REPORT

Tonkin+Taylor

Downtown Carpark Site Development

Contamination Site Management Plan

Prepared for
Precinct Properties NZ Limited
Prepared by
Tonkin & Taylor Ltd
Date
November 2025
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Document control

Title: Downtown Carpark Site Development Contamination Site Management Plan					
Date	**Version**	**Description**	**Prepared by:**	**Reviewed by:**	**Authorised by:**
September 2025	1	Draft CSMP for 80% FTAA	C. Di Vitto	L. Phuah	P. Millar
November 2025	2	Final CSMP	C. Di Vitto	L. Phuah	P. Millar

Distribution:

Precinct Properties NZ Limited	1 electronic copy
Baker & Associates Ltd	1 electronic copy
RCP Project Managers	1 electronic copy
Tonkin & Taylor Ltd (FILE)	1 electronic copy

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1 Introduction

Tonkin & Taylor Ltd. (T+T) has been engaged by Precinct Properties NZ Limited (Precinct) to prepare this preliminary contamination site management plan (CSMP) to outline procedures for Precinct's appointed contractor to follow during the proposed development, located at 2 Lower Hobson Street, Auckland (herein referred to as "the site"). The site location is presented in Figure 1.1.

This version of the CSMP has been prepared to support the application by Precinct for resource consent under the Fast Track Approvals Act 2024 for the site and has been prepared prior to confirming the final construction methodology for development. Due to site access constraints and the current structures basement coverage, fully complete intrusive site investigations have not been able to be completed. One environmental borehole and monitoring well, ENV-BH01, has been installed in the southwest corner (north of the former service station and workshop, shown on Figure 1.1) to establish whether activities from the former service station had caused significant hydrocarbon contamination and were impacting groundwater.

This CSMP outlines preliminary controls based on the desktop and limited testing which will need to be confirmed after intrusive investigations are complete and prior to construction. As such, a revised CSMP will be required prior to works commencement.

This CSMP report has been undertaken in accordance with our proposal[1] dated 8 August 2025.

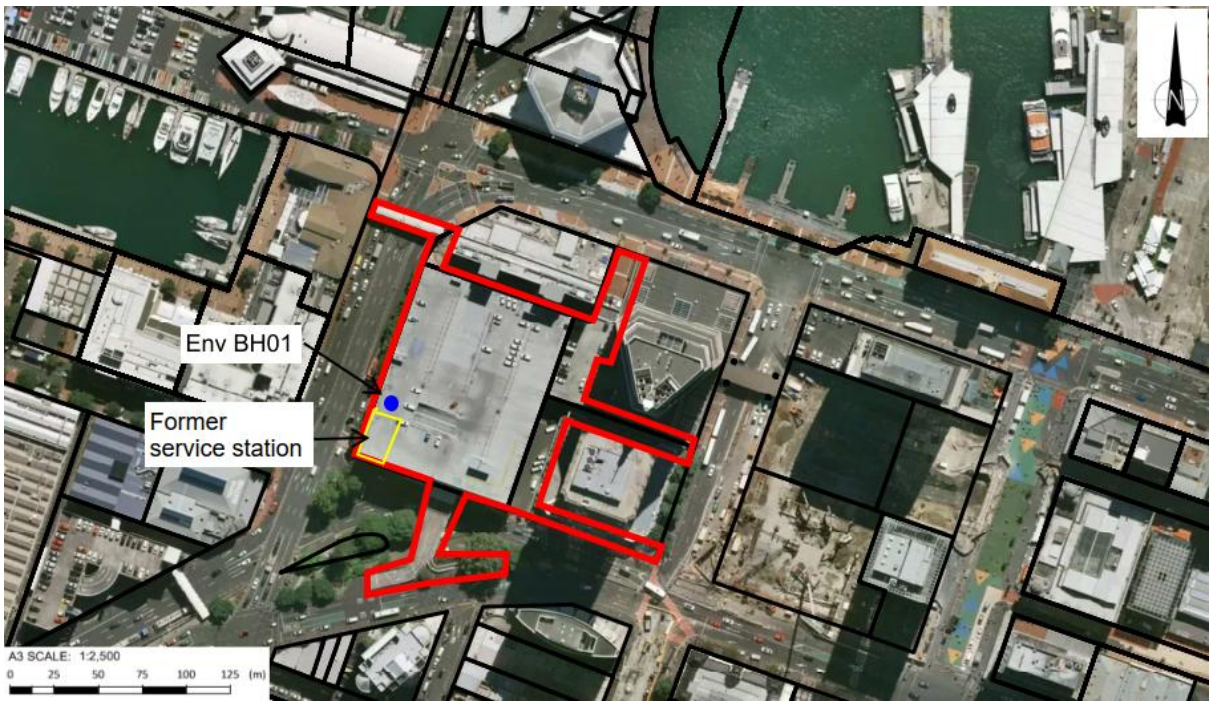

Figure 1.1: Site location shown in red outline (Basemap Source: LINZ Creative Commons Atribution 3.0 New Zealand)

1.1 Background

The site is on land reclaimed which has occurred in stages, with minor reclamation completed circa 1850 and major reclamation between the 1850s through to the 1920s by the Auckland Harbour Board. The reclamation fill comprises both materials cut from nearby, materials dumped from unknown imported sources and dredged materials. Old harbour records identify the location of the

[1] T+T LOE, 8 August 2025. *"Variation Order, Downtown Carpark Site Development – FTAA Update and Preliminary Design Fee Review (Vo-08 and VO-09)"*, Job number 1016043.2000

graving dock that extended over the north eastern to south western corners of the site. According to council records, the graving dock was infilled in 1923, prior to the reclamation of Quay Street (between Princess Wharf and the site). Since the 1940's the site has been used for commercial purposes and since the 1970's the site has been used as a carpark.

The proposed development includes the demolition of the existing Downtown Carpark building (together with the Lower Hobson Street pedestrian bridge and Customs Street West vehicle ramp located within part of the road reserve) and redevelopment of the site to provide for a mixed-use precinct providing for commercial, residential, hotel, retail, food and beverage and civic uses. The redevelopment involves three podium buildings, two towers and six levels of shared basement, including new public spaces and a new laneway network to provide connectivity within the city centre. In addition, the proposed development involves modifications to the podia of existing adjacent buildings (HSBC and Aon) to facilitate the new laneway network. Figure 1.2 presents the extent of the physical works area, presented by the solid and dashed orange lines.

This CSMP shall be implemented for the soil disturbance and earthworks activities and is the primary document for management of contamination at the site. This CSMP is appended to the Draft Construction Environmental Management Plan (CEMP) for the Downtown Carpark Site Development for ease of reference. The CEMP has been prepared by PPC together with RCP [2] for resource consenting purposes.

1.2 Objectives of the CSMP

The objectives of this CSMP are to:

- Provide procedures to manage potential ground contamination effects on human health and the environment during ground disturbance activities associated with the proposed site development works.
- Outline pre-works site investigations to support site development.
- Meet the requirements for proposed conditions of resource consents for ground disturbance works under the NESCS[3] and AUP[4].

1.3 Regulatory compliance

This CSMP has been prepared in general accordance with Ministry for the Environment (MfE) Contamination Land Management Guidelines (CLMG) No.1 "*Reporting on Contaminated Sites in New Zealand*" (revised 2021). Sampling procedures provided in the plan generally comply with the MfE CLMG No.5 "*Site Investigation and Analysis of Soils*" (revised 2021).

This plan considers the requirements of the Health and Safety at Work (Asbestos) Regulations (2016), the WorkSafe NZ *Approved Code of Practice (ACOP): Management and Removal of Asbestos* (December 2016) and the *New Zealand Guidelines for Assessing and Managing Asbestos in Soil* (BRANZ, October 2024).

The persons preparing this CSMP are suitably qualified and experienced practitioners (SQEP) as required by the NESCS and defined in the NES Soil Users' Guide.

[2] PPC and RCP, October 2025, Downtown Carpark Site Development – Draft Construction Environmental Management Plan.
[3] Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011.
[4] Auckland Unitary Plan operative in Part, 15 November 2016.

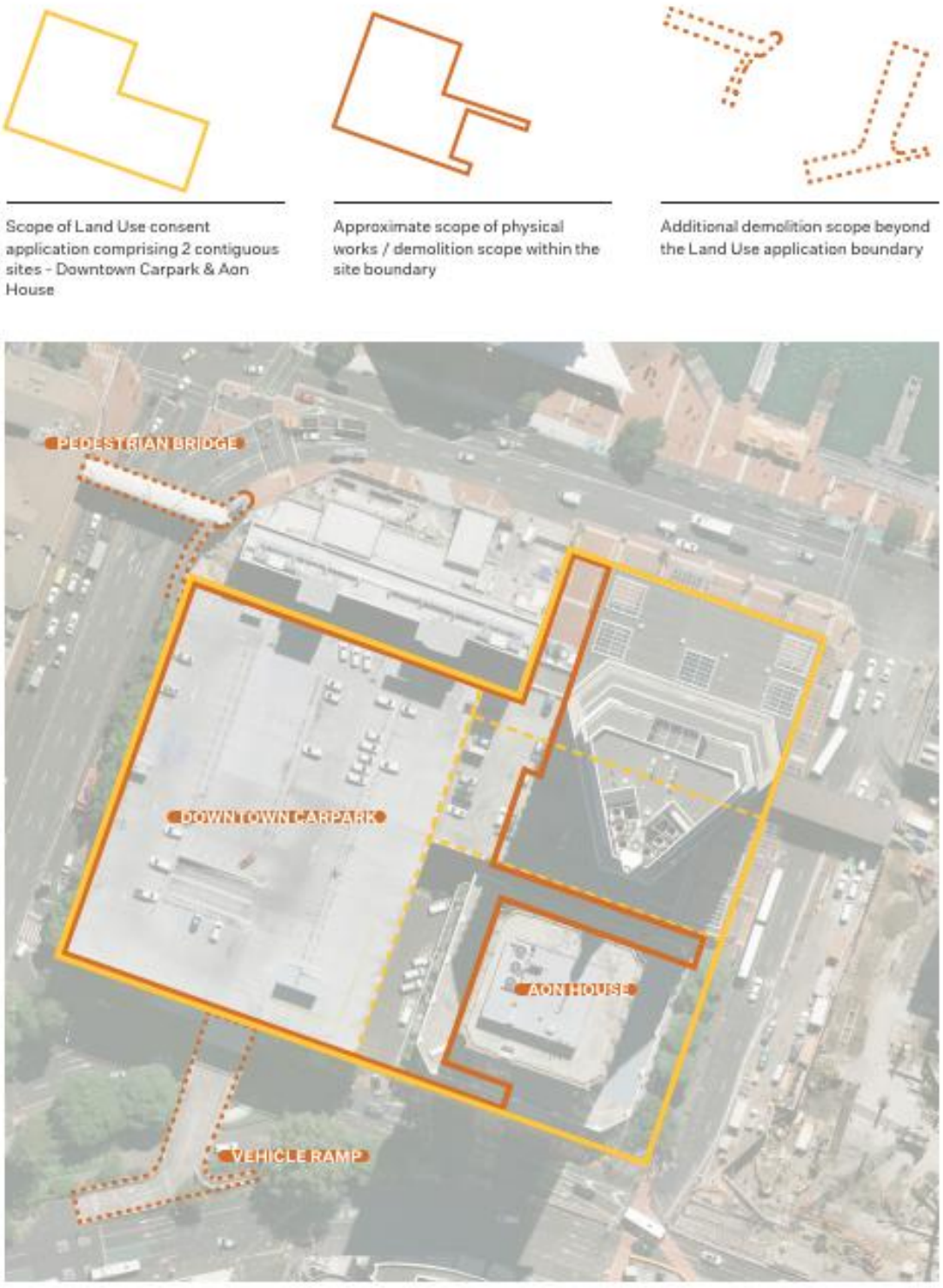

Figure 1.2: Site location and extent of physical works shown in solid orange outline (Source: WAM – Downtown Carpark Site Development Architecture & Landscape Report)

2 CSMP administration and control

This CSMP provides a framework for managing contamination hazards onsite by identifying potential hazards and suggesting mitigation measures. It provides information and recommendations to augment this process but is not intended to relieve the person conducting business or undertaking (PCBU) of either their responsibility for the health and safety of their workers, contractors and the public or its responsibility for the protection of the environment.

The provisions of this CSMP are mandatory for all persons (employees, contractors and sub-contractors) involved in undertaking any of the proposed ground disturbance works (earthworks, trenching, etc.).

2.1 Roles and responsibilities

The proposed roles and responsibilities under this CSMP are provided in Table 2.1.

Table 2.1: Organisational involvement

Company/organisation	Roles and responsibilities
Precinct Properties Limited	Site owner: responsible for ensuring compliance with consent conditions, including the requirements of the CSMP and ensuring a Contaminated Land Specialist (CLS) is retained during the works.
RCP Limited	RCP is the client appointed Project Manager and the client representative on site. RCP is responsible for ensuring compliance with the consent conditions, including the requirements of this CSMP and ensuring a CLS is retained during applicable work as the client representative.
Main Contractor (Contractor).	Responsible for implementation of CSMP during earthworks, including monitoring compliance of all Sub-contractors with the requirements for the CSMP.
Any subcontractor (s) undertaking soil disturbance work.	Responsible for undertaking works applicable to their craft in accordance with the requirements of this CSMP.
Contaminated Land Specialist (CLS)	Responsible for provision of ground contamination advice during the works and validation reporting, including additional soil testing. The CLS will be required to undertake site inspections during excavation to verify the requirements of this CSMP and applicable resource consent conditions are met. Inspections will be undertaken 1-2 times a week initially, with reduction considered thereafter depending on ground conditions, constructor and programme. The Contaminated Land Specialist shall be a suitably qualified and experienced practitioners (SQEP) as required by the NES Soil and defined in the NES Soil Users' Guide.
Competent person	A competent person must meet the requirements of the Health and Safety at Work (Asbestos) Regulations 2016. This can be the CLS. A person who has the knowledge, experience, skills and qualifications to carry out a particular task e.g. air monitoring during works, assessment of classification and appropriate controls for the activity, undertaking removal of asbestos or asbestos impacted soils.
Auckland Council (Regulatory)	Monitoring and compliance of consent conditions.

2.2 Distribution

A copy of the final approved CSMP shall be kept onsite at all times during construction activities. It is the responsibility of Precinct and/or their nominated project management company (RCP) to distribute the plan to the Contractor appointed to carry out the work. It is the responsibility of Precinct's nominated Contractor to distribute the CSMP to any other sub-contractors or parties carrying out earthworks.

2.3 Review and update

This CSMP is a live document. Statutory requirements, operating procedures or site conditions may vary and may require that this plan be amended or updated. Any variations to the CSMP proposed by the Contractor must be approved by Precinct and the CLS prior to works commencing or the variation being implemented if works have already commenced. If the changes are substantive, they may need to be approved by Council prior to implementation.

