	< 0.011	< 0.011	< 0.011	< 0.012	< 0.011	< 0.012	-	0.12	0.014	-	-	-
Pyrene	< 0.011	< 0.011	< 0.011	< 0.012	< 0.011	0.012	-	0.3	0.028	-	NA	56 [5]
Total Petroleum Hydrocarbons (mg/kg dry wt)												
C7 - C9	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	-	120 | 120 | 12,000 [5]	N/A [5]
C10 - C14	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	-	1,500 | 1,900 | 2,100 [5]	N/A [5]
C15 - C36	< 40	230	< 40	< 40	< 40	189	< 40	66	47	-	N/A [5]	N/A [5]
Total hydrocarbons (C7 - C36)	< 80	230	< 80	< 80	< 80	192	< 80	< 80	< 80	-	-	-

Above Background Concentration
Exceed Human Health Criteria
Exceed Environmental Criteria

Annotations

1. Auckland Regional Council - Technical Publication 153 - Table 3. Background Ranges of Trace Elements in Auckland Soils. Non-volcanic range selected.
2. National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health (NESCS). 2011. Values applicable to a 'COMMERCIAL/INDUSTRIAL' land use assessment have been adopted for this assessment. Criteria used for assessment of Total Recoverable Chromium is the screening value for Chromium VI.
3. National Environment Protection (Assessment of Site Contamination) Measure 1999 (amended 2013). Schedule B1 Health Investigations Levels for Soil Contaminants.
4. Auckland Unitary Plan Operative in Part. Environmental Discharge Criteria has been selected from Section E30 Contaminated Land. Table E30.6.1.4.1 - Permitted Activity Soil Acceptance Criteria
5. Ministry for the Environment (MfE). Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand. (1999). Module 4, Tables 4.11 and 4.13 for human health protection. Values applicable to 'commercial/industrial use' - all pathways for 'sand' soils at a depth of <1m bgl and 1-4m. Module 4 table 4.20 for protection of groundwater quality for 'sand' soils. N/A indicates estimated criterion exceeds 20,000 mg/kg. At 20,000 mg/kg residual separate phase is expected to have formed in soil matrix.

PoAL BN and FN Wharves Extension - Soil Analytical Results

Sample Name	BH01_0.7m	BH01_2.8m	BH02_1.8m	BH02_5.8m	Background Concentration (mg/kg)	Human Health Criteria	Environmental Risk (mg/kg)
Sample Date	26-Jun-2024	26-Jun-24	27-Jun-24	27-Jun-24		Commercial/ Industrial (mg/kg)	
Lab Number	3614776.1	3614776.5	3615811.1	3615811.5			
Sample Depth (in m below ground level)	0.7	2.8	1.8	5.8			
Dry Matter (g/100g as rcvd)	87	90	66	62	-	-	-
Heavy metals (mg/kg dry wt)							
Total Recoverable Arsenic	< 2	3	7	4	12 [1]	70 [2]	100 [4]
Total Recoverable Cadmium	< 0.10	< 0.10	< 0.10	< 0.10	0.65 [1]	1,300 [2]	7.5 [4]
Total Recoverable Chromium	40	28	10	17	55[1]	6,300 [2]	400 [4]
Total Recoverable Copper	55	38	9	14	45 [1]	> 10,000 [2]	325 [4]
Total Recoverable Lead	3.9	15.7	8.8	11.8	65 [1]	3,300 [2]	250 [4]
Total Recoverable Mercury	< 0.10	< 0.10	0.12	< 0.10	0.45 [1]	4,200 [2]	0.75 [4]
Total Recoverable Nickel	220	109	9	10	35 [1]	6,000 [3]	105 [4]
Total Recoverable Zinc	73	81	34	42	180 [1]	400,000 [3]	400 [4]
Polycyclic Aromatic Hydrocarbons (mg/kg dry wt)							
Total of Reported PAHs in Soil	< 0.3	0.3	< 0.4	< 0.4	-	-	-
Acenaphthylene	< 0.012	< 0.012	< 0.015	< 0.016	-	-	-
Anthracene	< 0.012	< 0.012	< 0.015	< 0.016	-	-	-
Benzo[a]anthracene	< 0.012	0.019	< 0.015	< 0.016	-	-	-
Benzo[a]pyrene (BAP)	< 0.012	0.029	< 0.015	< 0.016	-	-	-
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	< 0.027	0.04	< 0.038	< 0.039	-	35 [2]	-
Benzo[a]pyrene Toxic Equivalence (TEF)	< 0.027	0.04	< 0.038	< 0.039	-	-	20 [4]
Benzo[b]fluoranthene + Benzo[j]fluoranthene	< 0.012	0.029	< 0.015	< 0.016	-	-	-
Benzo[e]pyrene	< 0.012	0.017	< 0.015	< 0.016	-	-	-
Benzo[g,h,i]perylene	< 0.012	0.018	< 0.015	< 0.016	-	-	-
Benzo[k]fluoranthene	< 0.012	< 0.012	< 0.015	< 0.016	-	-	-
Chrysene	< 0.012	0.019	< 0.015	< 0.016	-	-	-
Dibenzo[a,h]anthracene	< 0.012	< 0.012	< 0.015	< 0.016	-	-	-
Fluoranthene	< 0.012	0.038	< 0.015	< 0.016	-	-	-
Indeno(1,2,3-c,d)pyrene	< 0.012	0.019	< 0.015	< 0.016	-	-	-
Perylene	< 0.012	< 0.012	0.033	< 0.016	-	-	-
Phenanthrene	< 0.012	< 0.012	< 0.015	< 0.016	-	-	-
Pyrene	< 0.012	0.042	< 0.015	< 0.016	-	NA	56 [5]
Total Petroleum Hydrocarbons (mg/kg dry wt)							
C7 - C9	< 20	< 20	< 30	< 30	-	120 | 120 | 12,000 [5]	N/A [5]
C10 - C14	< 20	< 20	< 20	< 20	-	1,500 | 1,900 | 2,100 [5]	N/A [5]
C15 - C36	< 40	< 40	< 40	93	-	N/A [5]	NA [5]
Total hydrocarbons (C7 - C36)	< 80	< 80	< 90	95	-	-	-

Above Background Concentration
Exceed Human Health Risk Criteria
Exceed Environmental Risk Criteria

