Attachment 4

Land Contamination
Assessment prepared by Beca

Land Contamination Assessment

May Road Development

Prepared for May 1 Limited

Prepared by Beca Limited

22 June 2022

Revision History

Revision Nº	Prepared By	Description	Date
1	Vicky Kennaugh	Feasibility Assessment	4 December 2020
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Document Acceptance

Action	Name	Signed	Date
Prepared by	Vicky Kennaugh		14 April 2022
Reviewed by	Phillip Ware		22 June 2022
Approved by	Dale Paice		22 June 2022
on behalf of	Beca Limited		

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Appendices

Executive Summary

May 1 Limited is planning future redevelopment of their properties at May Road, Mount Roskill (the Site). The Site is located on May Road in the suburb of Mount Roskill and encompasses the properties of 105, 105a-109a, and 119 May Road. The land at 54 Roma Road directly northwest of the Site will be a shaft site for Watercare Services Limited (Watercare)'s Central Interceptor tunnel and 105 May Road is currently being leased by Watercare to facilitate its construction. Beca Limited (Beca) was commissioned to undertake a land contamination investigation for the proposed works. The proposed works comprise earthworks across the majority of the Site in order to form platforms suitable for future development, to realign and naturalise an existing stream channel and to recontour floodplain areas within the Site. The concept design is presented in drawings 3126366-CA-0010 to CA-7301.

105 May Road

Buildings were historically present along the south/south-western boundary of the Site and later demolished by the mid 1970's. The Site then remained primarily undeveloped with a gravel laydown area and vegetation. The Site is currently being used by Watercare's Contractors as a site compound and laydown area. Historical soil investigations undertaken by third parties were reviewed as part of the desktop study and indicate the presence of fill material and soil contamination including asbestos. No soil sampling was undertaken at the Site by Beca as part of this investigation.

105A-109A May Road

The 105A-109A May Road Site was originally developed through the late 1950's to the 1970s. The Site was also historically used by Thermo Polycoatings LTD for 'plastic coatings of articles' and 'kitchenware non-stick coating applications'. The Site is currently used as a car yard and for timber pallet storage. Several stockpiles and general rubbish were also noted across the Site.

The contamination investigation comprised excavation of 18 test pits, installation of 8 boreholes for the collection of groundwater samples and collection of 3 surface water samples. Fill material comprising gravel with cobbles, and traces of buried waste e.g. concrete, bricks, plastic, glass, metal and timber, was observed across the majority of the Site at depths between 0.1-1.1 m bgl. Several soil stockpiles are located across the Site, comprising brown clayey silt with gravel, cobbles and waste material. The waste material (glass fragments, brick, concrete, nails, wire, plastic, rubber tires and timber) was observed on the surface of the stockpile and litter was observed to be scattered across the Site.

Soil contamination (heavy metals and asbestos) above the background concentrations for Auckland volcanic soils and above the applied environmental and human health criteria were recorded in several samples. Groundwater samples recorded concentrations of dissolved and total metals above the applied environmental criteria. Groundwater samples recovered from two boreholes recorded detectable concentrations of the PFAS compound PFOA, which is likely to be related to the historical kitchenware activity operating on the site prior to 1980. One surface water sample recorded a detectable concentration of the PFAS compound PFOS. The stream is a receiving environment for stormwater from the surrounding urban catchment therefore the source could be off-site and not related to the kitchenware coating operation however this has not been confirmed by this investigation. The recorded concentrations of the PFAS compounds in both groundwater and surface water were below the applied drinking water, environmental and interim trade waste disposal guidelines.

119 May Road

A warehouse structure was present from the early 1950's until it was demolished in 2006. Property file records indicate that a fuel oil Above Ground Storage Tank (AST) was present at the rear of the premises.

The soil investigation comprised the excavation of 15 test pits. Fill material comprising silty clay with gravel, cobbles, and traces of buried waste e.g. concrete, bricks, plastic, ceramic, glass, metal and timber was encountered to a maximum depth of 0.8 m bgl.

One soil sample recorded a chromium concentration above the human health and environmental guideline value. The elevated concentration is considered to be a localised exceedance within the fill material and is considered unlikely to present a significant risk to human health or the environment. Asbestos was detected in seven soil samples across six locations. A fragment of asbestos fibre cement was also identified at one of these locations. Three samples recorded concentrations of asbestos above the applied human health guideline.

Risk Assessment

An exposure pathway assessment was completed for the soil investigation and identified several potentially complete exposure pathways. These pathways would occur during demolition / construction (earthworks) phases and could be mitigated and managed through the implementation of management controls. As contaminants including heavy metals, asbestos and PFAS have been identified, all soil disturbance will need to be undertaken in accordance with the management procedures set out in a Contaminated Soils Management Plan (CSMP).

Under the requirements of the NZ asbestos in soils guidelines any soil disturbance works at 105A-109A May Road and 119 May Road should be undertaken as asbestos related works. The procedures for these works will be included within a CSMP.

Sampling of sediment or water quality of the watercourses located on the north-eastern boundary and crossing the Site between the 105 and 105A-109A properties was not undertaken as part of this investigation. Risks to future redevelopment at the Site from contamination within the watercourses relate to contamination already present in sediment from historical activities (on Site and from upstream sources) and also from the current and future Watercare operations if soil handling if not undertaken appropriately. If works are proposed within the watercourse further investigation may be required to inform management or disposal of the material.

Consenting Requirements

Based on the results of this investigation and the proposed works, if permitted activity criteria cannot be met, resource consents under the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (NESCS) as a restricted discretionary activity and Auckland Unitary Plan (AUP) Contaminated Land requirements (E30) as a discretionary activity will be required. As soil concentrations were recorded above the environmental permitted activity soil acceptance criteria a passive discharge consent for the Site may be required.

Soil Disposal

Soil generated during the land disturbance activities will be re-used at the Site if geotechnically suitable and appropriately managed and / or capped as agreed by the contaminated land Suitably Qualified and Experienced Practitioner (SQEP). Where the materials are not considered to be suitable for re-use, spoil materials may be disposed of off-site to a facility authorised to accept such materials.

The disposal of soil and groundwater containing PFAS compounds is currently restricted. There are currently no landfills in NZ where PFAS contaminated soil has a published acceptance level, however a landfill may still accept the material with certain conditions. Material remaining on site is likely to be the preferred option. Soil sampling should be undertaken to inform the presence of PFAS within soils that will be disturbed and may require off-site disposal.

If PFAS is not detected in soil, excess spoil will likely require disposal as managed fill or contaminated fill. Generally, if spoil contains asbestos material (as present at this Site) then that spoil will require disposal as contaminated fill. It is recommended that a copy of the soil analytical results be provided to the nominated disposal facilities for review and material acceptance prior to works commencing.

Conclusions and Recommendations

Soil and groundwater contamination presenting risks to construction workers and future site operators have been identified. These risks can be managed through the construction and operational phase through the resource consent and design processes and the implementation of management plans (including a CSMP).

PFAS is primarily an issue with regards to managing water or disposing of soil or water. It is recommended that soil sampling and/ or further groundwater sampling rounds are undertaken when the proposed earthworks and methodology are confirmed in more detail. This would enable the investigations to be targeted to areas of soil disturbance, and in the intervening time industry practices related to the management and disposal of PFAS contaminated material may have been advanced. As the concentrations measured as part of this investigation are low, the industry may also develop an appreciation of the wider pervasiveness of PFAS compounds in the urban environment and in effect develop background values below which management actions would not be practical. The identified contamination (including PFAS) can be managed during construction through implementation of a CSMP.

1 Introduction

1.1 Background

Beca Limited (Beca) has been commissioned by May 1 Limited to undertake a Land Contamination Assessment at their May Road properties (the Site). The Site is located on May Road in the suburb of Mount Roskill and encompasses the properties of 105, 105A-109A, and 119 May Road. The land directly north-east of the Site will be a shaft site for Watercare Services Limited (Watercare)'s Central Interceptor tunnel. To support the construction of Central Interceptor, Watercare is temporarily leasing part of the Site from May 1 Limited for construction activities such as Site offices, truck access, working platforms and stormwater management areas. Figure 1 shows Watercare's land, the Site and adjacent lots.

This report forms part of a suite of reports prepared to describe the future Site development and assess potential effects. Proposed works are described in the Resource Consent Drawings (June 2022). The other reports are:

- Contaminated Soils Management Plan (based on the findings of this assessment)
- Geotechnical Factual Report.
- Geotechnical Interpretive Report.
- Ecology Assessment.
- Civil and Stormwater Study.
- Resource Consent Drawings.
- Erosion and Sediment Control Plan

Figure 1: Site Location Plan

1.2 Proposed Works

The proposed works comprise earthworks across the majority of the Site in order to form platforms suitable for future development, to realign and naturalise an existing stream channel and to recontour floodplain areas within the Site to suit future developments and manage potential flood hazard effects. In addition to earthworks, the proposed works include landscape planting within floodplains and riparian margins and some modifications to public stormwater pipework to suit the final form.

Temporary earthworks associated with Watercare's Central Interceptor Project are already underway or due to be carried out soon on the adjacent Watercare land (54 Roma Road) and on 105 May Road as described in the sections below. This application covers the formation of the final landform on the Site once the Central Interceptor Project is constructed but not any interim earthworks on 105 May Road during its construction. This earthworks and flood risk effect assessment considers the effect of the proposed works against a pre-development condition represented by the terrain as it was prior 2013. Figure 2 shows cut-fill depths of the proposed bulk earthworks within the Site against that pre-development terrain.

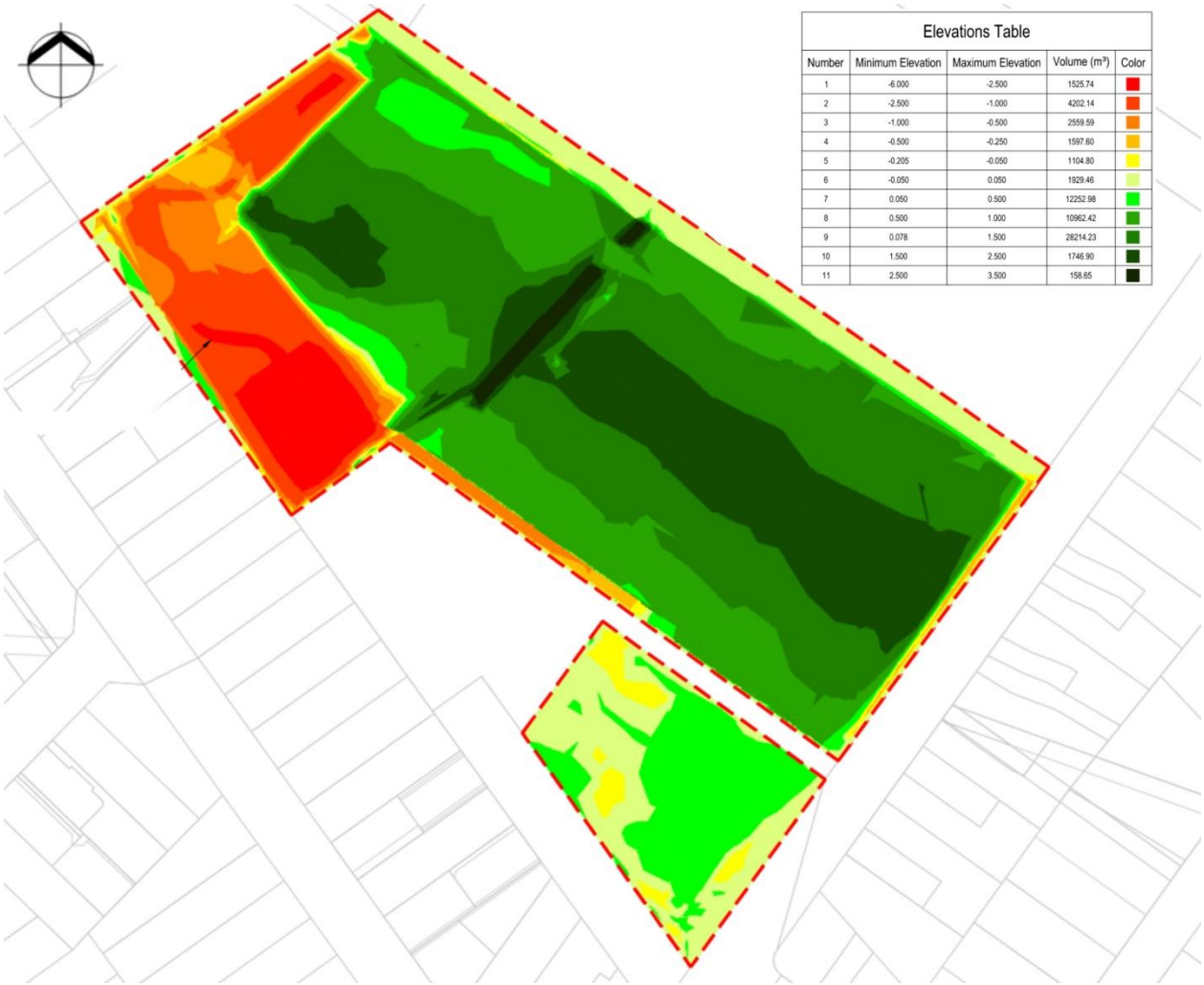


Figure 2. Earthworks Proposed Cut/Fill

1.2.1 Interim works on 105 May Road

Watercare is currently leasing part of the Site (105 May Road) until 2030 from May 1 Limited to facilitate construction of the Central Interceptor project. Watercare's contractors are currently in control of the area. Prior to the establishment of the final proposed works construction activities planned for the 105 May Road property include site offices, truck access, and earthworks to create working platforms and stormwater management areas. Watercare is responsible for any land distributing activities during the lease period including obtaining necessary consents and carrying out land contamination and geotechnical investigations.

Because of this, and because access is currently limited, no land contamination or geotechnical investigations for earthworks on 105 May Road have been carried out specific to this application (although Watercare has shared information that they have gathered to date). Any remaining necessary investigations will be carried out at the end of the lease period when 105 May Road is returned.

1.2.2 Adjacent works on 54 Roma Road

Watercare holds a resource consent to form the permanent tunnel shaft access at 54 Roma Road northeast of the Site under an outline plan of works (OPW60341982). Construction is underway on this site with completion assumed to be before 2030 (that is, the end of the lease). We assume that the finished works

proposed at the Watercare site following the completion of the Central Interceptor construction will return the ground levels to predevelopment levels at the boundary at the Site.

1.3 Purpose and Scope

The purpose of the land contamination investigation was to:

- Provide initial characterisation of potential contaminants in soils within the development area as a result of current or historical activities.
- Identify contaminated land consent requirements for the potential future development under the:
  - Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (NESCS).
  - Auckland Unitary Plan (AUP) Contaminated Land requirements (E30).
- Identify of areas of soil contamination which may require management with respect to risks to human health and to the environment.
- Provide advice for potential future development of the site including disposal of waste spoil, construction management methods and long term development considerations.

The scope of works included a desk-based review of historical background information, plus a ground investigation to provide an indication of potential contaminant levels.

The following information sources were reviewed:

- Auckland Council property files (provided by the Client).
- Auckland Council contamination enquiry, including discharge consent information within 200 m of the site
- Selected publicly available historical aerial photographs.

The ground investigation, undertaken in two phases, comprised:

- Phase 1:
  - Drilling/excavation of 34 test pits, 3 boreholes, 3 hand augers and the installation of 3 standpipe piezometers to a maximum depth of 5 m below ground level (bgl).
  - Collection of 146 soil samples and 3 groundwater samples.
  - Screening analysis of 77 soil samples plus 7 Quality Assurance / Quality Control (QA/QC) soil samples for a combination of heavy metals (arsenic, cadmium, chromium, copper, mercury, lead, nickel and zinc); poly aromatic hydrocarbons (PAH); total petroleum hydrocarbons (TPH); Benzene, toluene, xylene, ethylbenzene (BTEX), and asbestos.
  - Laboratory analysis of six potential fragments of asbestos containing material (ACM) for bulk asbestos.
  - Screening analysis of three groundwater samples plus one QA/QC sample and five sample blanks (field and trip blanks) for total and dissolved heavy metals (arsenic, cadmium, chromium, copper, lead, nickel and zinc), TPH, and per & poly fluoroalkyl substances (PFAS).
- Phase 2:
  - Drilling and installation of 5 piezometers to a maximum depth of 5 m bgl.
  - Collection of 24 soil samples, 8 groundwater samples and 3 surface water samples.
  - Screening analysis of 11 water samples plus 6 QA/QC samples for PFAS. Soil samples will be cold at the laboratory for three months following the date of this report issue.

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

- Ministry for the Environment (MfE) Contaminated Land Management Guidelines No. 1 – Reporting on Contaminated Sites in New Zealand (2011)*.
- MfE Contaminated Land Management Guidelines No. 5 – Site Investigation and Analysis (2011)*.
- New Zealand Guidelines for Assessing and Managing Asbestos in Soils (2017) (GAMAS).

- National Chemicals Working Group of the Heads of the EPAs Australia and New Zealand PFAS National Environmental Management Plan- Version 2.0 (January 2020).

*We note this investigation was undertaken prior to the release of the updated CLMG No.1 and No.5 in July 2021.

2 Site Description

2.1 Site Location and Area

The Site is located on May Road in the suburb of Mount Roskill and encompasses the parcels of 105 (Legal Description SEC 2 SO 4685230), 105A-109A (Legal Description Lot 1 DP 586970, and 119 May Road (Legal Description Lot 3 DP 40979). The Site is located to the north-west of Mount Roskill, it is typically flat between elevations of 49 and 51 mRL, and rises gently to the west, with a low-lying area in the north-western corner of the 105 property. A north-west aligned drainage channel follows the north-eastern boundary of the Site, before discharging to a culvert in the Watercare Site. A second perpendicular drain follows the boundary between 105 and 105A-109A May Road. The layout of the Site, property parcels and drains locations are shown in Figure 3.

A number of large warehouse and smaller shed structures are present on the 105A-109A May Road lots with various stockpiles of wood, refuse, and earth fill, while 105 and 119 May Road are predominately vacant. 105 May Road is currently being leased and serves as the location of the contractor's Site offices as part of Watercare's Central Interceptor project. 119 May road is a completely vacant grassed lot, with a few trees on the Site, the south-west corner has recently been utilised as a laydown area for a wastewater pipeline to be installed along the southern edge of the Site.

Figure 3: Site Parcels (red) and Main Drainage Channels (dashed blue) (Image Source: Nearmap Australia Pty Ltd)

3 Environmental Setting

3.1 Current Land Use

The portion of the Site comprising 105 May Road is currently leased to Watercare to enable the construction of the Central Interceptor Project (CIP). The northern portion of 105 May Road comprises an area of hardfill with office cabins, carparking and materials laydown area. The southern portion of 105 May Road is not currently used by Watercare or developed and is vegetated. The portion of the Site comprising 105A-109A May Road is currently used by several commercial tenants including, a car yard (AR motors) along the eastern frontage and a timber yard (Pacific Timber) in the central area. 119 May Road is currently vacant grassed land.

3.2 Surrounding Land Use

Surrounding land uses include:

- Commercial / industrial properties adjacent to the north-east boundary.
- Residential properties adjacent to the south-west and south-east boundaries.
- Watercare construction Site for the Central Interceptor project on the adjoining property to the north-west.

3.3 Topography

The topography of the Site is relatively flat between elevations of 49 and 51 mRL, and rises gently to the west, with a low-lying area in the north-western corner of the 105 property. A plan showing the topography of the Site is included as Figure 4. The summit of Pukewīwī/Puketāpapa/Mount Roskill, with an elevation of 110 mRL is located approximately 400 m to the east of the Site.

Figure 4: Site Topography (Image Source: Auckland Council GIS Viewer)

3.4 Watercourses and Drainage

There are three main drainage pathways through the Site:

- An intermittent watercourse flows along the south-western boundary of the 105 May Road Site from a public stormwater outlet at 33 Marion Avenue.
- A permanent watercourse (a tributary of Oakley Creek) runs along the north-western boundary of the Site.
- An intermittent watercourse that currently crosses the centre of the Site (along the boundary between 105 May Road and 105A-109A May Road) from a public stormwater outfall and flows into the permanent stream on the north-western boundary.

3.5 Geology and Hydrogeology

Published geological mapping (reproduced as Figure 5) indicates the Site is underlain by basalt lava. The East Coast Bays Formation of the Waitemata Group is likely to extend on to the south-western portion of the Site. A project specific geotechnical investigation was undertaken to better delineate the extent and thickness of the basalt flow; the findings of this investigation are reported[1] separately and indicated on Figure 6.

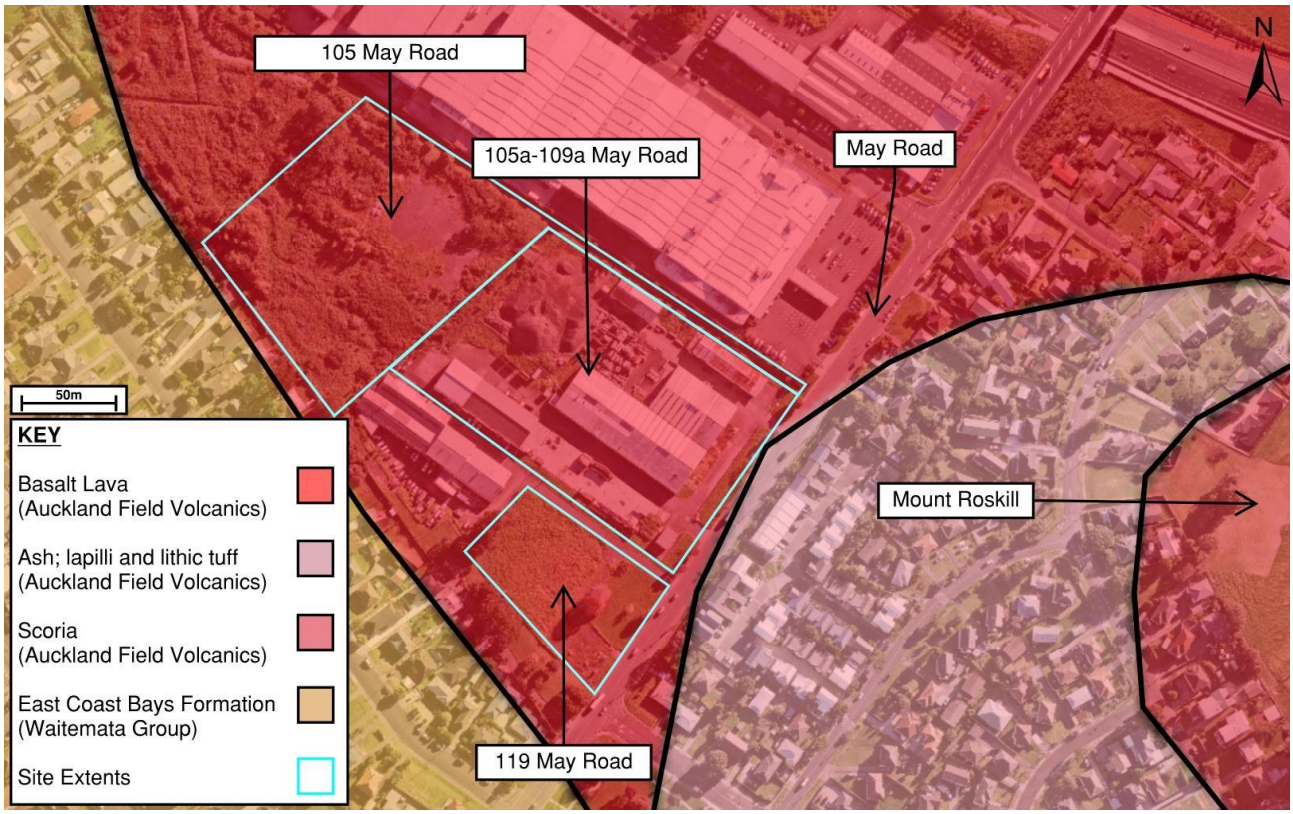


Figure 5: Mapped Geology of the Site (Edbrook, 2001).

[1] Beca Ltd. December 2020. Geotechnical Interpretive Report, May Road Development

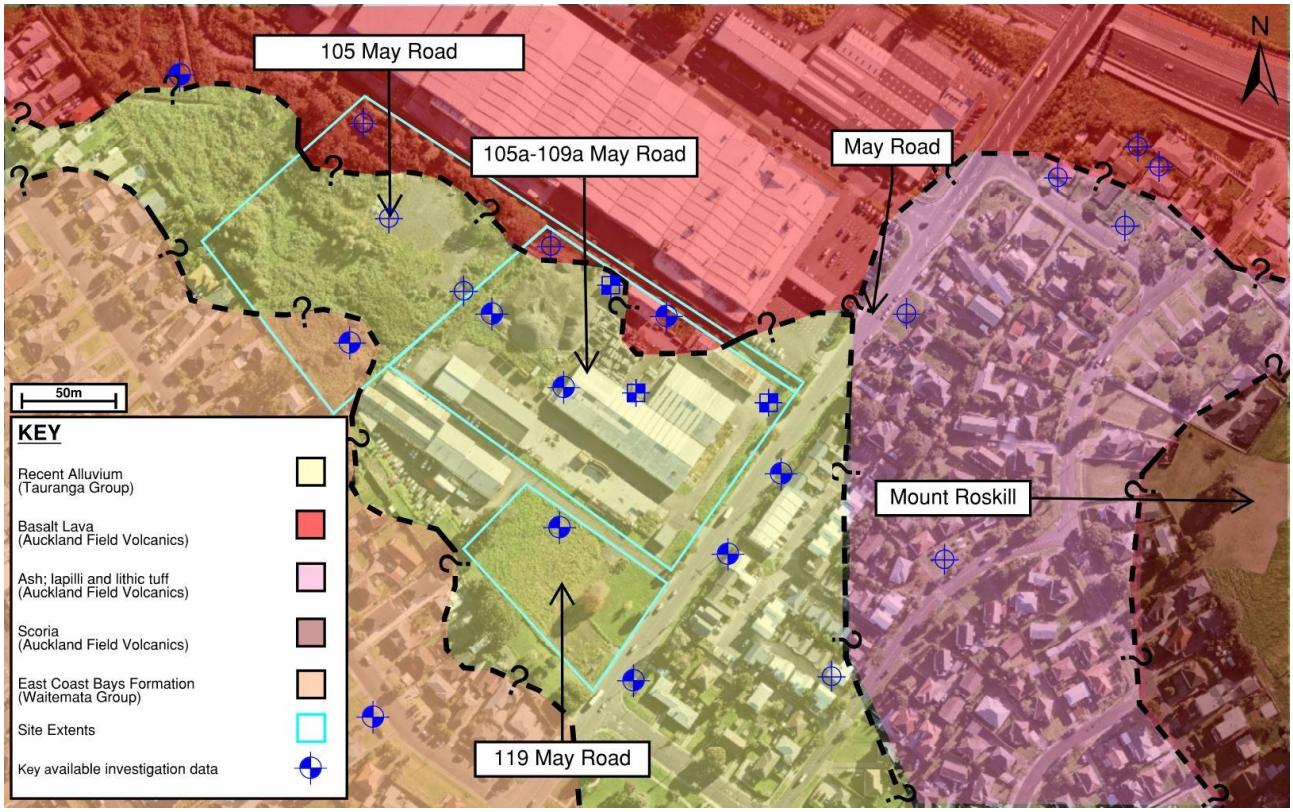


Figure 6. Revised geology[2] of the Site following investigations

Groundwater levels monitored as part of this investigation indicate groundwater levels are at the shallowest approximately 0.5m bgl (refer to Section 9.4 for further details).

3.6 Sensitive Receptors

Surrounding sensitive receptors include:

- Residential properties located adjacent to the south-western and south-eastern boundaries of the Site. Adjacent along the north-eastern boundary are commercial properties.
- Three watercourses passing through the Site.
- Current Site users, including Watercare's Central Interceptor subcontractors on the 105 May Road property.

[2] Beca Ltd. June 2022. Geotechnical Interpretive Report, May Road Development

4 Information Search

4.1 Historical Aerial Photographs

Historical aerial photographs for the Site have been sourced from:

- Auckland Council GIS Viewer (https://geomapspublic.aucklandcouncil.govt.nz/viewer/index.html) for the years 1940, 1959, 1996, 2001, 2008, 2015/16 and 2017
- Retrolens Historical Image Resource (http://retrolens.nz/) for years 1968, 1975 and 1988
- Nearmap (https://www.nearmap.com/nz/en) for 2020.

The aerial photographs have been reviewed to identify any changes in land use activities on the Site; pertinent observations are included in Table 1. Historical aerial images are provided in Appendix A.

Table 1: Summary of Historical Aerial Photograph Observations

Year	On-Site	Surrounding Area
1940	• The Site was predominantly undeveloped pasture. • Watercourses were present along the north-eastern boundary of 105 and 105A-109A May Road and crossing the central portion of the Site in a north-east/south-west orientation. These appear to be in the same approximate position as the current drainage channels. • Several buildings were present along the south-western boundary of 105 May Road. These properties were accessed by a track adjacent to the south-west of the Site, which connected to May Road.	• May Road was present. • The surrounding land was predominantly undeveloped pasture, with several isolated properties (likely domestic dwellings).
1959	• Several of the buildings noted in the south-western area of 105 May Road in the 1940 aerial had been demolished with only one large building and possibly some smaller structures remaining. • The eastern portion of 105A-109A May Road had been developed: in the east one large warehouse structure was present with three smaller structures present to the north-west. A number of small rectangular objects were present around the building. • A large warehouse structure was present in 119 May Road. • The watercourses noted in the 1940 aerial remain, and an additional channel present in the central location of 105 May Road (orientated north-south) was also visible.	• Significant residential development to the south, south-west and east of the Site has occurred. • A warehouse structure was present to the south of 105A-109A May Road and west of 119 May Road.

Year	On-Site	Surrounding Area
1968	• 105 May Road appears to be predominantly vegetated with what appears to be an unvegetated area in the north-west that connects to the eastern development by a path/ track. • The building structures noted in the 1959 aerial in the east of 105A-109A May Road have been removed/ redeveloped and several new large warehouses constructed (these appear to be the same structures that remain today based on shape/ size). • No significant changes observed in 119 May Road.	• A large warehouse structure was present adjacent to the north-eastern boundary of 105A-109A May Road. • The structure present to the south of 105A-109A May Road and west of 119 May Road has been extended along the southern boundary of 105A-109A May Road. • Further commercial/ industrial development has occurred to the north, and residential development to the south, west and east.
1975	• The buildings in the south-western portion of 105 May Road are no longer present. • No other significant changes observed.	• The structure adjacent to the north-eastern boundary of 105 May Road has been extended. • No other significant changes observed.
1988	• The vegetation in the northern portion of 105 May Road appears to have been removed and a track extends from this clearing in 105 May Road off-site to the north-west. • The building along the south-western boundary of the eastern portion of 105A-109A May Road has possibly extended west. • No other significant changes observed.	• Further commercial/ industrial development has occurred to the north, and residential development to the south, west and east.
1996	• First colour photograph reviewed. • The clearing in the northern portion of 105 May Road remains and a track now extends east towards the structures in the 105A-109A May Road. There appears to be a bridge over the watercourse to connect the two areas. • No other significant changes observed.	• No significant changes observed.
2001	• The cleared area in the northern portion 105 May Road has been vegetated. The bridge over the watercourse between the vegetated area in 105 May Road and buildings in 105A-109A May Road still remains although the location of the track is not clear. • A new structure with a red roof is visible on the central portion of 105A-109A May Road. • A number of vehicles are present in the central southern portion of 105A-109A May Road. • No significant changes were observed in 119 May Road.	• No other significant changes observed.

Year	On-Site	Surrounding Area
2008	• 105 May Road remains vegetated and the bridge and watercourse appears to be overgrown. • The structure with the red roof in 105A-109A May Road appeared to have been removed and there are shipping containers stored in this location. To the south-east of the shipping containers there appears to be piles of wood / timber / pallets. • All vehicles previously observed at the Site has been cleared from 105A-109A May Road. • The warehouses previously located on 119 May Road have been removed and the Site appears to be cleared and vegetated except for a sealed portion in the location of the historical warehouse parking lot.	• Additional developments appeared to have been undertaken on the properties on the south eastern border of the Site. No other significant changes were observed.
2015/16	• There is a dark grey, gravelly laydown area located in the central portion of 105 May Road. The road and bridge over the watercourse towards 105A-109A May Road also appears to be covered in the same grey gravel material. A lighter grey gravel road connects and extends from the laydown area in a north-westerly direction from 105 May Road. • There is a stockpile of the lighter grey gravels located in the northern area of 105A-109A May Road. • The shipping containers previously observed in 105A-109A May Road have been removed and replaced with what appears to be wooden pallets or boxes. • The eastern portion of the building located along the south-western boundary of 105A-109A May Road had been demolished and only concrete slab remains. • No other significant changes were observed in 119 May Road.	• A gravel road and what appears to be stockpiles of uncontrolled rubble were observed to the west of 105 May Road. • Some demolition works appeared to have been undertaken at a property directly south of 119 May Road.
2017	• No other significant changes were observed in 105 May Road. • No significant changes were observed in 119 May Road.	• No other significant changes observed.
2020	• A construction compound has been developed in 105 May Road. There are a number of Site cabins and parking areas in the northern portion and stockpiles of material and storage shipping containers to the central/ southern portions.	• No other significant changes observed.

Year	On-Site	Surrounding Area
	• In the western portion of 105A-109A May Road, the large gravel stockpile has been removed and wooden pallets and other unidentifiable objects are present across the Site. • Between the large warehouse buildings and eastern boundary of 105A-109A May Road are a large number of parked cars (currently a car yard). • There appears to be a stockpile of material and equipment laydown area in the eastern portion of 119 May Road.	