It is the responsibility of the appointed Contractor to distribute any changes to the plan to the relevant parties involved in the construction works and update the site copy.

2.4 Implementation

Responsibility for the implementation of the CSMP lies with the appointed Contractor and its sub-contractors. In the case of unexpected contamination discovery, the Contractor shall notify Precinct (or its designated project manager) immediately. Further information regarding the first response is provided in Section 5.

Precinct will engage a CLS to carry out inspections and provide advice as required during the works. The Contaminated Land Specialist shall be sufficiently experienced to comply with the "suitably qualified and experienced practitioner" (SQEP) as described in and required by the NES Soil Users' Guide.

3 Site description

A summary of the site, including details of the overall site history and contamination risks are provided below. For further detail, the reader is referred to the Preliminary Detailed Site Investigation Report[5].

3.1 Site location

The site is located at 2 Lower Hobson Street, on the corner of Lower Hobson Street and Customs Street West. The site is owned by Auckland Council and legally described as Lot 9 DP 60151.

Directly to the north of the site boundary is the M Social Hotel. Directly to the east are the Aon building and the HSBC tower building, both sites owned by Precinct. The wider block of land incorporating the M Social, the Aon Building and HSBC tower and the site are bound by Lower Hobson Street to the west, Quay Street to the north, Custom Street West to the south and Lower Albert Street to the east.

The Waitemata Harbour is located about 50 m to the north of the site.

3.2 Site condition

The Downtown Carpark building currently covers the site and is currently operational.

3.3 Site geology

The excepted site geology is summarised in Table 3.1. The published geological map is provided in Figure 3.1.

Table 3.1: Site geological model

Unit no.	Geological unit	Typical depth to top of unit (m bgl)	Description
1	Reclamation Fill	0 m	Reclamation fill is likely to comprise both locally sourced and imported fill materials, dredged materials and hydraulic fill together with debris from earlier construction of seawalls and structures. The available records from boreholes within the site indicate that variable gravels, sands and soft to very stiff silts and clays will be encountered within the fill layers, with occasional basalt boulders, organics, timber, brick, porcelain, and other rubble.
2	Recent marine sediments (Takanini Formation)	4 – 9 m	Tauranga Group sediments include recent marine "muds" typically comprising soft to stiff sandy silts and clays with significant organic content; and underlying Pleistocene-era alluvial sediments typically comprising soft to stiff pumiceous clays, silts and sands with some organic layers.
	Tauranga Group (Takanini Formation)	7 – 9 m	
3	Waitemata Group (East Coast Bays Formation)	5 – 11 m	Within the Auckland CBD, the ground typically comprises interbedded very weak to weak siltstone and sandstone. This unit often shows a well-

[5] T+T, November 2025, Downton Carpark Site Development, Preliminary Detailed Site Investigation Report, prepared for Precint, T+T ref. 1016043.2000

Unit no.	Geological unit	Typical depth to top of unit (m bgl)	Description
			developed weathering profile consisting on sands, silts and clays depending on the original parent lithology. The weathering profile in the top of the rock at the site has been affected by the historic coastal erosion processes in this area. The pre-European shoreline at the Downtown site is more or less along the boundary with Customs Street, and as a result the rock in this area is highly variable, because of the presence of wave cut platforms, and possible caves and small cliffs or other steep rock interfaces.

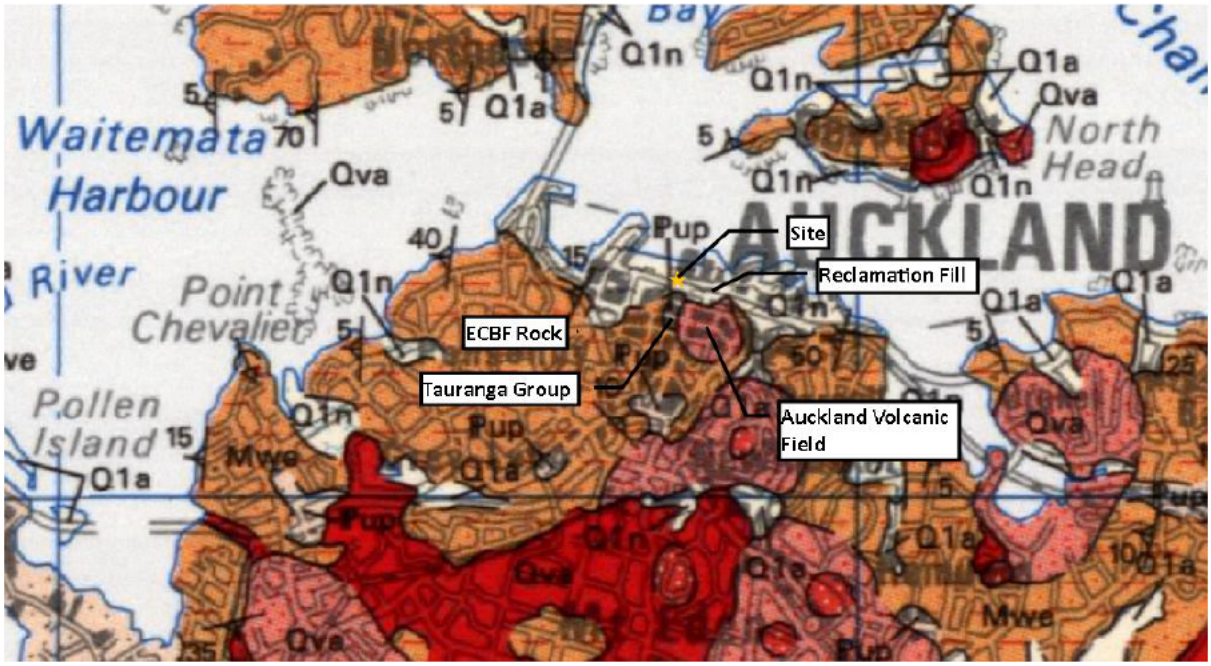

Figure 3.1: Published Geological Map (Source: Edbrooke, 2001)

3.4 Hydrogeology and hydrology

Groundwater is expected to be between 2.5 and 4 m below ground level and within the reclamation fill. The groundwater level is expected to rise slightly above sea leave towards Customs Street West, with levels rising to approximately 1.4 m RL[6]. The groundwater in this area is governed by the presence of the Waitemata Harbour and fluctuates with tidal changes. However, tidal fluctuations based on previous monitoring in the surrounding area indicate negligible fluctuations (100 – 200 mm).

It is considered that rainfall events have a negligible effect on the groundwater level but flows within fill material and stormwater pipes may locally affect groundwater levels.

[6] T+T, June 2020, Downtown Carpark Site Development – Geotechnical Concept Design Report, prepared for Precinct, T+T ref. 1016043.1000

3.5 Site history

The historical review and archaeological assessments completed by Clough & Associates[7],[8, 9] indicates that the site surrounds were reclaimed from the harbour in the mid 1800's and have since been used for a wide range of commercial purposes, although generally being dominated by retail and offices uses. A graving dock continued to operate at the site until 1902 and was infilled by the 1920s. The area occupied by the graving dock (northern portion of the site) appears to have remained vacant until a large commercial building was constructed on it in the 1940's.

In the late 1960's and early 1970's the current Downtown Carpark structure appears to have been constructed after the demolition of the previous commercial building. A service station appears to have operated between the late 1960's, with historical records noting the removal of two underground tanks in 1996. The former service station was located in the south-western corner of the site.

3.6 Contamination

Based on the site history, there is potential for contamination to be present at the site. Reclamation fill thickness below the site is expected to vary, and is likely to be 4 and 9 m. The underlying reclamation fill is considered the primary source of contamination on site and is generally anticipated to contain low levels of contamination with the occasional hotspots. Based on T+T's experience working on surrounding sites, the reclamation fill is anticipated to have low levels of metals and hydrocarbons present in soil/fill samples. Construction and demolition waste could be present in the underlying fill material, and this is likely where the hotspots of contamination in fill will be encountered. These anticipated conditions were confirmed within the borehole log for ENV-BH01, advanced in the southwest corner of the site. Laboratory testing from the reclaimed fill material also verified metals and hydrocarbons present, although levels were reported within environmental and human health land use standards.

A service station with underground tanks (USTs) was located at the southwestern corner of the site in the late 1970's, with the underground storage tanks noted to be removed in 1996. The removal of the USTs occurred prior to routine soil and groundwater sampling being required. No testing within the service station area has been able to be completed due to access constraints. ENV-BH01 advanced on the downgradient side of the service station indicates some olfactory evidence of residual hydrocarbons in the upper reclamation fill, however, none was detected near the water table. Monitoring of groundwater at that location did not indicate the presence of dissolved or free-phase hydrocarbons.

While this environmental location indicates that the service station is unlikely to have caused significant widespread contamination, there is still potential for localised residual hydrocarbon contamination around the former underground petroleum storage systems. Based on the soil and groundwater testing data from ENV-BH01 and, given the source was removed some 20 years ago, the likelihood of significant volatile contamination that could present a human health and environmental risk is low.

Groundwater is expected to be in contact with the reclamation fill beneath the site. Based on previous geotechnical investigations, the groundwater is expected to be encountered between 2 – 4 m below ground level. Groundwater sampling from the immediate area shows concentrations

[7] Clough & Associates Ltd (2012), Key Historical Themes in the Development of the CBD Waterfront. Report prepared for Auckland Council.
[8] Clough & Associates Ltd (2014), Proposed Redevelopment, Downtown Shopping Centre, Queen Street, Auckland Central: Archaeological Assessment. Report prepared for RCP and Precinct Properties Ltd, dated October 2014.
[9] Clough & Associates Ltd (2018), Quay Street Seawall Upgrade Princes Wharf Section: Archaeological Assessment. Report prepared for Auckland Transport, dated April 2018.

meet with 80% Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC) Guidelines levels, with the occasional exceedance observed in off-site historical data.

The following section provides more information on the contaminants of concern and risks to human health and the environment during the proposed development works.

A copy of the soil and groundwater testing results from ENV-BH01 are presented in Appendix A.

3.6.1 Contaminants of concern

The principal contaminants of concern identified by previous site activities and surrounding site investigations include:

- Heavy metals (particularly lead, arsenic and zinc);
- Semi-volatile organic compounds including polycyclic aromatic hydrocarbons (PAH);
- Volatile organic compounds including benzene, toluene, ethylbenzene and xylene (BTEX) compounds;
- Total petroleum hydrocarbons;
- Asbestos containing materials (ACM) include the potential for asbestos fibres/fines in fill or demolition derived waste during the early development of the site or in building foundation formwork. While there is also potential for the current building to include ACM building materials, it is anticipated that these are will not cause further contamination to the ground for the following reasons:
  - The site is fully paved and sealed.
  - Prior to demolition works, it is a requirement under the Health and Safety at Work (Asbestos) Regulations 2016 to conduct a hazardous materials survey to identify these materials. If ACM building materials are present, the ACM will be removed in a controlled manner by licenced contractors in accordance with the regulations and Approved Code of Practice: Management and Removal of Asbestos (ACoP)[10].
- Provisionally, cyanide to be initially screened. Limited sampling data from around the site indicates cyanide can be detected but the ranges observed are noted to be above laboratory limits of detection but below human health and environmental criteria. Initial screening is proposed to confirm concentrations on site meet with these anticipated ranges.

Tributyl tin (TBT) compounds are typically associated with anti-fouling agents in boat paints. The introduction of TBT in paints occurred in the 1960's and TBT was widely used until the late 1980's on all boat paints with some use in large vessels until the mid-2000's[11][12]. The graving dock and associated activities occurred during the 19th Century with infilling of the graving dock occurring in 1923. TBT has not been included in the analysis suite as the graving dockyard activities have occurred prior to the contaminant of concern being widely used and there is aerial photography from 1940 which shows the site has been reclaimed/infilled.

Per and poly-fluoroalkyl substances (PFAS) can be linked to firefighting equipment as part of dockyard activities, however, as the PFAS substances were widely used from the 1950's[12] onwards these have not been considered as contaminants of concern for the historic dockyard activities which operated in the 19th Century. No records of a fire which required firefighting response have

[10] Worksafe, December 2016, Approved Code of Practice: Management and Removal of Asbestos.
[11] M Lagerstrom et al, 24 June 2016, Total tine and organotin speciation in historical layers of antifouling paint on leisure boat hulls, Environmental Pollution, 220, 1333-1341
[12] Ministry for the Environment, March 2023, Hazardous Activities and Industries List Guidance – Identifying HAIL land

been observed in the historical review and as such PFAS has not been considered further as a contaminant of concern in regard to the historic dockyard or service station activities.

3.6.2 Contamination risk

It is expected the main human health risk is to the site workers as they could be exposed to the contaminated reclamation fill and groundwater, if present, during earthworks. As the site is located in a condensed central area of Auckland, and as there is limited sampling data to date, there is a potential risk to surrounding receivers such as surrounding office workers or the general public and the environment if not adequately controlled. Limited investigations from neighbouring sites indicate the concentrations of contaminants in the fill rarely present human health risk.

The majority of contamination is likely to be removed during the redevelopment works as a result of the proposed basement construction. As such, it is anticipated there will be no risk to future site users once the site is redeveloped.

The on-site contaminants of concern may enter the body through inhalation, ingestion or skin adsorption. However, it is usually the inhalation pathway that is most significant. The principal risks posed by potential contamination are summarised below:

1 Potential risk to onsite worker human health from direct skin contact and ingestion of contaminated soil during ground-breaking, excavation, trenching or other intrusive works.
2 Potential risk to human health from inhalation (of dust) and ingestion and contact with airborne dust and/or vapour during excavation works; and
3 Potential risk to the environment associated with:
    a Uncontrolled discharges of contaminated surface water or groundwater, and
    b Inappropriate handling or disposal of contaminated soils or waters.

Significant exposure to ground contamination hazards is considered to be unlikely due to the short term nature of the proposed excavations and the likely low concentrations of contamination. However, as some of the potential contaminants are known to be hazardous, it is important that exposure to ground contamination hazards is minimised to the maximum practicable extent. These control measures are detailed in the following sections.

4 Pre-works sampling procedures

The site is currently covered in the existing building structure and site surfacing associated with the operation of the Downtown Carpark. This makes sampling at the start of construction works important to determine the right levels of controls that will be in place for the soil disturbance works for the protection of human health and the environment. Currently, the limited testing data from preliminary investigations suggests on site ground conditions are consistent with the conditions anticipated in the historical record. However, further investigation across the wider site is required confirming the contamination condition and inform the future development. Additionally, this information will support disposal of spoil with the appropriate waste management facilitates.

Site investigations are proposed to be completed after demolition of the current structure. A Final Detailed Site Investigation (DSI) report will be prepared on completion of intrusive investigations. The DSI will be provided to Precinct and to Auckland Council.

Contamination sampling and revision of the CSMP controls will be undertaken by Precinct's project appointed CLS. The sampling programme is outlined below.