Annotations

1. Auckland Regional Council - Technical Publication 153 - Table 3. Background Ranges of Trace Elements in Auckland Soils. Non-volcanic range selected.
2. National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health (NESCS). 2011. Values applicable to a 'COMMERCIAL/INDUSTRIAL' land use assessment have been adopted for this assessment. Criteria used for assessment of Total Recoverable Chromium is the screening value for Chromium VI.
3. National Environment Protection (Assessment of Site Contamination) Measure 1999 (amended 2013). Schedule B1 Health Investigations Levels for Soil Contaminants.
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PoAL BN and FN Wharves Extension - Asbestos in Soil Results

Sample Name	NMB8a_0.4m	2024_NMB8b_0.1m	2024_NMB8b_1.5m	2024_NMB9_2m	2024_NMB9_5m	2023_NMB10_0.45m	2024_NMB10_3m	2024_NMB10_5.3m	BH01_1m	Human Health Risk [1]		
Sample Date	19-Jun-24	19-Jun-24	19-Jun-24	20-Jun-24	20-Jun-24	21-Jun-24	21-Jun-24	21-Jun-24	26-Jun-24	Residential	Recreational	Commercial/ Industrial
Lab Number	3611988.2	3611988.29	3611988.4	3611988.13	3611988.16	3611988.19	3611988.24	3611988.27	3614782.1			
Sample Depth (m bgl)	0.4	0.1	1.5	2.0	5.0	0.5	3.0	5.3	1m			
New Zealand Guidelines Semi Quantitative Asbestos												
Asbestos Presence / Absence	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.			
Description of Asbestos Form	-	-	-	-	-	-	-	-	-			
Weight of Asbestos in ACM (Non-Friable) (g dry wt)	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001			
Asbestos in ACM as % of Total Sample (% w/w)	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.01%	0.02%	0.05%
Weight of Asbestos as Fibrous Asbestos (Friable) (g dry wt)	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001			
Asbestos as Fibrous Asbestos as % of Total Sample (% w/w)	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001			
Weight of Asbestos as Asbestos Fines (Friable) (g dry wt)	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001			
Asbestos as Asbestos Fines as % of Total Sample (% w/w)	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001			
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001		0.001%	

Asbestos Detected
Above Human Health Criteria

Annotations

[1] New Zealand Guidelines for Assessing and Managing Asbestos in Soil (BRANZ, 2017).

PoAL BN and FN Wharves Extension - Asbestos in Soil Results

Sample Name	BH01_2.8m								Human Health Risk [1]		
Sample Date	26-Jun-24								Residential	Recreational	Commercial/ Industrial
Lab Number	3614782.4										
Sample Depth (m bgl)	2.8										
New Zealand Guidelines Semi Quantitative Asbestos											
Asbestos Presence / Absence	**Chrysotile (White Asbestos) detected.**										
Description of Asbestos Form	Loose fibres										
Weight of Asbestos in ACM (Non-Friable) (g dry wt)	< 0.00001										
Asbestos in ACM as % of Total Sample (% w/w)	< 0.001								0.01%	0.02%	0.05%
Weight of Asbestos as Fibrous Asbestos (Friable) (g dry wt)	< 0.00001										
Asbestos as Fibrous Asbestos as % of Total Sample (% w/w)	< 0.001										
Weight of Asbestos as Asbestos Fines (Friable) (g dry wt)	0.00007										
Asbestos as Asbestos Fines as % of Total Sample (% w/w)	< 0.001										
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample	< 0.001									0.001%	

Asbestos Detected
Above Human Health Criteria

PoAL BN and FN Wharves Extension - Groundwater Analytical Results				
Sample Name	BH02	2024_NMB9	Drinking Water Standards NZ [1]	ANZECC fresh water 80% protection of species [2]
Sample Date	23-Jul-24	23-Jul-24		
Lab Number	3634762.1	3634762.2		
Dissolved Heavy metals (g/m3)				
Dissolved Arsenic	< 0.02	< 0.02	0.01	0.14
Dissolved Cadmium	< 0.0010	< 0.0010	0.004	0.0008
Dissolved Chromium	< 0.010	< 0.010	0.05	0.04
Dissolved Copper	< 0.010	< 0.010	2	0.0025
Dissolved Lead	< 0.002	< 0.002	0.01	0.0094
Dissolved Mercury	< 0.00008	< 0.00008	0.007	0.0054
Dissolved Nickel	< 0.010	< 0.010	0.08	0.017
Dissolved Zinc	< 0.02	< 0.02	-	0.031
Total Heavy metals (g/m3)				
Total Recoverable Arsenic	< 0.021	< 0.021	0.01	0.14
Total Recoverable Cadmium	< 0.0011	< 0.0011	0.004	0.0008
Total Recoverable Chromium	< 0.011	< 0.011	0.05	0.04
Total Recoverable Copper	< 0.011	< 0.011	2	0.0025
Total Recoverable Lead	< 0.0021	< 0.0021	0.01	0.0094
Total Recoverable Mercury	< 0.00008	< 0.00008	0.007	0.0054
Total Recoverable Nickel	< 0.011	< 0.011	0.08	0.017
Total Recoverable Zinc	< 0.021	< 0.021	-	0.031
Polycyclic Aromatic Hydrocarbons (g/m3)				
Total PAHs	All < LOD	All < LOD	-	-
Total Petroleum Hydrocarbons (g/m3)				
C7 - C9	< 0.10	< 0.10	-	N/A [5]
C10 - C14	< 0.2	< 0.2	-	N/A [5]
C15 - C36	< 0.4	< 0.4	-	N/A [5]
Total hydrocarbons (C7 - C36)	< 0.7	< 0.7	-	-

Exceed Human Health Risk Criteria
Exceed Environmental Risk Criteria

Annotations

1. Water services (Drinking Water Standards for New Zealand) Regulations 2022

2.Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2018). Values for 80% protection adopted. Arsenic V has been used as no value for total arsenic exists.