4.2 Auckland Council Information

4.2.1 Contaminated Land Enquiry

A Site contamination enquiry was submitted to Auckland Council and a response received on the 29 September 2020. The full response is included in Appendix B and a summary of the information provided:

- Council records indicate the 105A – 109A May Road has possibly been subject to HAIL A17: Storage tanks or drums for fuel, chemicals or liquid waste.
- Council records indicate the Site 105A – 109A May Road, has a permit for an underground tank on Site issued in 1956. Additionally, aerial records indicate the Site has been utilised for the stockpiling of a number of materials over the years, including vehicles.
- There is no information held within Auckland Council records to suggest the Site 105 May Road, Mount Roskill, has been subject to HAIL activities.
- Due to the age of structures on Site (built in the 1950's) the potential for asbestos and/or lead paint may need to be considered.
- There is no information held within Auckland Council records to suggest the Site 119 May Road has been subject to HAIL activities. However, the original building, constructed in 1953, was demolished on Site in 2006, and therefore the potential for asbestos and/or lead paint may need to be considered.

Auckland Council also provided information of consents and incidents recorded within 200 m of the Site. The information provided is summarised in Table 2.

Table 2: Summary of Auckland Council Consents and Incidents Information

Item	Detail
Permitted Activity	• Contaminated Site discharge relating to the removal of an Underground Storage Tank (UST) at 58 Roma Road. The activity holder was Z Energy Limited.
Bores	• Four expired consents for the installation of groundwater bores. The bores related to the abstraction of groundwater for 'industrial ablution and vehicle washing supply', groundwater level and quality investigations and the 'extraction of groundwater for industrial supply'. The consents were granted in 1994 and expired in 1995.
Incidents	• Between 10 and 200 litres of chemicals related to roof cleaning runoff into surface water was recorded in 2009. • Sewage overflow into natural water was recorded in 2011. No other detail was provided.

Item	Detail
Consents	• Information on five consents were provided; three related to the bores detailed above. • The two other consents related to groundwater takes for 'use in welder cooling, industrial powder coating pre-treatment rinse tanks and ablutions' and 'for maintaining staff ablutions, cleaning and domestic use on an industrial Site.' Both consents are listed as surrendered, with expiry dates of 2005.

4.2.2 Closed Landfill Enquiry

The Auckland Council Closed Landfill team indicated that there are no closed landfills managed by the Closed Landfill Management (CLFM) team within 1 km of the Site. CLFM note however that their response does not include closed landfills that are privately owned, or that are managed by other council controlled organisations, such as Watercare or Regional Facilities Auckland. The full response by CLFM is provided in Appendix B.

4.3 Property File

The electronic property file for addresses 105, 105A-109A, 111 and 119 May Road were provided to the project team. A high-level review was undertaken and information relevant to the Sites history and potential contamination sources is summarised in this section. The reviewed reports can be provided upon request.

4.3.1 105 May Road

The file mainly holds site plans prepared by Aecom that was approved by council for Resource Consents for geotechnical investigations at May Road in January 2016.

4.3.2 105A-109A May Road

A summary of the pertinent information from the 105A-109A May Road Site is summarised in Table 3.

Table 3: Summary of 105A-109A May Road Property File Information

Document	Date	Details
Company registration letter	16 October 1970	• The letter noted that the company named Thermo Polycoatings LTD was carrying out the activity explained as '*plastic coatings of articles*' at 109 May Road. • A similar letter dated 5 July 1985 explains the activities as '*Kitchenware non-stick coating applications*'.
Company letter	19 November 1976	• The letter noted that welding activities were being undertaken at properties 109 and 111 May Road.
Fire safety certificate	27 November 1985	• A fire safety certificate for 111 May Road noted that some hazardous goods are normally stored at the premises. The hazardous goods are explained as Class 2 and Class 3 chemicals. Additional documentation reported the renewal licences from dangerous goods held by 'Thermo Polycoatings LTD.' • Additional certificates identified the dangerous goods (gases) stored in volumes over 60 litres in above ground tanks and mobile tanks, as wells as drums of petrol and kerosene stored in drums with a volume less than 60 litres for facilities located at 109 and 111 May Road. It was reported that the dangerous goods that were stored and used at the Site were for undertaking spray painting operations.

Document	Date	Details
Project Information Memorandum	11 March 1998	• The document reports proposed building works for 105 May Road including demolition of existing storage buildings, offices and ablutions in a warehouse. The document reports that the Site is affected by hazardous contaminants and that the Site may be subject to surface flooding. Details of the hazardous contaminants were not listed.
Other documents to note	-	• A building compliance certificates for a new dwelling at 105-107 May Road was noted. • Plans for proposed additions to warehouse buildings, car parks, stormwater pipes at 105 and 109 May Road. • Auckland Council notices for expired building warrant of fitness for the year 1995 onwards for the buildings located at 109 May Road. • Building consent applications, inspections, drainage and sanitary sewer connection permit applications

4.3.3 119 May Road

A summary of the pertinent information from the 119 May Road Site is summarised in Table 4.

Table 4: Summary of 119 May Road Property File Information

Document	Date	Details
Approved building consent	17 November 2006	A consent for the demolition of existing building structures and clearing the Site.
Project information memorandum	7 November 2006	The document reported the historical buildings at this property were first constructed between 1950 and 1960 and at the time of the report the facility was noted to be a ‘vacant ex clothing factory’. Associated demolition consent documents also included a letter, dated 26 November 2006, that stated that a resource consent was required for the demolition works due to the presence of protected trees (She-oak).
Fire safety certificate	6 August 1986	The facility at this property was noted as used as a ‘clothing and children shoes warehouse’ and that Class 3 (c) hazardous substances were stored at the facility.
Fire safety certificate	20 November 1985	The certificate noted that the facility at this property stored 4500 l fuel oil in an aboveground tank (AST). The location of the fuel oil storage tank was not noted in the property file. The company was registered as Kinway Garments LTD.
Building consent notice	13 June 1963	Noted the temporary erection of office accommodation adjacent to the existing factory located at 119 May Road. It was noted that the buildings will be removed after two years.
Letter from a dangerous goods inspector	23 February 1990	The letter noted that the dangerous goods licence for the Site can be cancelled as the aboveground fuel tank at the rear of the premises appeared not to be in use. It was based on the condition that the

Document	Date	Details
		aboveground tank be removed, serviced prior to further use or remain empty.
Other documents to note	-	Some consents for upgrades to underground water pipes, and stormwater drains

4.3.4 111 May Road

The review of the property file for 111 May road was limited to a high-level screening for contamination related activities since this file contained a large number of documents and is not the subject Site of this investigation.

- A building application dated May 1955 was included for application for permission to erect a factory. The application form was stamped 'approved'
- A building consent application was authorised for the facility dated 10 August 1998. The consent noted that the facility was proposed to be used as a motor vehicle servicing warehouse.
- Application for a dangerous good licence, dated 1988. Quantities or types of dangerous goods are not listed.
- A document dated July 1989 stating 'it is our intention to continue the manufacture of fibre glass products at these premises'.
- A resource consent application dated July 1998 included an overview of the Site history stating, the Site was used for engineering manufacturing and later as a commercial/ warehouse property with motor vehicle servicing and related activity.
- Several documents refer to a proposal to install a wireless communication mast.

4.4 Site Walkover

A Site walkover was undertaken by a Beca Environmental Scientist on 29 September 2020, accompanied by Mr Hamish Gard (TSA Project Manager). The following observations were made:

4.4.1 105 May Road

- The central and northern portions of 105 May Road are currently being used by Watercare and their subcontractors Ghella Abergeldie Joint Venture (GAJV) as a compound and laydown area for the construction of the Central Interceptor project. GAJV inductions are required to walk round 105 May Road.
- The northern and central portion of 105 May Road is covered with gravel hardfill. The southern portion and adjacent to the eastern boundary are vegetated.
- Waste bins/ skips, equipment (plant, construction materials), storage containers and stockpiles of gravel and basalt were present across 105 May Road.
- Standing water was observed in the south-western portions of the Site.
- Watercourses were present along the western, eastern and northern boundaries.
- General rubbish (including a fridge, plastic, litter) was observed across the Site.
- The south-eastern corner of 105 May Road is at an approximate 3 m higher elevation that the rest of the Site, with the south-western corner the low point.

4.4.2 105A-109A May Road

- The eastern frontage of the Site is currently used as a car yard, with cars parked for sale.
- The northern access road appeared to be used by Watercare / GAJV to access 105 May Road.
- In the central portion of the Site were piles of timber pallets.
- The western portion of the Site was also used by Watercare/ GAJV with plant (hi-ab and piling rig) and waste skips observed during the walkover.

- To the west of the central long warehouse building was a vegetated stockpile of sandy gravel. It appeared that this stockpile had been dug into previously. General rubbish was also observed on the stockpile.
- Large pieces of concrete (approximately 2.0 m length by 1.0 m wide by 0.5 m high) with potential ACM shuttering were observed in the west of 105A-109A May Road.
- Along the southern boundary was a concrete slab (indicative of a historical building foundation) with vehicles parked and piles of wood, paving slabs, tyres etc.
- In the southern access road several manholes with missing covers were observed.
- Surface cover varied across 105A-109A May Road comprising asphalt, gravel hardfill, vegetation and reinforced concrete slab. Potholes and cracking were observed in the hardcover.
- General rubbish (wood, plastic, metal, tyres) a boat and piles of wood/timber and disused metal frames were observed across 105A-109A May Road.

4.4.3 119 May Road

- 119 May Road is currently predominantly undeveloped and covered in grass/ vegetation.
- Along the eastern boundary and in the south-eastern corner the Site is covered in hardfill. Mr Gard indicated that this area was recently used as a laydown area during the installation of stormwater pipe along May Road.
- A stockpile of soil was present in the eastern portion of 119 May Road, again reported by Mr Gard to be related to the stormwater pipe installation.
- Several trees were present in the central eastern area with some general rubbish, a fly tipped armchair and concrete/ asphalt slabs observed.
- Some areas of standing water were observed.

4.5 Client Provided Information

Asbestos survey reports for the buildings located on the 105A-109A May Road Site were requested but were not provided for review. Three reports were provided by the Client for review of background information. Two of the reports were prepared by Babingtons for GAJV and one by Tonkin and Taylor (T&T) for Watercare as part of the Central Interceptor Project. We note that the Client has no reliance over the results or content of the Babingtons and Tonkin and Taylor reports and Beca have not independently verified the content. The reports have been reviewed to inform our assessment and a summary is provided.

4.5.1 Ground Contamination Investigation 105 May Rd, Mt Roskill – Tonkin and Taylor (January 2014)

T&T undertook a ground contamination assessment for Watercare at 105 May Road. The investigation area was described for two sections; Section 1 (not located on the Site that is being assessed as part of the current investigation and located at the current day 54 Roma Road) and Section 2 (located at 105 May Road). It is understood that during the Site investigation Watercare leased Section 2 and that it had previously been used by its owner for temporary storage of gravels and asphalt millings for community construction projects (the storage duration and origin of materials are unknown). Stockpiles of gravels and asphalt millings were noted to be located in the vicinity of the south-east corner of Section 2. It was further noted that Section 2 was only to be used by Watercare for access to Section 1 and, if required, be used as laydown or storage area for the future Central Interceptor Project (CIP).

Watercare requested the characterisation of the soils at Section 2 to establish whether the stockpiling activity has the potential to have caused contamination. T&T reported that a previous assessment had been undertaken in 2011 at the same location and the 2014 assessment was to be considered as a follow-up assessment in order to determine additional contamination that may have occurred between 2011 and 2014, It was reported to assess the ‘start of lease’ ground conditions.

Five test pits were excavated within Section 2 to a maximum of 2 m bgl. Soil samples were recovered from these test pits at varying depths as well as one additional surface soil sample from a sixth location. Water samples were recovered from four locations within reported drains; one upstream of Section 2, two locations within the Site and one downstream location of the Site.

20 soil samples were analysed for a suite of metals and polyaromatic hydrocarbons (PAH) and 10 samples for total petroleum hydrocarbons (TPH). Additionally, four water samples were analysed for metals, TPH and PAHs.

The laboratory results for soil recovered in Section 2 showed levels of metals and hydrocarbons above background concentrations. It was noted by T&T that the results indicated fill and topsoil were likely to have been impacted by historical infilling or current stockpiling activities. The underlying material met the natural background concentrations and was not considered to have been impacted by the overlying fill. ACM fragments were identified in a stockpile on Section 2 and low concentrations of asbestos were noted to likely be present in the topsoil and fill on this part of the Site. Further testing of surface soils for asbestos sampling was proposed to be undertaken.

No detectable concentrations of PAH or TPH were identified in any of the water samples tested. Total metal concentrations were marginally higher than the dissolved metals concentrations, indicating low concentrations of suspended sediment in the drains. The results of water samples collected from the on-Site drains indicate that the stockpiling activities did not appear to have been impacting the quality of water discharging from the Site.

4.5.2 Detailed Site Investigation – 105 May Road, Mt Roskill - Babingtons (March 2020)

Babingtons undertook a DSI for GAJV at the 105 the May Road Site as the Site is to be used as a staging area for primary construction for the CIP.

Soil sampling was undertaken to investigate any soil contamination through test pitting. The test pits were excavated to depths between 0.5 and 1.5 m bgl. Eight test pits were excavated in the central area of the Site during the first portion of the investigation in order to advise on off-site disposal options. During a second investigation phase, an additional five test pits were excavated in the remainder of the Site to determine the contamination risk of the soil. Five of the originally proposed test pits were not excavated due to access limitations or due to surface soil material being removed and disposed of prior to undertaking the investigation.

Suspected fill material was noted to have been encountered at all locations across the Site and natural ground was noted at some of the test pits. A CIP office compound was noted in one portion of the Site while the remainder of the Site was overgrown with grass, shrubs and trees. It was considered possible that uncontrolled filling and fly tipping had occurred at the Site in the past and that the extent of these materials may have been concealed by the undergrowth. Additional observations noted an overland water channel on the north eastern portion of the Site and that the Site was prone to flooding events. Some commentary was provided around previous sediment sampling that was undertaken at the overland flow path on the neighbouring Site (to the west of 105 May Road, at 58 Roma Road). It was reported that asbestos was present in concentrations above the human health guidelines and considered likely that asbestos contaminated sediment could have been deposited at 105 May Road during flooding events.

Soil samples were recovered from various depths in the soil profile and tested for heavy metals, PAHs TPHs and asbestos to target contaminants of concern relating to previous filling activities at and at surrounding areas. 29 soil samples were analysed for heavy metals, 16 soil samples were tested for TPHs and PAHs and 15 soil samples were tested for asbestos.

The laboratory results and major findings of the investigation are summarised:

- It was considered ‘more likely than not’ that the Site is a HAIL Site due to past and current Site activities (HAIL I – related to uncontrolled historical filling) on the ‘piece of land’
- It was noted that the soil underlying the Site comprised at least 1.5 m of fill at some locations
- Heavy metal concentrations exceeded the natural background concentrations at ten sampling locations, the NESCS human health guidelines were not exceeded for heavy metals
- Lead and zinc concentrations exceeded the AUP Permitted Activity Soil Acceptance Criteria at one location that indicated a risk to environmental receptors
- The soil concentrations of PAH analytes were reported above the laboratory detection limits, but below the relevant risk acceptance criteria at thirteen sample locations
- The soil concentrations of TPH analytes were found to be above the laboratory detection limits, but below the relevant risk acceptance criteria at nine sampling locations
- The proposed works and likely soil removal at this HAIL Site triggered the application of the NESCS and AUP.
- Soil sampling for asbestos was reported as follows:
  - Asbestos was detected in 2 of the 15 soil samples analysed, one of which exceeded the human health guidelines.
  - It was noted that limited sediment sampling was undertaken in 2019, in the overland flow path at a location that was referred to as ‘the main May Road Site’. It noted that the results showed asbestos concentrations above the human health guideline. The locations of where the samples were recovered was not clear and the concentrations of detected asbestos was not noted.
  - It was further reported that asbestos was measured above the human health guidelines at two separate sampling locations adjacent to each other in ‘the 2019 and 2020 investigations. It was further recommended that it would require Class B soil removal for that area of Site. However, the locations of where these samples were recovered were not clear and the concentrations of detected asbestos was not noted.
- The provided report summarises historical soil sampling investigations, undertaken by other consultants, at the Site.
  - A Site investigation by Tonkin and Taylor was undertaken in 2013 also provided and discussed in Section 4.5.1.
  - A Site investigation undertaken by Soil and Rock Consultants in 2019. The soil investigation excavated 13 hand auger holes to a maximum depth of 0.3 m bgl and analysed 14 soil samples recovered from these test pits. Heavy metals in two of the samples were reported above the natural background concentrations. None of the targeted hydrocarbon compounds were detected above the risk acceptance criteria. Asbestos was found to be present in one soil sample above the human health guidelines.

4.5.3 Preliminary and Detailed Site Investigation 105A-109A May Road, Mt Roskill - Babingtons (August 2020)

Babingtons undertook a PSI and DSI for GAJV at 105A-109A May Road (105A-109A May Road) as a portion of the Site is to be redeveloped for Site offices and car parking facilities for the construction Site at May Road as part of the Central Interceptor Project (CIP).

HAIL activities identified by Babingtons during this investigation on a ‘more likely than not’ basis to currently or to have historically occurred on the ‘piece of land’ intended for the proposed activity was noted as:

- A18 – Wood treatment or preservation including the commercial use of anti-sapstain chemicals during milling, or bulk storage of treated timber outside
- E1 – Asbestos products manufacture or disposal including Sites with buildings containing asbestos products known to be in a deteriorated condition
- G4 – Scrap yards including automotive dismantling, wrecking or scrap metal yards

- I – Any other land that has been subject to the intentional or accidental release of a hazardous substance in sufficient quantity that it could be a risk to human health or the environment.

The exact locations of the identified HAIL activities were not specified in the report. Based on the identified HAIL activities, the following contaminants of concern were identified by Babingtons:

- Asbestos Containing Material (ACM);
- Heavy metals, including boron, cobalt, mercury and tin; and
- Total Petroleum Hydrocarbons / Polycyclic Aromatic Hydrocarbons (TPH / PAH)

Soil contamination sampling took place to investigate potential contamination in the north-western portion of the Site through completion of seven test pits to a maximum depth of 0.8 m bgl. Samples were recovered from surface and 0.5 m bgl. Fill was observed in the majority of test pit locations to at least 0.7 m bgl, with natural ground encountered at some of the locations.

Soil samples were recovered from two stockpiles present on the Site (locations unknown) during the field investigation works. It was noted that the stockpile comprised mainly coarse granular basecourse material with broken concrete pieces intermixed. No obvious contamination was noted within the stockpiles.

The bigger of the two stockpiles were reported to be overgrown with grass and weeds and had not been disturbed in some time. Limited visual inspection of the material below the overgrowth indicated the material appeared to be a mixture of topsoil, coarse demolition waste and basecourse gravel material. The stockpile was observed to contain waste material such as plastics, metal, concrete and asphalt, intermixed with granular and cohesive soil material.

One sediment sample was recovered in the overland flow path at the Site boundary to be tested for asbestos since it was identified as a potential contaminant of concern during flood events at the Site.

The laboratory results and major findings of the investigation is summarised below:

- Asbestos was detected in six soil samples that were analysed on the ‘piece of land’, one of which exceeded the human health guidelines (in a soil sample recovered from surface)
- The sediment sample reportedly recovered from a location outside the boundary of what was referred to as the ‘piece of land’ (on the adjacent overland flow path) detected asbestos at a concentration that exceeded the human health guidelines
- Heavy metal concentrations were reportedly exceeding the natural background concentrations at five sampling locations but not the human health thresholds
- It was reported that five samples were analysed for PAHs, with concentrations in three of the samples exceeding the laboratory detection limits. However, there were no exceedances of the relevant risk acceptance criteria at any of the sampled locations for the intended land use.
- TPHs were reported to be detected in low concentrations above the laboratory detection limits in two of the three analysed samples but below the relevant guidelines criteria.

5 Summary of Information Search

5.1 105 May Road

- Watercourses present along the eastern and northern boundaries were observed in the 1940 aerial and are still present today. A watercourse was also noted on historical aerials in the centre of 105 May Road that was not observed during the walkover.
- The central area and northern boundary of 105 May Road is identified by Auckland Council to be within a flood plain/ flood prone area.
- Buildings were historically present along the south/south-western boundary observed in the 1940 aerial; several had been demolished by 1959 and all demolished by 1975.
- 105 May Road has historically been predominantly vegetated with the northern portion cleared and gravel laydown areas with tracks connecting the Site to 105A-109A May Road and off-Site to the west noted on multiple aerials.
- 105 May Road is currently being used by GAJV as a Site compound and laydown area.
- AC report they hold no records to suggest 105 May Road has been subject to HAIL activities, although as noted below, Babingtons determined the site to be a HAIL Site based on their DSI findings.
- The south-eastern corner of 105 May Road is at an approximate 3 m higher elevation that the rest of the Site.
- Historical ground investigations have been undertaken across 105 May Road by T&T and Babingtons.
  - The findings of the investigation identified varying depths of fill material across the Site. Babingtons considered it possible that uncontrolled filling and fly tipping had occurred at the Site in the past and that the extent of these materials may have been concealed by the undergrowth.
  - Soil contamination (heavy metals, TPH and PAH) were recorded above background soil concentrations in multiple samples.
  - ACM fragments were observed in a stockpile by T&T and it was considered likely that asbestos would be present in the topsoil and fill on this part of the Site.
  - Asbestos was also detected in soil, with several samples recording concentrations above human health guidelines.
  - Additional observations by Babingtons noted an overland water channel on the north-eastern boundary and that the Site was prone to flooding events. Commentary was provided by Babingtons around previous sediment sampling that was undertaken at the overland flow path on the adjacent western Site. It was reported that asbestos was present in concentrations above the human health guidelines and considered likely that asbestos contaminated sediment could have been deposited at 105 May Road during flooding events.
  - It was considered by Babingtons that 105 May Road was on a ‘more likely than not’ basis a HAIL Site due to past and current Site activities (HAIL I – related to uncontrolled historical filling).

5.2 105A-109A May

- 105A-109A May Road was observed to initially have been developed in the 1959 aerial. In the 1968 aerial the original structures appeared to have been removed/ redeveloped and several new structures constructed (these appear to be the same structures that remain today based on shape/ size).
- Historical aerials indicate that 105A-109A May Road has also been subject to vehicle storage and timber/ pallet storage.
- AC records indicate 105A-109A May Road has possibly been subject to HAIL A17: Storage tanks or drums for fuel, chemicals or liquid waste, with a permit for an underground tank issued in 1956. No details or

locations on this UST were provided. Additionally, AC stated that aerial records indicate the Site has been utilised for the stockpiling of a number of materials over the years, including vehicles.

- Documents contained within the property file indicate that 105A-109A May Road was historically used by Thermo Polycoatings LTD for 'plastic coatings of articles' (1970 company registration letter) and 'Kitchenware non-stick coating applications' (1985 letter).
- A fire safety certificated dated 1985 indicates dangerous goods (gases) stored in volumes over 60 litres in above ground tanks and mobile tanks, and drums of petrol and kerosene with a volume less than 60 litres for facilities located at 109 and 111 May Road. It was reported that the dangerous goods that were stored and used at the Site were for undertaking spray painting operations.
- Asbestos survey reports were requested for review but were not provided. Based on the age of construction of the buildings the presence of asbestos in structures is likely.
- Babingtons completed a PSI/DSI for 105A-109A May Road in 2020 for Watercare.
  - HAIL activities identified by Babingtons on a 'more likely than not' basis were:
    - A18 – Wood treatment or preservation including the commercial use of anti-sapstain chemicals during milling, or bulk storage of treated timber outside
    - E1 – Asbestos products manufacture or disposal including Sites with buildings containing asbestos products known to be in a deteriorated condition
    - G4 – Scrap yards including automotive dismantling, wrecking or scrap metal yards
    - I – Any other land that has been subject to the intentional or accidental release of a hazardous substance in sufficient quantity that it could be a risk to human health or the environment.
  - The locations of the HAIL activities were not described.
  - Test pits completed by Babingtons identified fill material to at least 0.7 m bgl and soil contamination comprising asbestos (above human health guidelines) and heavy metals (above background soil concentrations) were recorded. One sediment sample was recovered from the flow path on the western boundary; asbestos was detected at a concentration that exceeded the human health guidelines

5.3 119 May Road

- A warehouse structure was observed on the 1959 aerial, with Auckland Council indicating the building was constructed in 1953.
- Records in the property file indicate the Site was used as a clothing and shoe factory / warehouse.
- The property file records indicate that in 1985 a 4500 litre AST for fuel oil was reported to be present at the rear of the premises. In 1990 a letter noted that the AST did not appear to be in use and the dangerous goods license could be cancelled if the tank was removed, serviced prior to use or remained empty. The exact location of the fuel tank and if it was removed in 1990 is unknown.
- The warehouse was demolished in 2006.
- Auckland Council report they hold no records to suggest 119 May Road has been subject to HAIL activities.

6 Site Investigation Scope and Rationale

6.1 Potential Contaminants of Concern

Review of the Site historical information has identified the following land use activities which may have resulted in the contamination of soil and/or groundwater at the Site (Table 5). Potential contaminants of concern associated with these activities have also been identified.

Table 5: Potential Contaminants of Concern

Site Area	Activity	HAIL Code	Potential Contaminants of Concern
105 May Road	• Historical unknown filling	• I – Any other land that has been subject to the intentional or accidental release of a hazardous substance in sufficient quantity that it could be a risk to human health or the environment	• Heavy Metals including arsenic, cadmium, chromium, copper, lead, mercury, nickel, zinc • Total petroleum hydrocarbons (TPH) • Asbestos
105A-109A May Road	• The buildings on Site were constructed in the early 1950's and therefore the use of asbestos containing materials (ACM) and lead paint is possible. Over time these materials could have deteriorated resulted in contamination of shallow soil. • The presence of fill material related to the historical construction of the buildings is unknown. • Storage of fuel recorded on Site. • Reported historical activity relating to the application of non-stick coatings to kitchenware	• E1 – Asbestos products manufacture or disposal including Sites with buildings containing asbestos products known to be in a deteriorate state • I – Any other land that has been subject to the intentional or accidental release of a hazardous substance in sufficient quantity that it could be a risk to human health or the environment • A17 – Storage tanks or drums for fuel, chemicals or liquid waste	• Heavy Metals • Total petroleum hydrocarbons (TPH) • Polycyclic aromatic hydrocarbons (PAH) • Benzene, toluene, xylene, ethylbenzene (BTEX) • Asbestos • Per & Poly Fluoroalkyl Substances (PFAS)
119 May Road	• The building previously located on Site was constructed in the early 1950's and therefore the use of asbestos containing materials (ACM) and lead paint is possible. Over time these materials could have deteriorated resulted in	• E1 – Asbestos products manufacture or disposal including Sites with buildings containing asbestos products known to be in a deteriorate state. • I – Any other land that has been subject to the intentional or accidental	• Asbestos • Heavy Metals • TPH • BTEX • PAH

Site Area	Activity	HAIL Code	Potential Contaminants of Concern
	contamination of shallow soil. • The presence of fill material related to the historical construction or demolition of the building is unknown. • A fuel tank was reportedly present at the rear of the building.	release of a hazardous substance in sufficient quantity that it could be a risk to human health or the environment. • A17 – Storage tanks or drums for fuel, chemicals or liquid waste	

6.2 Investigation Rationale

A summary of the investigation and sampling rationale is included in Table 6.

As asbestos was identified as a main contaminant of concern the investigation sampling density was determined based on the recommended investigation approach set out in Table 3 of the GAMAS. The GAMAS sets out recommended investigation approaches based on five categories of the likelihood of asbestos contamination, from unlikely to known, which is used to inform the required sample density based on the site area.

Sampling of sediment or water quality of the watercourses located on the north-eastern boundary and crossing the Site between the 105 and 105A-109A properties was not undertaken as part of this phase of investigation. Risks to future redevelopment at the Site from contamination within the watercourses relate to contamination already present in sediment from historical activities (on Site and from upstream sources) and also from the current and future Watercare operations if soil handling if not undertaken appropriately. If works are proposed within the watercourse further investigation may be required to inform management or disposal of the material (water or sediment).

Table 6: Investigation Rationale

Site Area	Potential Contamination Source	Investigation Approach/ Rationale
105 May Road	• Historical unknown filling	• As Watercare and their contractors (GAJV) are currently occupying a portion of the Site and their proposed works comprise the excavation of the majority of the Site for an area of flood compensation. • No investigation works were undertaken at 105 May Road.
105A-109A May Road	• The buildings on Site were constructed in the early 1950's and therefore the use of asbestos containing materials (ACM) and lead paint is possible. Over time these materials could have deteriorated resulted in contamination of shallow soil	• Table 3 of the GAMAS recommends that were the likelihood of asbestos is possible (unsuspected fill) or suspected (based on the presence of pre-2000 building structures) then a sample density at the GAMAS recommended sample grid be undertaken. For 105A-109A May Road the recommended investigation sample density was calculated based on removing the approximate area of Site constraints where access was not possible (buildings, access routes to be maintained, service standoff etc - approx. 10,000 m^2) from the total Site area (20,000 m^2)- therefore 21 sample locations were recommended.

Site Area	Potential Contamination Source	Investigation Approach/ Rationale
	• The presence of fill material related to the historical construction of the buildings is unknown.	• Test pits were chosen to allow for better visual observations for potential buried waste or ACM across the Site. • Review of aerials indicates that the areas adjacent to the building footprints were predominantly covered in hardstanding from when they were developed, therefore shallow soil contamination from asbestos unlikely. An asbestos survey was not provided for the site. One soil sample location was identified in an area of soft landscaping targeting the perimeter of a building potentially containing ACM (based on age). All other building perimeters were surrounded in hardstanding. • Contamination relating to the deterioration of ACM/ lead paint would be limited to shallow soils as it would not migrate through the soil profile, therefore samples to be collected in the top 0.2 m. Asbestos fibres related to significant runoff or windblown deteriorated asbestos would likely be channelled to the catch pits observed during the Site walkover or areas of gravel hardfill or soft landscaped areas at the edge of the hardstanding (adjacent to the watercourses). Test pits were located in areas of gravel hardfill surface cover (predominantly the north-eastern corner of the Site). • 18 test pits to be located across the Site, to be undertaken on an approximate systematic grid of accessible areas to provide an indication of the presence of fill material. • Soil samples in fil material to be collected at regular intervals through the fill and where observations in changes in material type/ colour / odour were noted. • Soil samples were also recovered from the three boreholes to meet the recommended sample density. • Samples to be analysed for heavy metals, asbestos and TPH.
	• On-site stockpiles of unknown source	• Soil sampling from stockpiles of unknown material. One large stockpile was observed during the site walkover and other smaller stockpiles to be sampled prior to excavating a test pit in the same location. • Samples to be analysed for heavy metals, asbestos and TPH.
	• Storage of fuel recorded on Site	• Areas of potential fuel storage were not confirmed following the desk based information review. • An allowance for BTEX and PAH analysis in addition to the standard heavy metals and TPH analysis was included for. Samples for BTEX and PAH analysis would be determined based on field observations (e.g., staining and odours).
	• Reported historical activity relating to the application of non-stick coatings to kitchenware	Phase 1 • Installation and sampling of three boreholes located at the perimeter of the Site to enable collection of groundwater samples to identify potential widespread presence of PFAS. • Groundwater samples analysed for heavy metals, TPH and PFAS. • Soil samples for PFAS collected and held by the laboratory for future analysis if determined to be required. Soil samples not analysed during

Site Area	Potential Contamination Source	Investigation Approach/ Rationale
		this initial phase of investigation as the source location (i.e. building in which the non-stick coating was applied) is not confirmed. Phase 2 (March / April 2021) • Installation of an additional five boreholes to provide a greater sampling density across the site following the PFAS detection in the Phase 1 investigation.
119 May Road	• The building previously located on Site was constructed in the early 1950's and therefore the use of ACM and lead paint is possible. Over time these materials could have deteriorated resulted in contamination of shallow soil. • The presence of fill material related to the historical construction or demolition of the building is unknown.	• Table 3 of the GAMAS recommends that were the likelihood of asbestos is suspected (based on the presence of pre-2000 building structures) then a sample density at the GAMAS recommended sample grid be undertaken. For 119 May Road the approximate Site area is 6000 m^2 therefore 15 test pits recommended. • Contamination relating to the deterioration of ACM/ lead paint would be limited to shallow soils as it would not migrate through the soil profile, therefore samples to be collected in the top 0.2 m. • Soil samples in fil material to be collected at regular intervals through the fill and where observations in changes in material type/ colour / odour were noted. • Test pits were chosen to allow for better visual observations for potential buried waste or ACM across the Site. • Ten test pits will be located in the approximate position of the perimeter of the former building on Site. • The remaining five test pits will be located across the remainder of the Site to provide general coverage and an indication of the presence of potential fill. • Soil samples to be analysed for heavy metals, asbestos and TPH.
	• A fuel tank was reportedly present at the rear of the building.	• Three test pits located near the rear of the building (reported position of a fuel tank) to be analysed for PAH and BTEX.

6.3 NESCS Permitted Activity Provisions

Given activities on the MfE HAIL have been undertaken at the Site on a 'more likely than not' basis, the NESCS applies with respect to the soil sampling activities undertaken. The soil sampling was undertaken as a permitted activity in accordance with Regulation 8(2), as the following requirements were met;

- Measures were in place to minimise human exposure to contaminants before, during, and after the sampling program.
- The sampling locations were immediately restored to an erosion resistant state upon completion of the sampling program.
- No soil was removed from the Site except for sample analysis.