4.1 Sampling rationale

A combination of targeted and systematic sampling is proposed within the site and shared access way on the eastern side of the site as shown in the proposed sampling plan included in Appendix C and rationale indicated in Table 4.1

Table 4.1: Proposed detailed site investigation methodology and rationale

Sample locations (suggested but not limited too)	Sampling material	Comments
Targeted: • 2 No around former dock structures/ pump house • 1 No as former graving dock • 1 No at former Service Station and graving dock • 3 No at former service station **Systematic:** 5 No across the remainder of the site	Reclamation fill and/or underlying natural soils	• Collection of samples at surface, 0.5 m below ground level, 1 m bgl and 1 m thereafter unless signs of contamination are encountered to support disposal and final construction CSMP controls. • Target depth for investigations will be at least 1 m into natural soils or a minimum of 4 m below surface. • Sample analysis to be undertaken in accordance with Section 4.2.1. • Soil samples to be screened with field PID meter as per Section 4.2.3. • Groundwater wells will be installed and monitoring undertaken if significant contamination is encountered. At least 3 wells will be installed. Anticipated locations are shown in Figure 1 in Appendix C.

4.2 Sampling methodology

4.2.1 Soil sampling

Soil samples for chemical testing shall be collected in general accordance with the MfE CLMG No.5:

- Materials encountered shall be logged in accordance with the NZ Geotechnical Society "Guidelines for the classification and field description of soils and rocks for engineering purposes".
- Freshly gloved hands shall be used to collect soil samples into laboratory suPrecinctied containers.

Samples for asbestos testing shall be collected in general accordance with the methods for semi-quantitative analysis of asbestos in the soil as set out in the NZ Asbestos-in-soil Guidelines[13] as follows:

- Inspect soil for potential ACM fragments. Collect all suspected ACM into a zip-lock plastic bag.
- Collect a 500 mL sample of the soil using a freshly gloved hand or trowel.

Any equipment used to collect the samples shall be decontaminated between sample locations using clean water and Decon 90 (a phosphate-free detergent).

Samples for chemical analysis shall be shipped in chilled conditions to an IANZ-accredited laboratory under chain of custody documentation.

Soil samples shall be analysed for metals (arsenic, cadmium, chromium, copper, lead, nickel and zinc), semi-volatile organic compounds, volatile organic compounds, total petroleum hydrocarbons, asbestos (semi-quantitative analysis in accordance with NZ Asbestos-in-soil Guidelines[12]) and cyanide. Appropriate collection and analysis of duplicate samples shall be undertaken and as directed by the CLS.

4.2.2 Groundwater sampling

The following summarises the groundwater sampling programme and procedures to be completed, if required:

- At least one sampling round will be undertaken to characterise contaminant concentrations and to assess potential disposal/discharge options.
- The water level should be recorded for each well, prior to sampling using a calibrated dip meter.
- Wells should be purged prior to groundwater sampling. Groundwater sampling shall be undertaken using low-flow techniques.
- Groundwater samples shall be undertaken once three well volumes have been purged, and water quality field parameters have stabilised. Stabilised field parameters shall be recorded.
- Collection of field parameters shall be undertaken. An appropriate device should be calibrated prior to use in the field, and the following parameters should be recorded: conductivity, temperature, oxygen reductive potential (ORP), and pH.
- Descriptions of the visual and olfactory characteristics of the groundwater should be recorded each time a measurement is made and include details such as elapsed time, volume purged, colour, turbidity, odour, sheen etc.

[13] BRANZ, 2024, New Zealand Guidelines for Assessing and Managing Asbestos in Soil.

- Groundwater samples shall be collected in laboratory supplied sample bottles with new nitrile gloves used to handle each sample and sample bottle.
- Groundwater should be collected directly or with a laboratory field filter kit (where appropriate, for metals analysis) into laboratory prepared preserved and unpreserved sample containers.
- The water samples shall be labelled and dated and placed in a chilled container for transport to the laboratory.

Any equipment used to collect the samples shall be decontaminated between sample locations using clean water and Decon 90 (a phosphate-free detergent).

Samples for chemical analysis shall be shipped in chilled conditions to an IANZ-accredited laboratory under chain of custody documentation.

Groundwater samples shall be analysed for dissolved metals (arsenic, cadmium, chromium, copper, lead, nickel and zinc), semi-volatile organic compounds (screen), volatile organic compounds (screen), total petroleum hydrocarbons, cyanide and pH. Appropriate collection and analysis of QA/QC samples shall be undertaken and as directed by the CLS.

4.2.3 Vapour sampling

As discussed above in Section 3.6, there is a low risk of volatile organic compounds (VOC) from localised areas of petroleum hydrocarbons (i.e. petroleum hydrocarbons, solvents, oil, etc.) which may be present. While limited testing downgradient of the former service station and motor vehicle workshop did not indicate a potential significant vapour risk, this cannot be completely ruled out.

Screening of both the breathing space in the work area and downhole gas concentrations shall be conducted, for the parameters set out in Table 4.2, at all pre-works investigation locations in the vicinity of the former service station (the south-western corner of the site).

Downhole screening can be conducted by lowering a tube (or the instrument) into the auger hole/test pit used to collect soil samples. Additionally, bag analysis can be conducted by placing a small amount of sample into a sealed plastic bag with the instrument tube attached and recording PID readings every minute for 5 minutes.

Assessment of both soil sampling data and vapour screening data shall be undertaken prior to construction to assess vapour risk to the future sites users and structures. If required based on analytical soil data and vapour sampling, a vapour intrusion risk assessment shall be provided in the DSI. In the unlikely event that significant vapour concentrations could be present following basement construction, building protection design shall be considered in the Remedial Action Plan. Preliminary design options for reference to mitigate vapour intrusion are provided in Appendix F, however, a detailed design will be required for the structure if vapour intrusion is assessed to be a risk to the site.

Table 4.2: Action levels for VOC and gas screening

Vapour/gas	Action Level
Explosive gases	5% LEL [1]
CO	20 ppm [2]
O_2	19.5 to 23.5% [2]
H_2S	5 ppm [2]
Volatile ionisable compounds	5 ppm [3]

Notes:

1. AS/NZS 60079.10.:2009 Part 10.1: Classification of areas – Explosive gas atmospheres.
2. Worksafe Exposure Standard TWA as detailed in the New Zealand Workplace Exposure Standards (WES) and Biological Exposure Indices, edition 13, issued April 2022. Note that hydrogen sulphide is expected to have its TWA reviewed in 2023 and potentially lowered to 1ppm.
3. Only a limited number of compounds have New Zealand Workplace Exposure Standards (WES) lower than 5 ppm and it is unlikely that these compounds will be present in sufficient quantities to exceed their individual WES. 5 ppm has therefore been adopted as a practical screening level to avoid false positives associated with weather effects and instrument drift.

4.3 Data evaluation

Soil sample results shall be compared against the following evaluation criteria:

Soil assessment criteria

- To assess potential human health risks:
  - The NESCS Soil contaminant standards (SCS) for commercial/industrial use for the site workers during construction, as an initial screening criteria to assess risk to surrounding public during works and future site users[14];
  - Where NESCS values were not provided, guidance from the below documents, as per MfE's *"Contaminated Land Management Guideline No. 2, Hierarchy and Application in New Zealand of Environmental Guideline Values (Revised 2011)"*:
    - Australian National Environment Protection (Assessment of Site Contamination) Measure 1999, updated 2013;
    - MfE (Revised 2011) Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand for commercial/industrial land uses.
  - Building Research Association New Zealand New Zealand (BRANZ), October 2024, Guidelines for Assessing and Managing Asbestos in Soil.
- To assess environmental risks:
  - The Permitted Activity (PA) Soil Acceptance Criteria as defined in Section E30.6.1.4 of the AUP;
  - MfE Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand for groundwater quality.

[14] As the reclamation fill is proposed to be removed, residential apartments are proposed to be on level 6 and above and the site will be paved, the commercial standard is considered appropriate.

- To assess spoil disposal requirements:
  - For metals, the published non-volcanic background concentrations for Auckland described in the Auckland Regional Council "*Technical Publication 153 – Background Concentrations of Inorganic Elements in Soils from the Auckland Region*" (and cited in Section E30.6.1.4 of the AUP).
  - For organic compounds, Table H-2: Class 5 Waste Acceptance Criteria of WasteMinz, September 2023, Technical Guidelines for Disposal to Land, Rev 3.1.

Ground water assessment criteria

For the assessment of the protection of the marine environment from discharges from the site:

- The Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC) Guidelines (October 2000 version) for water discharges from a contaminated site in accordance with AUP Rule E30.6.2.1. A level of protection of 80% of species in marine water (following reasonable mixing) has been adopted for assessing concentrations of soluble contaminants in groundwater at the site boundary. A 95% level of protection has been adopted for benzene in accordance with AUP Rule E30.6.2.1.

For consideration of discharge to trade waste systems:

- Watercare Services Limited, July 2019, Trade waste characteristics and substances control.

4.4 Reporting

Results from the above testing shall be documented in the Final DSI report to Precinct. Copies shall be provided to the nominated Project Manager, the contractor and Auckland Council.

The Final DSI will outline the findings of the investigations and provide required actions by Precinct and the contractor. The management rationale shall be reviewed to ensure the appropriate level of control is implemented for the contamination identified (if any). If required, this CSMP shall be updated to reflect the findings of the soil sampling, and a new version will be issued for the remainder of the work. Contingency measures are provided for reference in Section 5 and Appendix D.

5 Health and safety procedures

The Contractor shall prepare and implement a risk assessment in compliance with the Health and Safety at Work Act, 2015 and associated regulations and other applicable legislation, regulations, codes and guidelines.

General protocols relating to the presence of potentially contaminated material are described in this section and should be included or referenced in site/task-specific risk assessments (such as a job safety analysis (JSA) or similar). The relevance of these protocols and level of protection required should be reviewed during the preparation of site/task-specific risk assessments.

5.1 Protective equipment

The wearing of the following PPE will be mandatory for all personnel involved in ground disturbance activities where the potential for direct contact (including accidental contact) with soil exists:

- Full-length clothing.
- Impermeable gloves, for example, nitrile, polyvinyl alcohol or viton. However, the resistance of the gloves to the contaminants likely to be encountered onsite should be confirmed prior to use.

Generally, these requirements are expected to be limited to personnel undertaking manual handling/excavation activities which may place them in direct contact with potentially contaminated materials. Personnel who are operating machinery, such as excavators and trucks, and are therefore unlikely to come into direct contact with contaminated materials are exempt from these requirements while they are operating the equipment.

Additional requirements such as safety glasses, dust masks, disposable coveralls etc. may be required depending on the results of additional soil sampling or more significant soil conditions (refer Appendix D). The conditions under which the need for additional requirements will be triggered shall be identified in the project health and safety plan or by communication from Precinct or their appointed client representative in conjunction with the Contaminated Land Specialist and the contractor.

Note: *Workers on contaminated sites can be subject to unusual stresses, for example, manual work while wearing dust masks or respirators, or exposure to elevated concentrations of contaminants. It would be prudent to check that personnel working under the requirements of this CSMP do not have any pre-existing conditions which might place them at risk as a result of such stresses.*

5.2 Decontamination and personal hygiene

Decontamination of personnel and portable equipment must be carried out to reduce safety, health and environmental risks and limit the migration of contaminants (from waste material, soil, water, equipment and PPE) around and outside the site. All personnel and equipment involved in ground breaking activities must be thoroughly decontaminated before leaving the site. Decontamination facilities shall comprise, as a minimum:

- Facilities for storing and changing PPE.
- Boot wash facilities.
- A hand and face wash facility.
- Bins for disposal of contaminated gloves and other consumables.

The following steps must be taken for decontamination of all personnel and equipment:

1 All equipment used for ground-breaking and excavation shall be decontaminated before it leaves the work area. This shall consist of the removal of all soil and dust from parts that have come into contact with contaminated soil or groundwater.

2 Once all equipment has been decontaminated, all personnel shall undergo personal decontamination comprising:

   a Rinsing and / or scrubbing of boots, gloves and other PPE to remove dirt and dust residues.

   b Removal of all PPE with disposable items such as gloves and dust mask (if worn) placed in a plastic bag or drum for waste collection.

   c Thorough washing of hands and face with soap and water.

All personnel need to complete the personal decontamination procedures whenever they stop work, i.e. for meal breaks, toilet breaks etc. All workers shall be briefed at the induction on the requirements for personal hygiene. The following shall be observed for all workers and visitors to the site:

- Eating, drinking or smoking shall only be permitted in specified areas of the site, and after decontamination has occurred.
- Hand to mouth and hand to face contact shall be avoided onsite.

Decontamination shall be undertaken immediately in the event of any body parts coming in direct contact with any soil and / or groundwater.

The work area shall be decontaminated at the completion of works within that area. This shall consist of removal of all soil and dust from the ground surface by sweeping, scraping and / or washing down as appropriate.

5.3 Asbestos management procedures

In order to help achieve compliance with the Asbestos Regulations, WorkSafe New Zealand has prepared an ACoP[10]. The ACoP is the governing document for the removal of bulk asbestos from buildings and is to be referred to inform the removal of asbestos from buildings and structures prior to and during their demolition in order not to cause ground contamination. Additionally, the ACoP refers readers to the NZ Asbestos-in-soil Guidelines[13] for further guidance on soil related asbestos contamination.

The key requirements of the regulations and ACoP are the following works must be undertaken under the supervision of a licenced asbestos removalist:

- More than 10 m^2 of asbestos containing material (ACM) from within buildings and structures
- Where asbestos contaminated soils require Class B work controls (refer Appendix D).

At present, there is limited soil testing information from the site to confirm the appropriate level of asbestos controls. Surrounding soil sampling data indicates isolated pockets of asbestos in soil is encountered where construction and demolition fill is present. Based on the site history, a warehouse was built on the site in the 1950's and was subsequently removed/demolished in the late 1960's/early 1970's. The current car park structure was constructed between 1968 and 1972 according to aerial photography and the property file information. It is possible asbestos was present in the former structure, and during demolition/removal the near surface soils/fill could have been impacted with fibres/fines and/or ACM. Additionally, based on T+T's experience with construction practises, there is the possibility that fibre board could have been used in foundation form work.

Soil sampling undertaken from ENV-BH01, in conjunction with soil data from surrounding sites, indicate a low level of asbestos (< 0.001% as fibres/fines) and this is largely associated with construction and demolition fill. As such, **Trace Asbestos Contamination controls** (refer Appendix E) will be adopted initially. Works should cease if construction/demolition fill and/or asbestos fragments are identified during surface removal. Soil sampling on site is proposed after the existing structures are removed and prior to earthworks commencing, with controls confirmed in the Final Detailed Site Investigation Report proposed after intrusive investigations. As the site has a well-documented history of demolition, we expect a more rigorous contaminated land monitoring/ inspection schedule would be indicated during earthworks.