LOD = Laboratory Limit of Detection

F

Appendix F – Borehole Logs

Environmental Machine Borehole Log

Borehole ID: BH01

Sheet 1 of 1

Project:	POAL BN and FN Wharves	**Project Number:**	3237885
Site Location:	Bledisloe North Wharf	**Client:**	Port of Auckland Ltd
Location:	Bledisloe Wharf	**Coordinate System:**	NZTM2000
		Northing:	5921394.1
		Easting:	1758119.0
		Vertical Datum:	
		Ground Level (mRL):	
		Location Method:	□ □S □□□□

Installations	Drilling: GWL	Drilling: Method	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
					0.5	-0.5		0-0.75m: no recovery / hydro vacuumed 0-0.1m: concrete 0.1-0.6m: asphalt 0.7m: silty fine to coarse GRAVEL, brown, subrounded-rounded, moist 0.75m: boulders, basalt	
					1.0	-1.0		Silty SAND, brown, loose, some gravel, slightly moist to moist	
					1.5	-1.5			
					2.0	-2.0		Silty, gravelly SAND, brown, loosely packed, moist, wet at 3-3.2m	
					2.5	-2.5			
					3.0	-3.0			
					3.5	-3.5		Silty, gravelly SAND, brown, very moist, loosely packed	
					4.0	-4.0			
					4.5	-4.5			
					5.0	-5.0			
					5.5	-5.5		Fine to medium GRAVEL, dark brown, subangular to subrounded, some boulders, some sand and silt, moist, wet at 6.1-6.5m	
					6.0	-6.0			
					6.5	-6.5			
					7.0	-7.0			
					7.5	-7.5			
					8.0	-8.0			
					8.5	-8.5			
					9.0	-9.0			
					9.5	-9.5			

Date Started:	26/06/2024	**Date End:**	26/06/2024
Logged By:	MS	**Drilled By:**	□ro□Dri□L□d
Inclination:		**Equipment:**	ML2
Diameter:		**Method:**	

Comments:

Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

Environmental Machine Borehole Log

Borehole ID: BH02

Sheet 1 of 1

Project:	POAL BN and FN Wharves	**Project Number:**	3237885
Site Location:	Bledisloe North Wharf	**Client:**	Port of Auckland Ltd
Location:	Fergusson Wharf	**Coordinate System:**	□□□M2□□□
		Northing:	□□2□□2□□□□
		Easting:	□□□□2□□□□□
		Vertical Datum:	
		Ground Level (mRL):	
		Location Method:	□ □S □□□□□

Installations	Drilling: GWL	Drilling: Method	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
					0.0	0.0		Asphalt	
								MUDCRETE, medium to coarse gravel, hard	
					0.5	-0.5		No recovery	
					1.0	-1.0		MUDCRETE, hard and stiff in parts, dry, some medium gravel	
					1.5	-1.5		No recovery	
								MUDCRETE, soft to firm, moist, silty texture	
					2.0	-2.0		MUDCRETE, hard and stiff in parts, dry, some medium gravel	
					2.5	-2.5		MUDCRETE, soft to firm, moist, silty and sandy texture	
								MUDCRETE, hard, dry, some medium gravel	
					3.0	-3.0		No recovery	
					3.5	-3.5		MUDCRETE, hard, dry, some medium gravel	
					4.0	-4.0		MUDCRETE, soft to firm, moist, silty and sandy texture	
					4.5	-4.5		No recovery	
					5.0	-5.0		MUDCRETE, soft to firm, moist, silty texture	
					5.5	-5.5		MUDCRETE, soft to hard, moist, sandy texture	
					6.0	-6.0			
					6.5	-6.5			
					7.0	-7.0			
					7.5	-7.5			
					8.0	-8.0			
					8.5	-8.5			
					9.0	-9.0			
					9.5	-9.5			

Date Started:	27/06/2024	**Date End:**	Comments:
Logged By:	MS	**Drilled By:**	□ro□Dri□L□d
Inclination:		**Equipment:**	ML2
Diameter:		**Method:**	

Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

Environmental Machine Borehole Log

Borehole ID: NMB8a
Sheet 1 of 1

Project:	POAL BN and FN Wharves	**Project Number:**	3237885
Site Location:	Bledisloe North Wharf	**Client:**	Port of Auckland Ltd
Location:	Bledisloe Wharf	**Coordinate System:**	□ □□M2□□□
		Northing:	□□2□□□□□□□
		Easting:	□□□□□□□□□□
		Vertical Datum:	
		Ground Level (mRL):	
		Location Method:	□ □S □□□□

Installations	Drilling: GWL	Drilling: Method	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
					0.5	-0.5		0-1m Hydro vacuum excavation 0-0.09m: concrete. 0.09-0.4m: fine to coarse GRAVEL, angular to subrounded 1m: boulders encountered. Hole terminated and relocated.	
					1.0	-1.0			
					1.5	-1.5			
					2.0	-2.0			
					2.5	-2.5			
					3.0	-3.0			
					3.5	-3.5			
					4.0	-4.0			
					4.5	-4.5			
					5.0	-5.0			
					5.5	-5.5			
					6.0	-6.0			
					6.5	-6.5			
					7.0	-7.0			
					7.5	-7.5			
					8.0	-8.0			
					8.5	-8.5			
					9.0	-9.0			
					9.5	-9.5			

Date Started:	19/06/2024	**Date End:**	19/06/2024
Logged By:	MS	**Drilled By:**	□ro□Dri□L□d
Inclination:		**Equipment:**	ML2
Diameter:		**Method:**	

Comments:
Hole terminated at 1m as boulders encountered

Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

Machine Borehole Log

Borehole ID: 2024_NMB8
Sheet 1 of 3

Project:	POAL BN and FN Wharves	**Project number:**	3237885
Site location:	Bledisloe North Wharf	**Client name:**	Port of Auckland Ltd
Location:	Bledisloe Wharf	**Coordinate system:**	NZTM2000
		Northing:	5921388.0
		Easting:	1758179.0
		Vertical datum:	Chart Datum
		Ground level (mRL):	5.60
		Location method:	GeoMaps +/- 5m