7 Summary of Field work

7.1 Summary of Field Work

7.1.1 Phase 1

The investigation was undertaken between 19 October and 9 November 2020. Soil samples were collected from 34 test pits, 3 boreholes, and 3 hand augers. Three groundwater samples were collected from the three installed boreholes. Test pits were excavated using a 15 tonne excavator and boreholes were drilled using a sonic drill rig. Site Investigation Plans are included as Figure 7 and Figure 8.

Figure 7: 105A-109A May Road Exploratory Hole Plan. Image Source: NearMap

Figure 8: 119 May Road Exploratory Hole Plan. Image Source: AC GeoMaps

7.1.2 Phase 2

The drilling and piezometer installation of an additional five boreholes was undertaken on the 29 and 30 March 2021 using a Geoprobe CPT rig. Groundwater and surface water sampling was undertaken on the 12 and 13 April 2021. A sample location plan is included as Figure 9.

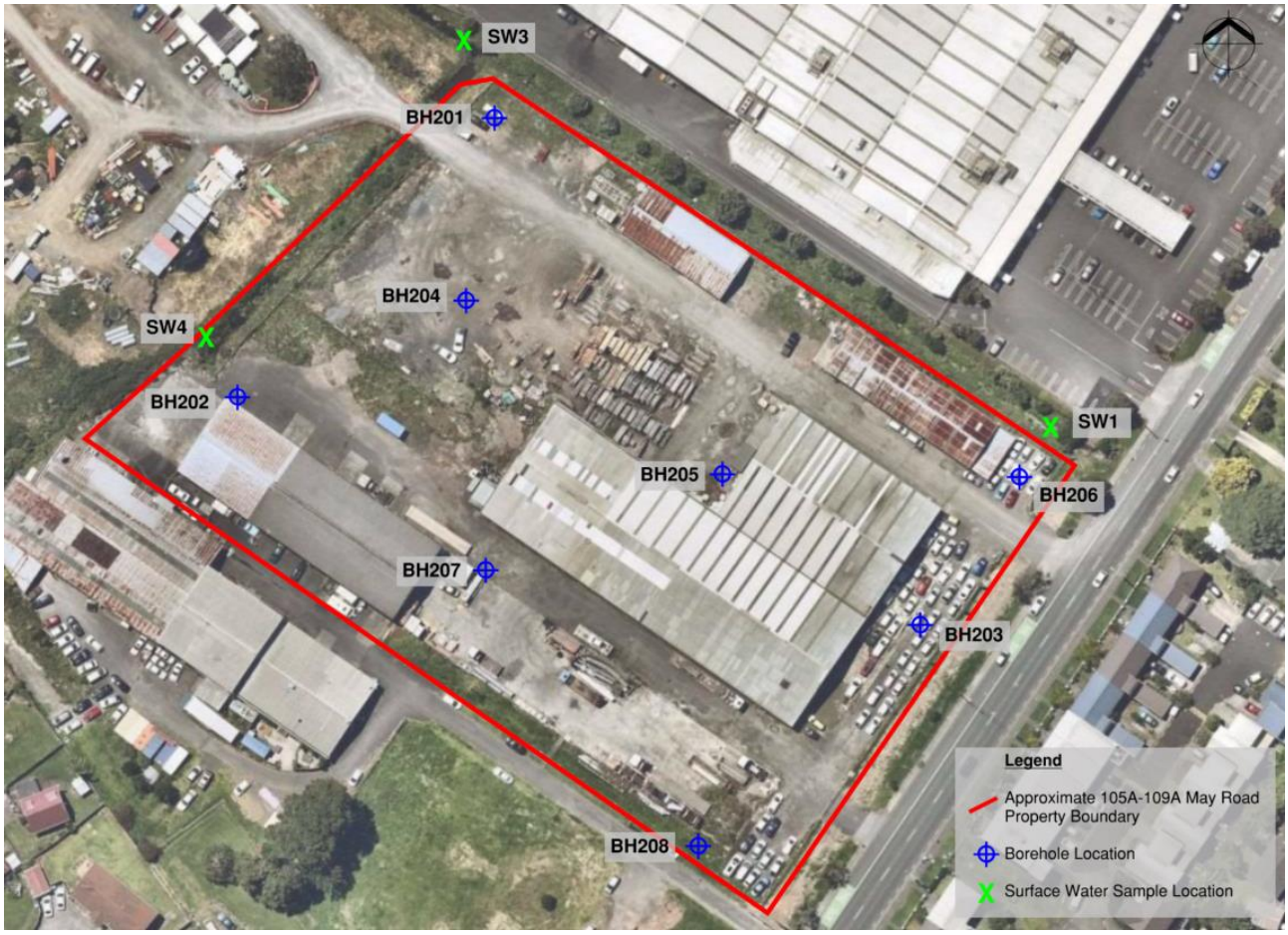


Figure 9: 105A-109A May Road Phase 2 Sample Location Plan (including BH201-BH203 from Phase 1) (Image Source: Nearmap Australia Pty Ltd)

7.2 Investigation Management and Health and Safety

7.2.1 Asbestos

Due to the potential for asbestos to be present a Safe Work Method Statement[3] (SWMS) was produced by Beca. This document informed the requirements for the management of asbestos in soils to provide appropriate controls and mitigation of potential asbestos risk during the intrusive investigations. This included the requirements for PPE and RPE, decontamination and disposal.

7.2.2 PFAS

Due to the very low detection/implied regulatory limits for PFAS concentrations in groundwater, the drilling and groundwater sampling methodology for recovering samples for PFAS analysis was undertaken in general accordance with the 'PFAS National Environmental Management Plan Version 2.0 prepared by the Heads of EPA Australia and New Zealand 2020' (herein after referred to as the 'PFAS guidelines'). By following these processes any cross contamination during sample handling was avoided and appropriate quality control and quality assurance sampling was undertaken.

[3] Beca (14 October 2020) Safe Work Method Statement: 105 and 119 May Road

7.3 Soil Sampling Methodology

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

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

Soil samples were collected from a range of depths across the soil profile ranging from 0.0 m to 4.5 m bgl. Up to five soil samples were collected at each location. Seven quality samples (duplicates) were collected for analysis.

The soil sampling methodology was determined based on the potential contamination sources:

- Deterioration of ACM or lead paint from buildings:
  - Asbestos does not migrate through the soil profile and therefore any contamination would be at the surface / in shallow soils.
  - Samples were collected at surface (0.0 – 0.1 m bgl) using hand tools.
- Fill Material
  - Soil samples were collected at regular intervals through the fill material and where observations in changes in material type/ colour / odour were noted.
  - Samples were recovered by the excavator.
- Stockpiles
  - Visual observations of the stockpiles indicated that each individual stockpile represented a singular unknown source.
  - A minimum of two samples were collected from each stockpile. The samples collected were grab samples from discrete locations and not composited.
  - Samples were recovered from the excavator.

Soil samples were collected directly by hand from excavated materials in the centre of the excavator bucket/placed at the side of the auger pit/borehole. A clean pair of nitrile gloves was worn for each sample to prevent cross-contamination. Samples were placed in laboratory supplied plastic or glass jars as appropriate and chilled prior to dispatch to R J Hill Laboratories Ltd (Hill Laboratories).

The GAMAS include for the field screening of asbestos by field sieving. Due to the cohesive nature of the encountered soils (clays and silts) sieving was not possible. Visual observations of encountered material were made to provide an indication of the presence of ACM.

All chemical laboratory analyses were undertaken by Hill Laboratories. Selected soil samples were analysed for asbestos, heavy metals, BTEX, PAH, and TPH. Soil samples were selected for analysis on the basis of several factors including spatial coverage and visual observations such as identification of fill material or changes in geology. A range of soils samples from across the soil profile were analysed to provide an understanding of the potential vertical extent of contamination. Soil samples not selected for analysis were held cold at the laboratory. Soil samples from the three boreholes were collected for PFAS analysis but not analysed to date. The samples were held cold at the laboratory for six months.

Five pieces of potential ACM were analysed for asbestos presence / absence.

7.4 Monitoring Well Installation and Groundwater Sampling Methodology

7.4.1 Monitoring Well Installation

The borehole installation investigation was undertaken in two phases:

- Phase 1 undertaken on the 6 November 2020.
  - Drilling of three boreholes using a sonic drill rig (BH201-BH203)
  - Installation of piezometers using 50mm PVC pipe with slotted screen sections at required depths.
  - Each well was backfilled with sand surround.
  - Two rinsate/trip blanks and one field blanks were collected for quality purposes.
- Phase 2 undertaken on 29/30 March 2021.
  - Drilling of five boreholes using a Geoprobe CPT rig (BH204-BH208).
  - Installation of piezometers using 38 mm PVC pipe with slotted screen sections at required depths.
  - Each well was backfilled with sand surround.
  - Two rinsate/trip blanks and one field blanks were collected for quality purposes.

Table 7 presents a summary of the borehole screen depths and locations.

Table 7. Piezometer Screen Levels

Piezo ID	Screen Depth (m bgl)		Borehole Location		
	Top	Bottom	Easting (NZTM)	Northing (NZTM)	Height (AK46)
BH201	1.5	4.7	1754239.036	5913621.753	49.736
BH202	1.5	5.0	1754181.983	5913564.663	49.816
BH203	1.5	5.0	1754324.436	5913512.461	50.010
BH204	1.5	5.0	1754235.400	5913583.922	49.797
BH205	1.5	5.0	1754283.318	5913544.947	49.993
BH206	1.5	5.0	1754345.705	5913543.785	50.032
BH207	1.5	5.0	1754234.433	5913527.066	49.987
BH208	1.5	5.0	1754276.518	5913465.713	50.099

7.4.2 Groundwater Sampling Methodology

Two groundwater monitoring events were undertaken:

- Phase 1 undertaken on 6 November (BH202 and BH203) and 9 November (BH201). The groundwater sampling could not be undertaken during one monitoring event due to adverse weather potentially comprising sample quality control.
- Phase 2 undertaken on the 12 April 2021 (BH201, BH203-BH206) and 13 April 2021 (BH202, BH207-BH208).

A peristaltic pump connected to a flow cell was used for purging and sampling each of the wells at the Site. A minimum of three times the volume of each well was purged prior to sampling. The water quality parameters of pH, electrical conductivity, temperature and dissolved oxygen were monitored continuously using a water quality meter and the sample collected when these parameters had stabilised. All groundwater samples were collected into clean, laboratory supplied jars and stored in chilly bins prior to being couriered to Hill Laboratories for analysis.

QA samples were collected during each phase of groundwater sampling comprising a trip blank, field blank, rinsate and duplicate samples.

All sampling equipment was decontaminated between sampling locations using type 1 water.

Field sampling and relevant sampling management procedures were undertaken in general accordance with the MfE Contaminated Land Management Guidelines No.5 – Site Investigation and Analysis (2011).

During Phase 1 a total of three groundwater samples were collected and sent for chemical laboratory analysis. Groundwater samples were scheduled for the following analyses: a suite of 36 PFAS compounds, total and dissolved heavy metals and TPH.

During Phase 2, eight groundwater samples were collected and sent for laboratory analysis of a suite of 47 PFAS compounds.

A data summary sheet of the results is presented in Appendix C.

7.4.3 Surface Water Sampling

Three surface water samples were collected on the 12 April 2021. Surface water samples were collected from just below surface level to reduce the disturbance of sediment. Samples were decanted from the sampling bottle into the appropriate laboratory sample containers. New sample bottles were used for the collection of each sample. A rinsate sample from the sampling bottle was collected for QA purposes. Surface water samples were sent for laboratory analysis of a suite of 47 PFAS compounds.

8 Assessment Criteria

8.1 Soil Assessment Criteria

8.1.1 Assessment of Human Health Risk

The adopted assessment criteria for the investigation have been selected in accordance with the hierarchy defined by *Ministry for the Environment* (MfE) *Contaminated Land Management Guidelines No.*2 (MfE, 2002) and are summarised below. Assessment criteria for residential, recreational, and commercial/industrial scenarios have been adopted given the uncertainty as to the future land use of the Site.

- Resource Management (National Environment Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011.
- MFE Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in NZ, 1999.
- Regional Screening Levels, US Environmental Protection Agency (USEPA, 2012).
- New Zealand Guidelines for Assessing and Managing Asbestos in Soil, 2017 (GAMAS).

8.1.2 Assessment of Environmental Risk

The risk posed by the discharge of contaminants in soil has been assessed against the following documents:

- Background Ranges of Trace Elements in Auckland Soils, Auckland Regional Council 2012. Background ranges for metals in volcanic soils. Hereinafter referred to as the Auckland Background Concentrations.
- Soil Acceptance Criteria, Auckland Unitary Plan Operative in Part 2018. Table E30.6.1.4.1 soil acceptance criteria for environmental discharges.
- Background Soil Concentrations and Soil Guideline Values for the Protection of Ecological Receptors, Landcare Research 2016.

8.2 Groundwater Assessment Criteria

8.2.1 Assessment of Human Health Risk

- The adopted assessment criteria for the groundwater investigation have been selected from the Ministry of Health (MoH) Drinking-water Standards for New Zealand (MoH, Revised 2008).
- For PFAS, drinking and recreational water quality standards for human health have been selected from the PFAS National Environmental Plan 2020, Version 2.0

8.2.2 Assessment of Environmental Risk

- The adopted assessment criteria for the groundwater investigation have been from the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC, 2018) for the protection of 90% of freshwater species[4].
- The environmental discharge criteria for PFAS have been adopted from the PFAS National Environmental Plan 2020, Version 2.0.

8.2.3 Trade Waste Disposal

- Environmental Protection Authority (Dr Peter Dawson), Disposal of PFAS containing Wastewater to Tradewaste (the interim trade Waste Disposal Guideline values for PFAS)

[4] A species protection level of 90% was applied because the Ecological Assessment indicates that the surface water courses on Site have an ecosystem in which aquatic biological diversity has been impacted to a significant degree by human activity. It is noted however that the ultimate downstream receiving environment was not assessment as part of the Ecological Assessment.

9 Results

9.1 Fieldwork Observations

9.1.1 105A-109A May Road

The following observations were made during the fieldwork investigation at 105A-109A May Road:

- The soil samples recovered from the Site varied in composition (clays, silts, sands, peat and gravel).
- Waste material (glass fragments, brick, concrete, nails, wire, plastic, rubber tires and timber) was observed on the surface of five stockpiles and litter was observed to be scattered across the Site;
- Buried waste (concrete, bricks, plastic, glass, metal and timber) was observed in locations BH201, the hand auger completed by the building adjacent to TP201, TP201, TP202, TP204, TP205, TP206, TP210, TP213 and TP215 at maximum depths between 0.1-1.1m bgl.
- A strong hydrocarbon odour was noted in TP206 between 0.5-1.2m bgl and TP208 between 0.7-0.9m bgl.
- Potential ACM fragments were identified at locations TP211 Stockpile, 1m from TP212 Stockpile and TP212 Stockpile and sent to the lab for analysis (i.e. Bulk ACM ID).
- Concrete service pipes were encountered in locations TP208, TP206 and TP209 at depths between 0.5-1m bgl, and ceramic service pipes were encountered in locations TP203 and TP205 at 0.7m and 1.2m bgl respectively. The service pipe locations are provided in Appendix D.
- Groundwater was encountered in locations BH201, BH202, BH203, TP201, TP216 and TP217 at depths between 0.2 and 4.0m bgl.
- The material that made up the fill across the majority of the Site was described as a reddish black gravel with cobbles and traces of buried waste e.g. concrete, plastic, metal, brick and timber fragments.
- The material within the stockpiles was typically described as a dry, brown clayey silt containing gravel, cobbles and waste material e.g. concrete, plastic, metal, brick, timber, glass and rubber.

Test pit, borehole and hand auger logs are provided in Appendix E.

9.1.2 119 May Road

The following observation were made during the fieldwork investigation at 119 May Road:

- The soil samples recovered from the Site varied in composition (clays, silts, sands, peat and gravel);
- Buried waste (concrete fragments and foundation blocks, brick, plastic, ceramic, glass, metal and timber fragments) was observed in the footprint of the historical building, in all locations except TP101, TP102, TP110, TP114 and TP115 at maximum depths between 0.3-0.8m bgl.
- A potential ACM fragment was identified within TP111 at 0-0.1m bgl and sent to the lab for analysis (i.e. Bulk ACM ID).
- Groundwater was encountered in locations TP103, TP104, TP105, TP106, TP107, TP109, TP110, TP113, TP114 and TP115 at depths between 1.4-3.0m bgl.
- The material that made up the fill across the majority of the Site was described as a brown silty clay with grey and orange mottling, gravel, cobbles and traces of buried waste e.g. concrete, brick, plastic, ceramic, glass, metal, and timber.

Test pit, borehole and hand auger logs are provided in Appendix E.

9.2 Summary of Soil Analytical Results

9.2.1 105A-109A May Road

Copies of the Hill Laboratory reports with the chemical and asbestos laboratory results are included in Appendix F and data summary sheets are in Appendix C. The following provides a summary of the analysis results.

Metals

45 soil samples were analysed for metals. In summary:

- Five samples recorded concentrations of arsenic, lead or nickel above 'residential' human health risk criteria, however one of the recorded nickel concentrations was within the background range for Auckland soils.
- One sample recorded concentrations of lead in exceedance of the 'recreational' human health risk criteria.
- The adopted assessment criteria for human health risk – 'commercial/industrial worker' scenario, were not exceeded in any soil sample analysed.
- Five samples recorded concentrations of lead and/or nickel above environmental discharge criteria. However, four of the nickel concentrations were within the background range for Auckland soils.
- Multiple samples recorded concentrations of cadmium, copper, lead, nickel, and arsenic above the Auckland Background Concentrations.

Table 8 presents a summary of the samples recording concentrations above the Auckland Background Concentrations (Background), the AUP Permitted Activity Discharge Criteria (Environmental) and the human health residential and recreational scenarios.

Table 8: Summary of samples recording heavy metal guideline exceedances

Sample ID	Depth	Analyte & Recorded Concentration	Exceeded Guideline Value
TP201	0.5 m	Lead 1,000 mg/kg	65 mg/kg (background) 880 mg/kg (recreation) 210 mg/kg (residential) 250 (environmental)
TP202	0.4 m	Lead 168 mg/kg	65 mg/kg (background)
TP203	0.4 m	Nickel 184 mg/kg*	105 mg/kg (environmental) 150 mg/kg (residential)
TP208	0.4 m	Nickel 120 mg/kg*	105 mg/kg (environmental)
TP212 Stockpile	0.0 m	Nickel 131 mg/kg*	131 mg/kg (environmental)
	0.5 m	Arsenic 14 mg/kg	12 mg/kg (background)
Stockpile 10m from TP213	0.3 m (eastward sample)	Nickel 121 mg/kg	12 mg/kg (background)
Stockpile by TP217		Lead 470 mg/kg	65 mg/kg (background) 210 mg/kg (residential)

Sample ID	Depth	Analyte & Recorded Concentration	Exceeded Guideline Value
	0.3 m (northward sample)		250 mg/kg (environmental)
		Nickel 138 mg/kg*	105 mg/kg (environmental)
TP218 Stockpile	0.0 m	Arsenic 28 mg/kg	12 mg/kg (background) 20 mg/kg (residential)
		Copper 94 mg/kg	90 mg/kg (background)
		Lead 71 mg/kg	65 mg/kg (background)
	0.5 m	Arsenic 22 mg/kg	12 mg/kg (background) 20 mg/kg (residential)
		Lead 80 mg/kg	65 mg/kg (background)
BH201	2.5-2.7 m	Copper 144 mg/kg	90 mg/kg (background)

** Recorded concentration was within the background range for Auckland soils*

Total Petroleum Hydrocarbons (TPH)

45 soil samples were analysed for TPH. In summary:

- The adopted assessment criteria for human health risk were not exceeded in any soil sample analysed.
- The adopted environmental discharge criteria were exceeded in four of the soil samples analysed – TP201 4.2 m, TP214 2.9 m, BH201 2.5-2.7 m and BH203 3.4-3.6 m. All four samples were recovered from peat material.
- 19 samples contained detectable concentrations of TPHs, primarily within the long hydrocarbon chain (i.e. C15 – C36) range.

Polycyclic Aromatic Hydrocarbons (PAH)

Eight soil samples were analysed for PAH in locations where a strong hydrocarbon odour was observed during the field investigation. In summary:

- The adopted assessment criteria for human health risk – ‘residential’, ‘recreational’ and ‘commercial /industrial worker’ scenarios, and environmental risk were not exceeded in any soil sample analysed.
- Of the eight soil samples analysed, five samples recorded detectable results of various PAH compounds.

Benzene Toluene Ethylbenzene and Xylenes (BTEX)

Eight soil samples were analysed for BTEX in locations where a strong hydrocarbon odour was noted during the field investigation. In summary:

- One sample recorded a detectable concentration of Ethylbenzene (TP208 0.4 m – 0.07 mg/kg), compared to a laboratory detection of < 0.06 mg/kg. The adopted assessment criteria for human health risk – ‘residential’ and ‘commercial/industrial worker’ scenarios, were not exceeded by this sample.
- All other samples recorded BTEX concentrations below the laboratory Level of Detection (LOD).

Asbestos in Soils

32 soil samples were analysed for asbestos. In summary:

- Four soil samples recorded the presence of asbestos;
  - Amosite (brown asbestos) and Chrysotile (white asbestos) detected as fibre cement in TP201 recovered from a depth of 0.5 m bgl. The recorded asbestos concentration was 0.03 % w/w asbestos as ACM, above the residential and recreational guideline values of 0.01 % w/w and 0.02 % w/w respectively.
  - Chrysotile was detected as loose fibres in a hand pit excavated at the 'building adjacent to TP201' sample location recovered from a depth of 0.5 m bgl. The combined Fibrous Asbestos and Asbestos Fines (FA/AF) concentration was recorded below the laboratory LOD (<0.001% w/w).
  - Amosite and Chrysotile detected as fibre cement and loose fibres in TP212 stockpile recovered from the ground surface. The recorded asbestos concentration as ACM was 0.035 % w/w, with the FA/AF concentration recorded below the laboratory LOD (<0.001% w/w).
  - Amosite and Chrysotile detected as ACM debris in TP212 stockpile recovered from 0.5 m above ground level. The recorded FA/AF concentration of 0.005 % w/w is above the applied human health guideline value of 0.001 % w/w.

Asbestos Containing Material (ACM)

- Four samples of potential ACM were recovered from the Site and underwent asbestos bulk ID:
  - Sample collected from 1 m from TP212 on the ground surface: amosite, chrysotile and crocidolite detected.
  - TP212 Stockpile (sample recovered from the bottom of the stockpile i.e. ground surface): amosite and chrysotile detected.
  - Two samples from TP211 Stockpile surface: Amosite and chrysotile detected in one sample, and the second was not ACM.

9.2.2 119 May Road

Metals

32 soil samples were analysed for metals. In summary:

- One sample (TP104 0.2m) recorded a concentration of chromium above the 'residential' human health risk criteria.
- The same sample contained concentrations of chromium and nickel above environmental discharge criteria. Although the nickel concentration was within the background range for Auckland soils.
- The adopted assessment criteria for human health risk – 'recreational' and 'commercial/industrial worker' scenarios, were not exceeded in any soil sample analysed.
- Four samples recorded concentrations of lead, cadmium, chromium and nickel above the Auckland Background Concentrations.

Table 9 presents a summary of the samples recording concentrations above the Auckland Background Concentrations (Background), the AUP Permitted Activity Discharge Criteria (Environmental) and the human health residential and recreational scenarios.

Table 9: Summary of samples recording heavy metal guideline exceedances

Sample ID	Depth	Analyte & Recorded Concentration	Exceeded Guideline Value
TP101	0.55 m	Cadmium 1.19 mg/kg	0.65 mg/kg (background)

Sample ID	Depth	Analyte & Recorded Concentration	Exceeded Guideline Value
TP104	0.2 m	Chromium 810 mg/kg	125 mg/kg (background) 400 mg/kg (environmental) 460 mg/kg (residential)
		Nickel 122 mg/kg*	320 mg/kg (background) 105 mg/kg (environmental)
TP105	0.3 m	Chromium 320 mg/kg	125 mg/kg (background)
TP113	0.2 m	Lead 177 mg/kg	65 mg/kg (background)

** Recorded concentration was within the background range for Auckland soils*

Total Petroleum Hydrocarbons (TPH)

32 soil samples were analysed for TPH. In summary:

- The adopted assessment criteria for human health risk and environmental discharge risk were not exceeded in any soil sample analysed.
- 10 samples contained detectable concentrations of TPHs, primarily within the long hydrocarbon chain (i.e. C15 – C36) range.

Polycyclic Aromatic Hydrocarbons (PAH)

14 soil samples were analysed for PAH. In summary:

- The adopted assessment criteria for human health risk – 'residential', 'recreational' and 'commercial/industrial worker' scenarios, and environmental risk were not exceeded in any soil sample analysed.
- Of the 14 soil samples analysed for PAH, only 1 sample produced detectable results of various PAH compounds (TP107 0.1m).

Benzene Toluene Ethylbenzene and Xylenes (BTEX)

14 soil samples were analysed for BTEX. In summary:

- The adopted assessment criteria for human health risk and environmental risk were not exceeded in any soil sample analysed.
- All samples recorded BTEX concentrations below the laboratory LOD.

Asbestos in Soils

23 soil samples were analysed for asbestos. In summary:

- 7 soil samples showed the presence of asbestos. The asbestos in the 7 samples was defined as follows:
  - Chrysotile detected as loose fibres in TP103 recovered from a depth of 0 m bgl. The combined FA/AF concentration was recorded at below the laboratory LOD (<0.001 % w/w).
  - Amosite and Chrysotile as ACM debris and loose fibres in TP107 recovered from a depth of 0.1 m bgl. The combined FA/AF concentration was recorded at 0.005 % w/w (above the human health guideline value of 0.001 % w/w).

- Chrysotile detected as loose fibres in TP111 recovered from a depth of 0 m bgl and 0.6 m bgl. The combined FA/AF concentrations in both samples were recorded at below the laboratory LOD (<0.001 % w/w).
- Amosite and Chrysotile detected as ACM debris in TP112 recovered from a depth of 0.3 m bgl. The recorded concentrations of asbestos as ACM or FA/AF were below the laboratory LOD (<0.001 % w/w).
- Amosite and Chrysotile as ACM debris and loose fibres in TP113 recovered from a depth of 0.2 m bgl. The combined FA/AF concentration was recorded at 0.004 % w/w (above the human health guideline value of 0.001 % w/w).
- Chrysotile detected as loose fibres in TP114 recovered from a depth of 0.2 m bgl. The combined FA/AF concentration was recorded at 0.002 % w/w (above the human health guideline value of 0.001 % w/w).

Asbestos Containing Material (ACM)

- One sample of potential ACM was recovered from the Site at location TP111 from a depth of 0-0.1m bgl and underwent asbestos bulk ID. The asbestos sample was identified as Fibre Cement with Amosite, Chrysotile and Crocidolite asbestos.

9.3 Quality Assurance and Quality Control

Seven duplicate soil samples were analysed as part of the investigation. The relative percentage difference (RPD) between the primary and duplicate samples has been calculated. The average RPD ranged from 2.9 to 56.9%. The higher RPDs are likely related to the typical heterogeneity of the fill material sampled and analysed as part of this investigation. Nonetheless, the results indicate a moderate to high level of accuracy in the sampling and analytical methods used in this investigation. Therefore, it is considered that the analytical results are appropriate and suitable for the purpose of this investigation.

9.4 Summary of Groundwater Level Monitoring

The results of groundwater level monitoring are summarised in Table 10.

Table 10: Summary of Groundwater Level Monitoring

Borehole	Sampling Date	Groundwater Level (m bgl)	Groundwater Elevation (AK46)
BH201	9 November 2020	1.21	48.53
BH202	6 November 2020	1.25	48.57
BH203	6 November 2020	0.34*	49.67
BH201	12 April 2021	1.40	48.34
BH202	13 April 2021	1.33	48.49
BH203	12 April 2021	0.33*	49.68
BH204	12 April 2021	1.46	48.34
BH205	12 April 2021	0.54	49.46
BH206	12 April 2021	0.88	49.15
BH207	13 April 2021	0.79	49.19

Borehole	Sampling Date	Groundwater Level (m bgl)	Groundwater Elevation (AK46)
BH208	13 April 2021	1.11	48.99

** Upon opening the well cap surface water entered the well and therefore the groundwater level may not be representative of the actual resting groundwater level*

Initial measurements of groundwater level at eight locations across the 105A-109A property indicate groundwater flow is to the north/ north-west, with groundwater levels varying between 49.7 m RL in the east of the site and 48 m RL in the west/north-west, as shown in Figure 10.

Figure 10: Indicative Groundwater Contour Plot (April 2021 Monitoring Results)

9.5 Summary of Groundwater and Surface Water Analytical Results

9.5.1 Metals

Three groundwater samples were analysed for total and dissolved metals. In summary:

- Two samples (GW202 and GW203) recorded concentrations heavy metals above the adopted assessment criteria for environmental risk; **Table 11** presents a summary of the samples recording concentrations above the ANZECC Freshwater Guidelines for New Zealand.
- The adopted drinking water standard for human health risk were not exceeded in any groundwater sample analysed.

Table 11: Summary of samples recording total and dissolved heavy metal guideline exceedances

Sample ID	Analyte	Recorded Concentration	Exceeded ANZECC Guideline Value
GW202	Total Chromium	0.0073 g/m^3	0.0033 g/m^3 (Cr III) / 0.006 g/m^3 (Cr VI)
	Total Copper	0.0066 g/m^3	0.0025 g/m^3
	Dissolved Copper	0.0028 g/m^3	0.0025 g/m^3
GW203	Total Chromium	0.027 g/m^3	0.0033 g/m^3 (Cr III) / 0.006 g/m^3 (Cr VI)
	Total Copper	0.0189 g/m^3	0.0025 g/m^3
	Total Lead	0.0061 g/m^3	0.0056 g/m^3
	Total Nickel	0.0145 g/m^3	0.013 g/m^3
	Total Zinc	0.032 g/m^3	0.031 g/m^3

9.5.2 Total Petroleum Hydrocarbons (TPH)

Three groundwater samples were analysed for TPH. In summary:

- The adopted assessment criteria for human health risk and environmental risk were not exceeded in any groundwater sample analysed.
- No samples contained detectable concentrations of TPH.

9.5.3 Per and Poly Fluoroalkyl Substances (PFAS)

During the Phase 1 investigation three groundwater samples were analysed for PFAS. During the Phase 2 investigation eight groundwater and three surface water samples were analysed for PFAS. The adopted assessment criteria for human health risk and environmental risk were not exceeded in any groundwater or surface water samples analysed. The interim trade waste discharge criteria were also not exceeded.

Groundwater

PFOA was detected in two groundwater samples (BH202 and BH207).The analysis was undertaken using the high-level test which has a detection limit of 0.025 µg/l. In summary:

- BH202 was sampled in both phases of investigation, with similar concentrations of PFOA recorded in each round of sampling. The sample duplicate and lab QC sample also recorded detections of PFOA.
- In the initial phase of sampling from BH202, PFHxA was also detected in the duplicate sample but not the primary sample.
- PFOA was also detected in BH207, at lower concentrations compared to BH202.
- No other PFAS compounds in the analysis suite were detected in groundwater.

Surface Water

PFOS was detected in one surface water sample: SW3. The concentration of 0.069 µg/l was below the applied human health, ecological 90% species protection level and trade waste criteria. The analysis was undertaken using the high-level test which has a detection limit of 0.025 µg/l. No other PFAS compounds in the analysis suite were detected in surface water.

Table 12 presents a summary of the samples recording detectable concentrations of PFAS compounds (guideline values provided for reference). A sample location plan showing the locations of PFAS detections is included as Figure 11.

Table 12: Summary of samples with detected concentrations of PFAS compounds (all units µg/l)

Sample Name	Sample Date	Detected PFAS Compound				
		L-PFOS	Total PFOS	Sum PFHxS + PFOS	PFHxA	PFOA
BH202	06/11/20	<0.025	<0.025	<0.025	<0.025	**0.06**
BH202 Duplicate	06/11/20	<0.025	<0.025	<0.025	**0.027**	**0.059**
BH202	13/04/21	<0.025	<0.025	<0.025	<0.025	**0.053**
BH202 Lab QC	13/04/21	<0.025	<0.025	<0.025	<0.025	**0.05**
BH207	13/04/21	<0.025	<0.025	<0.025	<0.025	**0.039**
SW3	12/04/21	**0.069**	**0.069**	**0.069**	<0.025	<0.025
Guideline Screening Criteria*	Drinking Water	-	-	0.07	-	0.56
	Recreational	-	-	2	-	10
	Ecological^	-	<LOD / 0.13 / 2.0 / 31	-	-	19 / 220 / 632 / 1824
	Trade Waste	-	0.1	-	-	0.1

**Refer to Section 9.2 for screening value references*

^Ecological screening values presented for 99% / 95% / 90% / 80% species protection. 'Detection' is considered more appropriate to be used for 99% species protection for PFOS as the guideline value for this is less than the laboratory level of detection.

Figure 11: Plan illustrating sample locations with PFAS detections (Image Source: Nearmap Australia Pty Ltd)

9.6 Quality Assurance and Quality Control

One duplicate soil sample was analysed during the groundwater investigation. The relative percentage difference (RPD) between the primary and duplicate sample was calculated. The RPD was low, with an average RPD of 1.2% PFAS and 10.8% for metals and hydrocarbons. These results indicate an acceptable level of accuracy in the sampling and analytical methods used in this investigation. Therefore, it is considered that the analytical results are appropriate and suitable for the purpose of this investigation.

QA/QC samples comprising rinsate samples, trip blanks and field blanks were also analysed as part of the PFAS investigation. No detectable concentrations of the PFAS compounds analysed for were recorded. Six additional samples were analysed by the laboratory as per the standard QA/QC procedures for PFAS analysis and reporting.