Appendix E Table 1 provides the minimum asbestos works controls for the works and for reference, should the asbestos in soil sampling indicate a re-rating of the controls after intrusive investigations, Appendix E Table 1 provides the required controls that should be adopted.

5.4 Vapour risk

As stated in Section 4.2.3, there is a low risk of volatile organic compounds (VOC) from localised areas of petroleum hydrocarbons (i.e. petroleum hydrocarbons, solvents, oil, etc.) which may be present in the area around the former service station and motor vehicle workshop.

After site surface removal, ground disturbance works MUST stop until pre-works sampling and gas screening can be completed in the immediate area of the former underground storage tanks (south-west corner of the site).

The following VOC management practices shall be adhered to during the development works within the former service station area:

- **No person shall enter any excavation without prior gas monitoring;**
- **Gas monitoring shall be according to Section 4.2.3 with the action levels in Table 4.2 used for evaluation of the readings;**

  If the action levels set out in Table 4.2 are exceeded works shall be suspended immediately, if possible the exposed soils covered or otherwise made safe, and the Contaminated Land Specialist consulted to define appropriate control measures. If readings are below the action levels, consult Section D5 (Appendix D) for appropriate controls;
- **Continuous monitoring for VOCs shall be made during services and foundation excavations if workers are required to enter an excavation; and**
- **Worksafe Confined Spaces entry permitting, and requirements must also be adhered to.**

5.5 Identification of new hazards

The Contractor is responsible for reviewing any new work element and assessing whether there are any new associated hazards and whether these can be eliminated, isolated or minimised. The Contractor shall seek review by the project manager, who will seek Contaminated Land Specialist input if necessary. The Contractor shall then instruct all staff on the health and safety procedures associated with the new hazard.

6 Ground disturbance procedures

The following controls and procedures must be implemented to manage potential contamination during **all ground disturbance activities, including but not limited to:**

- Removal of site surfacing/capping material (paving materials, asphalt, concrete, building/basement ground slabs etc.).
- All excavation, ground disturbance or intrusive works including piling works.
- Temporary stockpiling of excavated materials.
- Loading of excavated materials and transportation of these materials offsite (soil and/or groundwater).
- Disposal of soil materials and/or water, including dewatering.

Reference should also be made to the following sections:

- Health and safety procedures relating to contaminated soils are outlined in Section 5.
- Contingency procedures are outlined in Appendix D. These should be followed in the event of unexpected contamination discovery.
- Validation procedures are outlined in Section 7.

All procedures employed by the Contractor shall comply with the relevant Council bylaws and conditions of any resource/building consent(s), including *Guidance Document 05: Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region (June 2016)*.

Table 6.1: General earthworks/ground disturbance procedures

Earthworks practise	Contamination specific management
Site establishment	• The site hazard board shall state that there is a risk from soil contamination on the site. • Aspects of this CSMP will be included in the contractors site induction so all staff are aware of contamination risks. • Fencing or barriers shall be placed to exclude entry by persons who have not been inducted. • Appropriate decontamination facilities shall be established (refer to Section 5.2 for further detail). • Personal protective equipment shall be purchased and held on site (refer to Section 5.1). • Prior to off-site disposal of soil, approval must be received from the disposal site. Note: Sampling will potentially be required to inform disposal of underlying reclamation fill material. A conservative approach may be taken by disposal facilities until results are obtained, and this may result in higher disposal costs without soil analytical results. • Sampling to be undertaken after site surfacing removal or from spoil generate during pile installation, as outlined in Section 5.3 and 5.5.
Health and Safety at Work (Asbestos) Regulations.	**Trace Asbestos Contamination Controls** will be adopted initially until soil sampling can be undertaken. The procedures are outlined in Section 5.3 and a summary is presented in Appendix E Table 1.
Decontamination	Decontamination to be completed as per Section 5.2.

Earthworks practise	Contamination specific management
Dust and odour control for management of contaminated soil/soil disturbance	To avoid mobilisation of contaminants in dust and/or odour the following controls and monitoring systems shall be put in place: • Maintain damp conditions using a water truck and/or water sprays in trafficked areas and within the excavation, sorting, filling and loading areas. • Dust controls shall comply with the applicable Council guidelines, regulations and other applicable legislation. • Dust and odour should be monitored by the contractor on a continuous basis and controls upgraded if necessary (for example increasing the number of watering points and/or frequency of watering). • If odour and/or dust discharges are occurring, then the contingency measures in Appendix D shall be followed.
Sediment discharges	• No debris or spoil generated by the works is allowed to be discharged to the stormwater system. • Erosion and sediment control shall be managed in accordance with the sites Erosion and Sediment Control Plan, Council's guidelines and other applicable legislation, including where necessary the use of silt fences and runoff diversion bunds (as appropriate). • Soil must be reinstated to an erosion-resistant state within one month of completion of the soil disturbance works.
Excavation and transport	The Contractor shall ensure that: • Trucks shall be loaded directly, with soil stockpiles avoided where possible. As a minimum, trucks are to be covered when transporting spoil off the site. • Stockpiling of odorous materials is not permitted. • Where stockpiling of soil is necessary, stockpiles shall be: – Where required, stockpiles shall only be placed in an area where runoff can be controlled, clear of any flooding or ponding areas and at an adequate distance away from receptors. Alternatively appropriate sediment and erosion controls shall be constructed around the stockpiles (cut off drains, silt fences and silt socks) i.e. placed within areas where water and sediment discharges are controlled. – Kept damp during works. – The stockpiles will be covered with geotextile or a polythene if not in use for more than 3 days to prevent rainfall induced erosion and dust. – Any stockpile that is inactive for longer than 1 week shall be stabilised (i.e. mulched). • The disposal documentation/weighbridge dockets for each load shall be collected and provided to the CLS one month after completion of works. • No on-carting of material shall be undertaken, once loaded into the trucks the material must be disposed off to a facility consented to receive the level of contamination present.
Spoil disposal	• The disposal site operator must provide prior approval of its acceptance of the material before it is carted offsite. • All surplus soil must be disposed to a facility consented to receive the level of contamination. There is currently limited testing of the underlying historic fill, however, it is anticipated that the majority of the material is expected to meet with managed fill acceptance criteria. Pockets of soil may require disposal to consented landfill based on neighbouring soil testing data. As such the following disposal is expected:

Earthworks practise	Contamination specific management
	– Concrete - provided the material is free from staining, odour and deleterious materials (e.g. asbestos fragments) it may be suitable for recycling or disposal as cleanfill. – Asphalt pavements (if any) – disposal to managed fill or landfill. – Imported construction hardfill (granular engineered hardfill materials/Gap65) – disposal as cleanfill or can be reused on site provided the material is not mixed with underlying fill/soils and is otherwise free from staining, odour and deleterious materials. Visual inspection may be required by the CLS to ensure no demolition material can been mixed into the hardfill if it is proposed for reuse. – Underlying reclamation fill and soil (< 4 m bgl): Managed fill or Consented Landfill depending on testing data. Sampling beneath the existing building footprint is required to confirm the off-disposal location as set out in Section 4. – Underlying natural material (clayey silt): Cleanfill or Managed fill depending on testing data. Sampling beneath the existing building footprint is required to confirm the off-disposal location as set out in Section 4. The soil sampling information collected from Section 4 will be provided to the waste facilities to support offsite spoil disposal.
Spoil reuse	Spoil is not anticipated to be reused. The site redevelopment plans include the excavation of reclamation fill to accommodate basement levels across the site footprint. If spoil is likely to be considered for reuse, further assessment of the material will be required by a CLS.
Water discharges	• Where possible clean water shall be diverted away from excavation areas by use of bunds, socks etc. • All stormwater which has come into contact with exposed soil during earthworks, and does not soak away, will be contained for either: – Soakage to ground through a soakage pit located onsite. Location and suitability of soakage will need to be considered with contractors to manage adverse effects on neighbouring properties. Should this option be utilised, the location to be provided in the final CSMP updated prior to construction and/or within the construction methodology. – If soakage cannot be maintained and off-site discharge is required, discharge to tradewaste/sewer under permit or through a tradewaste contractor will be required. Further assessment required after site investigations outlined in Section 4 have been completed. – If discharge to stormwater system is required, the water shall be initially treated to remove sediment/solids. Validation of the discharge would be undertaken to establish it can meet the ANCEZZ 80% marine criteria (following reasonable mixing) prior to discharge. See **Stormwater Quality Monitoring** section.
Stormwater quality monitoring	As described in Section 3.6, available data suggests that groundwater intercepted by the excavation is likely to be suitable for disposal to stormwater following removal of any entrained sediment. However, as the reclamation fill materials may contain contaminants that could affect surface water quality, confirmation of the quality of any effluent generated from the site shall be confirmed prior to discharge. Proof of performance monitoring shall be conducted as follows: 1 All water is to either be contained on site or collected for off-site disposal to an appropriately licensed facility during the proof of performance monitoring period; 2 Samples of effluent are to be collected by the Contaminated Land Specialist from the outlet of the stormwater treatment system on a daily basis for 3 consecutive days;

Earthworks practise	Contamination specific management
	3 Following collection the samples shall be submitted to an IANZ accredited laboratory for analysis for TSS, metals and PAHs. Analysis for BTEX may be necessary if petroleum contamination is suspected particularly in the vicinity of the service station; 4 The Contaminated Land Specialist shall compare the averaged results to the ANZECC Guidelines for marine water at the level of protection of 80%of species; 5 If the average results obtained over the 3 day period comply with the respective ANZECC criteria discharges to stormwater network can commence; OR 6 Where the average effluent concentrations do not comply with the above criteria the contingency measures defined in Section Appendix D shall be implemented. For discharges to the stormwater network ongoing monitoring shall be conducted as follows: 1 Samples of effluent are to be collected from the outlet of the stormwater treatment system on a weekly basis (provided discharges are occurring) during the period that excavation/ground disturbance works are being conducted; 2 Following collection the samples shall be submitted to an IANZ accredited laboratory for analysis for TSS, metals and PAHs. Analysis for BTEX may be necessary and is to be confirmed by the CLS; 3 The results shall be compared to the ANZECC Guidelines within 1 working day of receipt of the results from the laboratory; 4 If the effluent concentrations do not comply with the above criteria the contingency measures for defined in Appendix D shall be implemented immediately; and 5 For discharges being conducted under contingency measures ongoing monitoring shall be conducted in accordance with the applicable permit conditions, e.g. trade waste permit requirements.
Imported material	• All soils imported to site must either be hardfill sourced direct from a consented quarry or meet with the following requirements: – Be crushed concrete sourced from a commercial recycler who can provide suitable testing information to show that the materials are free of asbestos; or – Be derived from a source, which is previously verified in accordance with the methods described in the NESCS, as being a piece of land to which the NESCS do not apply; or – Have been adequately investigated in accordance with MfE Contamination Land Management Guidelines No.5 – Site Investigation and Analysis of Soils (Revised 2021) by a CLS to meet the following: – For inorganic parameters: published background concentrations for Auckland non volcanic soils. – For organic parameters: cleanfill (Class 5) waste acceptance criteria[15]. Testing will depend on the potential contamination sources and may include metals, PAH, organochlorine pesticides (OCPs) and asbestos content. In all cases the testing information shall be provided to the Contaminated Land Specialist for approval prior to the materials being imported to site.
Contractor Required Monitoring	• Daily monitoring shall be undertaken to note use of personal protective equipment and presence of unexpected contamination. Action shall be taken as required to notify the relevant parties and rectify any controls if monitoring identifies that it is needed. • Erosion and sediment controls should be monitored on a regular basis, including after periods of heavy rain.

[15] WasteMinz, September 2023, Technical Guidelines for Disposal to Land Revision 3.1

Earthworks practise	Contamination specific management
	• Visual monitoring for dusts shall be carried out on a continuous basis.
Contingency measures	Contingency measures are set out in Appendix D.

7 Validation and completion reporting

Validation is the process of confirming the objectives of the works have been achieved, confirming works were undertaken according to agreed procedures and reporting on any incidents.

Validation of the site shall be conducted by the CLS. The validation programme recommended includes observation of the ground works and possible collection of soil samples to record the level of contamination (if any) remaining following excavation, prior to removal of underlying natural materials to cleanfill (if required).

7.1 Validation method

Given the limited potential for exposure to any residual contamination following completion of the works, it is proposed that soil validation samples, in addition to those described in Section 4, will not be required to be collected except where unexpected contamination conditions are encountered and remediated. In those instances, the appointed Contaminated Land Specialist shall inspect the material and provide additional advice on the collection of any validation samples.

If undertaken, validation sampling shall be undertaken by a suitably qualified Contaminated Land Specialist in accordance with the procedures described in Section 4.

7.2 Information required from the contractor

The following information is required from the Contractor for inclusion in project reporting:

- Copies of weighbridge summaries for the disposal destination for all contaminated materials.
- Documentation confirming the source, and where necessary testing, of any fill or soils imported during works.
- Records of visits by council representatives.
- Details of any complaints.
- Details of any health and safety incident related to the contamination and how they were resolved.
- Details of unexpected encounters/events and the action taken.

The Contractor shall provide the required information within one month of completion of the works to which the information relates.

7.3 Reporting

On completion of the soil disturbing works, a works completion letter shall be provided to Auckland Council incorporating the following:

- A summary of the works undertaken, including the location and dimensions of the excavations carried out, and the volume of soil excavated, including the quantities reused and disposed offsite.
- Confirmation that the soil disturbance works are complete.
- Confirmation that soil disturbance works were completed according to this CSMP and that there were no variations during the works; If there were variations the then the letter shall detail the nature of the variations and the measures taken to mitigate effects.
- Confirmation that there were no environmental incidents during the works. If there was an environmental incident, then the letter shall detail the nature of the incident and the measures taken to mitigate effects.

- Documentation confirming the source, and where necessary testing, of any fill or soils imported during works.
- Copies of laboratory report for and location of any soil contamination testing undertaken during the works.
- Confirmation of the disposal destination(s) of all spoil and the verification test results undertaken (where required) for disposal permitting.

8 Applicability

This report has been prepared for the exclusive use of our client Precinct Properties NZ Limited, with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement.

The plan has been prepared on the basis of information available at the date of preparation (refer to Section 3). The nature and continuity of soil conditions away from sample locations are inferred and it must be appreciated that actual conditions could vary from the assumed model.

This CSMP provides a framework for managing contamination hazards on site by identifying potential hazards and suggesting mitigation measures relevant to site conditions and works proposed at the time of writing. This CSMP provides information and recommendations to augment this process but is not intended to relieve the person conducting a business or undertaking (PCBU) of either their responsibility for the health and safety of their workers, contractors and the public, or their responsibility for protection of the environment.

Any persons undertaking ground disturbance works on the site must develop a site-specific risk assessment (such as a job safety analysis (JSA), or similar) to complement this CSMP and to address other health and safety requirements that may be applicable to their particular works. The site-specific risk assessment must also be modified to address any specific health, safety or environmental issues that may arise during the works.