Drilling						In Situ Tests						
GWL	Fluid Return	Recovery	Method	Casing	RQD	Su (kPa)	SPT	Samples	Depth (m)	RL (m)	Graphic Log	Soil / Rock Description	Geological Unit
		0%	VE						0.0	5.5		0.00 - 1.50m: no recovery. Vacuum excavation. Logged from downhole observations: 0.00 - 0.09m: concrete. 0.09 - 0.40m: fine to course GRAVEL. Gravel: angular to sub-rounded, HW, vesicular. 0.50m: Scoria approx 100 - 300mm diameter, HW. 1.00 - 1.50m: silty coarse sandy fine to coarse GRAVEL. Gravel: angular to sub-rounded, HW, vesicular.	
		42%	SPT				8 19 22 28/20mm N=50+		1.5	4.0		Medium dense, silty coarse sandy fine to coarse GRAVEL; dark brown; moist, non-plastic. Gravel: sub-angular to sub-rounded, SW, basalt. 1.60 - 1.74m: no recovery. BOULDER (Strong, UW, Basalt).	
		63%	SNC						2.0	3.5		Medium dense, silty fine to medium GRAVEL; dark brown and reddish orange; wet, non-plastic. Gravel: sub-rounded to sub-angular, SW, basalt and scoria.	
		22%	SPT				3 4 3 2 3 3 N=11		3.0	2.5		3.10 - 3.45m: no recovery.	
		76%	SNC						3.5	2.0		Medium dense, fine to coarse GRAVEL, minor silt, trace cobbles; dark grey, light grey, orange, and red; wet, non-plastic.	
		22%	SPT				3 3 2 2 2 3 N=9		4.5	1.0		4.60 - 4.95m: no recovery.	
		43%	SNC						5.0	0.5		Medium dense, fine to coarse GRAVEL, trace cobbles; dark grey, light grey, brown, and orange; wet, non-plastic. Gravel: sub-angular to sub-rounded, SW, basalt and scoria.	Fill
		22%	SPT				1 1 1 2 1 1 N=5		6.0	-0.5		6.20 - 6.55m: no recovery.	
		43%	SNC						6.5	-1.0		Loose, fine to medium GRAVEL; dark brown, black, orange, and grey; wet, non-plastic. Gravel: sub-rounded, SW, basalt. *6.75m: 70mm sub-rounded, SW, basalt cobble.*	
		0%	SPT				1 0 1 0 1 1 N=3		7.5	-2.0		7.05 - 8.15m: no recovery.	
		95%	SNC						8.5	-3.0		Very loose, silty fine to medium SAND, trace fine gravel; dark brown; moist, non-plastic. Gravel: sub-rounded, SW. Loose, fine to coarse GRAVEL; dark grey, dark brown, and orange; wet, non-plastic. Gravel: sub-rounded, SW, basalt. *9.00m: 2 x 60mm sub-rounded, SW, basalt cobbles.*	
		11%	SPT				1 3 4 3 3 5 N=15		9.5	-4.0		9.15 - 9.55m: no recovery. Medium dense, fine to coarse GRAVEL; dark brown, black, orange, and dark reddish brown; wet, non-plastic. Gravel: sub-angular to sub-rounded, SW, basalt. Stiff, fine to coarse sandy SILT, some fine to medium gravel, trace clay; light grey; moist, low plasticity.	

Date started:	19/06/2024	**Date end:**	19/06/2024
Logged by:	KM	**Drilled by:**	Pro-Drill Ltd
Vane ID:	N/A	**Equipment:**	ML2
Vane type:	N/A	**Method:**	SNC/TT/SPT/VE
Vane width:	N/A	**Inc/Az:**	90° / 0°
SPT ID:	ML2	**Diameter:**	63mm
SPT efficiency:	82%	**Fluid type:**	Water

Comments:
2.0 - 16.7m - Core disturbed within drill runs by sonic drilling methodology.
Hole terminated at target depth.
Ground water not measured.

For Explanation of Symbols and Abbreviations See Key Sheet

Machine Borehole Log

Borehole ID: 2024_NMB8
Sheet 2 of 3

Project:	POAL BN and FN Wharves	**Project number:**	3237885
Site location:	Bledisloe North Wharf	**Client name:**	Port of Auckland Ltd
Location:	Bledisloe Wharf	**Coordinate system:**	NZTM2000
		Northing:	5921388.0
		Easting:	1758179.0
		Vertical datum:	Chart Datum
		Ground level (mRL):	5.60
		Location method:	GeoMaps +/- 5m

Drilling						In Situ Tests							
GWL	Fluid Return	Recovery	Method	Casing	RQD	Su (kPa)	SPT	Samples	Depth (m)	RL (m)	Graphic Log	Soil / Rock Description	Geological Unit
		67%	SNC				1 1		10.5	-4.5		Stiff, fine to coarse sandy SILT, some fine to medium gravel, trace clay; light grey; moist, low plasticity. *10.50m: 80mm length metal fragment.*	Fill
		2%	SPT				3 3		11.0	-5.0		10.60 - 11.05m: no recovery.	
		26%	SNC				1 3 N=10		11.5	-5.5		Loose, fine to coarse GRAVEL; dark brown, black, and reddish brown; wet, non-plastic. Gravel: sub-rounded, SW, basalt.	
		3%	SPT				3 2		12.0	-6.0		12.20 - 12.65m: no recovery.	
		70%	SNC				2 2 2 1 N=7		12.5	-6.5		Very loose, fine to medium GRAVEL; dark brown, black, and reddish brown; wet, non-plastic. Gravel: sub-rounded, SW, basalt.	
		2%	SPT				11 10		13.0	-7.0		COBBLES, some fine to coarse gravel; dark grey; wet. Cobbles/gravel: sub-rounded, SW, basalt.	
		29%	SNC				5 5 7 12 N=29		13.5	-7.5		13.71 - 14.05m: no recovery.	
		83%	SNC				3 15 50/5mm N=50+		14.0	-8.0		Medium dense, fine to medium GRAVEL; dark brown, black, and reddish brown; wet, non-plastic. Gravel: sub-rounded, SW, basalt.	
		0%	SPT				2 3		14.5	-8.5		14.45 - 15.2m: no recovery.	
		12%	TT				2 2 4 4 Nc=12		15.0	-9.0		Medium dense, fine to medium GRAVEL; dark brown, black, and reddish brown; wet, non-plastic. Gravel: sub-rounded, SW, basalt.	
		100%	SPT				2 2 2		15.5	-9.5		COBBLE: Strong, SW, grey, basalt.	Tauranga Group
		90%	TT				3 3 5 N=13		16.0	-10.0		Stiff, SILT, minor clay, trace fine sand; grey; moist, low plasticity.	
		100%	SPT				3 5 7 7		16.5	-10.5		Stiff, clayey SILT, minor fine sand; grey; moist, high plasticity. Stiff, fine to medium sandy SILT, minor clay, trace medium to coarse gravel; grey; moist, low plasticity. Gravel: sub-angular, SW. *16.50m: core disturbed by sonic drilling (baked).*	
									17.0	-11.0		16.70 - 17.15m: no recovery. Solid SPT.	
									17.5	-11.5		Stiff, clayey SILT, minor fine sand; grey; moist, high plasticity. 17.25 - 18.00m: no recovery.	
									18.0	-12.0			
									18.5	-12.5		Medium dense, silty fine to medium SAND; grey; moist, non-plastic. *18.30m: minor clay; low plasticity.*	East Coast Bays Formation
									19.0	-13.0		Medium dense, silty fine to medium SAND, trace clay; grey; moist, low plasticity.	
									19.5	-13.5		Very stiff, fine to medium sandy SILT, some clay; grey; moist, high plasticity.	
										-14.0		Dense, silty fine to medium SAND; grey; moist, non-plastic.	