10 Discussion and Risk Assessment

10.1 Discussion: 105 May Road

The desk-based information review identified buildings were historically present along the south/south-western boundary observed in the 1940 aerial; several had been demolished by 1959 and all demolished by 1975. Since then, 105 May Road has been predominantly vegetated with the northern portion cleared and gravel laydown areas with tracks connecting the Site to 105A-109A May Road and off-Site to the west noted on multiple aerials. AC report they hold no records to suggest 105 May Road has been subject to HAIL activities, however based on the findings of the Babingtons DSI, they considered the 105 May Road property is a HAIL site on a 'more likely than not' basis due to past and current Site activities (HAIL I – related to uncontrolled historical filling).

105 May Road is currently being used by Watercare GAJV as a Site compound and laydown area. Watercare is responsible for any land distributing activities during the lease period including obtaining necessary consents and carrying out land contamination and geotechnical investigations. Due to this lease agreement no land contamination investigations for earthworks on 105 May Road have been carried out specific to this application (although Watercare has shared information that they have gathered to date). Any remaining necessary investigations will be carried out at the end of the lease period when 105 May Road is returned.

10.2 Discussion: 105A-109A May Road

The 105A-109A May Road Site was originally developed through the late 1950's to the 1970s and the Site is currently used as a car yard along the eastern frontage and for timber pallet storage in the central area. Several stockpiles and general rubbish were also noted across the Site. Potential sources of contamination identified in the desk based phase included:

- Potential presence of fill material related to the historical construction
- On-site stockpiles of unknown source
- Storage of fuel recorded on Site
- Reported historical activity relating to the application of non-stick coatings to kitchenware which may have included the use of PFAS

The findings of this investigation in relation to the identified potential sources are discussed:

10.2.1 Fill Material

The dominant fill material observed was gravel with cobbles, and traces of buried waste e.g. concrete, bricks, plastic, glass, metal and timber. Fill material was observed across the majority of the Site at maximum depths between 0.1-1.1m bgl. Underlying the fill was Holocene Alluvium described predominantly as grey mottled orange silty clays.

The findings of the laboratory analyses record concentrations of several heavy metals above the Auckland background volcanic soils concentrations; however, the majority were below the applied human health and environmental guidelines. Several elevated nickel concentrations were also recorded above the human health and/or the environmental guidelines but within the Auckland background volcanic soils concentrations and so are disregarded from further assessment.

Two locations recorded concentrations of heavy metals above the background, environmental and / or human health guidelines; TP201 at 0.5 m for lead and TP203 at 0.4 m for nickel.

Asbestos was detected in a localised area in the vicinity of TP201; fibre cement in TP201 (0.5 m bgl) with an asbestos ACM concentration of 0.03 % w/w (above the residential and recreational guideline values of 0.01 % w/w and 0.02 % w/w respectively) and loose fibres in a hand pit excavated at the 'building adjacent to TP201' also recovered at 0.5 m bgl. The FA/AF concentration was recorded below the laboratory LOD (<0.001% w/w). The hand pit was located to target the perimeter of a building that may have contained ACM cladding or roof, as it was the only accessible landscaped area for sampling of this kind. However, upon excavation the shallow material was found to comprise cobbles and therefore a sample for asbestos semi quantitative analysis could only be retrieved from 0.5 m bgl.

Due to the typical heterogeneity of fill material and multiple potential sources of asbestos at the Site it is recommended that soil disturbance works at 105A-109A May Road are undertaken as **asbestos related works.** The works should be undertaken in accordance with the procedures set out in a CSMP, including use of a contractor experienced in managing asbestos in soil, dampening down of material, visual survey and removal of ACM fragments during site works and stringent unexpected discovery procedures.

Groundwater analysis results (excluding PFAS which is discussed below) recorded concentrations of heavy metals above the 90% species protection environmental guidelines in two samples (BH202 and BH203). This indicates that soil contamination is potentially leaching into shallow groundwater which may present a risk to surface water receptors that receive baseflow from groundwater. BH203 is located at the upgradient end of the site, and as elevated concentrations were recorded in samples from this borehole it may be indicative of off-site contamination migrating on to site from the surrounding commercial/ industrial catchment. Elevated contaminant concentrations were not recorded in BH201 which is located downgradient and closest to the surface water streams.

The ANZECC 80% species protection level is specified in Auckland Unitary Plan rule E30.6.2.1 to be used to assess the risk from soluble contaminants: one groundwater sample (BH202) recorded a dissolved copper marginally above the ANZECC 80% species protection level (0.0028 g/m^3 compared to 0.0025 g/m^3). When laboratory uncertainty margins are taken into account the recorded concentration could vary between 0.0024 g/m^3 (below the guideline value) or 0.0032 g/m3 (above the guideline value). As the recorded concentration is only marginally above the guideline value, and in one sample only, it is considered unlikely that the recorded concentration represents a body of water that will have significant adverse effects on the environment.

10.2.2 Stockpiles

Several soil stockpiles are located across the Site. The material within the stockpiles was typically described as a dry, brown clayey silt containing gravel, cobbles and waste material. The waste material (glass fragments, brick, concrete, nails, wire, plastic, rubber tires and timber) was observed on the surface of the stockpile and litter was observed to be scattered across the Site. The source(s) of the stockpiles are unknown. Some stockpiles contained established vegetation at their surface which indicated they had been there several years, while others predominantly comprised exposed soils and appeared new (i.e. < 1 year old). Based on visual observations it appeared that each stockpile was comprised of material from a single source.

The stockpile located by TP217 and stockpile at TP218 recorded concentrations above human health guidelines for lead and arsenic respectively, with the lead concentration in the stockpile by TP217 also recording a concentration above the environmental guidelines.

Asbestos (fibres and ACM fragments) were detected in samples recovered from the stockpile located at TP212. The maximum concentrations of the asbestos as ACM was 0.035 % w/w and as FA/AF was 0.005 % w/w, which are within the asbestos related works scenario. One ACM fragment analysed for bulk ID from TP211 also confirmed the presents of amosite and chrysotile asbestos. Due the unknown source(s) of the stockpiles and heterogeneity of the material it is recommended that the stockpiles are removed and disposed

of off-Site. The stockpile removal works should be undertaken as **asbestos related works** and in accordance with the procedures set out in a Contaminated Soils Management Plan (CSMP). Further detail on the requirements of asbestos related works are provided **in Section 0.**

10.2.3 Fuel Storage

AC records indicated that an underground tank was present on the Site, however the locations or volumes of the tank is unknown. During the service clearance survey, a potential location of the fuel tank on the south-western edge of the central building was identified based on surface observations (cut lines in the asphalt and a potential vent pipe on the building) and the results of the ground penetrating radar survey (disturbed ground conditions indicating backfill but outline of a tank not obvious). Test pit TP215 was located in proximity to this area and elevated concentrations of hydrocarbons (TPH, BTEX, PAH) were not detected.

A strong hydrocarbon odour was noted in TP206 between 0.5-1.2m bgl and TP208 between 0.7-0.9m bgl. One PAH compound (perylene) was detected in TP206 and TPH and several PAHs detected in TP208. These detections were not significantly elevated and were still at least one order of magnitude below the human health and environmental guidelines. In both these locations underground service pipes were also encountered, and therefore the source of hydrocarbon odours could be related to the bedding material or pipes themselves acting as a preferential pathway.

TPH concentrations were recorded above the environmental discharge criteria within four soil samples across three locations. No indications of historical fuel storage were observed in these locations and all four samples were sourced from peat material at depths between 2.5-4.2m bgl. Due to the organic nature of peat, it can give false positives of hydrocarbon detects, indicating a presence of petroleum hydrocarbons where none are present. As a source of hydrocarbons has not been identified at the Site, no other samples recorded significantly elevated TPH concentrations and a hydrocarbon odour was not noted during the investigation, the elevated concentrations of TPH within these samples are not considered to represent anthropogenic contamination.

10.2.4 PFAS Compounds in Groundwater

Information in the Auckland Council property file indicates the Site was historically used by Thermo Polycoatings LTD for ‘plastic coatings of articles’ and ‘kitchenware non-stick coating applications’. This activity may have involved the used PFAS however Beca have not reviewed any specific evidence of the storage or use of PFAS compounds on the Site. In the initial investigation phase three groundwater samples were recovered to provide an indication of a potential widespread presence of PFAS. One sample (BH202) and the associated duplicate contained detectable concentrations of PFAS compounds (PFHxA and PFOA). The recorded concentrations of the PFAS compounds were below the drinking water, environmental and interim trade waste disposal guidelines. Research[5] indicates that PFOA are used in the production of non-stick coatings and therefore the source of the detected PFAS compounds in groundwater is considered likely to be on site. Further work was recommended to exclude off-site upstream sources and inform the distribution of contamination and PFAS concentrations at the Site.

Five additional piezometers were installed across the site during the second phase of investigation to provide a greater groundwater sample density and spread. Three surface water samples were also collected (‘upstream’ samples collected from the two water courses located on the north-western boundary and along the 105/105A-109 May Road boundary and a ‘downstream’ sample collected at the confluence of the two streams).

[5] American Cancer Society (https://www.cancer.org/cancer/cancer-causes/teflon-and-perfluorooctanoic-acid-pfoa.html, accessed 29/04/21)

The findings of the two phases of investigation indicate that PFAS contamination is not widespread across the Site. Within groundwater only one PFAS compound (PFOA) was detected in two groundwater samples recovered from boreholes BH202 and BH207, both located in the south-west of the Site. The concentrations recorded were within the same order of magnitude (0.039 µg/l (BH207) – 0.060 µg/l (BH202)) and below the applied human health, ecological and interim trade waste guidelines. No other PFAS compounds in the analysis suite were detected in groundwater.

The detection of PFHxA in the BH202 duplicate in the first phase of investigation is not considered to represent a significant risk as:

- The concentration was only marginally above the laboratory LOD (0.027 µg/l compared to 0.025 µg/l). Correspondence from the laboratory indicates that this value is within the uncertainty of the analysis method and not an 'absolute true value'. The correspondence from the laboratory is included within Appendix G.
- PFHxA was not detected in the BH202 primary sample in either phase of investigation or any other recovered groundwater samples.

There is a growing body of international research that indicates there is a background concentration of PFAS in both soil and groundwater in urban areas. A study[6] published by Bruseeau et al looked at thousands of soil samples across six countries and established that of the sites looked at, a background PFOS/PFOA concentration of 2.7 µg/kg reflecting the median of the maximums could be established.

PFAS is primarily an issue with regards to dealing with water or disposing of soil or water. Given the time between the time of the cookware operation and the present day, there is a possibility there is a small soil source area that is resulting in ongoing input into groundwater. This soil source is likely located within the south-west corner of the Site, based on the locations of PFOA detections. Once the proposed earthworks to be undertaken on the Site are confirmed, if soil disturbance is proposed within the south-west area of the Site soil sampling should be undertaken to inform the presence of this potential ongoing soil source of PFAS and the required management controls. Figure 12 presents a plan showing the area of the Site where PFAS soil sampling will be required in the future if soil disturbance is proposed.

Assessment of groundwater elevation indicates that groundwater flow is likely to be to the north-west. Surface water sample SW4 is located approximately downgradient of BH202. None of the 47 PFAS compounds analysed for were detected in the sample SW4, indicating that at the time of observation significant masses of PFAS are unlikely to be migrating within groundwater or entering the surface water course.

[6] Brusseau et al, June 2020, PFAS concentrations in soils: Background levels versus contaminated sites

Figure 12: Plan illustrating the area of Site in which PFAS soil sampling is required if future earthworks/ soil disturbance is proposed (Image Source: Nearmap Australia Pty Ltd)

10.2.5 PFAS Compounds in Surface Water

One PFAS compound (PFOS) was detected in one surface water sample (SW3). The recorded concentration in sample SW3 was marginally below the human health drinking water standard (0.069 µg/l compared to 0.070 µg/l), however as the streams are not used for drinking water the reported concentrations are not considered to present a risk. To assess the risk to ecological receptors the 90% species protection level was applied as the Ecological Assessment determined the streams on site to be highly disturbed systems. The recorded concentration (0.069 µg/l) is two orders of magnitude below this guideline value (2.0 µg/l).

The downgradient receiving environment of the on-site watercourses was not assessed as part of the Ecological Assessment and therefore the ecological value and appropriate species protection level is unknown. Comparison of the PFOS results from SW3 against the more conservative species protection levels indicates that the recorded PFOS concentration (0.069 µg/l) is below the 95% species protection concentration (0.13 µg/l) but not below the 99% species protection level (0.00023 µg/l). The 99% species protection is two orders of magnitude below the laboratory level of detection and therefore the detection level (<0.025 µg/l) is recommended as a more appropriate guideline value. The recorded SW3 concentration is less than three times the detection level and also the same order of magnitude. The 99% species protection level is a conservative tier 1 screening value, and industry research indicating a lack of repeatability of the study for which this conservative value is based may result in this screening concentration being revised upwards in the near future, however the timeframes for this or the revised screening value are unknown.

Sample location SW3 was located at the confluence of the two watercourses located on the Site. The upstream samples did not record the presence of any other PFAS compounds within the suite analysed. Based on

observations on site and review of the Auckland Council GIS Viewer, a public 900 mm concrete stormwater pipe discharges to the stream at the approximate point of confluence between the two streams. This stormwater pipe discharges from the land parcel located to the north-east of the 105A-109A May Road site.

The PFAS detection within surface water as SW3 is a different compound to that detected in groundwater (PFOS compared to PFOA). The stream is a receiving environment for stormwater from the surrounding urban catchment therefore the source could be off-site however this has not been proven by this investigation.

10.3 Discussion: 119 May Road

Review of historical information sources indicate a clothing and shoe factory / warehouse was constructed on the Site in the 1950s and demolished in 2006. Potential sources of contamination identified in the desk based phase included:

- The use of ACM and lead paint in the building construction / maintenance is considered likely based on the age. Over time these materials could have deteriorated resulted in contamination of shallow soil.
- Potential presence of fill material related to the historical construction or demolition of the building (if the demolition was improperly managed).
- A fuel tank reportedly present at the rear of the building.

The findings of this investigation in relation to the identified potential sources are discussed:

10.3.1 Deterioration of asbestos and / or lead paint and Fill Material

The dominant fill material observed was silty clay with gravel, cobbles, and traces of buried waste e.g. concrete, bricks, plastic, ceramic, glass, metal and timber. Fill material containing this waste was observed in the footprint of the historical building (except in the northern corner of the approximated footprint) at maximum depths between 0.3-0.8m bgl. Underlying the fill was Holocene Alluvium described as grey mottled orange silty clays.

Metal concentrations were recorded above background levels at four locations, all within the fill layer (i.e. 0.2-0.55m bgl). Three of the four samples were below the applied human health and environmental criteria. One sample (TP104 at 0.2 m bgl) recorded chromium (810 mg/kg) and nickel (122 mg/kg) concentrations above the environmental discharge criteria (400 and 105 mg/kg respectively) and the chromium concentration also exceeded the human health guideline for residential land use (460 mg/kg). The recorded nickel concentration was within the background range (320 mg/kg) for Auckland volcanic soils so this exceedance is disregarded from further assessment. The elevated chromium concentration within the shallow fill material at TP104 is considered to be a localised exceedance and is considered unlikely to present a significant risk to human health or the environment.

Asbestos was detected in seven soil samples across six locations. A fragment of asbestos fibre cement was also identified at one of these locations. All samples with asbestos detected were collected from shallow soils (depths from 0.0 m to 0.6 m bgl) within the fill layer. Asbestos doesn't mobilise through soil, and therefore the presence of asbestos at shallow depths (0.0-0.2 m bgl) and deeper depths (0.3-0.6 m bgl) indicates the source of asbestos to be a combination of:

- Deterioration of potential ACM rooves or external cladding on the building prior to demolition in areas around the perimeter of the building footprint that were not sealed by hardstanding. It is noted however that the shallow soils around the building were likely disturbed during demolition so an asbestos impacted 'halo' area cannot be defined.
- Historical filling or earthworks at the Site prior to the construction of the building in the 1950's, or improper management of the building demolition, foundation removal and associated earthworks.

Three of the seven samples with asbestos detections recorded concentrations of FA/AF above the laboratory detection limit and applied human health guideline of 0.001 % w/w. The highest FA/AF concentration recorded was 0.005 % w/w which is within the asbestos related works scenario. Any soil disturbance works at 119 May Road should be undertaken as **asbestos related works** and in accordance with the procedures set out in a CSMP. Further detail on the requirements of asbestos related works is provided in **Section 11.**

10.3.2 Fuel Tank

Low level detections of TPH and PAH were recorded in several samples, however all were significantly below the applied environmental and human health criteria. No visual or olfactory observations of fuel spills were noted during the investigation. Therefore, it is considered unlikely that a significant fuel spill occurred from the tank reported as previously located on Site.

10.4 Exposure Pathway Assessment

The Conceptual Site Model (CSM) (**Table 13**) was developed to inform the investigation and to describe the relationship between sources of contamination on Site, the human and environmental receptors that may be exposed to those contaminants in the context of a future commercial/industrial/residential/recreational use of the Site, and the pathways by which those receptors may be exposed

Table 13: Conceptual Site Modal (CSM)

Source	Receptor	Pathway	Pathway Complete?
• Heavy Metals • TPH • PAH • BTEX • Asbestos • PFAS	Construction workers	Exposure of workers to contaminants in soils and groundwater during Site redevelopment – dermal contact, ingestion or inhalation of dust/vapours.	**Complete Pathway** Soil concentrations recorded above human health criteria. The exposure pathway can be managed through implementation of management plan controls.
	Future Site users	Exposure of future Site users to contaminants in soils – dermal contact, ingestion or inhalation of dust/vapours.	**Complete Pathway** Soil concentrations recorded above human health criteria. The exposure pathway can be managed through implementation of management plan controls.
	General public	Exposure of general public to contaminants in soils– dermal contact, ingestion or inhalation of dust/vapours.	**Incomplete Pathway** Access to the Site by members of the general public will be prohibited during construction.
	Groundwater resources for public consumption	Leaching and migration of soil contaminants into groundwater	**Incomplete Pathway** No groundwater abstraction wells identified nearby the Site.
	Surface water	Sediment and runoff directly into surface water.	**Potentially Complete Pathway** Three watercourses are present on the Site. The exposure pathway can be managed through implementation of management plan controls.

Source	Receptor	Pathway	Pathway Complete?
		Migration of soil contaminants into surface water through shallow groundwater discharging into watercourses which ultimately discharge to Oakley Creek.	**Potentially Complete Pathway** PFAS has been detected within groundwater and heavy metals have been detected at concentrations above the environmental guidelines. The surface water sample collected downgradient of the groundwater PFAS detections did not record the presence of PFAS. Migration of significant concentrations of PFAS is not considered likely however cannot be ruled out.
		Contamination within surface water from off-site sources migrating into on-site surface water courses and / or groundwater.	**Potentially Complete Pathway** PFAS was detected in one surface water sample recovered from a watercourse that is the receiving environment of stormwater from the surrounding urban catchment. It is not confirmed that there is off-site contamination migration on to site or if there is migration that an effect is occurring.

10.5 Limitations of Site Characterisation

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

11 Development Implications

11.1 Consents

11.1.1 National Environmental Standard

The *Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011* (NESCS) applies to land as per clause 5(7):

"Land covered:

(7) The piece of land is a piece of land that is described by 1 of the following:
- *a) an activity or industry described in the HAIL is being undertaken on it;*
- *b) an activity or industry described in the HAIL has been undertaken on it;*
- *c) it is more likely than not that an activity or industry described in the HAIL is being or has been undertaken on it."*

The following HAIL activities have been identified for the Site:

- E1 – Asbestos products manufacture or disposal including Sites with buildings containing asbestos products known to be in a deteriorate state.
- I – Any other land that has been subject to the intentional or accidental release of a hazardous substance in sufficient quantity that it could be a risk to human health or the environment.

The NESCS applies to certain activities taking place on HAIL land. **Table 14** presents a summary of the NESCS activities and if these are triggered for the proposed works.

Table 14: NESCS Activity Triggers

Activity	Triggered
Removing or Replacing a Fuel Storage System	No
Sampling Soil	Yes – for the soil investigation (refer to **Section 6.3**)
Disturbing Soil	Yes
Subdividing or changing the land use	No– The Site is currently zoned commercial / light industry and no change to land use is proposed.

Soil Disturbance

Under Regulation 8(3) of the NESCS, soil disturbance of up to 25m^3 per 500 m^2 and disposal of up to 5 m^3 per 500 m^2 is allowed as a Permitted Activity (PA). **Table 15** presents a summary of the PA soil disturbance and disposal volumes.

Table 15: PA Criteria Summary

Site	HAIL Area*	PA Soil Disturbance Volume	PA Soil Disposal Volume
105 May Road	17,835 m^2	891.75 m^3	178.35 m^3
105A-109A May Road	19,164 m^2	958.2 m^3	191.64 m^3
119 May Road	5,650 m^2	282.5 m^3	56.5 m^3

Site	HAIL Area*	PA Soil Disturbance Volume	PA Soil Disposal Volume

**For the purposes of this assessment the extent of the HAIL is considered to be the entire property area.*

Additional PA criteria must also be applied with including;

- Controls to minimise the exposure of humans to contaminants.
- Reinstatement if soil to an erosion-resistant state within 1 month after the activity is complete.
- The duration of the activity must be no longer than 2 months.
- Soil must be disposed of a facility authorised to receive soil.

If the PA criteria cannot be met, resource consent as a restricted discretionary activity will be required.

11.1.1 Auckland Unitary Plan

The proposed works have been considered with respect to the following:

- E30.6.1.2 – Discharges of contaminants into air, or into water, or onto or into land from disturbing soil on land containing elevated levels of contaminants – *The Permitted Activity criteria cannot be met as the volume of soil disturbance is greater than the permitted activity criteria 200m^3.*
- **E30.6.1.4. Discharges of contaminants into air, or into water, or onto or into land from land not used for rural production activities** - *The Permitted Activity criteria cannot be met as soil contamination above the criteria specified in Table E30.6.1.4.1 Permitted activity soil acceptance criteria has been recorded.*

As the Permitted Activity criteria cannot be met, consent as a Controlled Activity under rule **E30.6.2.1. Discharges of contaminants into air, or into water, or onto or into land not meeting permitted activity standards E30.6.1.1; E30.6.1.2; E30.6.1.3; E30.6.1.4; or E30.6.1.5** has been considered. A summary of the Controlled Activity Criteria is provided in Table 16.

Table 16: AUP Controlled Activity Criteria

Rule E30.6.2.1 Criteria	Commentary
(1) A detailed site investigation (contaminated land) must be prepared and submitted to Council for consideration.	This Contamination Assessment meets the requirements of a Detailed Site Investigation and will be submitted to Council as part of the resource consent application.
(2) A site management plan (contaminated land) must be prepared and submitted to Council for consideration.	A Draft Contaminated Soils Management Plan (CSMP) has been prepared for the resource consent application. The CSMP will be updated
(3) A remedial action plan (contaminated land), relevant to the site and the proposed disturbance or remediation must be prepared and submitted to Council for consideration.	Full remediation of the site is not proposed as the soil disturbance being undertaken is to facilitate the development of the site and not for the purposes of remediation. The procedures within the CSMP are considered suitable to manage risks related to the proposed soil disturbance and a separate Remedial Action Plan is not considered necessary.
(4) The report on the detailed site investigation (contaminated land) must state either that: (a) the concentrations of soluble contaminants in any of the following:	One groundwater sample recorded dissolved copper marginally above the ANZECC 80% species protection level (0.0028 g/m^3 compared to 0.0025 g/m^3). When laboratory uncertainty margins are taken into account the recorded concentration could vary between 0.0024 g/m^3 (below the guideline value) or 0.0032 g/m^3 (above the guideline value). As

Rule E30.6.2.1 Criteria	Commentary
(i) overland stormwater at the site boundary, (ii) surface water within the site, or (iii) groundwater at the site boundary must not exceed the guideline values specified in Table 3.4.1 Trigger values for toxicants at alternative levels of protection in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC 2000 Guidelines) for marine or freshwater, where relevant, at the level of protection for 80 per cent of species, except for benzene where 95 per cent of species shall apply; or (b) discharges from the land are highly unlikely to cause significant adverse effects on the environment; or (c) the contamination associated with the land must be contained beneath a continuous impervious layer and must be located above the highest seasonal groundwater level beneath the site.	the recorded concentration is only marginally above the guideline value, and in one sample only, it is considered unlikely that the recorded concentration is having a significant adverse effect on the environment. PFAS compounds (PFOA) were also detected in two groundwater samples, at concentrations below the human health and ecological guidelines. Based on indicative groundwater flow direction the downgradient surface water sample (SW4) did not record detections of any of the analysed 47 PFAS compounds. The findings of this investigation indicate that at the time of observation significant masses of PFAS are unlikely to be migrating within groundwater or entering the surface water course. As PFAS is an emerging contaminant there is on-going research within the scientific community in the understanding on these compounds, the risks they pose and how to manage the effects. Further investigation of the presence of PFAS in soils at the site is proposed to be undertaken prior to commencement of earthworks and is detailed within the CSMP.

Based on the findings of this DSI consent as a discretionary activity under the AUP E30 rules is required.

11.2 Asbestos Regulations

11.2.1 Asbestos Related Works

As discussed in **Section 10**, soil disturbance at 105A-109A May Road and 119 May Road should be undertaken as **asbestos related works**, under the requirements of the NZ asbestos in soils guidelines.

The primary human health risk of asbestos is the inhalation of airborne, respirable asbestos fibres. As such, management of known asbestos contamination focuses on minimising the disturbance of asbestos containing material to limit the release of airborne asbestos fibres. WorkSafe NZ have adopted a trace level of 0.01 fibres / mL of air at which airborne asbestos fibres are measured. Air monitoring is not required by the NZ Asbestos in Soils Guidelines for asbestos related works unless considered to be required by the Suitably Qualified and Experienced Practitioner (SQEP). Based on the assessment undertaken to date air monitoring during soil disturbance is not considered necessary based on:

- The fill material encountered during this investigation was typically described as silty clay with some gravel and cobbles. Cohesive materials such as silts and clays are less likely to result in fibre release than coarser soils.
- Significant quantities of buried waste or friable asbestos were not observed during the investigation.
- Only 4 of 65 samples analysed recorded a concentration of FA/AF above the soil guideline value. The maximum recorded concentration (0.005 % w/w) was also only marginally above guideline value (0.001 % w/w).

Asbestos related works does not require the works to be undertaken by a licensed asbestos contractor or for the works to be notified to WorkSafe New Zealand. However, the contractor undertaking the works should be aware of the risks relating to asbestos and how to manage them, for example, having completed asbestos awareness training.

Asbestos related works requires mitigation controls which includes, disposable coveralls, nitrile gloves, steel toe capped gumboots, disposable P2 dust masks, dust suppression and decontamination areas and foot wash stations. The required controls and requirements will be set out in the CSMP.

If unexpected contamination is identified during future works, re-assessment of the risks by the SQEP will be required and air monitoring may be determined to be required. Unexpected contamination discovery protocols should be put in place by the contractor. Contamination indicators or hazardous materials may include but are not limited to the following:

- Unusual odours;
- Discoloured or stained water seepage and soils;
- Petroleum hydrocarbon contaminated soil, visual sheens and/or free product;
- Liquid waste, putrescible waste, household refuse and any material that normally would be sent to a licensed landfill;
- Any visible suspected Asbestos Containing Material (ACM);
- Large quantities of buried ACM including friable asbestos; or
- Intact or broken drums and containers.

If unexpected contamination is identified all soil disturbance works should stop and a SQEP should be contacted to provide advice on appropriate soil management and disposal.

As per the asbestos ACoP (Part D, Section 19), the works will become licensed asbestos removal works if;

- The WorkSafe NZ trace level (0.01 fibres / mL) is exceeded.
- More than 10 m^2 of soil is being removed.
- If ACD is associated with the removal.
- If the removal does not contain ‘minor contamination.’

11.3 Contaminated Soil Management Plan (CSMP)

The exposure pathway assessment identified complete exposure pathways which could be mitigated and managed through the implementation of specialist controls (via the implementation of management plans) during proposed land disturbance works. Specialist controls can be implemented through the development of a CSMP and include:

- A summary of human health controls for health and safety planning/training requirements, personal protective equipment, and personal monitoring.
- A summary of responsible parties to the land disposal works.
- A summary of environmental controls for odour, dust, noise, spoil stockpiling, spoil disposal, groundwater disposal.
- Procedures for encountering unknown contamination.

11.4 Disposal Options

The following provides definitions of the cleanfill, managed fill and contaminated fill.

11.4.1 Cleanfill

The Ministry for Environment (MfE) describes cleanfill material as; *’Material that when buried will have no adverse effect on people or the environment. Cleanfill material includes virgin natural materials such as clay, soil and rock, and other inert materials such as concrete or brick that are free of:*

- *combustible, putrescible, degradable or leachable components*
- *hazardous substances*

- *products or materials derived from hazardous waste treatment, hazardous waste stabilisation or hazardous waste disposal practices*
- *materials that may present a risk to human or animal health such as medical and veterinary waste, asbestos or radioactive substances*
- *liquid waste.'*

Essentially, inert soils are suitable as cleanfill if potential contaminants have been determined to be below published background concentrations.

11.4.2 Managed Fill

Managed fill is 'cleanfill type material but where material may include soils which exceed permitted activity contaminant concentrations that will not result in any significant adverse effect on human health, surface water or groundwater quality, including potable water sources' as defined in the AUP:OP. Individual landfill operators have consented acceptance levels for managed fill.

11.4.3 Contaminated Fill

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

11.4.4 Disposal Options

Wherever possible spoil generated during the land disturbance activities can be re-used at the Site if appropriately managed and / or capped as agreed by the SQEP. Where the materials are not considered to be suitable for re-use these spoil materials may be disposed of off-Site to an authorised facility authorised to accept such materials.

Based on the results of the soil investigation excess spoil will likely require disposal as managed fill or contaminated fill (based on the presence of asbestos within soils). There are a number of authorised facilities in Auckland which have Site specific acceptance criteria based on the requirements of their resource consents. It is recommended that a copy of the soil analytical results be provided to the nominated disposal facilities for review.

11.5 Further Work

The following further considerations are recommended:

- Soil sampling and/ or further groundwater sampling rounds are undertaken for analysis of PFAS when the proposed earthworks are confirmed, for example, at detailed design or tender stage. This would enable the investigations to be targeted to areas of soil disturbance to inform management and disposal. The CSMP provides management options for PFAS impacted material based on current guidelines.
- If required, further assessment of the 105 May Road Site following completion of the Watercare operations and dependent upon the proposed development.
- An asbestos demolition survey should be undertaken prior to any building demolition works at the Site.
- Assessment of the risk of asbestos in stream sediment if excavation within stream channels is proposed. The CSMP sets out procedures for the management of asbestos in soils/ sediment.

12 Conclusions

A Land Contamination Assessment was undertaken for the Site located at three property parcels (105, 105A-109A and 119 May Road). Resource Consent drawings indicate the works will comprise an area of cut along the south-western boundary of the 105A-109A property, raising of the ground levels over the remainder of the Site and a stream realignment and floodplain lowering within 105 May Road.

Summary of Investigation Findings

105 May Road

- Buildings were historically present along the south/south-western boundary as noted in the 1940 aerial photograph; several buildings had been demolished by 1959 and all demolished by 1975. Since then the Site has historically been predominantly vegetated with the northern portion cleared and gravel laydown areas with tracks connecting the Site to 105A-109A May Road and off-Site to the west.
- AC report they hold no records to suggest 105 May Road has been subject to HAIL activities, however Babingtons determine the Site is a HAIL site under HAIL activity I.
- Historical soil investigations undertaken by third parties indicate the presence of fill material and soil contamination including asbestos at the Site.
- The Site is currently being used by Watercare and their subcontractors as a Site compound and laydown area. As part of their occupation of the Site, Watercare will be excavating a large pond for flood compensation.
- No soil sampling was undertaken at the Site by Beca as part of this investigation.
- As the Site has been identified as a HAIL site by Babingtons, consent under the NESCS will be required if PA criteria cannot be met.

Babingtons report that lead and zinc concentrations exceeded the AUP Permitted Activity Soil Acceptance Criteria. If the PA criteria of the AUP cannot be met consent will be needed.

105A-109A May Road

- The 105A-109A May Road Site was originally developed through the late 1950's to the 1970s. The Site was also historically used by Thermo Polycoatings LTD for 'plastic coatings of articles' and 'Kitchenware non-stick coating applications'. During the walkover it was noted that the Site is currently used as a car yard along the eastern frontage and for timber pallet storage in the central area. Several stockpiles and general rubbish were also noted across the Site.
- A soil investigation comprising completion of 18 test pits was undertaken to provide general coverage of potential fill material and contamination sources across the Site. Eight boreholes were installed to enable collection of groundwater samples, and three surface water samples collected for assessment of risks related to PFAS.
- Fill material comprising gravel with cobbles, and traces of buried waste e.g. concrete, bricks, plastic, glass, metal and timber. Fill material was observed across the majority of the Site at maximum depths between 0.1-1.1m bgl. Underlying the fill was Holocene Alluvium described predominantly as grey mottled orange silty clays. A strong hydrocarbon odour was noted in TP206 between 0.5-1.2m bgl and TP208 between 0.7-0.9m bgl.
- Several soil stockpiles are located across the Site. The material within the stockpiles was typically described as a dry, brown clayey silt containing gravel, cobbles and waste material. The waste material (glass fragments, brick, concrete, nails, wire, plastic, rubber tires and timber) was observed on the surface of the stockpile and litter was observed to be scattered across the Site.
- Three locations recorded concentrations of heavy metals above the background, environmental and / or human health guidelines; TP201 at 0.5 m for lead, and stockpiles TP217 and TP218 for lead and arsenic respectively.