From time to time, statutory requirements, site ownership or occupation, operating procedures or site conditions may vary requiring that this plan be amended or updated.

We understand and agree that this report will be used in connection with the application by Precinct for resource consent under the Fast Track Approvals Act 2024 and by Auckland Council in undertaking its regulatory functions in connection with the monitoring of resource consents relating to this project.

Tonkin & Taylor Ltd

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Appendix A Soil and groundwater results from ENV-BH01

Appendix G, Table G1: Soil analytical results for Downtown Carpark

				Analytical data				
Sample ID					ENV-BH1 1.1-1.5m	ENV-BH1 3.3-3.5m	ENV-BH1 4.5-5.0m	ENV-BH1 7.3-7.5m
Depth					1.1-1.5	3.3-3.5	4.5-5	7.3-7.5
Geological unit	**NESCS Commercial/ Industrial[1]**	**AUP Permitted Activity Criteria[2]**	**Published Auckland Background Levels (non-volcanic)[3]**	**Maximum**	SILT (Construction Fill)	Clayey SILT (Reclamation Fill)	Cobbles and boulders (Reclamation Fill)	Clayey SAND (Natural)
Date					30/06/2025			
Asbestos								
Asbestos presence	>0.001%[4]	-	ND	-	-	-	Asbestos NOT detected	Asbestos NOT detected
Asbestos form	-	-	ND					
Asbestos as ACM (w/w%)	0.01%[4]	-	ND					
Asbestos Fibres/Fine (w/w %)	0.001%[4]	-	ND					
Total Cyanide*	150[8]	-	ND	<LoR	< 0.2	< 0.2	< 0.2	< 0.2
Metals								
Arsenic	70	100	12	7	4	4	4	7
Cadmium	1,300	7.5	0.65	0.24	0.24	< 0.10	< 0.10	< 0.10
Chromium	6,300	400	55	42	42	14	19	12
Copper	>10,000	325	45	83	83	17	33	7
Lead	3,300	250	65	260	260	14.3	16.4	16.2
Nickel	1,200[5]	105	35	90	90	9	19	10
Zinc	60,000[5]	400	180	169	169	43	105	34
BTEX								
Benzene	20[7]	0.0057[9]	<LoR	<LoR	< 0.06	< 0.06	< 0.07	< 0.06
Toluene	3100[7]	1.1[9]	<LoR	<LoR	< 0.06	< 0.06	< 0.07	< 0.06
Ethylbenzene	2600[7]	1.2[9]	<LoR	<LoR	< 0.06	< 0.06	< 0.07	< 0.06
m&p-Xylene	-	-	<LoR	<LoR	< 0.11	< 0.12	< 0.14	< 0.12
o-Xylene	-	-	<LoR	<LoR	< 0.06	< 0.06	< 0.07	< 0.06
Total xylenes	2300[7]	0.67[9]	<LoR	<LoR	< 0.17	< 0.18	< 0.21	< 0.18
Polycyclic Aromatic Hydrocarbons								
1-Methylnaphthalene	-	-	<LoR	0.036	0.036	< 0.014	< 0.015	< 0.014
2-Methylnaphthalene	-	-	<LoR	0.026	0.026	< 0.014	< 0.015	< 0.02
Acenaphthene	-	-	<LoR	0.104	0.104	< 0.014	< 0.015	< 0.014
Acenaphthylene	-	-	<LoR	0.380	0.38	< 0.014	< 0.015	< 0.014
Anthracene	refer BAPeq	refer BAPeq	<LoR	0.730	0.73	< 0.014	< 0.015	< 0.014
Benzo[a]anthracene	refer BAPeq	refer BAPeq	<LoR	2.200	2.2	< 0.014	< 0.015	0.029
Benzo[a]pyrene (BAP)	refer BAPeq	refer BAPeq	<LoR	2.300	2.3	< 0.014	< 0.015	0.041
BaP equivalent	25	20	<LoR	3.400	3.4	< 0.014	< 0.015	0.060
Benzo[b]fluoranthene + Benzo[j]fluoranthene	refer BAPeq	refer BAPeq	<LoR	2.500	2.5	< 0.014	< 0.015	0.043
Benzo[e]pyrene	-	-	<LoR	1.380	1.38	< 0.014	< 0.015	0.023
Benzo[g,h,i]perylene	-	-	<LoR	1.580	1.58	< 0.014	< 0.015	0.024
Benzo[k]fluoranthene	refer BAPeq	refer BAPeq	<LoR	0.920	0.92	< 0.014	< 0.015	0.029
Chrysene	refer BAPeq	refer BAPeq	<LoR	1.810	1.81	< 0.014	< 0.015	0.022
Dibenzo[a,h]anthracene	refer BAPeq	refer BAPeq	<LoR	0.310	0.31	< 0.014	< 0.015	< 0.014
Fluoranthene	refer BAPeq	refer BAPeq	<LoR	4.800	4.8	< 0.014	< 0.015	0.035
Fluorene	-	-	<LoR	0.161	0.161	< 0.014	< 0.015	< 0.014
Indeno(1,2,3-c,d)pyrene	refer BAPeq	refer BAPeq	<LoR	1.600	1.6	< 0.014	< 0.015	0.025
Naphthalene	1,100[7]	NA[9]	<LoR	0.000	< 0.07	< 0.07	< 0.08	< 0.07
Perylene	-	-	<LoR	0.510	0.51	< 0.014	< 0.015	< 0.014
Phenanthrene	-	-	<LoR	2.900	2.9	< 0.014	< 0.015	< 0.014
Pyrene	NA[7]	NA[9]	<LoR	5.100	5.1	0.017	< 0.015	0.038
Total Petroleum Hydrocarbons								
C7-C9	20000[7]	710[9]	<LoR	<LoR	< 20	< 20	< 0.014	< 20
C10-C14	8900[7]	1500[9]	<LoR	<LoR	< 20	< 20	< 0.014	< 20
C15-C36	NA[7]	NA[9]	<LoR	152	152	< 40	70	< 40
Total hydrocarbons (C7-C36)	-	-	<LoR	155	155	< 80	< 0.014	< 80

Notes:

All values in mg/kg unless otherwise indicated (i.e. asbestos).

'-' indicates not analysed or no relevant acceptance criteria

'*' indicates laboratory testing methods are not IANZ Laboratory Accrediation Cooperation (LAC) accredited. This is limited to total Cyanide only.

<LoR = less than laboratory limit of reporting

'ND or Asbestos NOT detected' = asbestos not identified to be present by the laboratory method.

NA indicates contaminant not limiting as based on estimated health-based criterion is significantly highly than likley to be encountered.

Yellow shading indicates that the results exceed NES Soil criteria: commercial/industrial

Green shading indicates that results exceed the AUP Permitted Activity Criteria

Blue shading indicates that results exceed the published background concentrations for volcanic soils in the Auckland Region

1 - MfE, June 2011. Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health: Commercial/Industrial, unless otherwise stated.

2 - Auckland Unitary Plan: Operative in Part Version (AUP). Permitted Activity Soil Criteria Table E30.6.1.4.1 (unless otherwise stated).

3 - Auckland Regional Council, Technical Publication 153, October 2001. Background Concentrations of inorganic elements in soils from the Auckland Region: volcanic soils

4 - BRANZ Ltd, 2017. New Zealand Guidelines for Assessing and Managing Asbestos in Soil.

5 - Assessment of Site Contamination National Environment Protection Measures (ASC NEPM) Toolbox – http://www.nepc.gov.au/nepms/assessment-site-contamination/toolbox.

6 - USPEA Regional Screening Levels - https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables

7 - MfE 1999. Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand, Revised 2011. Tier 1 Soil acceptance criteria for applicable pathway. Recreational use: Silty Clay soils at surface (<1 m).

8 - US EPA regional screening levels for Industrial soils adopted in the absence of cyanide limits for New Zealand.

9 - MfE 1999. Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand, Revised 2011. Soil acceptance criteria for protection of groundwater quality. Silty CLAY soil type with ground water at 2 m depth.

R J Hill Laboratories Limited
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Hamilton 3240 New Zealand

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Certificate of Analysis

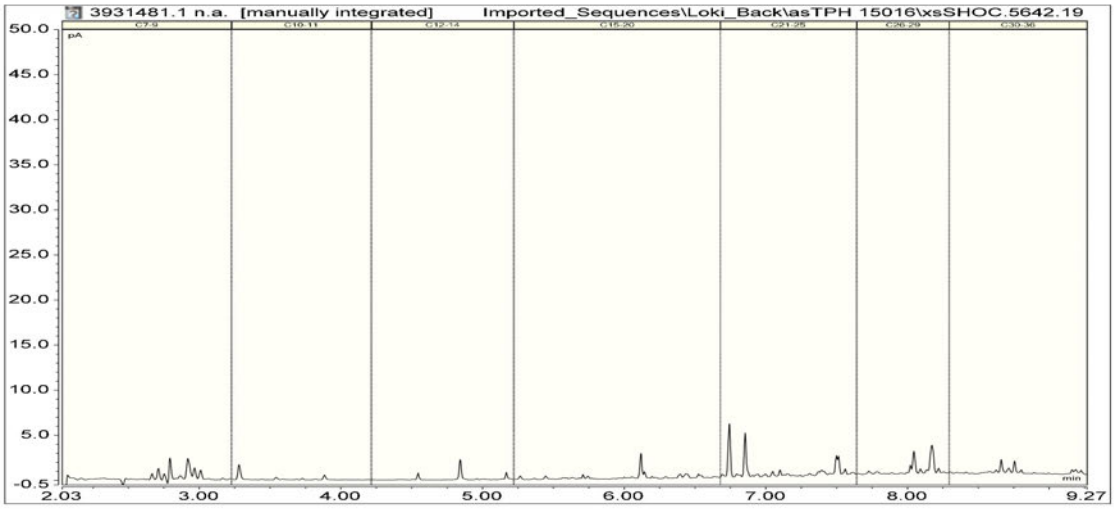
Client:	Tonkin & Taylor	**Lab No:**	3931481	SPv2
Contact:	Sami Myers-Hutchings	**Date Received:**	05-Jul-2025	
	C/- Tonkin & Taylor	**Date Reported:**	30-Jul-2025	
	PO Box 5271	**Quote No:**	80842	
	Auckland 1141	**Order No:**	1016043	
		Client Reference:	1016043	
		Submitted By:	Sami Myers-Hutchings	

Sample Type: Soil

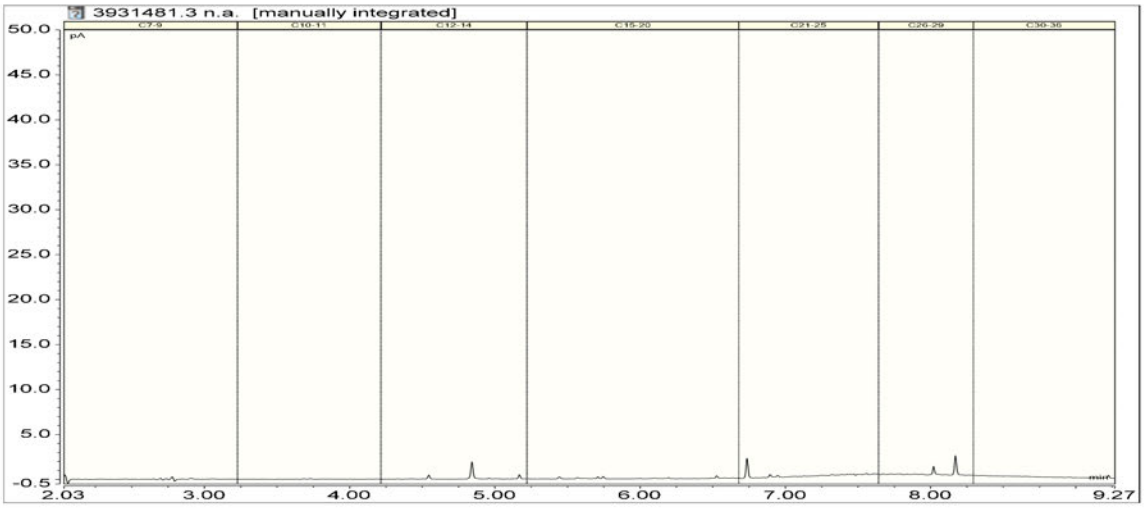
	Sample Name:	BH1 1.1-1.5m 30-Jun-2025	BH1 3.3-3.5m 30-Jun-2025	BH1 4.5-5.0m 30-Jun-2025	BH1 7.3-7.5m 30-Jun-2025
	Lab Number:	3931481.1	3931481.2	3931481.3	3931481.4
Individual Tests					
Dry Matter	g/100g as rcvd	80	73	67	73
Total Cyanide‡	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2
Heavy Metals, Screen Level					
Total Recoverable Arsenic	mg/kg dry wt	4	4	4	7
Total Recoverable Cadmium	mg/kg dry wt	0.34	< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	42	14	19	12
Total Recoverable Copper	mg/kg dry wt	83	17	33	7
Total Recoverable Lead	mg/kg dry wt	260	14.3	16.4	16.2
Total Recoverable Nickel	mg/kg dry wt	90	9	19	10
Total Recoverable Zinc	mg/kg dry wt	169	43	105	34
BTEX in Soil by Headspace GC-MS					
Benzene	mg/kg dry wt	< 0.06	< 0.06	< 0.07	< 0.06
Toluene	mg/kg dry wt	< 0.06	< 0.06	< 0.07	< 0.06
Ethylbenzene	mg/kg dry wt	< 0.06	< 0.06	< 0.07	< 0.06
m&p-Xylene	mg/kg dry wt	< 0.11	< 0.12	< 0.14	< 0.12
o-Xylene	mg/kg dry wt	< 0.06	< 0.06	< 0.07	< 0.06
Polycyclic Aromatic Hydrocarbons Screening in Soil*					
Total of Reported PAHs in Soil	mg/kg dry wt	29	< 0.4	< 0.4	0.3
1-Methylnaphthalene	mg/kg dry wt	0.036	< 0.014	< 0.015	< 0.014
2-Methylnaphthalene	mg/kg dry wt	0.026	< 0.014	< 0.015	< 0.02
Acenaphthylene	mg/kg dry wt	0.38	< 0.014	< 0.015	< 0.014
Acenaphthene	mg/kg dry wt	0.104	< 0.014	< 0.015	< 0.014
Anthracene	mg/kg dry wt	0.73	< 0.014	< 0.015	< 0.014
Benzo[a]anthracene	mg/kg dry wt	2.2	< 0.014	< 0.015	0.029
Benzo[a]pyrene (BAP)	mg/kg dry wt	2.3	< 0.014	< 0.015	0.041
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	3.4	< 0.032	< 0.035	0.060
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	3.4	< 0.032	< 0.035	0.060
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	2.5	< 0.014	< 0.015	0.043
Benzo[e]pyrene	mg/kg dry wt	1.38	< 0.014	< 0.015	0.023
Benzo[g,h,i]perylene	mg/kg dry wt	1.58	< 0.014	< 0.015	0.024
Benzo[k]fluoranthene	mg/kg dry wt	0.92	< 0.014	< 0.015	0.019
Chrysene	mg/kg dry wt	1.81	< 0.014	< 0.015	0.022
Dibenzo[a,h]anthracene	mg/kg dry wt	0.31	< 0.014	< 0.015	< 0.014
Fluoranthene	mg/kg dry wt	4.8	0.018	< 0.015	0.035
Fluorene	mg/kg dry wt	0.161	< 0.014	< 0.015	< 0.014

Sample Type: Soil					
Sample Name:		BH1 1.1-1.5m 30-Jun-2025	BH1 3.3-3.5m 30-Jun-2025	BH1 4.5-5.0m 30-Jun-2025	BH1 7.3-7.5m 30-Jun-2025
Lab Number:		3931481.1	3931481.2	3931481.3	3931481.4
Polycyclic Aromatic Hydrocarbons Screening in Soil*					
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	1.60	< 0.014	< 0.015	0.025
Naphthalene	mg/kg dry wt	< 0.07	< 0.07	< 0.08	< 0.07
Perylene	mg/kg dry wt	0.51	< 0.014	< 0.015	< 0.014
Phenanthrene	mg/kg dry wt	2.9	< 0.014	< 0.015	< 0.014
Pyrene	mg/kg dry wt	5.1	0.017	< 0.015	0.038
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	152	< 40	70	< 40
Total hydrocarbons (C7 - C36)	mg/kg dry wt	155	< 80	< 80	< 80

3931481.1
BH1 1.1-1.5m 30-Jun-2025
Client Chromatogram for TPH by FID



3931481.3
BH1 4.5-5.0m 30-Jun-2025
Client Chromatogram for TPH by FID



Analyst's Comments

It was observed that the containers for sample 3931481 3,4 were not completely filled. Volatile loss may have occurred due to the headspace created in the container.