Date started:	19/06/2024	**Date end:**	19/06/2024
Logged by:	KM	**Drilled by:**	Pro-Drill Ltd
Vane ID:	N/A	**Equipment:**	ML2
Vane type:	N/A	**Method:**	SNC/TT/SPT/VE
Vane width:	N/A	**Inc/Az:**	90° / 0°
SPT ID:	ML2	**Diameter:**	63mm
SPT efficiency:	82%	**Fluid type:**	Water

Comments:
2.0 - 16.7m - Core disturbed within drill runs by sonic drilling methodology.
Hole terminated at target depth.
Ground water not measured.

For Explanation of Symbols and Abbreviations See Key Sheet

Machine Borehole Log

Borehole ID: 2024_NMB8
Sheet 3 of 3

Project:	POAL BN and FN Wharves	**Project number:**	3237885
Site location:	Bledisloe North Wharf	**Client name:**	Port of Auckland Ltd
Location:	Bledisloe Wharf	**Coordinate system:**	NZTM2000
		Northing:	5921388.0
		Easting:	1758179.0
		Vertical datum:	Chart Datum
		Ground level (mRL):	5.60
		Location method:	GeoMaps +/- 5m

Drilling						In Situ Tests						
GWL	Fluid Return	Recovery	Method	Casing	RQD	Su (kPa)	SPT	Samples	Depth (m)	RL (m)	Graphic Log	Soil / Rock Description	Geological Unit
		86%	TT		70%		10 10 N=34		20.5	-14.5 -15.0		Dense, silty fine to medium SAND; grey; moist, non-plastic.	East Coast Bays Formation
		100%	SPT				16 34/65mm N=50+		21.0	-15.5		Extremely weak, SW, grey, SILTSTONE. Extremely weak, SW, grey, fine to medium SANDSTONE.	
		96%	TT		67%				21.5 22.0	-16.0 -16.5		Very weak, UW, grey, SILTSTONE.	
		0%	SPT				19 31/70mm Nc=50+		22.5	-17.0		22.50 - 22.64m: no recovery. Solid SPT. Very weak, UW, grey, SILTSTONE.	
		88%	TT		88%				23.0 23.5	-17.5 -18.0		Extremely weak, UW, grey, fine to medium SANDSTONE. *23.00m: 30mm bed with carbonaceous laminations.* Very weak, UW, grey, SILTSTONE. *23.42m: carbonaceous lamination.* *23.60 - 23.65m: 50mm bed with gently inclined carbonaceous laminations.*	
		0%	SPT				26 24/40mm Nc=50+		24.0	-18.5		Very weak, UW, grey, fine to medium SANDSTONE. 24.00 - 24.12m: no recovery. Solid SPT. 24.12m - End of Borehole, Hole terminated at target depth.	
									24.5 25.0 25.5 26.0 26.5 27.0 27.5 28.0 28.5 29.0 29.5	-19.0 -19.5 -20.0 -20.5 -21.0 -21.5 -22.0 -22.5 -23.0 -23.5 -24.0			

Date started:	19/06/2024	**Date end:**	19/06/2024
Logged by:	KM	**Drilled by:**	Pro-Drill Ltd
Vane ID:	N/A	**Equipment:**	ML2
Vane type:	N/A	**Method:**	SNC/TT/SPT/VE
Vane width:	N/A	**Inc/Az:**	90° / 0°
SPT ID:	ML2	**Diameter:**	63mm
SPT efficiency:	82%	**Fluid type:**	Water

Comments:
2.0 - 16.7m - Core disturbed within drill runs by sonic drilling methodology.
Hole terminated at target depth.
Ground water not measured.

For Explanation of Symbols and Abbreviations See Key Sheet

Machine Borehole Log

Borehole ID: 2024_NMB9

Project:	POAL BN and FN Wharves	**Project number:**	3237885
Site location:	Bledisloe North Wharf	**Client:**	Port of Auckland Ltd
Location:	Bledisloe Wharf	**Coordinate system:**	NZTM2000
		Vertical datum:	Chart Datum
		Northing:	5921382.0
		Ground level (mRL):	5.60
		Easting:	1758218.0
		Location method:	GeoMaps +/- 5m

Installations	Drilling: Return	Drilling: GWL	Drilling: Recovery	Drilling: Method	Drilling: Casing	Drilling: RQD	In Situ Tests: Su (kPa)	In Situ Tests: SPT	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
			0%	RC / VE						0.0 – 1.5	5.5 – 4.0		0.00 - 1.40m: no recovery. Logged from downhole observations. 0.00 - 1.00m: Concrete. 1.00 - 1.40m: silty fine SAND, some fine gravel, some clay; brown; moist, high plasticity. Gravel: sub-rounded, SW.	
			89%	SPT				4, 8, 8, 11, 10, 8, N=37		1.5 – 3.0	4.0 – 2.5		Very stiff, fine to medium sandy, fine gravelly SILT, minor clay; brown and dark grey; moist, low plasticity. Gravel: sub-rounded, SW. *2.30 - 2.50m: brown and reddish brown.*	
			100%	SNC						3.0	2.5 – 2.0		COBBLES, some fine to coarse gravel; grey; wet; non-plastic. Cobbles/ gravel: sub-rounded, SW, basalt.	
			22%	SPT				3, 5, 2, 7, 9, 7, N=25		3.0 – 3.5	2.5 – 2.0		3.10 - 3.45m: no recovery.	
			90%	SNC						3.5 – 4.5	2.0 – 1.0		COBBLES, some fine to coarse gravel; grey; wet; non-plastic. Cobbles/ gravel: sub-rounded, SW, basalt. Very stiff, fine to medium sandy, fine to medium GRAVEL, minor silt, trace clay; brown and dark grey; moist, low plasticity. Gravel: rounded, SW.	
			65%	SPT				6, 8, 15, 16, 19/10mm, N=50+		4.5 – 5.0	1.0 – 0.5		4.70 - 4.81m: no recovery. Dense, fine to coarse GRAVEL, some cobbles; black, grey, and reddish brown; wet, non-plastic. Gravel: sub-angular to sub-rounded, SW, basalt.	Fill
			100%	SNC						5.5	0.0		BOULDER (Strong, UW, basalt).	
			100%	TT		34%				5.5 – 6.0	0.0 – -0.5		COBBLES: grey; moist. Cobbles: sub-angular, SW, basalt.	
			38%	TT						6.25	-0.5		6.25 - 6.45m: no recovery.	
			22%	SPT				4, 8, 4, 4, 3, 2, N=13		6.5 – 7.0	-1.0 – -1.5		Medium dense, fine to medium SAND, minor fine to coarse gravel, minor silt, trace shell fragments; grey; wet, non-plastic. Gravel: angular to sub-angular, SW. Medium dense, fine to coarse GRAVEL; reddish brown, grey, and brown; wet, non-plastic. Gravel: angular to sub-angular, SW.	
			93%	SNC						7.5	-2.0		7.70 - 8.05m: no recovery.	
			22%	SPT				2, 3, 2, 3, 3, 2, N=10		8.0 – 8.5	-2.5 – -3.0		Medium dense, fine to coarse GRAVEL, trace fine to coarse sand, trace silt; brown; wet, non-plastic. Gravel: angular to sub-angular, SW.	
			67%	SNC						8.75	-3.0		8.75 - 9.10m: no recovery.	
			11%	SPT				3, 3, 3, 3, 1, 1, N=8		9.0 – 9.5	-3.5 – -4.0		Loose, fine to medium GRAVEL; grey, brown and reddish brown; wet, non-plastic. Gravel: sub-angular to sub-rounded, SW. 9.15 - 9.55m: no recovery. Loose, fine to coarse GRAVEL, trace cobbles; grey, reddish brown, and orange; wet, non-plastic. Gravel/cobbles: angular to sub-rounded, SW.	
			67%	SNC										