- Asbestos (fibres and ACM fragments) was detected in samples recovered from stockpiles TP212 and TP211. Asbestos fibre cement and fibres were also detected in soil samples recovered from TP201 and a hand dug pit adjacent to TP201 (next to a building). The maximum concentrations of the asbestos as ACM was 0.03 % w/w and as FA/AF was 0.005 % w/w, which are within the asbestos related works scenario.
- The PFAS compound PFOA was detected in two of eight groundwater samples (BH202 and BH207). The recorded concentrations were below the applied human health, ecological and trade waste criteria.
- PFOS was detected in one of three surface water samples, also below the applied human health, ecological and trade waste criteria.

119 May Road

- A warehouse structure was observed on the 1959 aerial, with AC indicating the building was constructed in 1953. Records in the property file indicate the Site was used as a clothing and shoe factory / warehouse. Property file records indicate that a fuel oil AST was be present at the rear of the premises. The warehouse structure was demolished in 2006. Based on the age of construction of the building the presence of asbestos or lead paint was considered likely.
- A soil investigation comprising the completion of 15 test pits, targeting the potential perimeter of the historical building structure (where asbestos / lead paint in cladding or rooves may have deteriorated and entered shallow soil) and also to provide general coverage of potential fill material across the Site was undertaken.
- Fill material comprising silty clay with gravel, cobbles, and traces of buried waste e.g. concrete, bricks, plastic, ceramic, glass, metal and timber was encountered to a maximum depth of 0.8 m bgl.
- One sample (TP104 at 0.2 m bgl) recorded a chromium concentration above the human health and environmental guideline value. The elevated concentration is considered to be a localised exceedance within the fill material and is considered unlikely to present a significant risk to human health or the environment.
- Asbestos was detected in seven soil samples across six locations. A fragment of asbestos fibre cement was also identified at one of these locations. All samples with asbestos detected were collected from shallow soils (< 0.6m) within the fill layer. Three samples recorded concentrations of FA/AF above the applied human health guidelines (0.001 % w/w), at a maximum concentration of 0.005 % w/w.

Risk Assessment

The exposure pathway assessment completed for the soil investigation identified several potentially exposure pathways which could be mitigated and managed through the implementation of management controls. Any soil disturbance works at 105A-109A May Road and 119 May Road should be undertaken as **asbestos related works**, under the requirements of the NZ asbestos in soils guidelines. All soil disturbance will need to be undertaken in accordance with the procedures set out in a CSMP.

Sampling of sediment or water quality of the watercourses located on the north-eastern boundary and crossing the Site between the 105 and 105A-109A properties was not undertaken as part of this phase of investigation. Risks to future redevelopment at the Site related to contamination within the watercourses relate to contamination already present in sediment from historical activities (on Site and from upstream sources) and also risks related to the current and future Watercare operations if soil handling if not undertaken appropriately. If works are proposed within the watercourse further investigation may be required to inform management or disposal of the material (water or sediment).

Consenting Requirements

Based on the results of this investigation and the proposed works, resource consents under the NESCS and AUP will be required.

Soil and Groundwater Disposal

Spoil generated during the land disturbance activities will be re-used at the Site if geotechnically suitable and appropriately managed and / or capped as agreed by the contaminated land Suitably Qualified and Experienced Practitioner (SQEP). Where the materials are not considered to be suitable for re-use, spoil materials may be disposed of off-site to a facility authorised to accept such materials.

The disposal of soil and groundwater containing PFAS is currently restricted: there are currently no landfills in NZ where PFAS contaminated soil has a published acceptance level, however a landfill may still accept the material with certain conditions. Material remaining on site may be the preferred option.

It is noted that PFAS analysis of soils has not yet been undertaken. Soil sampling should be undertaken to inform the potential presence of PFAS within soils that will actually be disturbed, that is in areas confirmed for excavation or trenching and may require off-site disposal.

If PFAS is not detected in soil, excess spoil will likely require disposal as managed fill or contaminated fill. Generally, if spoil contains asbestos material (as present at this Site) then the spoil will require disposal as contaminated fill. It is recommended that a copy of the soil analytical results be provided to the nominated disposal facilities for review and material acceptance.

If dewatering is required, consideration for the management of PFAS impacted groundwater will be required. The concentrations recorded to date are below the interim trade waste criteria, however these values may be revised by the time the works are undertaken. Further, the discharge of groundwater to trade waste would require agreement from the trade waste operator.

Conclusions and Recommendations

Soil and groundwater contamination presenting risks to construction workers and future site operators has been identified. These risks can be managed through the construction and operational phase through the resource consent and design processes and the implementation of management plans. PFAS is primarily an issue with regards to managing water or disposing of soil or water.

The PFAS compound PFOA detected within groundwater at the 105A-109A May Road Site points to the historical kitchenware coating operation as the source. Given the time between the kitchenware coating operation and the present day it is possible that there is a small PFAS soil source area that is resulting in ongoing input into groundwater. We have found no evidence of significant masses of PFAS migrating within groundwater to surface water. The recorded concentrations are below the applied human health, ecological and trade waste criteria.

The PFAS compound PFOS was detected in one surface water sample (SW3) at concentrations below the applied human health, ecological and trade waste criteria. This is a different compound to that detected in groundwater (PFOS compared to PFOA). The stream is a receiving environment for stormwater from the surrounding urban catchment therefore the source could be off-site and not related to the kitchenware coating operation however this has not been confirmed by this investigation.

The following further considerations are recommended:

- Soil sampling and/ or further groundwater sampling rounds are undertaken for analysis of PFAS when the proposed earthworks are confirmed, for example, at detailed design or tender stage. This would enable the investigations to be targeted to areas of soil disturbance to inform management and disposal. The CSMP provides management options for PFAS impacted material based on current guidelines.
- If required, further assessment of the 105 May Road Site following completion of the Watercare operations and dependent upon the proposed development.
- An asbestos demolition survey should be undertaken prior to any building demolition works at the Site.
- Assessment of the risk of asbestos in stream sediment if excavation within stream channels is proposed. The CSMP sets out procedures for the management of asbestos in soils/ sediment.

13 Limitations

This report has been prepared by Beca on the specific instructions of our Client. It is solely for our Client's use for the purpose for which it is intended in accordance with the agreed scope of work. Any use or reliance by any person contrary to the above, to which Beca has not given its prior written consent, is at that person's own risk.

This report is prepared solely for the purpose of the assessment of potential soil and groundwater contamination (Scope). The contents of this report may not be used for any purpose other than in accordance with the stated Scope.

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

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

A

Appendix A – Historic Aerial Photographs

1940

0 10 20 30
Meters

Scale @ A4
= 1:2,500

Date Printed:
18/09/2020

Auckland Council
Te Kaunihera o Tāmaki Makaurau

1959

0 10 20 30
Meters

Scale @ A4
= 1:2,500

Date Printed:
18/09/2020

Auckland Council
Te Kaunihera o Tāmaki Makaurau

1968

1975

1988

1996

0 10 20 30
Meters

Scale @ A4
= 1:2,500

Date Printed:
18/09/2020

Auckland Council
Te Kaunihera o Tāmaki Makaurau

2001

0 10 20 30
Meters

Scale @ A4
= 1:2,500

Date Printed:
18/09/2020

Auckland Council
Te Kaunihera o Tāmaki Makaurau

2008

0 10 20 30
Meters

Scale @ A4
= 1:2,500

Date Printed:
18/09/2020

Auckland Council
Te Kaunihera o Tāmaki Makaurau

2015 and 2016

0 10 20 30
Meters

Scale @ A4
= 1:2,500

Date Printed:
18/09/2020

Auckland Council
Te Kaunihera o Tāmaki Makaurau

2017

0 10 20 30
Meters

Scale @ A4
= 1:2,500

Date Printed:
18/09/2020

Auckland Council
Te Kaunihera o Tāmaki Makaurau

Sourced from http://maps.au.nearmap.com/

2020

B

Appendix B –Auckland Council Provided Information

29 September 2020

Beca
PO Box 6345
AUCKLAND 1141

Attention: Vicky Kennaugh

Dear Vicky

Site Contamination Enquiry – *105, 105A-109A and 119 May Road, Mount Roskill*

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

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

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

1. Hazardous Activities and Industries List (HAIL) Information

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

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

- HAIL Item (A.17) – Storage tanks or drums for fuel, chemicals or liquid waste.

There is no information held within our records to suggest the site 105 May Road, Mount Roskill, has been subject to HAIL activities.

Records indicate the site 105A – 109A May Road, Mount Roskill, has a permit for an underground tank on site issued in 1956. Additionally, aerial records indicate the site has been utilised for the stockpiling of a number of materials over the years, including vehicles, seen in aerial images below:



Additionally, due to the age of structures on site (built in the 1950's) the potential for asbestos and/or lead paint may need to be considered.

There is no information held within our records to suggest the site 119 May Road, Mount Roskill, has been subject to HAIL activities. However, the original building, constructed in 1953, was demolished on site in 2006, and therefore the potential for asbestos and/or lead paint may need to be considered.

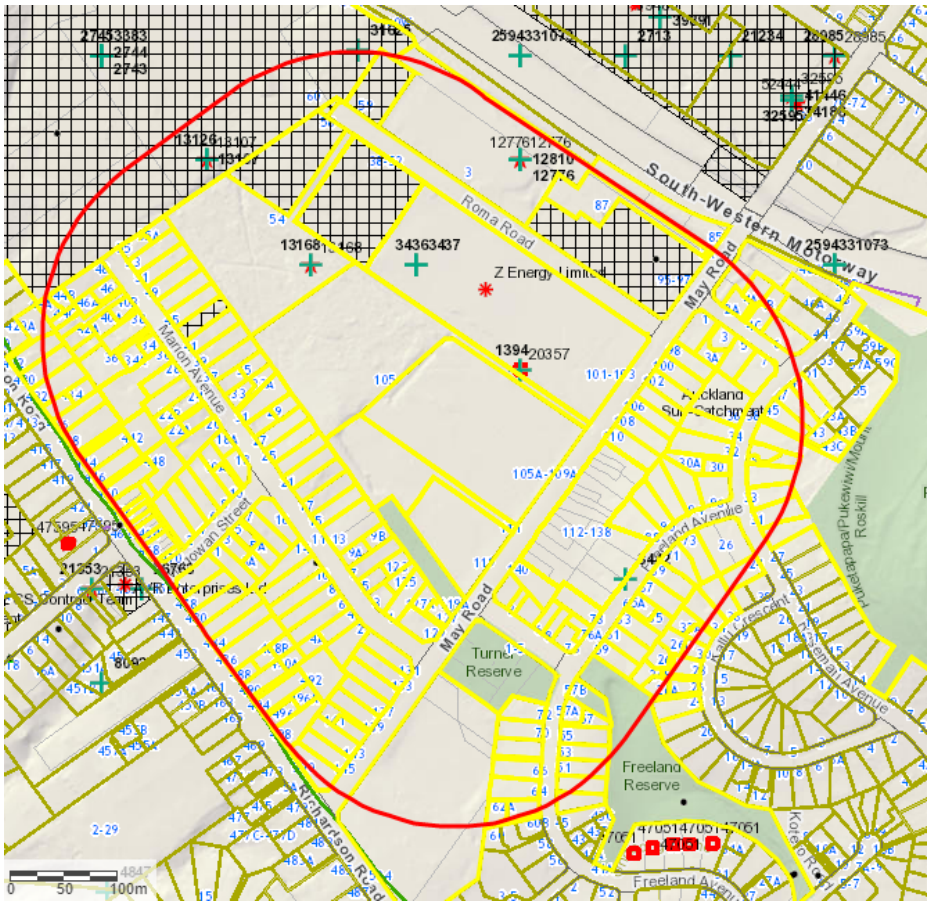
Please note:

- *If you are demolishing any building that may have asbestos containing materials (ACM) in it, you have obligations under the Health and Safety at Work (Abestos) Regulations 2016 for the management and removal of asbestos, including the need to engage a Competent Asbestos Surveyor to confirm the presence or absence of any ACM.*
- *Paints used on external parts of properties up until the mid-1970's routinely contained lead, a poison and a persistent environmental pollutant. You are advised to ensure that soils affected by old, peeling or flaking paint are assessed in relation to the proposed use of the property, including high risk use by young children.*

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

The Council database was searched for records of the following activities within approximately 200 metres of the site:

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



Legend:

All Consents
All Applications
All Permitted Activities
All Bores
Closed Landfill (Auckland Council owned)
Closed Landfill (Privately owned)

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

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

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

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

Please note Auckland Council cost recovers officer's time for all site enquiries. As such an invoice for $128 for the time involved in this enquiry will follow shortly.

Yours Sincerely,

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

Consents

CONSENT_ NUMBER	FILE_ REFERENCE	ACTIVITY	CONSENT_HOLDER	CONSENT STATUS	GRANTED DATE	REVIEW DATE	EXPIRY DATE	PURPOSE	WORKS_DESCRIPTION	EASTING	NORTHING	ACTIVITY ID	ACTIVITY STATUS	ACTIVITY_DESCRIPTION	SITE_NAME	SITE_DESCRIPTION	DATE_ CREATED	PROPERTY_ADDRESS
12776	C512-12-1281	Bore	H J Ryan Limited	Expired	19940623		19950623	Authorize the construction of a bore for the extraction of groundwater for industrial supply.	Construction of a 150mm dia. bore to approx 20-40m depth and installation of steel casing to approx. 10-16m.	1754300	5913800	1360	Drilled	Approx 30 cmpd		Roma Road, Mt Roskill	2/06/2017	
12810	AG949724	Take	H J Ryan Limited	Surrendered	19940715	20000701	20051231	TO TAKE GROUNDWATER FROM A PROPOSED 150MM DIA BORE FOR USE IN WELDER COOLING, INDUSTRIAL POWDER COATING PRETREATMENT RINSE TANKS AND ABLUTIONS	TAKE FROM A NEW 150MM DIAMETER BORE	1754300	5913800	4421	NeverOccurred	Welder cooling, industrial powder coating pre-treatment rinse tanks and ablutions			2/06/2017	ROMA ROAD MT ROSKILL Auckland City
13107	C512-12-1367	Bore	Foodstuffs North Island Limited	Expired	19940830		19950830	Authorize the construction of a bore for the extraction of groundwater for industrial ablution and vehicle washing supply	Construction of a 100mm dia. bore to approx 600m depth and installation of steel casing to approx. 65m.	1754000	5913800	4533	Drilled	Use at commercial premises and for 3 staff houses, ablutions, cafeteria, cleaning, vehicle cleaning, gardens, general maintenance, fire pump testing. Approx 60 cmpd.		380 Richardson Road, Mt Roskill	2/06/2017	
13126	AG949899	Take	Foodstuffs North Island Limited	Surrendered	19940921	20000901	20051231	TO TAKE GROUNDWATER FOR MAINTAINING STAFF ABLUTIONS, CLEANING AND DOMESTIC USE ON AN INDUSTRIAL SITE.	A 100 MM DIAMETER BORE LOCATED APPROXIMATELY 100 METRES OFF ROMA ROAD	1754000	5913800	4494	NeverOccurred	Maintaining staff ablutions, cleaning and domestic use on an industrial site	Foodstuff Auckland	60 Roma Rd, Mt Roskill, Auckland	2/06/2017	60 Roma Rd Mt Roskill Auckland City
13168	C512-12-1391*	Bore	Wiri Oil Services Limited	Expired	19940916		19950916	Authorize the construction of three (3) bores for groundwater level and/or Chemistry investigations Associated with BC 4554, 4555, 4556.	Construction of three (3) 50mm dia. bores to approx 5m depth. Installation of PVC casing to approx 5m and PVC screen from approx. 1m to 5m if required.	1754100	5913700	4556	Drilled	3 monitoring bores		Wiri Oil Services 149-187 Roscommon Road, Wiri	2/06/2017	

Permitted Activity

PERMITTED_ ACTIVITY_ID	FILE_ REFERENCE	PERMITTED_ ACTIVITY_ HOLDER	PERMITTED_ ACTIVITY_ TYPE	ACTIVITY	CONSENT_STATUS	PURPOSE	WORKS_DESCRIPTION	EASTING	NORTHING	ACTIVITY _ID	ACTIVITY _STATUS	ACTIVITY_ DESCRIPTION	SITE_NAME	SITE_ DESCRIPTION	PROPERTY_ADDRESS
51584	5-46-3753	Z Energy Limited	Contaminated Site Discharge	Contaminated Site Discharge	Assessment Completed	UST removal assessment of ground conditions	5-46-3753peter kavanagh	1754267	5913677	20673	Occurring	tank pull report	56 Roma Road, Mt Roskill	UST removal	58 Roma Road Mount Roskill Auckland Central

Bores

CONSENT NUMBER	FILE_ REFERENCE	CONSENT_ HOLDER	BORE ID	GRANTED DATE	EXPIRY DATE	CONSENT STATUS	PURPOSE	WORKS_ DESCRIPTION	EASTING	NORTHING	ACTIVITY STATUS	BORE _USE	ACTIVITY_DESCRIPTION	SITE_DESCRIPTION	MAIN_AQUIFER	AQUIFER	SUB_AQUIFER1	DATE_ DRILLED	TOTAL DEPTH	STATIC_ WATER_ LEVEL	STATIC_ WATER DATE
13107	C512-12-1367	Foodstuffs North Island Limited	4533	19940830	19950830	Expired	Authorize the construction of a bore for the extraction of groundwater for industrial ablution and vehicle washing supply	Construction of a 100mm dia. bore to approx 600m depth and installation of steel casing to approx. 65m.	1754000	5913800	Drilled	Industrial	Use at commercial premises and for 3 staff houses, ablutions, cafeteria, cleaning, vehicle cleaning, gardens, general maintenance, fire pump testing. Approx 60 cmpd.	380 Richardson Road, Mt Roskill	Waitemata	Auckland Isthmus Waitemata		19940913	591	8.1	19950119
13168	C512-12-1391*	Wiri Oil Services Limited	4556	19940916	19950916	Expired	Authorize the construction of three (3) bores for groundwater level and/or Chemistry investigations Associated with BC 4554, 4555, 4556.	Construction of three (3) 50mm dia. bores to approx 5m depth. Installation of PVC casing to approx 5m and PVC screen from approx. 1m to 5m if required.	1754100	5913700	Drilled	Observation / Piezo	3 monitoring bores	Wiri Oil Services 149-187 Roscommon Road, Wiri				19940919	5.5		
12776	C512-12-1281	H J Ryan Limited	1360	19940623	19950623	Expired	Authorize the construction of a bore for the extraction of groundwater for industrial supply.	Construction of a 150mm dia. bore to approx 20-40m depth and installation of steel casing to approx. 10-16m.	1754300	5913800	Drilled	Industrial	Approx 30 cmpd	Roma Road, Mt Roskill	Volcanic	Auckland Isthmus Volcanic	Mt Roskill-Mt Albert Volcanic	19940711	16.5		
12776	C512-12-1281	H J Ryan Limited	1360	19940623	19950623	Expired	Authorize the construction of a bore for the extraction of groundwater for industrial supply.	Construction of a 150mm dia. bore to approx 20-40m depth and installation of steel casing to approx. 10-16m.	1754300	5913800	Drilled	Industrial	Approx 30 cmpd	Roma Road, Mt Roskill	Volcanic	Auckland Isthmus Volcanic	Mt Roskill-Mt Albert Volcanic	19940711	16.5		

Incidents

INCIDENTNUMBER	XCOORD	YCOORD	NZTMXCOORD	NZTMYCOORD	LOCATION	SUBURB	CATCHMENT CODE	POLLUTANT TYPE	REPORT	INCIDENTTYPE	IMPACT	VOLUME	PROBLEM FOUND	CULPRIT TRACED	RECORD DATE	INVESTIGATION DATE
09/1778	1754104.9	5913415.4	1754104.9	5913415.4	12 Marion Ave	Mt Roskill	546	Other Chemicals	Roofcleaning runoff into s/w	Water / Land Pollution	Potential	10-200 litres	YES	YES	21/05/2009	21/05/2009
Nov-60	1754429.34	5913705.03	1754429.34	5913705.03	95-97 May Rd	Mt Roskill	546	Wastewater - Sewer Overflow	DWSO	Sewage Overflow	Natural Water	N/A	YES	YES	11/11/2011	11/11/2011

Vicky Kennaugh

From: Zihao Lin <zihao.lin@aucklandcouncil.govt.nz> on behalf of closedlandfills <closedlandfills@aklc.govt.nz>
Sent: Friday, 18 September 2020 4:19 PM
To: Vicky Kennaugh; closedlandfills
Subject: RE: Closed Landfill Enquiry - May Road

Hi Vicky,

There are no closed landfills managed by CLFM within 1,000 m of your subject sites.

The Closed Landfill Management team (CLFM) generally only holds information on closed landfills owned and/or managed by Auckland Council. This search does not include closed landfills that are privately owned, or that are managed by other council controlled organisations, such as Watercare or Regional Facilities Auckland.

Other contamination information in the area may be available in property files, LIM reports, or by making a contaminated sites enquiry. Instructions for doing so are in the council website.

Please contact closedlandfills@aklc.govt.nz if you require any further information.

Ngā mihi | Kind regards,

Zihao Lin | Graduate Engineer
Engineering & Technical Services Unit
B.E (Civil), MEngSt (Civil)
Mobile +64-21 578 651
Auckland Council, Level 6, Auckland House
135 Albert Street, Auckland
Visit our website: www.aucklandcouncil.govt.nz

From: Vicky Kennaugh <Vicky.Kennaugh@beca.com>
Sent: Friday, 18 September 2020 1:35 PM
To: closedlandfills <closedlandfills@aklc.govt.nz>
Subject: Closed Landfill Enquiry - May Road

Good Afternoon,

Please can you advise if there are any closed landfills located at or within 1km of the site located at 105, 105A-109A and 119 May Road.

A site plan is attached.

Thanks

Vicky

Vicky Kennaugh
Senior Environmental Scientist – Auckland Environments
Beca

C

Appendix C – Analytical Results Summary Tables

105A-109A May Road

105A-109A May Road - Soil Analytical Results															
Sample Name	**TP201 0.5m**	**TP201 1.0m**	**TP201 4.2m**	**TP202 0.4m**	**TP202 1.6m**	**TP203 0.4m**	**TP204 0.4m**	**TP204 1.5m**	**TP205 0.4m**	**TP205 1.0m**	**Assessment Criteria**				
Sample Date	27-Oct-20	27-Oct-20	27-Oct-20	27-Oct-20	27-Oct-20	27-Oct-20	23-Oct-20	23-Oct-20	27-Oct-20	27-Oct-20		Human Health Risk			
Sample Depth (m)	0.5	1	4.2	0.4	1.6	0.4	0.4	1.5	0.4	1					
Lab Number	2463453.10	2463453.2	2463453.4	2463453.50	2463453.7	2463453.8	2463453.9	2463453.11	2463453.12	2463453.54	Background Criteria	Residential Land Use Scenario	Parks / Recreation Land Use Scenario	Commercial / Industrial Worker Scenario	Environmental Discharge Risk
Soil Observed	CLAY	CLAY	PEAT	Silty CLAY	Silty SAND	Clayey SILT	Silty Clay	PEAT	CLAY	Silty CLAY					
Heavy Metals (mg/kg dry wt)															
Total Recoverable Arsenic	4	2	9	3	< 2	< 2	< 2	< 2	2	< 2	0.4-12 [1]	20 [2]	80 [2]	70 [2]	100 [5]
Total Recoverable Cadmium	**1.06**	0.12	< 0.3	0.29	< 0.10	0.28	0.12	0.3	< 0.10	< 0.10	<0.1-0.65 [1]	3 [2]	400 [2]	1300 [2]	7.5 [5]
Total Recoverable Chromium	24	26	8	29	13	56	34	50	15	23	3-125 [1]	460 [2]	2700 [2]	6300 [2]	400 [5]
Total Recoverable Copper	**197**	18	90	40	6	57	23	41	16	9	20-90 [1]	>10,000 [2]	>10,000 [2]	>10,000 [2]	325 [5]
Total Recoverable Lead	**1000**	16.2	< 0.9	**168**	11.5	8.7	9.2	8.1	11.7	10.1	<1.5-65 [1]	210 [2]	880 [2]	3300 [2]	250 [5]
Total Recoverable Mercury	< 0.10	< 0.10	< 0.3	0.12	< 0.10	< 0.10	< 0.10	0.1	< 0.10	< 0.10	<0.03-0.45 [1]	310 [2]	1800 [2]	4200 [2]	0.75 [5]
Total Recoverable Nickel	60	21	45	29	13	184	65	33	41	12	4-320 [1]	150 [3]	-	2,200 [3]	105 [5]
Total Recoverable Zinc	270	57	61	220	15	108	63	96	30	17	54-1,160 [1]	2300 [3]	-	35,000 [3]	400 [5]
BTEX in Soil by Headspace GC-MS															
Benzene	-	-	-	-	-	-	-	-	-	-	-	1.1 [4]	-	3 [4]	-
Toluene	-	-	-	-	-	-	-	-	-	-	-	(68) [4]	-	(94) [4]	-
Ethylbenzene	-	-	-	-	-	-	-	-	-	-	-	(53) [4]	-	(180) [4]	-
m&p-Xylene	-	-	-	-	-	-	-	-	-	-	-	(48) [4]	-	(150) [4]	-
o-Xylene	-	-	-	-	-	-	-	-	-	-					
Polycyclic Aromatic Hydrocarbons (mg/kg dry wt)															
Total of Reported PAHs in Soil	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1-Methylnaphthalene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2-Methylnaphthalene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Acenaphthylene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Acenaphthene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Anthracene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo[a]anthracene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo[a]pyrene (BAP)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	22 / 47 [6]
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	-	-	-	-	-	-	-	-	-	-	-	10 [2]	40 [2]	35 [2]	-
Benzo[a]pyrene Toxic Equivalence (TEF)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20 [5]
Benzo[b]fluoranthene + Benzo[j]fluoranthene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo[e]pyrene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo[g,h,i]perylene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo[k]fluoranthene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chrysene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dibenzo[a,h]anthracene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fluoranthene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	89 / 190 [6]
Fluorene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Indeno(1,2,3-c,d)pyrene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Naphthalene	-	-	-	-	-	-	-	-	-	-	-	58 [4]	-	(190) [4]	-
Perylene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Phenanthrene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pyrene	-	-	-	-	-	-	-	-	-	-	-	(1600) [4]	-	NA [4]	-
Total Petroleum Hydrocarbons (mg/kg dry wt)															
C7 - C9	< 8	< 8	< 80	< 8	< 8	< 8	< 8	< 11	< 8	< 9	-	120 [4]	-	120 [4]	130 / 170 [6]
C10 - C14	< 20	< 20	< 160	< 20	< 20	< 20	< 20	< 30	< 20	< 20	-	(470) [4]	-	(1500) [4]	110 / 140 [6]
C15 - C36	< 40	< 40	**1460**	196	< 40	< 40	< 40	< 50	< 40	< 40	-	N/A [4]	-	N/A [4]	1300 / 2500 [6]
Total hydrocarbons (C7 - C36)	< 70	< 70	1510	196	< 70	< 70	< 70	< 80	< 70	< 70	-	-	-	-	-

Annotations

1 Auckland Regional Council 2002. Technical Publication 153, Table 3. Background Ranges of Trace Elements in Auckland Soils. Volcanic range selected.

2 Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2012. Values applicable for inorganic and organic substances 'residential 10% produce', 'recreation', and 'commercial / industrial outdoo worker unpaved' have been selected.

3 United States Environmental Protection Agency (US EPA) Regional Screening Levels. Soil contamination standards for 'residential' and 'industrial' soil have been selected.

4 Ministry for the Environment Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand 1999. Module 4 values applicable to SAND soils <1m in depth (i.e. conservative approach) have been selected for 'residential' (Tables 4.10 and 4.13) and 'commercial/industrial' (Tables 4.11 and 4.14) land use scenarios.

Brackets denote values exceed threshold likley to correspond to formation of residual separate phase hydrocarbons
NA indicates contaminant not limiting as estimated health based crtierion is signficantly higher than that likley to be encountered on site
N/A indicates estimated criterion exceeds 20,000 mg/kg. At 20,000 mg/kg residual separate phase is expected to have formed in soil matrix

5 Auckland Unitary Plan Operative in Part 2018. Table E30.6.1.4.1 Soil Acceptance Criteria.

6 Landcare research 2016. User Guide: Background soil concentrations and soil guideline values for the protection of ecological receptors (Eco-SGVs)- Consultation Draft, Table 7. Values applicable to a fine soil for a 'residential/recreational' area and a 'commerical industrial' area

Above Background Concentration
Concentrations above Human Health Criteria
Concentrations above Environmental Discharge Criteria

105A-109A May Road - Soil Analytical Results															
Sample Name	**TP206 0.5m**	**TP206 1.2m**	**TP207 0.5m**	**TP207 1.3m**	**TP208 0.4m**	**TP208 0.8m**	**TP209 0.4m**	**TP210 0.5m**	**TP210 2.4m**	**TP211 0.3m**	**Assessment Criteria**				
Sample Date	23-Oct-20	23-Oct-20	23-Oct-20	23-Oct-20	22-Oct-20	22-Oct-20	22-Oct-20	27-Oct-20	27-Oct-20	22-Oct-20		Human Health Risk			
Sample Depth (m)	0.5	1.2	0.5	1.3	0.4	0.8	0.4	0.5	2.4	0.3					
Lab Number	2463453.13	2463453.14	2463453.15	2463453.16	2463453.19	2463453.20	2463453.21	2463453.23	2463453.26	2463453.27	Background Criteria	Residential Land Use Scenario	Parks / Recreation Land Use Scenario	Commercial / Industrial Worker Scenario	Environmental Discharge Risk
Soil Observed	Clayey SILT	Clayey SILT	CLAY	Silty SAND	Clayey SILT	CLAY	CLAY	CLAY	Silty SAND	Clayey SILT					
Heavy Metals (mg/kg dry wt)															
Total Recoverable Arsenic	< 2	< 2	< 2	< 2	< 2	< 2	< 2	3	< 2	< 2	0.4-12 [1]	20 [2]	80 [2]	70 [2]	100 [5]
Total Recoverable Cadmium	< 0.10	< 0.10	0.12	< 0.10	0.13	< 0.10	< 0.10	< 0.10	< 0.10	0.1	<0.1-0.65 [1]	3 [2]	400 [2]	1300 [2]	7.5 [5]
Total Recoverable Chromium	16	21	35	7	47	27	18	15	11	33	3-125 [1]	460 [2]	2700 [2]	6300 [2]	400 [5]
Total Recoverable Copper	14	5	12	3	52	9	3	7	6	33	20-90 [1]	>10,000 [2]	>10,000 [2]	>10,000 [2]	325 [5]
Total Recoverable Lead	8.2	6.1	7.7	2	11.8	6.9	4.7	6.4	7.3	5.4	<1.5-65 [1]	210 [2]	880 [2]	3300 [2]	250 [5]
Total Recoverable Mercury	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.13	0.11	< 0.10	<0.03-0.45 [1]	310 [2]	1800 [2]	4200 [2]	0.75 [5]
Total Recoverable Nickel	13	9	13	9	120	14	5	8	13	68	4-320 [1]	150 [3]	-	2,200 [3]	105 [5]
Total Recoverable Zinc	41	14	290	< 4	81	20	10	11	21	76	54-1,160 [1]	2300 [3]	-	35,000 [3]	400 [5]
BTEX in Soil by Headspace GC-MS															
Benzene	< 0.06	< 0.06	< 0.06	< 0.05	< 0.06	< 0.07	-	-	-	-	-	1.1 [4]	-	3 [4]	-
Toluene	< 0.06	< 0.06	< 0.06	< 0.05	< 0.06	< 0.07	-	-	-	-	-	(68) [4]	-	(94) [4]	-
Ethylbenzene	< 0.06	< 0.06	< 0.06	< 0.05	0.07	< 0.07	-	-	-	-	-	(53) [4]	-	(180) [4]	-
m&p-Xylene	< 0.11	< 0.11	< 0.12	< 0.10	< 0.11	< 0.13	-	-	-	-	-	(48) [4]	-	(150) [4]	-
o-Xylene	< 0.06	< 0.06	< 0.06	< 0.05	< 0.06	< 0.07	-	-	-	-					
Polycyclic Aromatic Hydrocarbons (mg/kg dry wt)															
Total of Reported PAHs in Soil	< 0.4	< 0.4	< 0.4	< 0.3	0.8	1.9	-	-	-	-	-	-	-	-	-
1-Methylnaphthalene	< 0.013	< 0.013	< 0.014	< 0.012	0.062	0.163	-	-	-	-	-	-	-	-	-
2-Methylnaphthalene	< 0.013	< 0.013	< 0.014	< 0.012	0.087	0.24	-	-	-	-	-	-	-	-	-
Acenaphthylene	< 0.013	< 0.013	< 0.014	< 0.012	< 0.013	< 0.014	-	-	-	-	-	-	-	-	-
Acenaphthene	< 0.013	< 0.013	< 0.014	< 0.012	< 0.013	< 0.014	-	-	-	-	-	-	-	-	-
Anthracene	< 0.013	< 0.013	< 0.014	< 0.012	< 0.013	< 0.014	-	-	-	-	-	-	-	-	-
Benzo[a]anthracene	< 0.013	< 0.013	< 0.014	< 0.012	0.016	< 0.014	-	-	-	-	-	-	-	-	-
Benzo[a]pyrene (BAP)	< 0.013	< 0.013	< 0.014	< 0.012	0.019	< 0.014	-	-	-	-	-	-	-	-	22 / 47 [6]
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	< 0.04	< 0.04	< 0.04	< 0.03	< 0.04	< 0.04	-	-	-	-	-	10 [2]	40 [2]	35 [2]	-
Benzo[a]pyrene Toxic Equivalence (TEF)	< 0.04	< 0.04	< 0.04	< 0.03	< 0.04	< 0.04	-	-	-	-	-	-	-	-	20 [b]
Benzo[b]fluoranthene + Benzo[j]fluoranthene	< 0.013	< 0.013	< 0.014	< 0.012	0.022	< 0.014	-	-	-	-	-	-	-	-	-
Benzo[e]pyrene	< 0.013	< 0.013	< 0.014	< 0.012	0.017	< 0.014	-	-	-	-	-	-	-	-	-
Benzo[g,h,i]perylene	< 0.013	< 0.013	< 0.014	< 0.012	0.015	< 0.014	-	-	-	-	-	-	-	-	-
Benzo[k]fluoranthene	< 0.013	< 0.013	< 0.014	< 0.012	< 0.013	< 0.014	-	-	-	-	-	-	-	-	-
Chrysene	< 0.013	< 0.013	< 0.014	< 0.012	0.013	< 0.014	-	-	-	-	-	-	-	-	-
Dibenzo[a,h]anthracene	< 0.013	< 0.013	< 0.014	< 0.012	< 0.013	< 0.014	-	-	-	-	-	-	-	-	-
Fluoranthene	< 0.013	< 0.013	< 0.014	< 0.012	0.033	< 0.014	-	-	-	-	-	-	-	-	89 / 190 [b]
Fluorene	< 0.013	< 0.013	< 0.014	< 0.012	< 0.013	< 0.014	-	-	-	-	-	-	-	-	-
Indeno(1,2,3-c,d)pyrene	< 0.013	< 0.013	< 0.014	< 0.012	0.015	< 0.014	-	-	-	-	-	-	-	-	-
Naphthalene	< 0.07	< 0.07	< 0.07	< 0.06	0.46	1.47	-	-	-	-	-	58 [4]	-	(190) [4]	-
Perylene	< 0.013	0.026	< 0.014	< 0.012	< 0.013	< 0.014	-	-	-	-	-	-	-	-	-
Phenanthrene	< 0.013	< 0.013	< 0.014	< 0.012	0.014	< 0.014	-	-	-	-	-	-	-	-	-
Pyrene	< 0.013	< 0.013	< 0.014	< 0.012	0.035	< 0.014	-	-	-	-	-	(1600) [4]	-	NA [4]	-
Total Petroleum Hydrocarbons (mg/kg dry wt)															
C7 - C9	< 8	< 8	< 9	< 8	< 8	< 9	< 8	< 8	< 9	< 8	-	120 [4]	-	120 [4]	130 / 170 [6]
C10 - C14	< 20	< 20	< 20	< 20	32	55	< 20	< 20	< 20	< 20	-	(470) [4]	-	(1500) [4]	110 / 140 [6]
C15 - C36	< 40	< 40	< 40	< 40	< 40	< 40	< 40	< 40	< 40	< 40	-	N/A [4]	-	N/A [4]	1300 / 2500 [6]
Total hydrocarbons (C7 - C36)	< 70	< 70	< 70	< 70	< 70	79	< 70	< 70	< 70	< 70	-	-	-	-	-

Annotations

1 Auckland Regional Council 2002. Technical Publication 153, Table 3. Background Ranges of Trace Elements in Auckland Soils. Volcanic range selected.