‡ Analysis subcontracted to an external provider. Refer to the Summary of Methods section for more details.

Appendix No.1 - ALS Report

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
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
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
Total Cyanide	Samples extracted in alkaline conditions prior to on-line distillation and colourmetric determination using Segmented Flow Analysis. Subcontracted test, Analytica Laboratories Limited, Hamilton. EPA Method 9013A Revision 2 (Modified) and ISO 14403:2012(E) (Modified).	0.2 mg/kg dry wt	1-4
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	BaP Potency Equivalence calculated from; Benzo(a)anthracene x 0.1 + Benzo(b)fluoranthene x 0.1 + Benzo(j)fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Benzo(a)pyrene x 1.0 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Fluoranthene x 0.01 + Indeno(1,2,3-c,d)pyrene x 0.1. Ministry for the Environment. 2011. Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health. Wellington: Ministry for the Environment.	0.024 mg/kg dry wt	1-4
Benzo[a]pyrene Toxic Equivalence (TEF)*	Benzo[a]pyrene Toxic Equivalence (TEF) calculated from; Benzo [a]pyrene x 1.0 + Benzo(a)anthracene x 0.1 + Benzo(b) fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Indeno(1,2,3-c,d)pyrene x 0.1. Guidelines for assessing and managing contaminated gasworks sites in New Zealand (GMG) (MfE, 1997).	0.024 mg/kg dry wt	1-4
Heavy Metals, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1-4
BTEX in Soil by Headspace GC-MS	Solvent extraction, Headspace GC-MS analysis. Tested on as received sample. In-house based on US EPA 8260 and 5021.	0.05 - 0.10 mg/kg dry wt	1-4
Polycyclic Aromatic Hydrocarbons Screening in Soil*	Sonication extraction, GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8270.	0.010 - 0.05 mg/kg dry wt	1-4
Total Petroleum Hydrocarbons in Soil			
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	1, 3
C7 - C9	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	1-4
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	1-4
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	1-4
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	1-4

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

Testing was completed between 07-Jul-2025 and 30-Jul-2025. 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

CERTIFICATE OF ANALYSIS

Work Order	: **NH2500823**		
Client	: **R J Hill Laboratories Limited**	Laboratory	: Environmental Hamilton
Contact	: Environmental Reports Officer	Contact	: Customer Services NH
Address	: Private Bag 3205 Hamilton Waikato New Zealand 3204	Address	: Ruakura Research Centre, 10 Bisley Rd Hamilton WKO New Zealand 3214
Telephone	: 07 858 2000	Telephone	: +64 7 974 4740
Project	: fbSubAnalytica 707	Date Samples Received	: 21-Jul-2025 08:30
Order number	: PO104429	Date Analysis Commenced	: 23-Jul-2025
C-O-C number	: ----	Issue Date	: 28-Jul-2025 11:32
Sampler	: ----		
Site	: ----		
Quote number	: EN/000		
No. of samples received	: 4		
No. of samples analysed	: 4		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below.

Signatories	*Position*	*Accreditation Category*
Astra Southerwood	Section Supervisor - Organics	Soil Prep, Hamilton, Waikato
Louise Coombridge	Chemist - Inorganics	Inorganics, Hamilton, Waikato

Page	:	**2 of 4**
Work Order	:	**NH2500823**
Client	:	**R J Hill Laboratories Limited**
Project	:	**fbSubAnalytica 707**

General Comments

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key: CAS Number: CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR: Limit of Reporting (detection limit).

Unit	*Description*
%	Percent
mg/kg dry weight	mg/kg dry weight

>: greater than.
<: less than.
ø: ALS is not IANZ accredited for these tests.
^: This result is computed from individual analyte detections at or above the level of reporting.
~: Indicates an estimated value.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Workorder Comments

Samples were collected by yourselves (or your agent) and analysed as received at ALS NZ (or at the subcontracted laboratories, when applicable). Samples were in acceptable condition unless otherwise noted on this report.

Page : **3 of 4**
Work Order : **NH2500823**
Client : **R J Hill Laboratories Limited**
Project : **fbSubAnalytica 707**

Analytical Results

Sub-Matrix: SOIL
(Matrix: SOIL)

Compound	CAS Number	LOR	Unit	Client Sample ID	3931481.1	3931481.2	3931481.3	3931481.4	----
				Client Sampling date / time	21-Jul-2025 00:00	21-Jul-2025 00:00	21-Jul-2025 00:00	21-Jul-2025 00:00	----
					NH2500823-001	NH2500823-002	NH2500823-003	NH2500823-004	----
					Result	Result	Result	Result	----
MC_S: Moisture Content									
Moisture Content	----	0.1	%		**19.7**	**24.6**	**27.8**	**25.1**	----
TC_S: Total Cyanide									
Total Cyanide	57-12-5	0.20	mg/kg dry weight		<0.20	<0.20	<0.20	<0.20	----

Brief Method Summaries

Analytical Methods	Method	Matrix	Method Descriptions
Moisture Content in Soil	MC_S	SOIL	Moisture content is determined gravimetrically by drying at 103 °C.
Total Cyanide in Soil	TC_S	SOIL	Samples extracted in alkaline conditions prior to on-line distillation and colourmetric determination using Segmented Flow Analysis. EPA Method 9013A Revision 2 (Modified) and ISO 14403:2012(E) (Modified).

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Christchurch 8024 New Zealand

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Certificate of Analysis

Client:	Tonkin & Taylor	**Lab No:**	3931750 A2Pv1
Contact:	Sami Myers-Hutchings	**Date Received:**	05-Jul-2025
	C/- Tonkin & Taylor	**Date Reported:**	10-Jul-2025
	PO Box 5271	**Quote No:**	80842
	Auckland 1141	**Order No:**	1016043
		Client Reference:	1016043
		Submitted By:	Sami Myers-Hutchings

Sample Type: Soil

Sample Name:		BH1 4.5-4.5m 30-Jun-2025 2:30 pm	BH1 4.5-5.0 30-Jun-2025 2:30 pm
Lab Number:		3931750.1	3931750.2
Asbestos Presence / Absence		Asbestos NOT detected.	Asbestos NOT detected.
Description of Asbestos Form		-	-
Asbestos in ACM as % of Total Sample*	% w/w	< 0.001	< 0.001
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001
Asbestos as Fibrous Asbestos as % of Total Sample*	% w/w	< 0.001	< 0.001
Asbestos as Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001
As Received Weight	g	675.2	385.6
Dry Weight	g	493.6	297.9
Moisture*	%	27	23
Sample Fraction >10mm	g dry wt	41.1	167.4
Sample Fraction <10mm to >2mm	g dry wt	114.9	84.3
Sample Fraction <2mm	g dry wt	335.9	45.1
<2mm Subsample Weight	g dry wt	50.2	45.1
Weight of Asbestos in ACM (Non-Friable)	g dry wt	< 0.00001	< 0.00001
Weight of Asbestos as Fibrous Asbestos (Friable)	g dry wt	< 0.00001	< 0.00001
Weight of Asbestos as Asbestos Fines (Friable)*	g dry wt	< 0.00001	< 0.00001

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	1-2
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	1-2
Moisture*	Sample dried at 100 to 105°C. Calculation = (As received weight - Dry weight) / as received weight x 100.	1 %	1-2
Sample Fraction >10mm	Sample dried at 100 to 105°C, 10mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1-2
Sample Fraction <10mm to >2mm	Sample dried at 100 to 105°C, 10mm and 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1-2
Sample Fraction <2mm	Sample dried at 100 to 105°C, 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1-2
Asbestos Presence / Absence	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0.01%	1-2
Description of Asbestos Form	Description of asbestos form and/or shape if present.	-	1-2
Weight of Asbestos in ACM (Non-Friable)	Measurement on analytical balance, from the >10mm Fraction. Weight of asbestos based on assessment of ACM form. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1-2
Asbestos in ACM as % of Total Sample*	Calculated from weight of asbestos in ACM and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1-2
Weight of Asbestos as Fibrous Asbestos (Friable)	Measurement on analytical balance, from the >10mm Fraction. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1-2
Asbestos as Fibrous Asbestos as % of Total Sample*	Calculated from weight of fibrous asbestos and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1-2
Weight of Asbestos as Asbestos Fines (Friable)*	Measurement on analytical balance, from the <10mm Fractions. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1-2
Asbestos as Asbestos Fines as % of Total Sample*	Calculated from weight of asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1-2
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	Calculated from weight of fibrous asbestos plus asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1-2

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

Testing was completed on 10-Jul-2025. 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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Certificate of Analysis

Client:	Tonkin & Taylor	**Lab No:**	3939090 SPv1
Contact:	Sami Myers-Hutchings	**Date Received:**	16-Jul-2025
	C/- Tonkin & Taylor	**Date Reported:**	28-Jul-2025
	PO Box 5271	**Quote No:**	80842
	Auckland 1141	**Order No:**	1016043.200/05/01
		Client Reference:	1016043.200/05/01
		Submitted By:	Betsy Gillies

Sample Type: Aqueous

Sample Name:		GW1 16-Jul-2025
Lab Number:		3939090.1
Individual Tests		
Salinity*		17.0
Total Cyanide‡	g/m³	< 0.0010
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn		
Dissolved Arsenic	g/m³	< 0.02
Dissolved Cadmium	g/m³	< 0.0010
Dissolved Chromium	g/m³	< 0.010
Dissolved Copper	g/m³	< 0.010
Dissolved Lead	g/m³	< 0.002
Dissolved Nickel	g/m³	< 0.010
Dissolved Zinc	g/m³	< 0.02
BTEX in Water by Headspace GC-MS		
Benzene	g/m³	< 0.0010
Toluene	g/m³	< 0.0010
Ethylbenzene	g/m³	< 0.0010
m&p-Xylene	g/m³	< 0.002
o-Xylene	g/m³	< 0.0010
Polycyclic Aromatic Hydrocarbons Screening in Water, By Liq/Liq		
Acenaphthene	g/m³	< 0.00010
Acenaphthylene	g/m³	< 0.00010
Anthracene	g/m³	< 0.00010
Benzo[a]anthracene	g/m³	< 0.00010
Benzo[a]pyrene (BAP)	g/m³	< 0.00010
Benzo[b]fluoranthene + Benzo[j] fluoranthene	g/m³	< 0.00010
Benzo[g,h,i]perylene	g/m³	< 0.00010
Benzo[k]fluoranthene	g/m³	< 0.00010
Chrysene	g/m³	< 0.00010
Dibenzo[a,h]anthracene	g/m³	< 0.00010
Fluoranthene	g/m³	< 0.00010
Fluorene	g/m³	< 0.0002
Indeno(1,2,3-c,d)pyrene	g/m³	< 0.00010
Naphthalene	g/m³	< 0.0005
Phenanthrene	g/m³	< 0.0004
Pyrene	g/m³	< 0.0002

Sample Type: Aqueous		
Sample Name:		GW1 16-Jul-2025
Lab Number:		3939090.1
Total Petroleum Hydrocarbons in Water		
C7 - C9	g/m³	< 0.10
C10 - C14	g/m³	< 0.2
C15 - C36	g/m³	< 0.4
Total hydrocarbons (C7 - C36)	g/m³	< 0.7

Analyst's Comments

‡ Analysis subcontracted to an external provider. Refer to the Summary of Methods section for more details.