Date started:	20/06/2024	**Date end:**	20/06/2024
Logged by:	KM	**Drilled by:**	Pro-Drill Ltd
Vane ID:	N/A	**Equipment:**	ML2
Vane type:	N/A	**Method:**	SPT/TT/SNC/VE/RC
Vane width:	N/A	**Inclination:**	90°
SPT No:	ML2	**Diameter:**	63mm
SPT efficiency:	82%	**Fluid type:**	Water

Comments:
Hole terminated at target depth.
Ground water not measured.

For Explanation of Symbols and Abbreviations See Key Sheet

Machine Borehole Log

Borehole ID: 2024_NMB9

Project:	POAL BN and FN Wharves	**Project number:**	3237885
Site location:	Bledisloe North Wharf	**Client:**	Port of Auckland Ltd
Location:	Bledisloe Wharf	**Coordinate system:**	NZTM2000
		Vertical datum:	Chart Datum
		Northing:	5921382.0
		Ground level (mRL):	5.60
		Easting:	1758218.0
		Location method:	GeoMaps +/- 5m

Drilling: Return	Drilling: GWL	Drilling: Recovery	Drilling: Method	Drilling: Casing	Drilling: RQD	In Situ Tests: Su (kPa)	In Situ Tests: SPT	Depth (m)	RL (m)	Soil/ Rock Description	Geological Unit
		67%	SNC				1 2 1 2 2 2 N=7	10.5	-4.5	Loose, fine to coarse GRAVEL, trace cobbles; grey, reddish brown, and orange; wet, non-plastic. Gravel/cobbles: angular to sub-rounded, SW.	Fill
		22%	SPT					11.0	-5.0	10.70 - 11.05m: no recovery.	
		96%	SNC					11.5	-5.5	Loose, fine to coarse GRAVEL, trace fine sand, trace silt; grey; wet, non-plastic. Gravel: angular to sub-angular, SW.	
		89%	SPT				0 0 0 0 0 0 N=0	12.0	-6.0		
		100%	SNC					12.5	-6.5	Soft, silty CLAY, trace fine sand, trace shell fragments; grey; moist, high plasticity.	Recent Marine Sediments
		100%	SPT				0 0 0 1 0 0 N=1	13.5	-7.0		
		95%	SNC					14.0	-7.5		
		100%	SPT				1 3 2 4 3 5 N=14	14.5	-8.0		
		100%	SNC					15.0	-8.5	Soft, fine to medium sandy SILT, some shell fragments, minor clay; grey; moist, low plasticity.	
		0%	SPT				9 21 50/20mm Nc=50+	15.5	-9.0		
		88%	TT		18%			16.0	-9.5	Very stiff, clayey SILT, trace fine sand; grey; moist; high plasticity.	Tauranga Group
		0%	SPT				16 34/65mm Nc=50+	16.5	-10.0	*15.85m: some fine sand.*	
		99%	TT		92%			17.0	-10.5	Hard, clayey SILT, minor fine sand; grey; moist, high plasticity.	East Coast Bays Formation
		0%	SPT				13 37/55mm Nc=50+	17.5	-11.0	16.70 - 16.87m: no recovery. Solid SPT.	
		91%	TT		91%			18.0	-11.5	Extremely weak, SW, grey, medium to coarse SANDSTONE.	
								18.5	-12.0	Extremely weak, SW, grey, fine SANDSTONE.	
								19.0	-12.5	Very weak, SW, interbedded SILTSTONE and SANDSTONE. Bedding: sub-horizontal, moderately thin.	
								19.5	-13.0	18.00 - 18.14m: no recovery. Solid SPT.	
									-13.5	Very weak, SW, interbedded SILTSTONE and SANDSTONE. Bedding: sub-horizontal, moderately thin to moderately thick. *18.22m: carbonaceous lamination.* *18.60m: carbonaceous lamination.*	
									-14.0	Very weak, SW, grey, medium to coarse SANDSTONE. *19.10 - 19.15m: 50mm bed with sub-horizontal carbonaceous laminations.*	
										19.50 - 19.63m: no recovery. Solid SPT.	
										Very weak, UW, grey, medium to coarse SANDSTONE.	

Date started:	20/06/2024	**Date end:**	20/06/2024
Logged by:	KM	**Drilled by:**	Pro-Drill Ltd
Vane ID:	N/A	**Equipment:**	ML2
Vane type:	N/A	**Method:**	SPT/TT/SNC/VE/RC
Vane width:	N/A	**Inclination:**	90°
SPT No:	ML2	**Diameter:**	63mm
SPT efficiency:	82%	**Fluid type:**	Water

Comments:
Hole terminated at target depth.
Ground water not measured.