2 Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2012. Values applicable for inorganic and organic substances 'residential 10% produce', 'recreation', and 'commercial / industrial outdoor worker unpaved' have been selected.

3 United States Environmental Protection Agency (US EPA) Regional Screening Levels. Soil contamination standards for 'residential' and 'industrial' soil have been selected.

4 Ministry for the Environment Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand 1999. Module 4 values applicable to SAND soils <1m in depth (i.e. conservative approach) have been selected for 'residential' (Tables 4.10 and 4.13) and 'commercial/industrial' (Tables 4.11 and 4.14) land use scenarios.

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

NA indicates contaminant not limiting as estimated health based crtierion is signficantly higher than that likley to be encountered on site

N/A indicates estimated criterion exceeds 20,000 mg/kg. At 20,000 mg/kg residual separate phase is expected to have formed in soil matrix

5 Auckland Unitary Plan Operative in Part 2018. Table E30.6.1.4.1 Soil Acceptance Criteria.

6 Landcare research 2016. User Guide: Background soil concentrations and soil guideline values for the protection of ecological receptors (Eco-SGVs)- Consultation Draft, Table 7. Values applicable to a fine soil for a 'residential/recreational' area and a 'commerical industrial' area

Above Background Concentration
Concentrations above Human Health Criteria
Concentrations above Environmental Discharge Criteria

105A-109A May Road - Soil Analytical Results																
Sample Name	**TP212 0.4m**	**TP212 2.25m**	**TP213 0.4m**	**TP213 0.9m**	**TP213 2.1m**	**TP214 2.2m**	**TP214 2.9m**	**TP215 0.4m**	**TP215 1.5m**	**TP216 1.2m**	**Assessment Criteria**				
Sample Date	21-Oct-20	21-Oct-20	27-Oct-20	27-Oct-20	27-Oct-20	22-Oct-20	22-Oct-20	23-Oct-20	23-Oct-20	23-Oct-20		Human Health Risk			
Sample Depth (m)	0.4	2.25	0.4	0.9	2.1	2.2	2.9	0.4	1.5	1.2					
Lab Number	2463453.66	2463453.65	2463453.31	2463453.33	2463453.37	2463453.41	2463453.42	2463453.43	2463453.45	2463453.48	Background Criteria	Residential Land Use Scenario	Parks / Recreation Land Use Scenario	Commercial / Industria Worker Scenario	Environmental Discharge Risk
Soil Observed	CLAY	CLAY	Clayey SILT	Silty CLAY	CLAY	SAND	PEAT	CLAY	CLAY	Silty CLAY					
Heavy Metals (mg/kg dry wt)															
Total Recoverable Arsenic	< 2	< 2	3	2	< 2	< 2	10	< 2	< 2	4	0.4-12 [1]	20 [2]	80 [2]	70 [2]	100 [5]
Total Recoverable Cadmium	< 0.10	< 0.10	0.14	0.25	0.13	< 0.10	0.29	< 0.10	< 0.10	< 0.10	<0.1-0.65 [1]	3 [2]	400 [2]	1300 [2]	7.5 [5]
Total Recoverable Chromium	29	20	20	26	19	< 2	24	14	33	39	3-125 [1]	460 [2]	2700 [2]	6300 [2]	400 [5]
Total Recoverable Copper	6	5	59	23	9	< 2	40	4	15	30	20-90 [1]	>10,000 [2]	>10,000 [2]	>10,000 [2]	325 [5]
Total Recoverable Lead	8.2	6.3	10.8	16.5	8	1.2	2.7	4.8	10.8	7.4	<1.5-65 [1]	210 [2]	880 [2]	3300 [2]	250 [5]
Total Recoverable Mercury	< 0.10	0.11	< 0.10	< 0.10	0.13	< 0.10	0.18	< 0.10	0.12	< 0.10	<0.03-0.45 [1]	310 [2]	1800 [2]	4200 [2]	0.75 [5]
Total Recoverable Nickel	9	9	16	28	12	< 2	48	8	23	25	4-320 [1]	150 [3]	-	2,200 [3]	105 [5]
Total Recoverable Zinc	15	19	59	42	31	8	92	12	39	69	54-1,160 [1]	2300 [3]	-	35,000 [3]	400 [5]
BTEX in Soil by Headspace GC-MS															
Benzene	-	-	-	-	-	-	-	< 0.05	< 0.08	-	-	1.1 [4]	-	3 [4]	-
Toluene	-	-	-	-	-	-	-	< 0.05	< 0.08	-	-	(68) [4]	-	(94) [4]	-
Ethylbenzene	-	-	-	-	-	-	-	< 0.05	< 0.08	-	-	(53) [4]	-	(180) [4]	-
m&p-Xylene	-	-	-	-	-	-	-	< 0.10	< 0.16	-	-	(48) [4]	-	(150) [4]	-
o-Xylene	-	-	-	-	-	-	-	< 0.05	< 0.08	-					
Polycyclic Aromatic Hydrocarbons (mg/kg dry wt)															
Total of Reported PAHs in Soil	-	-	-	-	-	-	-	< 0.3	< 0.4	-	-	-	-	-	-
1-Methylnaphthalene	-	-	-	-	-	-	-	< 0.012	< 0.017	-	-	-	-	-	-
2-Methylnaphthalene	-	-	-	-	-	-	-	< 0.012	< 0.017	-	-	-	-	-	-
Acenaphthylene	-	-	-	-	-	-	-	< 0.012	< 0.017	-	-	-	-	-	-
Acenaphthene	-	-	-	-	-	-	-	< 0.012	< 0.017	-	-	-	-	-	-
Anthracene	-	-	-	-	-	-	-	< 0.012	< 0.017	-	-	-	-	-	-
Benzo[a]anthracene	-	-	-	-	-	-	-	< 0.012	< 0.017	-	-	-	-	-	-
Benzo[a]pyrene (BAP)	-	-	-	-	-	-	-	< 0.012	< 0.017	-	-	-	-	-	22 / 47 [6]
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	-	-	-	-	-	-	-	< 0.03	< 0.04	-	-	10 [2]	40 [2]	35 [2]	-
Benzo[a]pyrene Toxic Equivalence (TEF)	-	-	-	-	-	-	-	< 0.03	< 0.04	-	-	-	-	-	20 [5]
Benzo[b]fluoranthene + Benzo[j]fluoranthene	-	-	-	-	-	-	-	< 0.012	< 0.017	-	-	-	-	-	-
Benzo[e]pyrene	-	-	-	-	-	-	-	< 0.012	< 0.017	-	-	-	-	-	-
Benzo[g,h,i]perylene	-	-	-	-	-	-	-	< 0.012	< 0.017	-	-	-	-	-	-
Benzo[k]fluoranthene	-	-	-	-	-	-	-	< 0.012	< 0.017	-	-	-	-	-	-
Chrysene	-	-	-	-	-	-	-	< 0.012	< 0.017	-	-	-	-	-	-
Dibenzo[a,h]anthracene	-	-	-	-	-	-	-	< 0.012	< 0.017	-	-	-	-	-	-
Fluoranthene	-	-	-	-	-	-	-	< 0.012	< 0.017	-	-	-	-	-	89 / 190 [6]
Fluorene	-	-	-	-	-	-	-	< 0.012	< 0.017	-	-	-	-	-	-
Indeno(1,2,3-c,d)pyrene	-	-	-	-	-	-	-	< 0.012	< 0.017	-	-	-	-	-	-
Naphthalene	-	-	-	-	-	-	-	< 0.06	< 0.09	-	-	58 [4]	-	(190) [4]	-
Perylene	-	-	-	-	-	-	-	0.028	0.017	-	-	-	-	-	-
Phenanthrene	-	-	-	-	-	-	-	< 0.012	< 0.017	-	-	-	-	-	-
Pyrene	-	-	-	-	-	-	-	< 0.012	< 0.017	-	-	(1600) [4]	-	NA [4]	-
Total Petroleum Hydrocarbons (mg/kg dry wt)															
C7 - C9	< 8	< 8	< 8	< 11	< 9	< 8	< 60	< 8	< 10	< 9	-	120 [4]	-	120 [4]	130 / 170 [6]
C10 - C14	< 20	< 20	< 20	< 30	< 20	< 20	< 120	< 20	< 20	< 20	-	(470) [4]	-	(1500) [4]	110 / 140 [6]
C15 - C36	< 40	< 40	< 40	60	< 40	< 40	1590	< 40	< 40	< 40	-	N/A [4]	-	N/A [4]	1300 / 2500 [6]
Total hydrocarbons (C7 - C36)	< 70	< 70	< 70	< 80	< 70	< 70	1660	< 70	< 70	< 70	-	-	-	-	-

Annotations

1 Auckland Regional Council 2002. Technical Publication 153, Table 3. Background Ranges of Trace Elements in Auckland Soils. Volcanic range selected.

2 Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2012. Values applicable for inorganic and organic substances 'residential 10% produce', 'recreation', and 'commercial / industrial outdoo worker unpaved' have been selected.

3 United States Environmental Protection Agency (US EPA) Regional Screening Levels. Soil contamination standards for 'residential' and 'industrial' soil have been selected.

4 Ministry for the Environment Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand 1999. Module 4 values applicable to SAND soils <1m in depth (i.e. conservative approach) have been selected for 'residential' (Tables 4.10 and 4.13) and 'commercial/industrial' (Tables 4.11 and 4.14) land use scenarios.

Brackets denote values exceed threshold likley to correspond to formation of residual separate phase hydrocarbons
NA indicates contaminant not limiting as estimated health based crtierion is signficantly higher than that likley to be encountered on site
N/A indicates estimated criterion exceeds 20,000 mg/kg. At 20,000 mg/kg residual separate phase is expected to have formed in soil matrix

5 Auckland Unitary Plan Operative in Part 2018. Table E30.6.1.4.1 Soil Acceptance Criteria.

6 Landcare research 2016. User Guide: Background soil concentrations and soil guideline values for the protection of ecological receptors (Eco-SGVs)- Consultation Draft, Table 7. Values applicable to a fine soil for a 'residential/recreational' area and a 'commerical industrial' area

Above Background Concentration
Concentrations above Human Health Criteria
Concentrations above Environmental Discharge Criteria

105A-109A May Road - Soil Analytical Results

Sample Name	TP216 3.1m	TP217 0.7m	TP212 Stockpile 0.5m	TP212 Stockpile 0m	Stockpile 10m from TP213 0.3m (Eastward sample)	Stockpile by TP217 0.3m (Northward sample)	TP218 Stockpile 0m	TP218 Stockpile 0.5m	BH201 0-0.3m	BH201 1.5-1.8m	Assessment Criteria				
Sample Date	23-Oct-20	22-Oct-20	21-Oct-20	21-Oct-20	23-Oct-20	22-Oct-20	23-Oct-20	23-Oct-20	29-Oct-20	29-Oct-20		Human Health Risk			
Sample Depth (m)	3.1	0.7	0.5	0	0.3	0.3	0	0.5	0	1.5					
Lab Number	2463453.50	2463453.51	2463453.62	2463453.63	2463453.55	2463453.57	2463453.52	2463453.61	2464741.50	2464741.60	Background Criteria	Residential Land Use Scenario	Parks / Recreation Land Use Scenario	Commercial / Industrial Worker Scenario	Environmental Discharge Risk
Soil Observed	PEAT	CLAY	GRAVEL	GRAVEL	Clayey SILT	Clayey SILT	Clayey SILT	Clayey SILT	SILT	CLAY					
Heavy Metals (mg/kg dry wt)															
Total Recoverable Arsenic	4	< 2	**14**	8	9	8	**28**	**22**	9	< 2	0.4-12 [1]	20 [2]	80 [2]	70 [2]	100 [5]
Total Recoverable Cadmium	< 0.10	< 0.10	0.18	0.24	0.3	0.49	0.37	0.3	0.12	< 0.10	<0.1-0.65 [1]	3 [2]	400 [2]	1300 [2]	7.5 [5]
Total Recoverable Chromium	5	20	35	39	69	125	52	58	55	28	3-125 [1]	460 [2]	2700 [2]	6300 [2]	400 [5]
Total Recoverable Copper	35	6	50	53	48	68	**94**	85	37	15	20-90 [1]	>10,000 [2]	>10,000 [2]	>10,000 [2]	325 [5]
Total Recoverable Lead	1.4	6.2	48	47	58	**470**	**71**	**80**	37	14.6	<1.5-65 [1]	210 [2]	880 [2]	3300 [2]	250 [5]
Total Recoverable Mercury	< 0.10	< 0.10	< 0.10	< 0.10	0.16	0.33	< 0.10	0.11	0.23	< 0.10	<0.03-0.45 [1]	310 [2]	1800 [2]	4200 [2]	0.75 [5]
Total Recoverable Nickel	14	13	98	131	121	138	89	89	92	21	4-320 [1]	150 [3]	-	2,200 [3]	105 [5]
Total Recoverable Zinc	15	47	114	137	169	240	330	250	78	32	54-1,160 [1]	2300 [3]	-	35,000 [3]	400 [5]
BTEX in Soil by Headspace GC-MS															
Benzene	-	-	-	-	-	-	-	-	-	-	-	1.1 [4]	-	3 [4]	-
Toluene	-	-	-	-	-	-	-	-	-	-	-	(68) [4]	-	(94) [4]	-
Ethylbenzene	-	-	-	-	-	-	-	-	-	-	-	(53) [4]	-	(180) [4]	-
m&p-Xylene	-	-	-	-	-	-	-	-	-	-	-	(48) [4]	-	(150) [4]	-
o-Xylene	-	-	-	-	-	-	-	-	-	-					
Polycyclic Aromatic Hydrocarbons (mg/kg dry wt)															
Total of Reported PAHs in Soil	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1-Methylnaphthalene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2-Methylnaphthalene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Acenaphthylene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Acenaphthene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Anthracene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo[a]anthracene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo[a]pyrene (BAP)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	22 / 47 [6]
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	-	-	-	-	-	-	-	-	-	-	-	10 [2]	40 [2]	35 [2]	-
Benzo[a]pyrene Toxic Equivalence (TEF)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20 [5]
Benzo[b]fluoranthene + Benzo[j]fluoranthene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo[e]pyrene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo[g,h,i]perylene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo[k]fluoranthene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chrysene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dibenzo[a,h]anthracene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fluoranthene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	89 / 190 [6]
Fluorene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Indeno(1,2,3-c,d)pyrene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Naphthalene	-	-	-	-	-	-	-	-	-	-	-	58 [4]	-	(190) [4]	-
Perylene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Phenanthrene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pyrene	-	-	-	-	-	-	-	-	-	-	-	(1600) [4]	-	NA [4]	-
Total Petroleum Hydrocarbons (mg/kg dry wt)															
C7 - C9	< 80	< 9	< 8	< 8	< 8	< 9	< 8	< 8	< 8	< 9	-	120 [4]	-	120 [4]	130 / 170 [6]
C10 - C14	< 150	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	-	(470) [4]	-	(1500) [4]	110 / 140 [6]
C15 - C36	1260	< 40	58	44	195	175	530	120	210	< 40	-	N/A [4]	-	N/A [4]	1300 / 2500 [6]
Total hydrocarbons (C7 - C36)	1280	< 70	< 70	< 70	198	177	530	120	210	< 70	-	-	-	-	-

Annotations

1 Auckland Regional Council 2002. Technical Publication 153, Table 3. Background Ranges of Trace Elements in Auckland Soils. Volcanic range selected.

2 Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2012. Values applicable for inorganic and organic substances 'residential 10% produce', 'recreation', and 'commercial / industrial outdoor worker unpaved' have been selected.

3 United States Environmental Protection Agency (US EPA) Regional Screening Levels. Soil contamination standards for 'residential' and 'industrial' soil have been selected.

4 Ministry for the Environment Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand 1999. Module 4 values applicable to SAND soils <1m in depth (i.e. conservative approach) have been selected for 'residential' (Tables 4.10 and 4.13) and 'commercial/industrial' (Tables 4.11 and 4.14) land use scenarios.

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

NA indicates contaminant not limiting as estimated health based crtierion is signficantly higher than that likley to be encountered on site

N/A indicates estimated criterion exceeds 20,000 mg/kg. At 20,000 mg/kg residual separate phase is expected to have formed in soil matrix

5 Auckland Unitary Plan Operative in Part 2018. Table E30.6.1.4.1 Soil Acceptance Criteria.

6 Landcare research 2016. User Guide: Background soil concentrations and soil guideline values for the protection of ecological receptors (Eco-SGVs)- Consultation Draft, Table 7. Values applicable to a fine soil for a 'residential/recreational' area and a 'commerical industrial' area

Above Background Concentration

Concentrations above Human Health Criteria

Concentrations above Environmental Discharge Criteria

105A-109A May Road - Soil Analytical Results										
Sample Name	**BH201 2.5-2.7m**	**BH202 0.5-0.7m**	**BH202 3.2-3.5m**	**BH203 1.5-1.7m**	**BH203 3.4-3.6m**	**Assessment Criteria**				
Sample Date	29-Oct-20	29-Oct-20	29-Oct-20	29-Oct-20	29-Oct-20		Human Health Risk			
Sample Depth (m)	2.5	0.5	3.2	1.5	3.4					
Lab Number	2464741.8	2464741.20	2464741.30	2464741.2	2464741.13	Background Criteria	Residential Land Use Scenario	Parks / Recreation Land Use Scenario	Commercial / Industrial Worker Scenario	Environmental Discharge Risk
Soil Observed	PEAT	Silty CLAY	SILT	Clayey SILT	PEAT					
Heavy Metals (mg/kg dry wt)										
Total Recoverable Arsenic	9	3	< 2	< 2	< 5	0.4-12 [1]	20 [2]	80 [2]	70 [2]	100 [5]
Total Recoverable Cadmium	0.2	< 0.10	< 0.10	< 0.10	< 0.3	<0.1-0.65 [1]	3 [2]	400 [2]	1300 [2]	7.5 [5]
Total Recoverable Chromium	17	18	31	55	< 5	3-125 [1]	460 [2]	2700 [2]	6300 [2]	400 [5]
Total Recoverable Copper	**144**	9	24	21	18	20-90 [1]	>10,000 [2]	>10,000 [2]	>10,000 [2]	325 [5]
Total Recoverable Lead	2.9	4.6	5.2	7	< 0.9	<1.5-65 [1]	210 [2]	880 [2]	3300 [2]	250 [5]
Total Recoverable Mercury	0.3	0.12	< 0.10	< 0.10	< 0.3	<0.03-0.45 [1]	310 [2]	1800 [2]	4200 [2]	0.75 [5]
Total Recoverable Nickel	34	28	68	46	7	4-320 [1]	150 [3]	-	2,200 [3]	105 [5]
Total Recoverable Zinc	40	10	66	44	19	54-1,160 [1]	2300 [3]	-	35,000 [3]	400 [5]
BTEX in Soil by Headspace GC-MS										
Benzene	-	-	-	-	-	-	1.1 [4]	-	3 [4]	-
Toluene	-	-	-	-	-	-	(68) [4]	-	(94) [4]	-
Ethylbenzene	-	-	-	-	-	-	(53) [4]	-	(180) [4]	-
m&p-Xylene	-	-	-	-	-	-	(48) [4]	-	(150) [4]	-
o-Xylene	-	-	-	-	-					
Polycyclic Aromatic Hydrocarbons (mg/kg dry wt)										
Total of Reported PAHs in Soil	-	-	-	-	-	-	-	-	-	-
1-Methylnaphthalene	-	-	-	-	-	-	-	-	-	-
2-Methylnaphthalene	-	-	-	-	-	-	-	-	-	-
Acenaphthylene	-	-	-	-	-	-	-	-	-	-
Acenaphthene	-	-	-	-	-	-	-	-	-	-
Anthracene	-	-	-	-	-	-	-	-	-	-
Benzo[a]anthracene	-	-	-	-	-	-	-	-	-	-
Benzo[a]pyrene (BAP)	-	-	-	-	-	-	-	-	-	22 / 47 [6]
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	-	-	-	-	-	-	10 [2]	40 [2]	35 [2]	-
Benzo[a]pyrene Toxic Equivalence (TEF)	-	-	-	-	-	-	-	-	-	20 [5]
Benzo[b]fluoranthene + Benzo[j]fluoranthene	-	-	-	-	-	-	-	-	-	-
Benzo[e]pyrene	-	-	-	-	-	-	-	-	-	-
Benzo[g,h,i]perylene	-	-	-	-	-	-	-	-	-	-
Benzo[k]fluoranthene	-	-	-	-	-	-	-	-	-	-
Chrysene	-	-	-	-	-	-	-	-	-	-
Dibenzo[a,h]anthracene	-	-	-	-	-	-	-	-	-	-
Fluoranthene	-	-	-	-	-	-	-	-	-	89 / 190 [6]
Fluorene	-	-	-	-	-	-	-	-	-	-
Indeno(1,2,3-c,d)pyrene	-	-	-	-	-	-	-	-	-	-
Naphthalene	-	-	-	-	-	-	58 [4]	-	(190) [4]	-
Perylene	-	-	-	-	-	-	-	-	-	-
Phenanthrene	-	-	-	-	-	-	-	-	-	-
Pyrene	-	-	-	-	-	-	(1600) [4]	-	NA [4]	-
Total Petroleum Hydrocarbons (mg/kg dry wt)										
C7 - C9	< 60	< 9	< 9	< 9	< 70	-	120 [4]	-	120 [4]	130 / 170 [6]
C10 - C14	< 120	< 20	< 20	< 20	< 140	-	(470) [4]	-	(1500) [4]	110 / 140 [6]
C15 - C36	**1820**	< 40	< 40	< 40	**1410**	-	N/A [4]	-	N/A [4]	1300 / 2500 [6]
Total hydrocarbons (C7 - C36)	1860	< 70	< 70	< 70	1430	-	-	-	-	-

Annotations

1 Auckland Regional Council 2002. Technical Publication 153, Table 3. Background Ranges of Trace Elements in Auckland Soils. Volcanic range selected.

2 Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2012. Values applicable for inorganic and organic substances 'residential 10% produce', 'recreation', and 'commercial / industrial outdoor worker unpaved' have been selected.

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Above Background Concentration
Concentrations above Human Health Criteria
Concentrations above Environmental Discharge Criteria

105a-109a May Road - Soil Analytical Results													
Sample Name	**TP201 0.5m**	**TP201 1m**	**TP202 0.4m**	**TP203 0.4m**	**TP204 0.4m**	**TP205 0.4m**	**TP206 0.5m**	**TP207 0.5m**	**TP208 0.4m**	**TP209 0.4m**	**Assessment Criteria**		
Sample Date	27-Oct-20	27-Oct-20	27-Oct-20	27-Oct-20	23-Oct-20	27-Oct-20	23-Oct-20	23-Oct-20	22-Oct-20	22-Oct-20			
Sample Depth (m)	0.5	1.0	0.4	0.4	0.4	0.4	0.5	0.5	0.4	0.4	Residential [1]	Recreational [1]	Commercial and Industrial [1]
Lab Number	2464737.10	2464737.2	2464737.5	2464737.80	2464737.9	2464737.12	2464737.13	2464737.15	2464737.19	2464737.21			
New Zealand Guidelines Semi Quantitative Asbestos in Soil													
As Received Weight (g)	886.7	814.4	923.3	673.4	889	909	1024.6	921.6	902.8	1143.7	-	-	-
Dry Weight (g)	738.3	609.6	707.8	536.7	694.2	691.2	759.7	662.8	702.8	943.4	-	-	-
Moisture (%)	17	25	23	20	22	24	26	28	22	18	-	-	-
Sample Fraction >10mm (g dry wt)	150.4	4.4	210.6	53.6	89.1	14.6	20.3	237.2	16.5	27	-	-	-
Sample Fraction <10mm to >2mm (g dry wt)	188.3	249.8	228.4	210.7	156.7	224.4	180.1	238.7	231.7	166.8	-	-	-
Sample Fraction <2mm (g dry wt)	398.5	351.6	266.7	271.5	446	449.9	557.8	185	453.3	746.5	-	-	-
<2mm Subsample Weight (g dry wt)	58.6	53.4	59.1	53.6	52	57	57.8	51.1	59	59.1	-	-	-
Asbestos Presence / Absence	**Amosite (Brown Asbestos) and Chrysotile (White Asbestos) detected.**	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	-	-	-
Description of Asbestos Form	**Fibre cement**	-	-	-	-	-	-	-	-	-	-	-	-
Weight of Asbestos in ACM (Non-Friable) (g dry wt)	0.2211	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	-	-	-
Asbestos in ACM as % of Total Sample (% w/w)	0.03	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.01%	0.02%	0.05%
Weight of Asbestos as Fibrous Asbestos (Friable) (g dry wt)	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	-	-	-
Asbestos as Fibrous Asbestos as % of Total Sample (% w/w)	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	-	-
Weight of Asbestos as Asbestos Fines (Friable) (g dry wt)	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	-	-	-
Asbestos as Asbestos Fines as % of Total Sample (% w/w)	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	-	-
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample (% w/w)	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001		0.001%	

105a-109a May Road - Soil Analytical Results													
Sample Name	**TP210 0.5m**	**TP211 Stockpile 0m**	**TP211 Stockpile 0.5m**	**TP211 0.3m**	**TP212 Stockpile 0m**	**TP212 Stockpile 0.5m**	**TP212 0.4m**	**TP213 0.4m**	**TP213 0.9m**	**TP214 0.6m**	**Assessment Criteria**		
Sample Date	27-Oct-20	22-Oct-20	22-Oct-20	22-Oct-20	21-Oct-20	21-Oct-20	21-Oct-20	27-Oct-20	27-Oct-20	22-Oct-20			
Sample Depth (m)	0.5	0.0	0.5	0.3	0.0	0.5	0.4	0.4	0.9	0.6	Residential [1]	Recreational [1]	Commercial and Industrial [1]
Lab Number	2464737.23	2464737.6	2464737.61	2464737.27	2464737.63	2464737.62	2464737.66	2464737.31	2464737.33	2464737.39			
New Zealand Guidelines Semi Quantitative Asbestos in Soil													
As Received Weight (g)	861.8	987.4	876.7	886.2	1149	1077.4	888.2	941	507.6	986.1	-	-	-
Dry Weight (g)	604.6	928.1	815.7	665.8	1060.9	1004.6	677.1	693.2	302.7	698.3	-	-	-
Moisture (%)	30	6	7	25	8	7	24	26	40	29	-	-	-
Sample Fraction >10mm (g dry wt)	69.2	289.2	228.5	< 0.1	414.6	212.8	< 0.1	62	< 0.1	< 0.1	-	-	-
Sample Fraction <10mm to >2mm (g dry wt)	275.6	352.5	322.6	93.6	344.6	411.2	114	98.2	84.7	229.4	-	-	-
Sample Fraction <2mm (g dry wt)	258.8	284.8	263.7	569.9	300.9	380	560.3	532.6	217.1	467.2	-	-	-
<2mm Subsample Weight (g dry wt)	59.3	59.1	57.5	52.1	56.7	55.1	57.9	57.6	53.6	55.8	-	-	-
Asbestos Presence / Absence	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	**Amosite (Brown Asbestos) and Chrysotile (White Asbestos) detected.**	**Amosite (Brown Asbestos) and Chrysotile (White Asbestos) detected.**	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	-	-	-
Description of Asbestos Form	-	-	-	-	**Fibre cement and Loose fibres**	**ACM debris**	-	-	-	-	-	-	-
Weight of Asbestos in ACM (Non-Friable) (g dry wt)	< 0.00001	< 0.00001	< 0.00001	< 0.00001	0.3667	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	-	-	-
Asbestos in ACM as % of Total Sample (% w/w)	< 0.001	< 0.001	< 0.001	< 0.001	0.035	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.01%	0.02%	0.05%
Weight of Asbestos as Fibrous Asbestos (Friable) (g dry wt)	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	-	-	-
Asbestos as Fibrous Asbestos as % of Total Sample (% w/w)	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	-	-
Weight of Asbestos as Asbestos Fines (Friable) (g dry wt)	< 0.00001	< 0.00001	< 0.00001	< 0.00001	0.00103	0.04617	< 0.00001	< 0.00001	< 0.00001	< 0.00001	-	-	-
Asbestos as Asbestos Fines as % of Total Sample (% w/w)	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.005	< 0.001	< 0.001	< 0.001	< 0.001	-	-	-
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample (% w/w)	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.005	< 0.001	< 0.001	< 0.001	< 0.001		0.001%	

Annotations

[1] BRANZ New Zealand Guidelines for Assessing and Managing Asbestos in Soil - Table 5 Soil Guideline Values for asbestos in NZ

Asbestos Detected
Concentrations above Human Health Criteria

105a-109a May Road - Soil Analytical Results														
Sample Name	**TP215 0.4m**	**TP216 0.4m**	**TP217 0.7m**	**Building Adjacent to TP201 (0.5m)**	**Stockpile 10m From TP213 0.3m (Eastward sample)**	**Stockpile 10m From TP213 0.3m (Westward sample)**	**Stockpile By TP217 0.3m (Northward sample)**	**Stockpile By TP217 0.3m (southward sample)**	**TP218 Stockpile 0m**	**BH201 0-0.3m**	**Assessment Criteria**		
Sample Date	23-Oct-20	23-Oct-20	22-Oct-20	27-Oct-20	23-Oct-20	22-Oct-20	22-Oct-20	22-Oct-20	23-Oct-20	29-Oct-20			
Sample Depth (m)	0.4	0.4	0.7	0.5	0.3	0.3	0.3	0.3	0.0	0.0-0.3	Residential [1]	Recreational [1]	Commercial and Industrial [1]
Lab Number	2464737.43	2464737.47	2464737.51	2464737.53	2464737.56	2464737.54	2464737.58	2464737.57	2464737.52	2464737.69			
New Zealand Guidelines Semi Quantitative Asbestos in Soil													
As Received Weight (g)	969.3	946.8	1012.2	944.7	571.6	628	581.4	611.8	795.4	758.6	-	-	-
Dry Weight (g)	801.4	828.6	716.4	854.2	412.4	539.8	410.5	460.1	707.9	692.9	-	-	-
Moisture (%)	17	12	29	10	28	14	29	25	11	9	-	-	-
Sample Fraction >10mm (g dry wt)	< 0.1	4.9	< 0.1	360.9	19.8	17.6	136.9	79	257.9	117.2	-	-	-
Sample Fraction <10mm to >2mm (g dry wt)	130.7	109.9	177	233.5	74.5	173.1	45.4	106.7	201.2	258.1	-	-	-
Sample Fraction <2mm (g dry wt)	668.4	712	537.9	259.2	317.6	347.9	227.4	273.4	248.2	317.3	-	-	-
<2mm Subsample Weight (g dry wt)	56.4	58.3	50.1	51.9	56.6	59.1	50.4	53.3	54.9	55.8	-	-	-
Asbestos Presence / Absence	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	**Chrysotile (White Asbestos) detected.**	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	-	-	-
Description of Asbestos Form	-	-	-	**Loose fibres**	-	-	-	-	-	-	-	-	-
Weight of Asbestos in ACM (Non-Friable) (g dry wt)	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	-	-	-
Asbestos in ACM as % of Total Sample (% w/w)	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.01%	0.02%	0.05%
Weight of Asbestos as Fibrous Asbestos (Friable) (g dry wt)	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	-	-	-
Asbestos as Fibrous Asbestos as % of Total Sample (% w/w)	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	-	-
Weight of Asbestos as Asbestos Fines (Friable) (g dry wt)	< 0.00001	< 0.00001	< 0.00001	0.00005	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	-	-	-
Asbestos as Asbestos Fines as % of Total Sample (% w/w)	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	-	-
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample (% w/w)	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.001%		