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: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Individual Tests			
Salinity*	Conductivity Meter (WTW Cond 340i with nonlinear temperature compensation according to EN 27 888). APHA 2520 B : Online Edition.	0.2	1
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B : Online Edition.	-	1
Total Cyanide	Acid distillation, distillate measured by colourmetric analysis. Subcontracted test, Analytical Laboratories Limited, Hamilton. APHA 4500-CN C - Modified - Discrete Analyser - Online edition.	0.0010 g/m³	1
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn	0.45µm Filtration, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00005 - 0.0010 g/m³	1
BTEX in Water by Headspace GC-MS	Headspace GC-MS analysis. In-house based on US EPA 8260 and 5021.	0.0010 - 0.002 g/m³	1
Polycyclic Aromatic Hydrocarbons Screening in Water, By Liq/Liq	Liquid / liquid extraction, GC-MS/MS analysis. In-house based on US EPA 8270.	0.00010 - 0.0005 g/m³	1
Total Petroleum Hydrocarbons in Water			
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	0.10 g/m³	1
C10 - C14	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	0.2 g/m³	1
C15 - C36	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	0.4 g/m³	1
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	0.7 g/m³	1

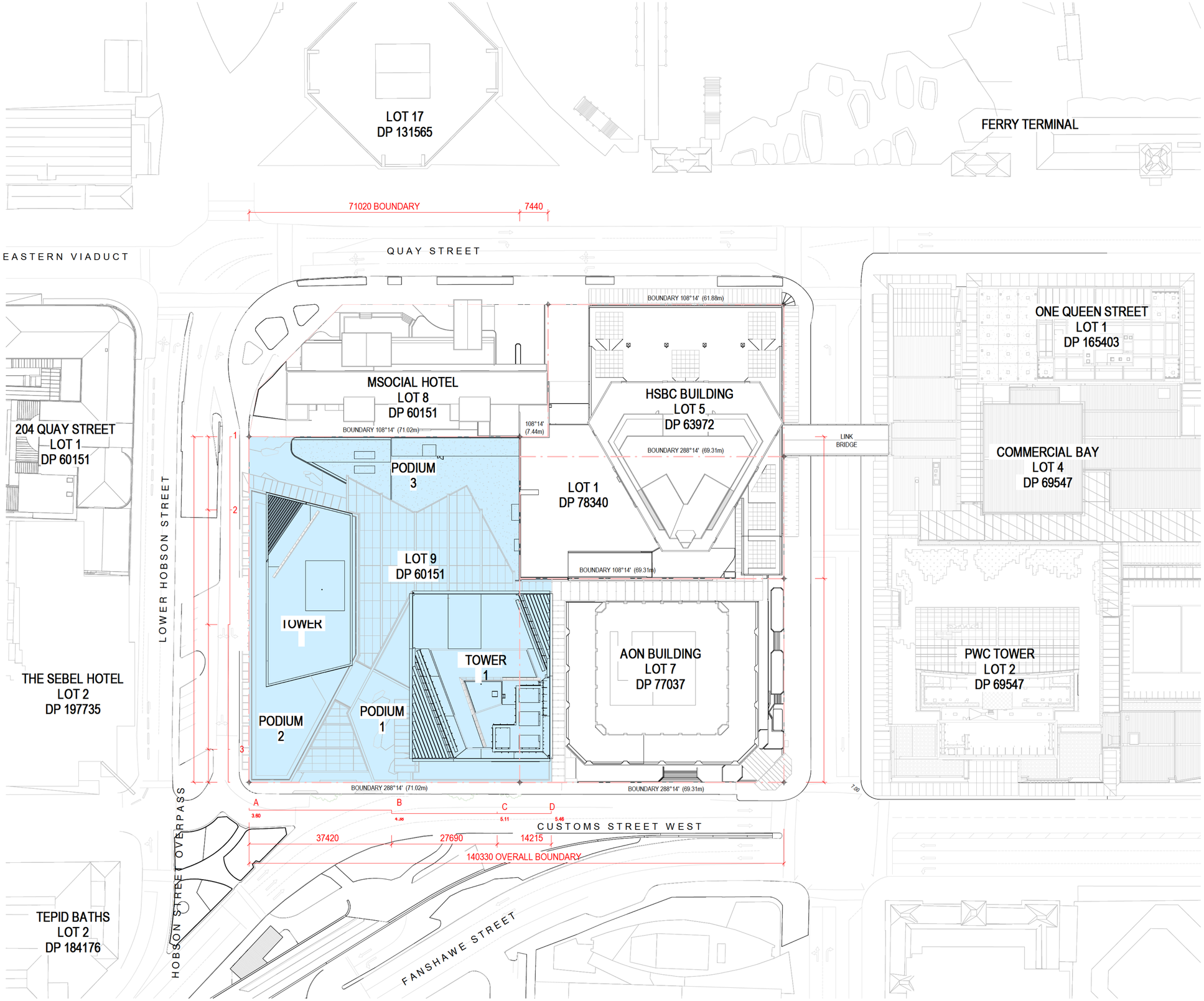
These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Testing was completed between 21-Jul-2025 and 28-Jul-2025. 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

Appendix B Development plans



LOWER HOBSON STREET LEVELS
SURVEYED SPOT HEIGHTS MEASURED AT THE CENTRE LINE OF THE STREET PARALLEL TO THE SITE BOUNDARY (SUBSEQUENCED IN EASTERLY DIRECTION STARTING AT INTERSECTION LOWER HOBSON/LOWER ALBERT ST):

1 - 3.32m
2 - 3.28m
3 - 3.25m
4 - 3.28m
5 - 3.45m

DISTANCE BETWEEN SPOT HEIGHTS:

1-2 = 19.226m
2-3 = 30.100m
3-4 = 32.700m
4-5 = 8.700

TOTAL = 90.710m

CALCULATIONS:

MSL 1-2 (3.32 + 3.28) /2 x 19.226 = 63.45
MSL 2-3 (3.28 + 3.25) /2 x 30.100 = 98.28
MSL 3-4 (3.25 + 3.28) /2 x 32.700 = 106.77
MSL 4-5 (3.28 + 3.45) /2 x 8.700 = 29.28

TOTAL = 63.45 + 98.28 + 106.77 + 29.28 = 297.78

MEAN STREET LEVEL - LOWER HOBSON STREET:
297.78 / 90.710m = **3.283m**

CUSTOMS STREET WEST LEVELS
SURVEYED SPOT HEIGHTS MEASURED AT THE CENTRELINE OF THE STREET PARALLEL TO THE SITE BOIUNDARY (SUBSEQUENCED IN EASTERLY DIRECTION STARTING AT INTERSECTION LOWER HOBSON/LOWER ALBERT ST):

A - 3.60m
B - 4.38m
C - 5.11m
D - 5.46m

DISTANCE BETWEEN SPOT HEIGHTS:

A-B =37.420m
B-C = 27.690m
C-D = 14.215m

TOTAL = 79.325m

CALCULATIONS:

MSL A-B (3.60 + 4.38) /2 x 37.420 = 149.31
MSL B-C (4.38 + 5.11) /2 x 27.690 = 131.39
MSL C-D (5.11 + 5.46) /2 x 14.215 = 75.13

TOTAL = 149.31 + 131.39 + 75.13 = 355.83

MEAN STREET LEVEL - CUSTOMS STREET:
355.83 / 79.325 = **4.486m**

Revisions
—
A 05/09/25 Draft FTA Issue
B 26/09/25 FTA Issue
C 03/10/25 FTA Issue

Notes
—
COMMERCIAL IN CONFIDENCE

SURVEY INFORMATION NOTES:

ALL SURVEY INFORMATION AND EXISTING BUILDING PLANS ARE PROVIDED BY EXTERNAL SOURCES AND MUST BE CHECKED/ VERIFIED ON SITE

DENOTES PROJECT SITE

LEGAL DESCRIPTIONS:

LOT7, DP77037, AREA= 4704 SQM
NA33C/37 - AON HOUSE (29 CUSTOMS ST W)

LOT9, DP60151, AREA= 6442 SQM
NA15A/424 - DT CARPARK (31 CUSTOMS ST W)

LOTS BELOW NOT INCLUDED IN THIS CONSENT:

LOT1, DP78340, AREA= 2218 SQM
NA128C/787 - HSBC HOUSE (188 QUAY ST)

LOT5, DP63972, AREA= 2512 SQM
NA128C/787 - HSBC HOUSE (188 QUAY ST)

LOT8, DP60151, AREA= 2408 SQM
NA15A/423 - MSOCIAL (196/200QUAY ST)

N PROJECT NORTH
N TRUE NORTH

Consultants
—
RCP
Project Manager
RLB
Quantity Surveyor
HOLMES
Structural Engineer
NDY
Services Engineer
JENSEN HUGHES
Fire Engineer
TONKIN + TAYLOR
Civil Engineer
FLOW
Traffic Engineer
MOTT MACDONALD
Facade Engineer

Client
—
Precinct

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Registered Architects and Designers
www.warrenandmahoney.com

Project Title
—
DOWNTOWN CARPARK DEVELOPMENT

2 LOWER HOBSON STREET,
AUCKLAND CBD, AUCKLAND 1010

Drawing Title
—
MEAN STREET LEVEL PLAN

Drawing Status
—
FTA ISSUE

Drawing Details
—

Scale	1 : 500@ A1
Date	03/10/25
Job No	9234
Drawn	WAM
Checked	WAM

Drawing No — FTA-05-005
Revision — C

Appendix C Proposed site investigation plan

T:\Auckland\Projects\1016043\1016043.1000\3 Contaminated Land\WorkingMaterial\CAD\1016043-001.dwg 2023-Jun-07 1:21:28 pm Plotted By: MARS

Tonkin+Taylor

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0	First Issue	

DESIGNED			FIGURE STATUS
DRAWN	MARS	25.05.23	FINAL ISSUE
DESIGN CHECKED			PROJECT PHASE
FIGURE CHECKED			SITE INVESTIGATIONS

NOT FOR CONSTRUCTION

THIS DRAWING IS NOT TO BE USED FOR CONSTRUCTION PURPOSES UNLESS SIGNED AS APPROVED

APPROVED DATE

CLIENT **PRECINCT PROPERTIES LTD**

PROJECT **DOWNTOWN CARPARK REDEVELOPMENT - 2 LOWER HOBSON STREET**

TITLE PROPOSED CONTAMINATED LAND INTRUSIVE SITE INVESTIGATIONS

SCALE (A1) 1:750 FIG No. APPENDIX B FIGURE 1 REV 0

Appendix D Contingency measures

D1 Contingency measures

The following actions are proposed in the event that unexpected conditions are encountered, discharges occur and/or complaints are received in relation to the works. Mitigation measures should be applied in accordance with the hierarchy of control – eliminate, isolate and minimise.

D2 Roles and responsibilities

As described in Section 2, except where otherwise noted, the Contractor shall be responsible for implementation of all aspects of this CSMP. The Contractor's site supervisor shall be authorised to enact contingency and emergency measures without delay.

D3 Emergency response procedures

Should an incident occur on site which may result in any unauthorised discharges (vapour, odour, water, soil, separate phase hydrocarbons (SPH) etc.), the Contractor's site supervisor will take control of the situation and coordinate the efforts of all on site to minimise the impact. Ultimately, in the event, albeit unlikely, that sustained and uncontrollable discharges (exceeding the specified action levels) occur from the site, emergency response and evacuation procedures, including provisions for notifying and managing neighbouring site users, shall be implemented. The emergency response and evacuation procedures shall be specified in the project specific health and safety plan.

D4 Unexpected ground conditions

The onus is on the site staff to note where visual and olfactory indicators of impacted soil/water exist and notify the Land Remediation Specialist to ensure the appropriate procedures are put in place depending on the type and level of conditions encountered. Typical visual and olfactory indicators of impacted soil could include the following:

- Odour (petroleum hydrocarbons, oil);
- Black staining coupled with an odour may indicate the presence of heavy oil or hydrocarbons;
- Green/yellow discoloured soil may indicate high levels of copper and chromium;
- Black gravel/sand may be boiler ash materials that could be high in metals and PAHs;
- Inclusions of deleterious materials such as timber, plastic, rubber, metal;
- Archaeological finds while excavating e.g. shells, pottery, glass, partial structures (former dockyard); and
- Buried demolition debris containing suspected asbestos containing materials (ACM).

The presence of other chemical compounds at high levels may dictate further controls be implemented and additional or different containment/disposal be required. The first response procedures are to ensure it is appropriately contained while decisions about its management are being undertaken. The following is a "first response" checklist for site staff to follow should visual or olfactory evidence of impacted soil is encountered during the works onsite.

Appendix D Table 1: First response checklist – impacted soils

First Response Checklist:	
Stop work in the immediate vicinity of the discovery and isolate the area by taping, coning or fencing off.	☐
Advise contractor site manager and/or contaminated land specialist.	☐
Update the site Hazard Board and prevent access to the area by unnecessary personnel.	☐
If ACM is observed minimise site disturbance at that location and provide barriers to stop staff entering area. *In the event that ACM is observed, the contractor shall contact both the contaminated land specialist and the project appointed asbestos licensed removalist.*	☐
If odours are present cover the material over with non-odorous soil or hay/straw and lime to prevent nuisance odour.	☐
The contaminated land specialist to inspect and advise of specific controls. No materials shall be removed from the affected area until approval has been provided by the contaminated land specialist.	☐

D5 Odour, dust and vapour exposures

D5.1 Dust exposures

The following hierarchy of actions is proposed in the event that dust discharges occur from the works:

1 As described in Section 5.1, the wearing of dust masks shall be implemented in the event that visible dust is generated. If dusts are discharging beyond the boundary of the work area the following actions shall be implemented immediately.

2 Increase wetting of the exposed materials until discharges are mitigated. Consider employing automated suppression systems if problems are recurring.

3 Cover or temporarily backfill excavations to address discharges while alternative mitigation measures are implemented. Alternative mitigation measures may start with revising operational procedures, for example significantly reducing open areas in conjunction with the controls described above. However, if the discharges persist, professional advice should be sought in order to define appropriate control measures. It is recommended that consultation with appropriate council representatives also be undertaken prior to recommencing works.

D5.2 Odour and vapour exposures

The following hierarchy of actions is proposed in the event that odour or vapour discharges occur from the works:

1 Implement gas monitoring of the work space as set out in Section 5.4. If the action levels set out in Table 4.2 are exceeded works, in the area of odour or vapour discharges, shall be suspended immediately, if possible the exposed soils covered or otherwise made safe, and the Contaminated Land Specialist consulted to define appropriate control measures.

2 If vapour concentrations remain below the action levels set out in Table 4.2, the following shall be implemented:

   a As described in Section D5.1, increase wetting of the exposed materials by use of water carts or hand held hoses etc.; or

   b Minimising the open areas of excavations as much as practicable, including whenever possible covering or temporarily backfilling excavations when not excavating; or

c If these measures do not address odour or vapour discharges (if objectionable odours or measurable vapours remain for more than 30 seconds) the works, in the area of odour or vapour discharges, shall be suspended, if possible the exposed soils covered, and the Contaminated Land Specialist consulted to define appropriate control measures.

D6 Water discharges

As described in Section 6, where the quality of water being discharged from the site cannot meet the standards required for discharge to stormwater, or unexpected contamination conditions are encountered additional controls will be required.

If unexpected contamination conditions are encountered the following controls shall be implemented:

- The area in which unexpected contamination conditions have been encountered shall be isolated so that stormwater from this area can be separated from that generated across the wider site;
- If dewatering is required to continue from the area in which unexpected contamination conditions have been encountered then the effluent should either be contained for testing prior to disposal, or one of the following options could be implemented; and
- The procedures described in Appendix D D4 shall be implemented.

A number of options could be employed if the quality of water being discharged from the site cannot meet the standards required for discharge to stormwater on an ongoing basis, including, but not limited to:

1 Collection and discharge to an appropriately designed soakage field within the site; and/or

2 Improving effluent quality through additional treatment; and/or

3 Collection (for example by tanker trucks) for off-site disposal to an appropriately licensed facility; and/or

4 Discharge to sewer, subject to removal of sediment and issue of any necessary temporary trade waste permits. However, diversion to tradewaste cannot be assumed to be available.

The Contaminated Land Specialist shall be consulted to assist with defining appropriate control measures in the event that the standards required for discharge to stormwater cannot be met.