For Explanation of Symbols and Abbreviations See Key Sheet

Machine Borehole Log

Borehole ID: 2024_NMB9

Sheet 3 of 3

Project:	POAL BN and FN Wharves	**Project number:**	3237885
Site location:	Bledisloe North Wharf	**Client:**	Port of Auckland Ltd
Location:	Bledisloe Wharf	**Coordinate system:**	NZTM2000
		Northing:	5921382.0
		Easting:	1758218.0
		Vertical datum:	Chart Datum
		Ground level (mRL):	5.60
		Location method:	GeoMaps +/- 5m

Installations	Drilling: Return	Drilling: GWL	Drilling: Recovery	Drilling: Method	Drilling: Casing	Drilling: RQD	In Situ Tests: Su (kPa)	In Situ Tests: SPT	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
			91%	TT		91%		30 20/15mm Nc=50+		20.5 21.0 21.5 22.0 22.5 23.0 23.5 24.0 24.5 25.0 25.5 26.0 26.5 27.0 27.5 28.0 28.5 29.0 29.5	-14.5 -15.0 -15.5 -16.0 -16.5 -17.0 -17.5 -18.0 -18.5 -19.0 -19.5 -20.0 -20.5 -21.0 -21.5 -22.0 -22.5 -23.0 -23.5 -24.0		Very weak, UW, grey, medium to coarse SANDSTONE. Weak, UW, grey, SILTSTONE. *20.05m: pinkish white lamination.* Very weak, UW, grey, coarse SANDSTONE. 21.00 - 21.09m: no recovery. Solid SPT. 21.09m - End of Borehole, Hole terminated at target depth.	East Coast Bays Formation

Date started:	20/06/2024	**Date end:**	20/06/2024
Logged by:	KM	**Drilled by:**	Pro-Drill Ltd
Vane ID:	N/A	**Equipment:**	ML2
Vane type:	N/A	**Method:**	SPT/TT/SNC/VE/RC
Vane width:	N/A	**Inclination:**	90°
SPT No:	ML2	**Diameter:**	63mm
SPT efficiency:	82%	**Fluid type:**	Water

Comments:

Hole terminated at target depth.
Ground water not measured.

For Explanation of Symbols and Abbreviations See Key Sheet

Machine Borehole Log

Borehole ID: 2024_NMB10
Sheet 1 of 3

Project:	POAL BN and FN Wharves	**Project number:**	3237885
Site location:	Bledisloe North Wharf	**Client name:**	Port of Auckland Ltd
Location:	Bledisloe Wharf	**Coordinate system:**	NZTM2000
		Northing:	5921371.0
		Easting:	1758302.0
		Vertical datum:	Chart Datum
		Ground level (mRL):	5.60
		Location method:	GPS +/- 5m

Drilling: GWL	Fluid Return	Recovery	Method	Casing	RQD	In Situ Tests: Su (kPa)	SPT	Samples	Depth (m)	RL (m)	Graphic Log	Soil / Rock Description	Geological Unit
		0%	RC / VE						0.5	5.5		0.00 - 1.50m: no recovery. Logged from downhole observations. 0.00 - 0.45m: Concrete. 0.45m: shelly, silty, medium to coarse SAND, trace fine to medium gravel; light grey; moist, non-plastic. Gravel: sub-angular to sub-rounded, MW. Shells: fragments. 0.70m: shelly fine to coarse SAND; light brown; moist to dry, non-plastic. Shells: fragments. 0.95m: fine to coarse sandy SHELLS; light brown; wet (from hydrovac), non-plastic. Shells: fragments. 1.50m: shelly fine to coarse SAND; light brown; moist, non-plastic. Shells: fragments.	Fill
		89%	SPT				1 3 3 3 2 2 N=10		1.5	4.0		Medium dense, fine gravelly, fine to coarse SAND, some shell fragments, trace silt; light brown; moist, non-plastic.	
		95%	SNC						2.0	3.5			
									2.5	3.0		Stiff, fine to coarse sandy SILT, some clay, minor fine to coarse gravel; brown and orange; moist, high plasticity. Gravel: angular to sub-rounded, SW.	
		45%	SPT				0 0 8 13 20 9/70mm N=50+		3.0	2.5		Stiff, clayey SILT, some fine to medium sand, trace fine to coarse gravel, trace shells, trace organics; dark brown, black, orange, and light grey; moist, high plasticity. Gravel: angular to sub-rounded, SW. Shells: fragments. Organics: amorphous.	
		28%	SNC						3.5	2.0		Stiff, fine to coarse sandy SILT, some fine to coarse gravel, minor clay, trace shell fragments; brown; moist, low plasticity. Gravel: angular to sub-rounded, SW. 3.20 - 3.44m: no recovery.	
									4.0	1.5		Stiff, clayey SILT, some fine to medium gravel, trace fine sand; dark brown; moist, high plasticity. Gravel: sub-angular to sub-rounded, SW. 'Dense', fine to coarse sandy silty GRAVEL, minor clay; light grey; wet, high plasticity (matrix). Gravel: angular to sub-rounded, SW. 3.74 - 4.50m: no recovery.	
		11%	SPT				1 2 1 2 2 1 N=6		4.5	1.0		Loose, fine to coarse GRAVEL; brown and orange; wet, non-plastic. Gravel: angular to sub-rounded, SW. 4.55 - 4.95m: no recovery.	
		43%	SNC						5.0	0.5		Loose, fine to coarse GRAVEL, trace cobbles; brown and brownish orange; wet, non-plastic. Gravel: angular to sub-angular, SW. Cobbles: sub-angular, SW. Loose, fine to coarse sandy SHELLS, trace coarse gravel; light brown; wet, non-plastic. Shells: fragments. Gravel: sub-angular, SW.	
									5.5	0.0		Firm, clayey SILT, some fine to medium sand, trace shells; brown; moist, high plasticity. 5.45 - 6.10m: no recovery.	
		56%	SPT				5 4 3 2 2 1 N=8		6.0	-0.5		Loose, fine to medium gravelly, silty, fine to coarse SAND, minor shell fragments, trace clay; brown and black; wet, low plasticity. Gravel: sub-rounded, SW. 6.35 - 6.55m: no recovery.	
		90%	SNC						6.5	-1.0		Loose, fine to coarse GRAVEL, some fine to coarse sand, some silt, trace shell fragments; brown; wet, non-plastic. Gravel: sub-angular to sub-rounded, SW.	
									7.0	-1.5		Loose, silty, fine to coarse SAND, minor shell fragments, minor clay; light brown; moist, low plasticity. *7.10m: 100mm bed of coarse sandy SHELLS.* *7.30 - 7.60m: some shells.*	
		0%	SPT				1 0 1 0 0 0 N=1		7.5	-2.0		7.60 - 8.00m: no recovery.	
		95%	SNC						8.0	-2.5		Very loose, shelly fine to coarse SAND, minor silt; light brown; moist, non-plastic. Shells: fragments.	
									8.5	-3.0			
		33%	SPT				2 2 2 2 2 2 N=8		9.0	-3.5		9.25 - 9.55m: no recovery.	
									9.5	-4.0		Loose, silty, fine to coarse sandy SHELLS; light brown; wet, non-plastic. *9.90m: grey.*	

Date started:	21/06/2024	**Date end:**	21/06/2024
Logged by:	KM	**Drilled by:**	Pro-Drill Ltd
Vane ID:	N/A	**Equipment:**	ML2
Vane type:	N/A	**Method:**	SNC/SPT/TT/RC/VE
Vane width:	N/A	**Inc/Az:**	90° / 0°
SPT ID:	ML2	**Diameter:**	63mm
SPT efficiency:	82%	**Fluid type:**	Water

Comments:
Hole terminated at target depth.
Ground water not measured.