105a-109a May Road - Soil Analytical Results					
Sample Name	**BH202 0.5-0.7m**	**BH203 0.1-0.3m**	**Assessment Criteria**		
Sample Date	29-Oct-20	29-Oct-20			
Sample Depth (m)	0.5-0.7	0.1-0.3	Residential [1]	Recreational [1]	Commercial and Industrial [1]
Lab Number	2464737.67	2464737.72			
New Zealand Guidelines Semi Quantitative Asbestos in Soil					
As Received Weight (g)	749.6	1269	-	-	-
Dry Weight (g)	545.5	1175	-	-	-
Moisture (%)	27	7	-	-	-
Sample Fraction >10mm (g dry wt)	< 0.1	497.1	-	-	-
Sample Fraction <10mm to >2mm (g dry wt)	143.2	346.5	-	-	-
Sample Fraction <2mm (g dry wt)	400.2	329	-	-	-
<2mm Subsample Weight (g dry wt)	58.3	56.4	-	-	-
Asbestos Presence / Absence	Asbestos NOT detected.	Asbestos NOT detected.	-	-	-
Description of Asbestos Form	-	-	-	-	-
Weight of Asbestos in ACM (Non-Friable) (g dry wt)	< 0.00001	< 0.00001	-	-	-
Asbestos in ACM as % of Total Sample (% w/w)	< 0.001	< 0.001	0.01%	0.02%	0.05%
Weight of Asbestos as Fibrous Asbestos (Friable) (g dry wt)	< 0.00001	< 0.00001	-	-	-
Asbestos as Fibrous Asbestos as % of Total Sample (% w/w)	< 0.001	< 0.001	-	-	-
Weight of Asbestos as Asbestos Fines (Friable) (g dry wt)	< 0.00001	< 0.00001	-	-	-
Asbestos as Asbestos Fines as % of Total Sample (% w/w)	< 0.001	< 0.001	-	-	-
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample (% w/w)	< 0.001	< 0.001	0.001%		

Annotations

[1] BRANZ New Zealand Guidelines for Assessing and Managing Asbestos in Soil - Table 5 Soil Guideline Values for asbestos in NZ

Asbestos Detected
Concentrations above Human Health Criteria

105A-109A May Road - Chemicals in Groundwater					
Sample Name	**GW201**	**GW202**	**GW203**	**Assessment Criteria**	
Sample Date	9-Nov-20	6-Nov-20	6-Nov-20	**ANZECC Freshwater [1]**	**Drinking Standards NZ [2]**
Lab Number	2472579.1	2472579.2	2472579.3		
Trace Total Heavy Metals (g/m^3)					
Total Arsenic	< 0.0011	0.0012	0.0023	0.094 / 0.042**	0.01
Total Cadmium	< 0.000053	< 0.000053	< 0.000053	0.0004	0.004
Total Chromium	0.0021	**0.0073**	**0.027**	0.0033 / 0.006**	0.05
Total Copper	0.00157	**0.0066**	**0.0189**	0.0018	2.00
Total Lead	0.00042	0.0026	**0.0061**	0.0056	0.01
Total Nickel	0.00146	0.0077	**0.0145**	0.013	0.08
Total Zinc	0.003	0.011	**0.032**	0.015	1.50
Trace Dissolved Heavy Metals (g/m^3)					
Dissolved Arsenic	< 0.0010	< 0.0010	< 0.0010	0.094 / 0.042**	0.01
Dissolved Cadmium	< 0.00005	< 0.00005	< 0.00005	0.0004	0.004
Dissolved Chromium	< 0.0005	< 0.0005	< 0.0005	0.0033 / 0.006**	0.05
Dissolved Copper	0.0006	**0.0028**	0.001	0.0018	2.00
Dissolved Lead	< 0.00010	< 0.00010	< 0.00010	0.0056	0.01
Dissolved Nickel	< 0.0005	0.0052	0.0012	0.013	0.08
Dissolved Zinc	< 0.0010	0.0041	0.0024	0.015	1.50
Total Petroleum Hydrocarbons in Water (g/m^3)					
C7 - C9	< 0.10	< 0.10	< 0.10	-	18,000 [3]
C10 - C14	< 0.2	< 0.2	< 0.2	-	> S [3]
C15 - C36	< 0.4	< 0.4	< 0.4	-	> S [3]
Total hydrocarbons (C7 - C36)	< 0.7	< 0.7	< 0.7	-	-

Annotations

** Arsenic values are for As(III) / As(V). Chromium values are for Cr(III) / Cr(VI).

1 Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2019). Values for 90% protection adopted. https://www.waterquality.gov.au/anz-guidelines/guideline-values/default/water-quality-toxicants/search.

2 Drinking-water Standards for New Zealand 2005 (Revised 2018). Ministry of Health New Zealand.

3 Users guide to Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand. Module 5. Groundwater Tier 1 criteria. Information from Table 5.12.
> S denotes calculated limit exceeds solubility limit given TPH criteria based on aliphatic component only. Seperate consideration is given to the aromatic component.

Above freshwater quality guideline value

Above drinking water standards

105A-109A May Road - Poly- and Perfluorinated Alkyl Substances (PFAS) Results Assessment Table																			
Sample Name	**BH201**		**BH202**		**BH203**		**BH204**	**BH205**	**BH206**	**BH207**	**BH208**	**SW1**	**SW3**	**SW4**	**Assessment Criteria**			
Assure Quality Sample ID	20-312648-1A	21-110291-8A	20-312648-2A	21-110291-14A	20-312648-3A	21-110291-10A	21-110291-6A	21-110291-11A	21-110291-9A	21-110291-13A	21-110291-12A	21-110291-1A	21-110291-3A	21-110291-4A	Human health - Drinking water quality guideline value [1]	Human health - Recreational water quality guideline value [2]	Ecological - Freshwater and Interim Marine guideline value [3]	Tradewaste - Interim Tradewaste Disposal Guideline Values [4]
Hills Sample ID	2472579.1	2582797.1	2472579.2	2582797.16	2472579.3	2582797.12	2582797.8	2582797.13	2582797.11	2582797.15	2582797.14	2582797.1	2582797.3	2582797.4				
Sample Date	6-Nov-20	12-Apr-21	6-Nov-20	13-Apr-21	6-Nov-20	12-Apr-21	12-Apr-21	12-Apr-21	12-Apr-21	13-Apr-21	13-Apr-21	12-Apr-21	12-Apr-21	13-Apr-21				
PFAS (µg/L)																		
PFPrS	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	-	-	-	-
PFBS	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	-	-	-	-
PFPeS	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	-	-	-	-
di-PFHxS (1)	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	-	-	-	-
mono-PFHxS (1)	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	-	-	-	-
L-PFHxS (1)	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	-	-	-	-
Total PFHxS (3)	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	-	-	-	-
PFHpS	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	-	-	-	-
di-PFOS (5)	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	-	-	-	-
mono-PFOS (5)	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	-	-	-	-
L-PFOS (5)	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	**0.069**	<0.025	-	-	-	-
Total PFOS (7)	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	**0.069**	<0.025	-	-	<LOD / 0.13 / 2 / 31	0.1
Sum PFHxS+PFOS (1)	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	**0.069**	<0.025	0.07	2	-	-
PFNS	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	-	-	-	-
PFDS	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	-	-	-
PFBA	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	-	-	-
PFPeA	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	-	-	-
PFHxA	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	-	-	-	-
PFHpA	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	-	-	-	-
PFOA	<0.025	<0.025	**0.060**	**0.053**	<0.025	<0.025	<0.025	<0.025	<0.025	**0.039**	<0.025	<0.025	<0.025	<0.025	0.56	10	19 / 220 / 632 / 1824	0.1
PFNA	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	-	-	-	-
PFDA	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	-	-	-	-
PFUnDA	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	-	-	-	-
PFDoDA	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	-	-	-
PFTrDA	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	-	-	-
PFTeDA	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	-	-	-
PFOSA	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	-	-	-	-
NEtFOSA-M	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	-	-	-
NMeFOSA-M	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	-	-	-
NEtFOSAA	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	-	-	-	-
NMeFOSAA	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	-	-	-	-
NEtFOSE-M	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	-	-	-
NMeFOSE-M	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	-	-	-
4:2 FTS	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	-	-	-	-
6:2 FTS	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	-	-	-	-
8:2 FTS	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	-	-	-
10:2 FTS	-	<0.025	-	<0.025	-	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	-	-	-	-
F-53B (major)	-	<0.10	-	<0.10	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	-	-	-
F-53B (minor)	-	<0.050	-	<0.050	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	-	-	-	-
Sum F-53B	-	<0.10	-	<0.10	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	-	-	-
FPrPA (3:3FTA)	-	<0.10	-	<0.10	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	-	-	-
FPePA (5:3FTA)	-	<0.025	-	<0.025	-	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	-	-	-	-
FHpPA (7:3FTA)	-	<0.025	-	<0.025	-	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	-	-	-	-
ADONA	-	<0.025	-	<0.025	-	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	-	-	-	-
HFPO-DA (GenX)	-	<0.050	-	<0.050	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	-	-	-	-
P37DMOA	-	<0.050	-	<0.050	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	-	-	-	-
PFECHS	-	<0.025	-	<0.025	-	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	-	-	-	-

Annotations
1 January 2020, PFAS National Environmental Management Plan - Version 2.0, National Chemicals Working Group of the Heads of EPAs Australia and New Zealand
2 January 2020, PFAS National Environmental Management Plan - Version 2.0, National Chemicals Working Group of the Heads of EPAs Australia and New Zealand
Note that the source recognises that people's use of recreational water is not the same and therefore depending on screening, a locally appropriate guideline should be investigated.
3 January 2020, PFAS National Environmental Management Plan - Version 2.0, National Chemicals Working Group of the Heads of EPAs Australia and New Zealand
Note that values for 99% / 95% / 90% / 80% species protection are presented. 'Detection' is considered more appropriate to be used for 99% species protection for PFOS as the guideline value for this is less than the laboratory level of detection.
4 Interim Trade Waste Disposal Guideline values for PFAS: https://www.mfe.govt.nz/sites/default/files/media/Land/PFOS-disposal-to-trade-waste-guidance.pdf

Screening Legend
Above drinking water quality guideline value [1]
Above recreational water quality guideline value
Above 99 % species protection guideline value
Above 95 % species protection guideline value
Above 90 % species protection guideline value
Above 80 % species protection guideline value
Above Interim Tradewaste Disposal Guideline

105A-109 A May Road - Poly- and Perflourinated Alkyl Substances (PFAS) QA/QC Results

	2020 Drilling QA/QC				2020 Groundwater Sampling QA/QC					2021 Drilling QA/QC				2021 Groundwater / Surface Water QA/QC					Assessment Criteria			
Assure Quality Sample ID	20-300548-1A	20-300548-2A	20-300548-3A	QC-BLK_RPT-14108227	20-312648-4A	20-312648-6A	20-312648-5A	20-312648-7A	QC-BLK_RPT-14201536	21-100069-1A	21-100069-2A	21-100069-3A	QC-BLK_RPT-15584065	21-110291-7A	21-110291-2A	21-110291-5A	21-110291-15A	QC-BLK_RPT-15639150				
Hills Sample ID	2464741.15	2464741.16	2464741.17	-	2472579.4	2472579.6	2472579.5	-	-	2573008.1	2573008.3	2573008.4	-	2582797.9	2582797.2	2582797.5	Duplicate of 21-110291-14A	-				
Sample Description	BHA - Rinsate from core split	BHB - Field blank	BHC - Rinsate from drill barrel	Batch Reagent Blank*	GWA - Rinsate from interface meter	GWC - Field blank	BH202 - Duplicate	Lab QC Sample (20-312648-6A)*	Reportable Blank*	Trip Blank	Plastic Push Tube Rinsate	Metal Casing Rinsate	Reportable Blank*	BH204 Duplicate	UPL1 rinsate (SW2)	Interface meter rinsate (GW1)	Lab QC Sample (BH202)*	Batch Reagent Blank*	Human health - Drinking water quality guideline value [1]	Human health - Recreational water quality guideline value [2]	Ecological - Freshwater and Interim Marine guideline value [3]	Tradewaste - Interim Tradewaste Disposal Guideline Values [4]
Sample Date	6-Nov-20	6-Nov-20	6-Nov-20	-	6-Nov-20	6-Nov-20	6-Nov-20	-	-	29-Mar-21	29-Mar-21	29-Mar-21	-	12-Apr-21	12-Apr-21	12-Apr-21	-	-				
PFAS (µg/L)																						
PFPrS	<0.0010	<0.0010	<0.0010	<0.0010	<0.025	<0.025	<0.025	<0.025	<0.025	<0.0010	<0.0010	<0.0010	<0.0010	<0.025	<0.025	<0.025	<0.025	<0.025	-	-	-	-
PFBS	<0.0010	<0.0010	<0.0010	<0.0010	<0.025	<0.025	<0.025	<0.025	<0.025	<0.0010	<0.0010	<0.0010	<0.0010	<0.025	<0.025	<0.025	<0.025	<0.025	-	-	-	-
PFPeS	<0.0010	<0.0010	<0.0010	<0.0010	<0.025	<0.025	<0.025	<0.025	<0.025	<0.0010	<0.0010	<0.0010	<0.0010	<0.025	<0.025	<0.025	<0.025	<0.025	-	-	-	-
di-PFHxS (1)	<0.0010	<0.0010	<0.0010	<0.0010	<0.025	<0.025	<0.025	<0.025	<0.025	<0.0010	<0.0010	<0.0010	<0.0010	<0.025	<0.025	<0.025	<0.025	<0.025	-	-	-	-
mono-PFHxS (1)	<0.0010	<0.0010	<0.0010	<0.0010	<0.025	<0.025	<0.025	<0.025	<0.025	<0.0010	<0.0010	<0.0010	<0.0010	<0.025	<0.025	<0.025	<0.025	<0.025	-	-	-	-
L-PFHxS (1)	<0.0010	<0.0010	<0.0010	<0.0010	<0.025	<0.025	<0.025	<0.025	<0.025	<0.0010	<0.0010	<0.0010	<0.0010	<0.025	<0.025	<0.025	<0.025	<0.025	-	-	-	-
Total PFHxS (3)	<0.0010	<0.0010	<0.0010	<0.0010	<0.025	<0.025	<0.025	<0.025	<0.025	<0.0010	<0.0010	<0.0010	<0.0010	<0.025	<0.025	<0.025	<0.025	<0.025	-	-	-	-
PFHpS	<0.0010	<0.0010	<0.0010	<0.0010	<0.025	<0.025	<0.025	<0.025	<0.025	<0.0010	<0.0010	<0.0010	<0.0010	<0.025	<0.025	<0.025	<0.025	<0.025	-	-	-	-
di-PFOS (5)	<0.0010	<0.0010	<0.0010	<0.0010	<0.025	<0.025	<0.025	<0.025	<0.025	<0.0010	<0.0010	<0.0010	<0.0010	<0.025	<0.025	<0.025	<0.025	<0.025	-	-	-	-
mono-PFOS (5)	<0.0010	<0.0010	<0.0010	<0.0010	<0.025	<0.025	<0.025	<0.025	<0.025	<0.0010	<0.0010	<0.0010	<0.0010	<0.025	<0.025	<0.025	<0.025	<0.025	-	-	-	-
L-PFOS (5)	<0.0010	<0.0010	<0.0010	<0.0010	<0.025	<0.025	<0.025	<0.025	<0.025	<0.0010	<0.0010	<0.0010	<0.0010	<0.025	<0.025	<0.025	<0.025	<0.025	-	-	-	-
Total PFOS (7)	<0.0010	<0.0010	<0.0010	<0.0010	<0.025	<0.025	<0.025	<0.025	<0.025	<0.0010	<0.0010	<0.0010	<0.0010	<0.025	<0.025	<0.025	<0.025	<0.025	-	-	< LOD / 0.13 / 2 / 31	0.1
Sum PFHxS+PFOS (1)	<0.0010	<0.0010	<0.0010	<0.0010	<0.025	<0.025	<0.025	<0.025	<0.025	<0.0010	<0.0010	<0.0010	<0.0010	<0.025	<0.025	<0.025	<0.025	<0.025	0.07	2	-	-
PFNS	<0.0010	<0.0010	<0.0010	<0.0010	<0.050	<0.050	<0.050	<0.050	<0.050	<0.0010	<0.0010	<0.0010	<0.0010	<0.050	<0.050	<0.050	<0.050	<0.050	-	-	-	-
PFDS	NR	NR	NR	NR	<0.10	<0.10	<0.10	<0.10	<0.10	<0.0010	<0.0010	<0.0010	<0.0010	<0.10	<0.10	<0.10	<0.10	<0.10	-	-	-	-
PFBA	<0.0010	<0.0010	<0.0010	<0.0010	<0.10	<0.10	<0.10	<0.10	<0.10	<0.0010	<0.0010	<0.0010	<0.0010	<0.10	<0.10	<0.10	<0.10	<0.10	-	-	-	-
PFPeA	<0.0010	<0.0010	<0.0010	<0.0010	<0.10	<0.10	<0.10	<0.10	<0.10	<0.0010	<0.0010	<0.0010	<0.0010	<0.10	<0.10	<0.10	<0.10	<0.10	-	-	-	-
PFHxA	<0.0010	<0.0010	<0.0010	<0.0010	<0.025	<0.025	**0.027**	<0.025	<0.025	<0.0010	<0.0010	<0.0010	<0.0010	<0.025	<0.025	<0.025	<0.025	<0.025	-	-	-	-
PFHpA	<0.0010	<0.0010	<0.0010	<0.0010	<0.025	<0.025	<0.025	<0.025	<0.025	<0.0010	<0.0010	<0.0010	<0.0010	<0.025	<0.025	<0.025	<0.025	<0.025	-	-	-	-
PFOA	<0.0010	<0.0010	<0.0010	<0.0010	<0.025	<0.025	**0.059**	<0.025	<0.025	<0.0010	<0.0010	<0.0010	<0.0010	<0.025	<0.025	<0.025	**0.05**	<0.025	0.56	10	19 / 220 / 632 / 1824	0.1
PFNA	<0.0010	<0.0010	<0.0010	<0.0010	<0.025	<0.025	<0.025	<0.025	<0.025	<0.0010	<0.0010	<0.0010	<0.0010	<0.025	<0.025	<0.025	<0.025	<0.025	-	-	-	-
PFDA	<0.0010	<0.0010	<0.0010	<0.0010	<0.025	<0.025	<0.025	<0.025	<0.025	<0.0010	<0.0010	<0.0010	<0.0010	<0.025	<0.025	<0.025	<0.025	<0.025	-	-	-	-
PFUnDA	<0.0010	<0.0010	<0.0010	<0.0010	<0.025	<0.025	<0.025	<0.025	<0.025	<0.0010	<0.0010	<0.0010	<0.0010	<0.025	<0.025	<0.025	<0.025	<0.025	-	-	-	-
PFDoDA	<0.0010	<0.0010	<0.0010	<0.0010	<0.10	<0.10	<0.10	<0.10	<0.10	NR	NR	NR	NR	<0.10	<0.10	<0.10	<0.10	<0.10	-	-	-	-
PFTrDA	<0.0010	<0.0010	<0.0010	<0.0010	<0.10	<0.10	<0.10	<0.10	<0.10	NR	NR	NR	NR	<0.10	<0.10	<0.10	<0.10	<0.10	-	-	-	-
PFTeDA	<0.0010	<0.0010	<0.0010	<0.0010	<0.10	<0.10	<0.10	<0.10	<0.10	NR	NR	NR	NR	<0.10	<0.10	<0.10	<0.10	<0.10	-	-	-	-
PFOSA	<0.0010	<0.0010	<0.0010	<0.0010	<0.025	<0.025	<0.025	<0.025	<0.025	<0.0010	<0.0010	<0.0010	<0.0010	<0.025	<0.025	<0.025	<0.025	<0.025	-	-	-	-
NEtFOSA-M	<0.0010	<0.0010	<0.0010	<0.0010	<0.10	<0.10	<0.10	<0.10	<0.10	NR	NR	NR	NR	<0.10	<0.10	<0.10	<0.10	<0.10	-	-	-	-
NMeFOSA-M	<0.0010	<0.0010	<0.0010	<0.0010	<0.10	<0.10	<0.10	<0.10	<0.10	NR	NR	NR	NR	<0.10	<0.10	<0.10	<0.10	<0.10	-	-	-	-
NEtFOSAA	<0.0010	<0.0010	<0.0010	<0.0010	<0.025	<0.025	<0.025	<0.025	<0.025	<0.0010	<0.0010	<0.0010	<0.0010	<0.025	<0.025	<0.025	<0.025	<0.025	-	-	-	-
NMeFOSAA	<0.0010	<0.0010	<0.0010	<0.0010	<0.025	<0.025	<0.025	<0.025	<0.025	<0.0010	<0.0010	<0.0010	<0.0010	<0.025	<0.025	<0.025	<0.025	<0.025	-	-	-	-
NEtFOSE-M	<0.0010	<0.0010	<0.0010	<0.0010	<0.10	<0.10	<0.10	<0.10	<0.10	NR	NR	NR	NR	<0.10	<0.10	<0.10	<0.10	<0.10	-	-	-	-
NMeFOSE-M	<0.0010	<0.0010	<0.0010	<0.0010	<0.10	<0.10	<0.10	<0.10	<0.10	NR	NR	NR	NR	<0.10	<0.10	<0.10	<0.10	<0.10	-	-	-	-
4:2 FTS	<0.0010	<0.0010	<0.0010	<0.0010	<0.025	<0.025	<0.025	<0.025	<0.025	<0.0010	<0.0010	<0.0010	<0.0010	<0.025	<0.025	<0.025	<0.025	<0.025	-	-	-	-
6:2 FTS	<0.0010	<0.0010	<0.0010	<0.0010	<0.050	<0.050	<0.050	<0.050	<0.050	<0.0010	<0.0010	<0.0010	<0.0010	<0.050	<0.050	<0.050	<0.050	<0.050	-	-	-	-
8:2 FTS	<0.0010	<0.0010	<0.0010	<0.0010	<0.10	<0.10	<0.10	<0.10	<0.10	<0.0010	<0.0010	<0.0010	<0.0010	<0.10	<0.10	<0.10	<0.10	<0.10	-	-	-	-
10:2 FTS	-	-	-	-	-	-	-	-	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.025	<0.025	<0.025	<0.025	<0.025	-	-	-	-
F-53B (major)	-	-	-	-	-	-	-	-	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.10	<0.10	<0.10	<0.10	<0.10	-	-	-	-
F-53B (minor)	-	-	-	-	-	-	-	-	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.050	<0.050	<0.050	<0.050	<0.050	-	-	-	-
Sum F-53B	-	-	-	-	-	-	-	-	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.10	<0.10	<0.10	<0.10	<0.10	-	-	-	-
FPrPA (3:3FTA)	-	-	-	-	-	-	-	-	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.10	<0.10	<0.10	<0.10	<0.10	-	-	-	-
FPePA (5:3FTA)	-	-	-	-	-	-	-	-	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.025	<0.025	<0.025	<0.025	<0.025	-	-	-	-
FHpPA (7:3FTA)	-	-	-	-	-	-	-	-	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.025	<0.025	<0.025	<0.025	<0.025	-	-	-	-
ADONA	-	-	-	-	-	-	-	-	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.025	<0.025	<0.025	<0.025	<0.025	-	-	-	-
HFPO-DA (GenX)	-	-	-	-	-	-	-	-	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.050	<0.050	<0.050	<0.050	<0.050	-	-	-	-
P37DMOA	-	-	-	-	-	-	-	-	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.050	<0.050	<0.050	<0.050	<0.050	-	-	-	-
PFECHS	-	-	-	-	-	-	-	-	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.025	<0.025	<0.025	<0.025	<0.025	-	-	-	-

Annotations
1 January 2020, PFAS National Environmental Management Plan - Version 2.0, National Chemicals Working Group of the Heads of EPAs Australia and New Zealand
2 January 2020, PFAS National Environmental Management Plan - Version 2.0, National Chemicals Working Group of the Heads of EPAs Australia and New Zealand
Note that the source recognises that people's use of recreational water is not the same and therefore depending on screening, a locally appropriate guideline should be investigated.
3 January 2020, PFAS National Environmental Management Plan - Version 2.0, National Chemicals Working Group of the Heads of EPAs Australia and New Zealand
Note that values for 99% / 95% / 90% / 80% species protection are presented. 'Detection' is considered more appropriate to be used for 99% species protection for PFOS as the guideline value for this is less than the laboratory level of detection.
4 Interim Trade Waste Disposal Guideline values for PFAS: https://www.mfe.govt.nz/sites/default/files/media/Land/PFOS-disposal-to-trade-waste-guidance.pdf
*Additional analysis undertaken by Assure Quality Laboratory as QA/QC procedures for PFAS analysis and reporting

Screening Legend
Above drinking water quality guideline value[1]
Above recreational water quality guideline value[2]
Above 99 % species protection guideline value
Above 95 % species protection guideline value
Above 90 % species protection guideline value
Above 80 % species protection guideline value
Above Interim Tradewaste Disposal Guideline

119 May Road

119 May Road - Soil Analytical Results															
Sample Name	**TP101 0m**	**TP101 0.55m**	**TP102 0m**	**TP102 1.35m**	**TP103 0m**	**TP103 3m**	**TP104 0.2m**	**TP104 0.8m**	**TP105 0.3m**	**TP105 0.7m**	**Assessment Criteria**				
Sample Date	19-Oct-20	20-Oct-20	19-Oct-20	20-Oct-20	19-Oct-20	20-Oct-20	20-Oct-20	20-Oct-20	20-Oct-20	20-Oct-20		Human Health Risk			
Sample Depth (m)	0	0.55	0	1.35	0	3	0.2	0.8	0.3	0.7					
Lab Number	2461227.53	2461227.1	2461227.54	2461227.5	2461227.55	2461227.8	2461227.9	2461227.1	2461227.12	2461227.13	Background Criteria	Residential Land Use Scenario	Parks / Recreation Land Use Scenario	Commercial / Industrial Worker Scenario	Environmental Discharge Risk
Soil Observed	SILT	Silty CLAY	SILT	Clayey SILT	Clayey SILT	SILT	Sandy GRAVEL	Silty CLAY	Sandy GRAVEL	Silty CLAY					
Heavy Metals (mg/kg dry wt)															
Total Recoverable Arsenic	5	< 2	5	< 2	7	< 2	< 2	< 2	4	5	0.4-12 [1]	20 [2]	80 [2]	70 [2]	100 [5]
Total Recoverable Cadmium	0.51	**1.19**	0.26	< 0.10	< 0.10	0.15	< 0.10	< 0.10	< 0.10	< 0.10	<0.1-0.65 [1]	3 [2]	400 [2]	1300 [2]	7.5 [5]
Total Recoverable Chromium	21	17	17	15	40	30	**810**	18	**320**	29	3-125 [1]	460 [2]	2700 [2]	6300 [2]	400 [5]
Total Recoverable Copper	34	25	15	6	21	4	72	4	47	5	20-90 [1]	>10,000 [2]	>10,000 [2]	>10,000 [2]	325 [5]
Total Recoverable Lead	31	15.8	41	8	19.7	4.7	4.8	6.8	10.8	6.3	<1.5-65 [1]	210 [2]	880 [2]	3300 [2]	250 [5]
Total Recoverable Mercury	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	<0.03-0.45 [1]	310 [2]	1800 [2]	4200 [2]	0.75 [5]
Total Recoverable Nickel	37	7	10	14	30	11	**122**	6	65	9	4-320 [1]	150 [3]	-	2,200 [3]	105 [5]
Total Recoverable Zinc	230	52	41	35	51	41	105	15	71	17	54-1,160 [1]	2300 [3]	-	35,000 [3]	400 [5]
BTEX in Soil by Headspace GC-MS															
Benzene	-	< 0.05	-	< 0.06	-	< 0.05	< 0.07	< 0.08	< 0.05	< 0.07	-	1.1 [4]	-	3 [4]	-
Toluene	-	< 0.05	-	< 0.06	-	< 0.05	< 0.07	< 0.08	< 0.05	< 0.07	-	(68) [4]	-	(94) [4]	-
Ethylbenzene	-	< 0.05	-	< 0.06	-	< 0.05	< 0.07	< 0.08	< 0.05	< 0.07	-	(53) [4]	-	(180) [4]	-
m&p-Xylene	-	< 0.10	-	< 0.11	-	< 0.10	< 0.13	< 0.15	< 0.10	< 0.14	-	(48) [4]	-	(150) [4]	-
o-Xylene	-	< 0.05	-	< 0.06	-	< 0.05	< 0.07	< 0.08	< 0.05	< 0.07					
Polycyclic Aromatic Hydrocarbons (mg/kg dry wt)															
Total of Reported PAHs in Soil	-	< 0.3	-	< 0.4	-	< 0.3	< 0.4	< 0.4	< 0.3	< 0.4	-	-	-	-	-
1-Methylnaphthalene	-	< 0.011	-	< 0.013	-	< 0.012	< 0.014	< 0.016	< 0.011	< 0.015	-	-	-	-	-
2-Methylnaphthalene	-	< 0.011	-	< 0.013	-	< 0.012	< 0.014	< 0.016	< 0.011	< 0.015	-	-	-	-	-
Acenaphthylene	-	< 0.011	-	< 0.013	-	< 0.012	< 0.014	< 0.016	< 0.011	< 0.015	-	-	-	-	-
Acenaphthene	-	< 0.011	-	< 0.013	-	< 0.012	< 0.014	< 0.016	< 0.011	< 0.015	-	-	-	-	-
Anthracene	-	< 0.011	-	< 0.013	-	< 0.012	< 0.014	< 0.016	< 0.011	< 0.015	-	-	-	-	-
Benzo[a]anthracene	-	< 0.011	-	< 0.013	-	< 0.012	< 0.014	< 0.016	< 0.011	< 0.015	-	-	-	-	-
Benzo[a]pyrene (BAP)	-	< 0.011	-	< 0.013	-	< 0.012	< 0.014	< 0.016	< 0.011	< 0.015	-	-	-	-	22 / 47 [6]
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	-	< 0.03	-	< 0.04	-	< 0.03	< 0.04	< 0.04	< 0.03	< 0.04	-	10 [2]	40 [2]	35 [2]	-
Benzo[a]pyrene Toxic Equivalence (TEF)	-	< 0.03	-	< 0.04	-	< 0.03	< 0.04	< 0.04	< 0.03	< 0.04	-	-	-	-	20 [5]
Benzo[b]fluoranthene + Benzo[j]fluoranthene	-	< 0.011	-	< 0.013	-	< 0.012	< 0.014	< 0.016	< 0.011	< 0.015	-	-	-	-	-
Benzo[e]pyrene	-	< 0.011	-	< 0.013	-	< 0.012	< 0.014	< 0.016	< 0.011	< 0.015	-	-	-	-	-
Benzo[g,h,i]perylene	-	< 0.011	-	< 0.013	-	< 0.012	< 0.014	< 0.016	< 0.011	< 0.015	-	-	-	-	-
Benzo[k]fluoranthene	-	< 0.011	-	< 0.013	-	< 0.012	< 0.014	< 0.016	< 0.011	< 0.015	-	-	-	-	-
Chrysene	-	< 0.011	-	< 0.013	-	< 0.012	< 0.014	< 0.016	< 0.011	< 0.015	-	-	-	-	-
Dibenzo[a,h]anthracene	-	< 0.011	-	< 0.013	-	< 0.012	< 0.014	< 0.016	< 0.011	< 0.015	-	-	-	-	-
Fluoranthene	-	< 0.011	-	< 0.013	-	< 0.012	< 0.014	< 0.016	< 0.011	< 0.015	-	-	-	-	89 / 190 [6]
Fluorene	-	< 0.011	-	< 0.013	-	< 0.012	< 0.014	< 0.016	< 0.011	< 0.015	-	-	-	-	-
Indeno(1,2,3-c,d)pyrene	-	< 0.011	-	< 0.013	-	< 0.012	< 0.014	< 0.016	< 0.011	< 0.015	-	-	-	-	-
Naphthalene	-	< 0.06	-	< 0.07	-	< 0.06	< 0.07	< 0.08	< 0.06	< 0.08	-	58 [4]	-	(190) [4]	-
Perylene	-	< 0.011	-	< 0.013	-	< 0.012	< 0.014	< 0.016	< 0.011	< 0.015	-	-	-	-	-
Phenanthrene	-	< 0.011	-	< 0.013	-	< 0.012	< 0.014	< 0.016	< 0.011	< 0.015	-	-	-	-	-
Pyrene	-	< 0.011	-	< 0.013	-	< 0.012	< 0.014	< 0.016	< 0.011	< 0.015	-	(1600) [4]	-	NA [4]	-
Total Petroleum Hydrocarbons (mg/kg dry wt)															
C7 - C9	< 30	< 8	< 9	< 8	< 9	< 8	< 9	< 10	< 8	< 9	-	120 [4]	-	120 [4]	130 / 170 [6]
C10 - C14	< 60	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	-	(470) [4]	-	(1500) [4]	110 / 140 [6]
C15 - C36	620	58	< 40	< 40	83	< 40	< 40	< 40	53	< 40	-	N/A [4]	-	N/A [4]	1300 / 2500 [6]
Total hydrocarbons (C7 - C36)	620	< 70	< 70	< 70	86	< 70	< 70	< 70	< 70	< 70	-	-	-	-	-

Annotations

1 Auckland Regional Council 2002. Technical Publication 153, Table 3. Background Ranges of Trace Elements in Auckland Soils. Volcanic range selected.