D7 Complaints procedure

A written record of all complaints received shall be maintained. The Contractor's site supervisor shall initiate an investigation and notify Auckland Council as soon as practicable on receipt of a complaint, including providing details of any corrective actions taken.

Appropriate feedback will be provided to the complainant, such as the response made and any corrective actions taken, in response to the complaint.

D8 Notification requirements

Precinct or the client appointed representative shall be notified immediately in the event that any contingency measures are required to be implemented.

Auckland Council (regulatory) shall be notified in writing as soon as practicable in the event of receiving any complaints.

Appendix E Asbestos Controls Table

Appendix E Table 1: Minimum controls required by level of Asbestos Works

SCENARIO	CLASS B CONTAMINATION > 0.01 f/ml in air > 0.01% w/w AF+FA in soil > 1% ACM	LOW LEVEL ASBESTOS CONTAMINATION < 0.01% f/ml in air > 0.001% w/w AF+FA in soil > 0.01 % w/w ACM	TRACE ASBESTOS CONTAMINATION < 0.01% f/ml in air ≤ 0.001% w/w AF+FA in soil < 0.01% w/w ACM
ADDITIONAL DOCUMENTATION/ NOTIFICATION REQUIREMENTS	Asbestos removal control plan and WorkSafe notification for asbestos removal.	No additional notification required.	No additional notification required.
OVERSIGHT BY A LICENSED REMOVALIST	Required.	Not required but recommended.	Not required.
PERSONAL PROTECTIVE EQUIPMENT	Disposable coveralls rated type 5, category 3, nitrile gloves, steel toe capped gumboots or safety footwear with disposable overshoes.	Disposable coveralls rated type 5, category 3, nitrile gloves, steel toe capped gumboots or safety footwear with disposable overshoes.	No asbestos-specific PPE as concentrations are unlikely to exceed trace levels in air.
RESPIRATORY PROTECTIVE EQUIPMENT	Half-face P3 respirator with particulate filter.	Disposable P2 dust mask.	No asbestos-specific requirements as concentrations are unlikely to exceed trace levels in air.
DUST/ASBESTOS FIBRE SUPPRESSION	Water and polymer spray via localised points before and during works.	Water spray via localised points.	Water spray via localised points.
AIR MONITORING	Air monitoring not required but recommended given setting and to confirm that concentrations are below 0.01 f/ml.	Air monitoring not required but recommended given setting and to confirm that concentrations are below 0.01 f/ml.	Air monitoring not required.
CLEANING FACILITIES	Dedicated cleaning area and foot wash. **	Foot wash and used PPE collection area.	Foot wash and used PPE collection area.
VEHICLE (TRUCK) PROTECTION	200 µm heavy-gauge polythene wrapped soil/lined trays and truck covered.	Truck lining/soil wrapping depends on the receiving landfill. All trucks should be covered.	Truck lining/soil wrapping depends on the receiving landfill. All trucks should be covered.
	HEPA filter system fitted for all occupied vehicles where friable ACM on site (lagging, insulation, etc).	Standard air conditioning.	Standard air conditioning.

SCENARIO	CLASS B CONTAMINATION	LOW LEVEL ASBESTOS CONTAMINATION	TRACE ASBESTOS CONTAMINATION
	> 0.01 f/ml in air > 0.01% w/w AF+FA in soil > 1% ACM	< 0.01% f/ml in air > 0.001% w/w AF+FA in soil > 0.01 % w/w ACM	< 0.01% f/ml in air ≤ 0.001% w/w AF+FA in soil < 0.01% w/w ACM
VEHICLE WASHING FACILITIES	Visual assessment plus swab (if friable) by an independent assessor or competent person* or CLS following brush and or wash down.	Visual assessment by a competent person* or CLS following brush and or wash down.	Visual assessment by a competent person* or CLS following brush and or wash down.

* A competent person must meet the requirements of regulation 41(3) of the Asbestos Regulations. An independent person, who must not be otherwise involved in the physical removal works, is required to undertake air monitoring and clearance inspections (where required).

** Asbestos PPE must be double bagged and top tied or tapped (turkey neck) for appropriate disposal.

E1.1 Asbestos air monitoring

In the event, the controls require escalation to higher levels of asbestos in soil works, air monitoring may be required. Should air monitoring be required the following procedure shall apply at a minimum:

- Air Monitoring will be undertaken by the Contaminated Land Specialist for the first three working days of the soil disturbance works, subject to weather conditions.

  If fibres are detected at levels > 0.01 fibre/mL, works shall cease until a review of asbestos management controls are undertaken and modified where necessary. Further controls will be implemented until results are < 0.01 fibre/mL. The review shall be undertaken jointly by a competent person, Precinct and/or the designated client representative and the contractor. If fibres remain < 0.01 fibre/mL for the duration of the monitoring period, the Contaminated Land Specialist or a competent person may consider the reduction of the controls in conjunction with visual observations and/or soil sample results. All air monitoring results shall be reported in the validation report (refer to Section 7).
- Additional monitoring shall occur if there is a change in work method or significant change in conditions relative to the first three (3) working days.
- A minimum of three air monitoring pumps shall be used, one upwind of the excavation and two downwind.
- Monitoring and establishment of the monitors shall be undertaken by the Contaminated Land Specialist, or by a competent person.
- Air monitoring cowls shall be analysed by a IANZ accredited laboratory.
- Air monitoring results shall be evaluated on receipt of the results by a competent person.

Appendix F Vapour design aspects

F1 Design standards

There are requirements to safeguard people from injury or illness caused by hazardous agents or contaminants on site under the Building Act 2004 and the New Zealand Building Code contained in the First Schedule of the Building Regulations 1992. The relevant section in the Building Code is Clause F1 Hazardous Agents on site.

The level of protection to site users is based on a risk assessment, which informs the level of building protection required to protect human health of future site users. If a vapour intrusion risk is assessed to be present, then a vapour intrusion risk assessment report will be undertaken prior to construction, and a Remedial Action Plan (RAP) will be provided. The reports will:

- Evaluate the risk from vapour intrusion into the proposed building; and
- Present preliminary information on typical mitigation options with respect to vapour intrusion.

The design of the vapour protection system will be undertaken in general accordance with the consideration of the following relevant documents:

- CIRIA Guidance CIRIA C665;
- USEPA OSWAR guidance (Assessing and Mitigating the Vapour Intrusion Pathway from Subsurface Vapor Sources to Indoor Air, June 2015);
- BS8485 Code of Practice for the Design of Protective Measures for Methane and Carbon Dioxide Ground Gases for New Buildings; and
- Vapour Intrusion Technical Guidance. New Jersey Department of Environmental Protection. Site Remediation and Waste Management Programme. January 2018.

F2 Source of vapour

The potential contaminants present at the Downtown Carpark site from the former service station, contaminated reclamation fill and / or other historic activities which have impacted the subsurface may pose a vapour risk by migrating into the proposed development from the saturated and unsaturated zones via a number of different contaminant sources and pathways (Figure Appendix F.1 overleaf). Vapour intrusion sources, if present, are expected to be from historic on-site sources and the risk for residual hydrocarbons to pose an intrusion following development is very low.

F3 Vapour intrusion pathways

The development of a conceptual vapour model assists in understanding and evaluating the potential for risk. For the conceptual site model developed for the development, the following factors have been considered:

- Sources of vapour.
- Potential receptors associated with any development works.
- Possible pathways for vapour.

As outlined in Section F2, the potential for vapour is associated with contaminants present in soil at the site.

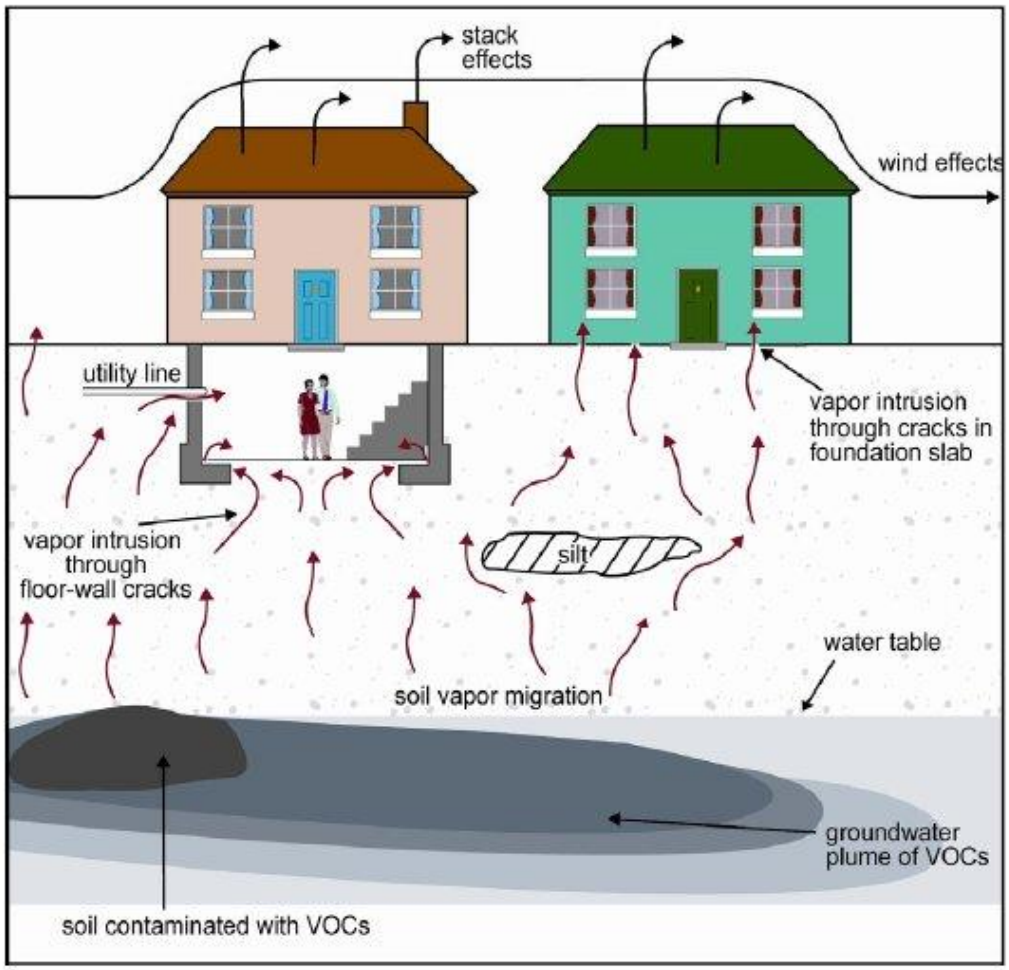

Figure Appendix F.1: Typical migration pathways (Source: US EPA http://www.epa.gov/region6/6pd/rcra_c/ca/)

F4 Risk assessment

For a vapour intrusion risk to exist, there must be a source, a pathway and a driving force to cause the vapours to be drawn into a building. Furthermore, vapour intrusion requires an unsaturated zone for vapour migration. Based on the available investigation data, there is the potential for vapour intrusion risk with respect to the proposed development if residual petroleum hydrocarbon products have impacted the soils and are not able to be removed during development.

If a vapour risk is identified, then the potential risk for vapour intrusion requires the implementation of mitigation measures to reduce or eliminate the risk as part of the design of the building. Vapour protection systems typically comprise the use of a vapour barrier to avoid or reduce entry of vapours into the structure and a venting/extraction system (either passive or with a sub-slab depressurisation system) to provide a preferential pathway. Further details regarding the implementation of vapour protection systems are detailed in the following section.

F5 Vapour protection system

Vapour protection systems typically comprise the use of a vapour barrier to block entry of vapours into the structure and a venting system (either passive or with a sub-slab depressurisation system).

The aim of such systems is two-fold:

- Firstly, block the potential pathway from the source to the receptors. This is achieved by installing a fully sealed vapour barrier and ensuring all penetrations are effectively sealed.
- Avoiding a driving force from the sub-slab space into the building by installing a sub-slab venting system with vacuum pump and treatment, if required.

In addition to these two aspects there are additional mechanisms that can be incorporated into the design that can further reduce the risk including:

- Minimising or avoiding enclosed spaces in the basement where no ventilation is present.
- Providing adequate ventilation in the basement including providing additional flow to create a slight positive pressure within the basement.

F5.1 Vapour barrier

The selection of an appropriate barrier is primarily governed by the following factors:

- Ability to block the entry of the vapours into the building for a long period of time.
- Chemical resistance to the vapours and chemicals present.
- Availability of a suitability qualified contractor.
- Supply and installation cost.
- Impact on construction activities.

In New Zealand and overseas, high density polyethylene (HDPE) is generally selected for passive barriers as they meet all of these requirements. In T+T's experience with design and installation of these systems, an HDPE barrier is considered the most appropriate solution based on the ability to block vapours (and documented testing to support this through applicable standards) and the availability of experienced installers in New Zealand. Typically, 1.5 mm HDPE geomembrane is readily available for supply in New Zealand and is relatively robust during installation.

However, other proprietary systems can be used as suitable vapour barriers subject to those systems being able to block entry of vapours entering the building. Robust testing data should be provided to support this claim, and be resistant to the contaminant of concern, and testing data should be undertaken in accordance with applicable standards i.e. ASTM or GRI standards. A full options assessment can be undertaken if vapour intrusion is identified and once building foundation designs are confirmed.

Governing factor	**HDPE**
Ability to block the entry of vapours	HDPE is effective at preventing the entry of vapour. The main areas for vapour migration are via holes and failed welds. Both non-destructive and destructive testing of welds can reduce the likelihood of failed welds. Regular inspections during installation can also identify any damage to the barrier. HDPE is the most commonly used barrier material internationally.
Chemical resistance	HDPE has a high chemical resistance to a wide range of hydrocarbons and volatile organic compounds.

Governing factor	HDPE
Availability of suitably qualified contractor	A number of suitably qualified contractors operate in New Zealand with successful track history in vapour barrier installations.
Impact on construction activities.	HDPE is robust and can handle most normal construction activities. Damage during construction can be repaired.

F5.2 Venting system

Venting systems are generally based on either a granular aggregate layer with a pipe collection network or an engineered drainage blanket such as a triaxial geonet.

The advantage of a granular aggregate system is that they can tolerate a greater range of settlement, are relatively simple to install and typically more cost effective provided a supply of aggregate is available. The main disadvantage is that the granular layer is significantly thicker and requires more excavation (typical thickness is between 150 mm and 400 mm).

The use of an engineered venting layer such as a triaxial geonet requires greater care during installation to ensure good connection between the sheets and the extraction pipework is achieved. The layers are also typically more expensive than a granular layer, but due to material being significantly thinner (typically 5 to 10 mm) are used where there are limitations in space, or additional excavation is not ideal.

The venting system can be designed to allow for passive of active venting to allow for sub-slab depressurisation if needed. Active depressurisation would require an extraction system to be installed to actively extract sub-slab vapours, typically at roof level or at a location where vapours can be safely vented.

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