For Explanation of Symbols and Abbreviations See Key Sheet

Machine Borehole Log

Borehole ID: 2024_NMB10

Project:	POAL BN and FN Wharves	**Project number:**	3237885
Site location:	Bledisloe North Wharf	**Client name:**	Port of Auckland Ltd
Location:	Bledisloe Wharf	**Coordinate system:**	NZTM2000
		Northing:	5921371.0
		Easting:	1758302.0
		Vertical datum:	Chart Datum
		Ground level (mRL):	5.60
		Location method:	GPS +/- 5m

Drilling						In Situ Tests						
GWL	Fluid Return	Recovery	Method	Casing	RQD	Su (kPa)	SPT	Samples	Depth (m)	RL (m)	Graphic Log	Soil / Rock Description	Geological Unit
		95%	SNC						10.5	-4.5		Loose, silty, fine to coarse sandy SHELLS; light brown; wet, non-plastic.	Fill
		89%	SPT				1 2 2 2 2 1 N=7		11.0	-5.0			
		87%	SNC						11.5	-5.5		Stiff, clayey SILT, some fine sand; light greenish grey; moist, high plasticity.	Tauranga Group
		56%	SPT				0 1 1 1 1 2 N=5		12.0	-6.0		Loose, fine to coarse sandy SHELLS, trace silt; light grey; wet, non-plastic. Shells: fragments.	
		95%	SPT						12.5	-6.5		12.45 - 12.65m: no recovery.	
		78%	SPT				2 2 2 2 2 3 N=9		13.0	-7.0		Loose, silty fine to coarse sandy SHELLS; light grey; wet, non-plastic. Shells: fragments.	
		95%	SNC						13.5	-7.5		Loose, silty, shelly, fine to coarse SAND; light grey; wet, non-plastic. Shells: fragments.	
		100%	SPT				1 1 8 6 4 2 N=20		14.0	-8.0		Loose, fine to coarse sandy SHELLS, trace silt; light grey; moist, non-plastic. Shells: fragments.	
		100%	SNC						14.5	-8.5		14.05 - 14.15m: no recovery.	
		0%	SPT				4 10 8 22 20/15mm Nc=50+		15.0	-9.0		Loose, fine to coarse sandy SHELLS, trace silt; light grey; wet, non-plastic. Shells: fragments.	
		88%	TT		66%				15.5	-9.5			
		0%	SPT				16 34/70mm Nc=50+		16.0	-10.0		Very stiff, fine to medium sandy SILT, some clay; grey; moist, high plasticity.	
		100%	TT		99%				16.5	-10.5		Very stiff, clayey SILT; grey; moist, high plasticity.	
		0%	SPT				16 34/65mm Nc=50+		17.0	-11.0		Very stiff, fine to medium sandy SILT, some clay; grey; moist, high plasticity. 16.70 - 17.02m: no recovery. Solid SPT.	East Coast Bays Formation
									17.5	-11.5		Extremely weak, SW, grey, SILTSTONE. Extremely weak, SW, grey, fine to medium SANDSTONE.	
									18.0	-12.0			
									18.5	-12.5		18.00 - 18.14m: no recovery. Solid SPT. Very weak, UW, grey, SILTSTONE.	
									19.0	-13.0		*18.55m: 50mm bed of coarse sandstone.* *18.80m: 100mm bed of coarse sandstone.*	
									19.5	-13.5			
										-14.0		19.50 - 19.64m: no recovery. Solid SPT. Weak, UW, grey, fine SANDSTONE.	

Date started:	21/06/2024	**Date end:**	21/06/2024
Logged by:	KM	**Drilled by:**	Pro-Drill Ltd
Vane ID:	N/A	**Equipment:**	ML2
Vane type:	N/A	**Method:**	SNC/SPT/TT/RC/VE
Vane width:	N/A	**Inc/Az:**	90° / 0°
SPT ID:	ML2	**Diameter:**	63mm
SPT efficiency:	82%	**Fluid type:**	Water

Comments:
Hole terminated at target depth.
Ground water not measured.

Machine Borehole Log

Borehole ID: 2024_NMB10
Sheet 3 of 3

Project:	POAL BN and FN Wharves	**Project number:**	3237885
Site location:	Bledisloe North Wharf	**Client name:**	Port of Auckland Ltd
Location:	Bledisloe Wharf	**Coordinate system:**	NZTM2000
		Northing:	5921371.0
		Easting:	1758302.0
		Vertical datum:	Chart Datum
		Ground level (mRL):	5.60
		Location method:	GPS +/- 5m

Drilling						In Situ Tests							
GWL	Fluid Return	Recovery	Method	Casing	RQD	Su (kPa)	SPT	Samples	Depth (m)	RL (m)	Graphic Log	Soil / Rock Description	Geological Unit
		71%	TT		63%		25 25/30mm Nc=50+		20.5 21.0 21.5 22.0 22.5 23.0 23.5 24.0 24.5 25.0 25.5 26.0 26.5 27.0 27.5 28.0 28.5 29.0 29.5	-14.5 -15.0 -15.5 -16.0 -16.5 -17.0 -17.5 -18.0 -18.5 -19.0 -19.5 -20.0 -20.5 -21.0 -21.5 -22.0 -22.5 -23.0 -23.5 -24.0		Weak, UW, grey, fine SANDSTONE. *20.15m: sandstone: fine to coarse.* *20.20m: joint: steeply inclined, undulating, rough, narrow, clean.* *20.40m: joint: steeply inclined, undulating, rough, very narrow, clean.* 21.00 - 21.10m: no recovery. Solid SPT. 21.10m - End of Borehole, Hole terminated at target depth.	East Coast Bays Formation

Date started:	21/06/2024	**Date end:**	21/06/2024
Logged by:	KM	**Drilled by:**	Pro-Drill Ltd
Vane ID:	N/A	**Equipment:**	ML2
Vane type:	N/A	**Method:**	SNC/SPT/TT/RC/VE
Vane width:	N/A	**Inc/Az:**	90° / 0°
SPT ID:	ML2	**Diameter:**	63mm
SPT efficiency:	82%	**Fluid type:**	Water

Comments:
Hole terminated at target depth.
Ground water not measured.

For Explanation of Symbols and Abbreviations See Key Sheet