2 Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2012. Values applicable for inorganic and organic substances 'residential 10% produce', 'recreation', and 'commercial / industrial outdoor worker unpaved' have been selected.

3 United States Environmental Protection Agency (US EPA) Regional Screening Levels. Soil contamination standards for 'residential' and 'industrial' soil have been selected.

4 Ministry for the Environment Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand 1999. Module 4 values applicable to SAND soils <1m in depth (i.e. conservative approach) have been selected for 'residential' (Tables 4.10 and 4.13) and 'commercial/industrial' (Tables 4.11 and 4.14) land use scenarios.

Brackets denote values exceed threshold likley to correspond to formation of residual separate phase hydrocarbons
NA indicates contaminant not limiting as estimated health based crtierion is signficantly higher than that likley to be encountered on site
N/A indicates estimated criterion exceeds 20,000 mg/kg. At 20,000 mg/kg residual separate phase is expected to have formed in soil matrix

5 Auckland Unitary Plan Operative in Part 2018. Table E30.6.1.4.1 Soil Acceptance Criteria.

6 Landcare research 2016. User Guide: Background soil concentrations and soil guideline values for the protection of ecological receptors (Eco-SGVs)- Consultation Draft, Table 7. Values applicable to a fine soil for a 'residential/recreational' area and a 'commerical industrial' area

Above Background Concentration
Concentrations above Human Health Criteria
Concentrations above Environmental Discharge Criteria

119 May Road - Soil Analytical Results

Sample Name	TP106 0.5m	TP106 1.9m	TP107 0.1m	TP107 0.9m	TP108 0m	TP108 2.9m	TP109 0m	TP109 0.8m	TP109 1.1m	TP109 2.3m	Assessment Criteria				
Sample Date	20-Oct-20	20-Oct-20	20-Oct-20	20-Oct-20	19-Oct-20	20-Oct-20	19-Oct-20	20-Oct-20	20-Oct-20	20-Oct-20		Human Health Risk			
Sample Depth (m)	0.5	1.9	0.1	0.9	0	2.9	0	0.8	1.1	2.3					
Lab Number	2461227.16	2461227.18	2461227.19	2461227.2	2461227.56	2461227.23	2461227.57	2461227.24	2461227.26	2461227.27	Background Criteria	Residential Land Use Scenario	Parks / Recreation Land Use Scenario	Commercial / Industrial Worker Scenario	Environmental Discharge Risk
Soil Observed	Silty CLAY	SILT	Clayey SILT	Silty CLAY	Clayey SILT	PEAT	SILT	CLAY	Sandy SILT	Silty SAND					
Heavy Metals (mg/kg dry wt)															
Total Recoverable Arsenic	< 2	< 2	10	< 2	6	3	3	< 2	< 2	< 2	0.4-12 [1]	20 [2]	80 [2]	70 [2]	100 [5]
Total Recoverable Cadmium	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.16	0.23	< 0.10	< 0.10	< 0.10	<0.1-0.65 [1]	3 [2]	400 [2]	1300 [2]	7.5 [5]
Total Recoverable Chromium	47	6	40	11	29	37	16	12	5	28	3-125 [1]	460 [2]	2700 [2]	6300 [2]	400 [5]
Total Recoverable Copper	24	5	20	2	16	51	57	5	3	35	20-90 [1]	>10,000 [2]	>10,000 [2]	>10,000 [2]	325 [5]
Total Recoverable Lead	7.6	5.8	19.9	6.2	16.5	4.4	24	8	4.8	4.6	<1.5-65 [1]	210 [2]	880 [2]	3300 [2]	250 [5]
Total Recoverable Mercury	< 0.10	0.1	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	<0.03-0.45 [1]	310 [2]	1800 [2]	4200 [2]	0.75 [5]
Total Recoverable Nickel	27	6	31	8	23	74	7	9	5	75	4-320 [1]	150 [3]	-	2,200 [3]	105 [5]
Total Recoverable Zinc	40	4	48	19	37	80	49	25	14	69	54-1,160 [1]	2300 [3]	-	35,000 [3]	400 [5]
BTEX in Soil by Headspace GC-MS															
Benzene	< 0.06	< 0.06	< 0.05	-	-	-	-	< 0.06	< 0.06	-	-	1.1 [4]	-	3 [4]	-
Toluene	< 0.06	< 0.06	< 0.05	-	-	-	-	< 0.06	< 0.06	-	-	(68) [4]	-	(94) [4]	-
Ethylbenzene	< 0.06	< 0.06	< 0.05	-	-	-	-	< 0.06	< 0.06	-	-	(53) [4]	-	(180) [4]	-
m&p-Xylene	< 0.11	< 0.11	< 0.10	-	-	-	-	< 0.12	< 0.12	-	-	(48) [4]	-	(150) [4]	-
o-Xylene	< 0.06	< 0.06	< 0.05	-	-	-	-	< 0.06	< 0.06	-					
Polycyclic Aromatic Hydrocarbons (mg/kg dry wt)															
Total of Reported PAHs in Soil	< 0.3	< 0.3	< 0.3	-	-	-	-	< 0.4	< 0.4	-	-	-	-	-	-
1-Methylnaphthalene	< 0.013	< 0.013	< 0.012	-	-	-	-	< 0.014	< 0.014	-	-	-	-	-	-
2-Methylnaphthalene	< 0.013	< 0.013	< 0.012	-	-	-	-	< 0.014	< 0.014	-	-	-	-	-	-
Acenaphthylene	< 0.013	< 0.013	< 0.012	-	-	-	-	< 0.014	< 0.014	-	-	-	-	-	-
Acenaphthene	< 0.013	< 0.013	< 0.012	-	-	-	-	< 0.014	< 0.014	-	-	-	-	-	-
Anthracene	< 0.013	< 0.013	< 0.012	-	-	-	-	< 0.014	< 0.014	-	-	-	-	-	-
Benzo[a]anthracene	< 0.013	< 0.013	< 0.012	-	-	-	-	< 0.014	< 0.014	-	-	-	-	-	-
Benzo[a]pyrene (BAP)	< 0.013	< 0.013	0.026	-	-	-	-	< 0.014	< 0.014	-	-	-	-	-	22 / 47 [6]
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	< 0.04	< 0.03	0.03	-	-	-	-	< 0.04	< 0.04	-	-	10 [2]	40 [2]	35 [2]	-
Benzo[a]pyrene Toxic Equivalence (TEF)	< 0.03	< 0.03	0.03	-	-	-	-	< 0.04	< 0.04	-	-	-	-	-	20 [5]
Benzo[b]fluoranthene + Benzo[j]fluoranthene	< 0.013	< 0.013	0.02	-	-	-	-	< 0.014	< 0.014	-	-	-	-	-	-
Benzo[e]pyrene	< 0.013	< 0.013	0.013	-	-	-	-	< 0.014	< 0.014	-	-	-	-	-	-
Benzo[g,h,i]perylene	< 0.013	< 0.013	0.013	-	-	-	-	< 0.014	< 0.014	-	-	-	-	-	-
Benzo[k]fluoranthene	< 0.013	< 0.013	< 0.012	-	-	-	-	< 0.014	< 0.014	-	-	-	-	-	-
Chrysene	< 0.013	< 0.013	0.013	-	-	-	-	< 0.014	< 0.014	-	-	-	-	-	-
Dibenzo[a,h]anthracene	< 0.013	< 0.013	< 0.012	-	-	-	-	< 0.014	< 0.014	-	-	-	-	-	-
Fluoranthene	< 0.013	< 0.013	0.029	-	-	-	-	< 0.014	< 0.014	-	-	-	-	-	89 / 190 [6]
Fluorene	< 0.013	< 0.013	< 0.012	-	-	-	-	< 0.014	< 0.014	-	-	-	-	-	-
Indeno(1,2,3-c,d)pyrene	< 0.013	< 0.013	< 0.012	-	-	-	-	< 0.014	< 0.014	-	-	-	-	-	-
Naphthalene	< 0.07	< 0.07	< 0.06	-	-	-	-	< 0.07	< 0.07	-	-	58 [4]	-	(190) [4]	-
Perylene	< 0.013	< 0.013	< 0.012	-	-	-	-	< 0.014	< 0.014	-	-	-	-	-	-
Phenanthrene	< 0.013	< 0.013	< 0.012	-	-	-	-	< 0.014	< 0.014	-	-	-	-	-	-
Pyrene	< 0.013	< 0.013	0.031	-	-	-	-	< 0.014	< 0.014	-	-	(1600) [4]	-	NA [4]	-
Total Petroleum Hydrocarbons (mg/kg dry wt)															
C7 - C9	< 8	< 8	< 8	< 8	< 8	< 19	< 10	< 9	< 8	< 8	-	120 [4]	-	120 [4]	130 / 170 [6]
C10 - C14	< 20	< 20	< 20	< 20	< 20	< 40	< 20	< 20	< 20	< 20	-	(470) [4]	-	(1500) [4]	110 / 140 [6]
C15 - C36	55	< 40	84	< 40	< 40	260	< 40	< 40	< 40	< 40	-	N/A [4]	-	N/A [4]	1300 / 2500 [6]
Total hydrocarbons (C7 - C36)	< 70	< 70	90	< 70	< 70	260	< 70	< 70	< 70	< 70	-	-	-	-	-

Annotations

1 Auckland Regional Council 2002. Technical Publication 153, Table 3. Background Ranges of Trace Elements in Auckland Soils. Volcanic range selected.

2 Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2012. Values applicable for inorganic and organic substances 'residential 10% produce', 'recreation', and 'commercial / industrial outdoor worker unpaved' have been selected.

3 United States Environmental Protection Agency (US EPA) Regional Screening Levels. Soil contamination standards for 'residential' and 'industrial' soil have been selected.

4 Ministry for the Environment Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand 1999. Module 4 values applicable to SAND soils <1m in depth (i.e. conservative approach) have been selected for 'residential' (Tables 4.10 and 4.13) and 'commercial/industrial' (Tables 4.11 and 4.14) land use scenarios.

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

NA indicates contaminant not limiting as estimated health based crtierion is signficantly higher than that likley to be encountered on site

N/A indicates estimated criterion exceeds 20,000 mg/kg. At 20,000 mg/kg residual separate phase is expected to have formed in soil matrix

5 Auckland Unitary Plan Operative in Part 2018. Table E30.6.1.4.1 Soil Acceptance Criteria.

6 Landcare research 2016. User Guide: Background soil concentrations and soil guideline values for the protection of ecological receptors (Eco-SGVs)- Consultation Draft, Table 7. Values applicable to a fine soil for a 'residential/recreational' area and a 'commerical industrial' area

Above Background Concentration
Concentrations above Human Health Criteria
Concentrations above Environmental Discharge Criteria

119 May Road - Soil Analytical Results																
119 May Road - Soil Analytical Results											**Assessment Criteria**					
Sample Name	**TP110 0m**	**TP110 1.1m**	**TP111 0m**	**TP111 1.2m**	**TP112 0.3m**	**TP112 0.7m**	**TP113 0.2m**	**TP113 2.35m**	**TP114 0.2m**	**TP114 1.1m**		Human Health Risk				
Sample Date	19-Oct-20	20-Oct-20	20-Oct-20	20-Oct-20	20-Oct-20	20-Oct-20	20-Oct-20	20-Oct-20	20-Oct-20	20-Oct-20						
Sample Depth (m)	0	1.1	0	1.2	0.3	0.7	0.2	2.35	0.2	1.1						
Lab Number	2461227.58	2461227.29	2461227.31	2461227.33	2461227.35	2461227.36	2461227.39	2461227.41	2461227.42	2461227.44						
Soil Observed	Clayey SILT	CLAY	Silty CLAY	Silty CLAY	Clayey SILT	Clayey SILT	Clayey SILT	Silty SAND	Clayey SILT	Clayey SILT	Background Criteria	Residential Land Use Scenario	Parks / Recreation Land Use Scenario	Commercial / Industrial Worker Scenario	Environmental Discharge Risk	
Heavy Metals (mg/kg dry wt)																
Total Recoverable Arsenic	5	< 2	7	< 2	6	< 2	6	< 2	< 2	< 2	0.4-12 [1]	20 [2]	80 [2]	70 [2]	100 [5]	
Total Recoverable Cadmium	0.37	< 0.10	0.1	< 0.10	< 0.10	< 0.10	0.11	< 0.10	< 0.10	< 0.10	<0.1-0.65 [1]	3 [2]	400 [2]	1300 [2]	7.5 [5]	
Total Recoverable Chromium	25	15	33	25	47	11	49	36	17	28	3-125 [1]	460 [2]	2700 [2]	6300 [2]	400 [5]	
Total Recoverable Copper	36	4	22	5	28	2	22	39	11	7	20-90 [1]	>10,000 [2]	>10,000 [2]	>10,000 [2]	325 [5]	
Total Recoverable Lead	29	8.1	19.2	8	15.9	4.1	**177**	5.3	22	7.5	<1.5-65 [1]	210 [2]	880 [2]	3300 [2]	250 [5]	
Total Recoverable Mercury	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	<0.03-0.45 [1]	310 [2]	1800 [2]	4200 [2]	0.75 [5]	
Total Recoverable Nickel	32	6	48	12	57	4	44	84	15	11	4-320 [1]	150 [3]	-	2,200 [3]	105 [5]	
Total Recoverable Zinc	90	15	55	24	48	7	80	72	28	23	54-1,160 [1]	2300 [3]	-	35,000 [3]	400 [5]	
BTEX in Soil by Headspace GC-MS																
Benzene	-	< 0.06	-	-	-	-	-	-	-	-	-	1.1 [4]	-	3 [4]	-	
Toluene	-	< 0.06	-	-	-	-	-	-	-	-	-	(68) [4]	-	(94) [4]	-	
Ethylbenzene	-	< 0.06	-	-	-	-	-	-	-	-	-	(53) [4]	-	(180) [4]	-	
m&p-Xylene	-	< 0.12	-	-	-	-	-	-	-	-	-	(48) [4]	-	(150) [4]	-	
o-Xylene	-	< 0.06	-	-	-	-	-	-	-	-						
Polycyclic Aromatic Hydrocarbons (mg/kg dry wt)																
Total of Reported PAHs in Soil	-	< 0.4	-	-	-	-	-	-	-	-	-	-	-	-	-	
1-Methylnaphthalene	-	< 0.014	-	-	-	-	-	-	-	-	-	-	-	-	-	
2-Methylnaphthalene	-	< 0.014	-	-	-	-	-	-	-	-	-	-	-	-	-	
Acenaphthylene	-	< 0.014	-	-	-	-	-	-	-	-	-	-	-	-	-	
Acenaphthene	-	< 0.014	-	-	-	-	-	-	-	-	-	-	-	-	-	
Anthracene	-	< 0.014	-	-	-	-	-	-	-	-	-	-	-	-	-	
Benzo[a]anthracene	-	< 0.014	-	-	-	-	-	-	-	-	-	-	-	-	-	
Benzo[a]pyrene (BAP)	-	< 0.014	-	-	-	-	-	-	-	-	-	-	-	-	22 / 47 [6]	
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	-	< 0.04	-	-	-	-	-	-	-	-	-	10 [2]	40 [2]	35 [2]	-	
Benzo[a]pyrene Toxic Equivalence (TEF)	-	< 0.04	-	-	-	-	-	-	-	-	-	-	-	-	20 [5]	
Benzo[b]fluoranthene + Benzo[j]fluoranthene	-	< 0.014	-	-	-	-	-	-	-	-	-	-	-	-	-	
Benzo[e]pyrene	-	< 0.014	-	-	-	-	-	-	-	-	-	-	-	-	-	
Benzo[g,h,i]perylene	-	< 0.014	-	-	-	-	-	-	-	-	-	-	-	-	-	
Benzo[k]fluoranthene	-	< 0.014	-	-	-	-	-	-	-	-	-	-	-	-	-	
Chrysene	-	< 0.014	-	-	-	-	-	-	-	-	-	-	-	-	-	
Dibenzo[a,h]anthracene	-	< 0.014	-	-	-	-	-	-	-	-	-	-	-	-	-	
Fluoranthene	-	< 0.014	-	-	-	-	-	-	-	-	-	-	-	-	89 / 190 [6]	
Fluorene	-	< 0.014	-	-	-	-	-	-	-	-	-	-	-	-	-	
Indeno(1,2,3-c,d)pyrene	-	< 0.014	-	-	-	-	-	-	-	-	-	-	-	-	-	
Naphthalene	-	< 0.07	-	-	-	-	-	-	-	-	-	58 [4]	-	(190) [4]	-	
Perylene	-	< 0.014	-	-	-	-	-	-	-	-	-	-	-	-	-	
Phenanthrene	-	< 0.014	-	-	-	-	-	-	-	-	-	-	-	-	-	
Pyrene	-	< 0.014	-	-	-	-	-	-	-	-	-	(1600) [4]	-	NA [4]	-	
Total Petroleum Hydrocarbons (mg/kg dry wt)																
C7 - C9	< 9	< 9	< 9	< 8	< 8	< 8	< 9	< 9	< 8	< 9	-	120 [4]	-	120 [4]	130 / 170 [6]	
C10 - C14	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	-	(470) [4]	-	(1500) [4]	110 / 140 [6]	
C15 - C36	198	< 40	192	< 40	< 40	< 40	67	< 40	< 40	< 40	-	N/A [4]	-	N/A [4]	1300 / 2500 [6]	
Total hydrocarbons (C7 - C36)	199	< 70	193	< 70	< 70	< 70	< 70	< 70	< 70	< 70	-	-	-	-	-	

Annotations

1 Auckland Regional Council 2002. Technical Publication 153, Table 3. Background Ranges of Trace Elements in Auckland Soils. Volcanic range selected.

2 Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2012. Values applicable for inorganic and organic substances 'residential 10% produce', 'recreation', and 'commercial / industrial outdoor worker unpaved' have been selected.

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N/A indicates estimated criterion exceeds 20,000 mg/kg. At 20,000 mg/kg residual separate phase is expected to have formed in soil matrix

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Above Background Concentration
Concentrations above Human Health Criteria
Concentrations above Environmental Discharge Criteria

119 May Road - Soil Analytical Results									
Sample Name	**TP115 0.4m**	**TP115 2m**			**Assessment Criteria**				
Sample Date	20-Oct-20	20-Oct-20				Human Health Risk			
Sample Depth (m)	0.4	2			Background Criteria	Residential Land Use Scenario	Parks / Recreation Land Use Scenario	Commercial / Industria Worker Scenario	Environmental Discharge Risk
Lab Number	2461227.47	2461227.49							
Soil Observed	Clayey SILT	Clayey SILT							
Heavy Metals (mg/kg dry wt)									
Total Recoverable Arsenic	< 2	< 2			0.4-12 [1]	20 [2]	80 [2]	70 [2]	100 [5]
Total Recoverable Cadmium	< 0.10	< 0.10			<0.1-0.65 [1]	3 [2]	400 [2]	1300 [2]	7.5 [5]
Total Recoverable Chromium	18	49			3-125 [1]	460 [2]	2700 [2]	6300 [2]	400 [5]
Total Recoverable Copper	4	34			20-90 [1]	>10,000 [2]	>10,000 [2]	>10,000 [2]	325 [5]
Total Recoverable Lead	9.6	6.2			<1.5-65 [1]	210 [2]	880 [2]	3300 [2]	250 [5]
Total Recoverable Mercury	< 0.10	< 0.10			<0.03-0.45 [1]	310 [2]	1800 [2]	4200 [2]	0.75 [5]
Total Recoverable Nickel	5	76			4-320 [1]	150 [3]	-	2,200 [3]	105 [5]
Total Recoverable Zinc	13	192			54-1,160 [1]	2300 [3]	-	35,000 [3]	400 [5]
BTEX in Soil by Headspace GC-MS									
Benzene	-	-			-	1.1 [4]	-	3 [4]	-
Toluene	-	-			-	(68) [4]	-	(94) [4]	-
Ethylbenzene	-	-			-	(53) [4]	-	(180) [4]	-
m&p-Xylene	-	-			-	(48) [4]	-	(150) [4]	-
o-Xylene	-	-							
Polycyclic Aromatic Hydrocarbons (mg/kg dry wt)									
Total of Reported PAHs in Soil	-	-			-	-	-	-	-
1-Methylnaphthalene	-	-			-	-	-	-	-
2-Methylnaphthalene	-	-			-	-	-	-	-
Acenaphthylene	-	-			-	-	-	-	-
Acenaphthene	-	-			-	-	-	-	-
Anthracene	-	-			-	-	-	-	-
Benzo[a]anthracene	-	-			-	-	-	-	-
Benzo[a]pyrene (BAP)	-	-			-	-	-	-	22 / 47 [6]
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	-	-			-	10 [2]	40 [2]	35 [2]	-
Benzo[a]pyrene Toxic Equivalence (TEF)	-	-			-	-	-	-	20 [5]
Benzo[b]fluoranthene + Benzo[j]fluoranthene	-	-			-	-	-	-	-
Benzo[e]pyrene	-	-			-	-	-	-	-
Benzo[g,h,i]perylene	-	-			-	-	-	-	-
Benzo[k]fluoranthene	-	-			-	-	-	-	-
Chrysene	-	-			-	-	-	-	-
Dibenzo[a,h]anthracene	-	-			-	-	-	-	-
Fluoranthene	-	-			-	-	-	-	89 / 190 [6]
Fluorene	-	-			-	-	-	-	-
Indeno(1,2,3-c,d)pyrene	-	-			-	-	-	-	-
Naphthalene	-	-			-	58 [4]	-	(190) [4]	-
Perylene	-	-			-	-	-	-	-
Phenanthrene	-	-			-	-	-	-	-
Pyrene	-	-			-	(1600) [4]	-	NA [4]	-
Total Petroleum Hydrocarbons (mg/kg dry wt)									
C7 - C9	< 8	< 9			-	120 [4]	-	120 [4]	130 / 170 [6]
C10 - C14	< 20	< 20			-	(470) [4]	-	(1500) [4]	110 / 140 [6]
C15 - C36	< 40	< 40			-	N/A [4]	-	N/A [4]	1300 / 2500 [6]
Total hydrocarbons (C7 - C36)	< 70	< 70			-	-	-	-	-

Annotations

1 Auckland Regional Council 2002. Technical Publication 153, Table 3. Background Ranges of Trace Elements in Auckland Soils. Volcanic range selected.

2 Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2012. Values applicable for inorganic and organic substances 'residential 10% produce', 'recreation', and 'commercial / industrial outdoor worker unpaved' have been selected.

3 United States Environmental Protection Agency (US EPA) Regional Screening Levels. Soil contamination standards for 'residential' and 'industrial' soil have been selected.

4 Ministry for the Environment Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand 1999. Module 4 values applicable to SAND soils <1m in depth (i.e. conservative approach) have been selected for 'residential' (Tables 4.10 and 4.13) and 'commercial/industrial' (Tables 4.11 and 4.14) land use scenarios.

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

NA indicates contaminant not limiting as estimated health based crtierion is signficantly higher than that likley to be encountered on site

N/A indicates estimated criterion exceeds 20,000 mg/kg. At 20,000 mg/kg residual separate phase is expected to have formed in soil matrix

5 Auckland Unitary Plan Operative in Part 2018. Table E30.6.1.4.1 Soil Acceptance Criteria.

6 Landcare research 2016. User Guide: Background soil concentrations and soil guideline values for the protection of ecological receptors (Eco-SGVs)- Consultation Draft, Table 7. Values applicable to a fine soil for a 'residential/recreational' area and a 'commerical industrial' area

Above Background Concentration
Concentrations above Human Health Criteria
Concentrations above Environmental Discharge Criteria

119 May Road - Soil Analytical Results													
Sample Name	**TP101 0m**	**TP102 0m**	**TP103 0m**	**TP103 0.5m**	**TP104 0.2m**	**TP104 0.8m**	**TP105 0.3m**	**TP106 0.5m**	**TP107 0.1m**	**TP107 0.9m**	**Assessment Criteria**		
Sample Date	20-Oct-20	21-Oct-20	21-Oct-20	21-Oct-20	20-Oct-20	20-Oct-20	20-Oct-20	20-Oct-20	20-Oct-20	20-Oct-20			
Sample Depth (m)	0.0	0.0	0.0	0.5	0.2	0.8	0.3	0.5	0.1	0.9	Residential [1]	Recreational [1]	Commercial and Industrial [1]
Lab Number	2461296.10	2461296.5	2461296.80	2461296.9	2461296.12	2461296.13	2461296.15	2461296.19	2461296.22	2461296.23			
New Zealand Guidelines Semi Quantitative Asbestos in Soil													
As Received Weight (g)	245.6	428.9	471.9	834.6	1079	956.8	942.4	587.1	964.2	914.8	-	-	-
Dry Weight (g)	106	289.8	343.9	598.4	1042.8	717.3	898	406.8	730.3	673.1	-	-	-
Moisture (%)	57	32	27	28	3	25	5	31	24	26	-	-	-
Sample Fraction >10mm (g dry wt)	2.7	< 0.1	26.5	< 0.1	564.6	< 0.1	459.1	< 0.1	61.4	< 0.1	-	-	-
Sample Fraction <10mm to >2mm (g dry wt)	31.3	31.8	69.4	247.2	398.3	134.5	306.7	71.8	225.4	88.3	-	-	-
Sample Fraction <2mm (g dry wt)	71.4	257.6	247.2	349.1	79.4	581.9	131.9	334.6	443.1	583.8	-	-	-
<2mm Subsample Weight (g dry wt)	51.3	55.5	54.6	56.6	58.1	58.8	56.4	56.1	51	55.3	-	-	-
Asbestos Presence / Absence	Asbestos NOT detected.	Asbestos NOT detected.	**Chrysotile (White Asbestos) detected.**	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	**Amosite (Brown Asbestos) and Chrysotile (White Asbestos) detected.**	Asbestos NOT detected.	-	-	-
Description of Asbestos Form	-	-	**Loose fibres**	-	-	-	-	-	**ACM debris and Loose fibres**	-	-	-	-
Weight of Asbestos in ACM (Non-Friable) (g dry wt)	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	-	-	-
Asbestos in ACM as % of Total Sample (% w/w)	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.01%	0.02%	0.05%
Weight of Asbestos as Fibrous Asbestos (Friable) (g dry wt)	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	-	-	-
Asbestos as Fibrous Asbestos as % of Total Sample (% w/w)	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	-	-
Weight of Asbestos as Asbestos Fines (Friable) (g dry wt)	< 0.00001	< 0.00001	0.00005	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	0.03697	< 0.00001	-	-	-
Asbestos as Asbestos Fines as % of Total Sample (% w/w)	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.005	< 0.001	-	-	-
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample (% w/w)	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.005	< 0.001	0.001%		

119 May Road - Soil Analytical Results													
Sample Name	**TP108 0m**	**TP109 0m**	**TP110 0m**	**TP111 0m**	**TP111 0.6m**	**TP111 1.2m**	**TP112 0.3m**	**TP112 0.7m**	**TP113 0.2m**	**TP113 1.1m**	**Assessment Criteria**		
Sample Date	20-Oct-20	20-Oct-20	20-Oct-20	20-Oct-20	21-Oct-20	21-Oct-20	21-Oct-20	21-Oct-20	21-Oct-20	21-Oct-20			
Sample Depth (m)	0.0	0.0	0.0	0.0	0.6	1.2	0.3	0.7	0.2	1.1	Residential [1]	Recreational [1]	Commercial and Industrial [1]
Lab Number	2461296.28	2461296.27	2461296.32	2461296.35	2461296.36	2461296.37	2461296.39	2461296.4	2461296.43	2461296.44			
New Zealand Guidelines Semi Quantitative Asbestos in Soil													
As Received Weight (g)	591	412.8	372.9	1004.4	927.9	839.9	907.2	871.2	946.9	848	-	-	-
Dry Weight (g)	449.8	240.8	265.3	764.9	708.2	631.6	719.5	700.9	693.9	642.8	-	-	-
Moisture (%)	24	42	29	24	24	25	21	20	27	24	-	-	-
Sample Fraction >10mm (g dry wt)	< 0.1	< 0.1	0.8	73.3	96.6	< 0.1	122.8	< 0.1	45.9	< 0.1	-	-	-
Sample Fraction <10mm to >2mm (g dry wt)	98.7	65.2	45.6	112	261.7	155.4	254.8	234.9	176	190.4	-	-	-
Sample Fraction <2mm (g dry wt)	350.4	175.4	218.7	578.6	346.6	472.7	341.8	464.3	472.1	450.9	-	-	-
<2mm Subsample Weight (g dry wt)	54.3	57.6	50.4	55.6	56.1	56	57.8	57.3	57.2	54.9	-	-	-
Asbestos Presence / Absence	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	**Chrysotile (White Asbestos) detected.**	**Chrysotile (White Asbestos) detected.**	Asbestos NOT detected.	**Amosite (Brown Asbestos) and Chrysotile (White Asbestos) detected.**	Asbestos NOT detected.	**Amosite (Brown Asbestos) and Chrysotile (White Asbestos) detected.**	Asbestos NOT detected.	-	-	-
Description of Asbestos Form	-	-	-	**Loose fibres**	**Loose fibres**	-	**ACM debris**	-	**ACM debris and Loose fibres**	-	-	-	-
Weight of Asbestos in ACM (Non-Friable) (g dry wt)	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	-	-	-
Asbestos in ACM as % of Total Sample (% w/w)	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.01%	0.02%	0.05%
Weight of Asbestos as Fibrous Asbestos (Friable) (g dry wt)	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	-	-	-
Asbestos as Fibrous Asbestos as % of Total Sample (% w/w)	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	-	-
Weight of Asbestos as Asbestos Fines (Friable) (g dry wt)	< 0.00001	< 0.00001	< 0.00001	0.00031	0.00003	< 0.00001	0.0023	< 0.00001	0.02727	< 0.00001	-	-	-
Asbestos as Asbestos Fines as % of Total Sample (% w/w)	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.004	< 0.001	-	-	-
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample (% w/w)	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.004	< 0.001	0.001%		

119 May Road - Soil Analytical Results						
Sample Name	**TP114 0.2m**	**TP114 0.6m**	**TP115 0.1m**	**Assessment Criteria**		
Sample Date	20-Oct-20	20-Oct-20	20-Oct-20			
Sample Depth (m)	0.2	0.6	0.1	Residential [1]	Recreational [1]	Commercial and Industrial [1]
Lab Number	2461296.46	2461296.47	2461296.50			
New Zealand Guidelines Semi Quantitative Asbestos in Soil						
As Received Weight (g)	626.2	615.6	409.5	-	-	-
Dry Weight (g)	504.7	510.3	281.7	-	-	-
Moisture (%)	19	17	31	-	-	-
Sample Fraction >10mm (g dry wt)	5.6	< 0.1	1.1	-	-	-
Sample Fraction <10mm to >2mm (g dry wt)	67.2	23.4	12.4	-	-	-
Sample Fraction <2mm (g dry wt)	431.7	485.2	267.9	-	-	-
<2mm Subsample Weight (g dry wt)	54.2	58.9	54	-	-	-
Asbestos Presence / Absence	**Chrysotile (White Asbestos) detected.**	Asbestos NOT detected.	Asbestos NOT detected.	-	-	-
Description of Asbestos Form	**Loose fibres**	-	-	-	-	-
Weight of Asbestos in ACM (Non-Friable) (g dry wt)	< 0.00001	< 0.00001	< 0.00001	-	-	-
Asbestos in ACM as % of Total Sample (% w/w)	< 0.001	< 0.001	< 0.001	0.01%	0.02%	0.05%
Weight of Asbestos as Fibrous Asbestos (Friable) (g dry wt)	< 0.00001	< 0.00001	< 0.00001	-	-	-
Asbestos as Fibrous Asbestos as % of Total Sample (% w/w)	< 0.001	< 0.001	< 0.001	-	-	-
Weight of Asbestos as Asbestos Fines (Friable) (g dry wt)	0.00885	< 0.00001	< 0.00001	-	-	-
Asbestos as Asbestos Fines as % of Total Sample (% w/w)	0.002	< 0.001	< 0.001	-	-	-
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample (% w/w)	0.002	< 0.001	< 0.001	0.001%		

Annotations
[1] BRANZ New Zealand Guidelines for Assessing and Managing Asbestos in Soil - Table 5 Soil Guideline Values for asbestos in NZ

Asbestos Detected
Concentrations above Human Health Criteria

105A-109A May Road - Soil Analytical Results																					
Sample Name	**TP209 0.4m**	**TP209 0.4m Duplicate**	**RPD**	**TP213 0.4m**	**TP213 0.4m Duplicate**	**RPD**	**TP213 0.9m**	**TP213 0.9m Duplicate**	**RPD**	**TP213 2.1m**	**TP213 2.1m Duplicate**	**RPD**	**TP109 0.8m**	**TP109 0.8m Duplicate**	**RPD**	**TP109 2.3m**	**TP109 2.3m Duplicate**	**RPD**	**BH201 1.5-1.8m**	**BH201 1.5-1.8m Duplicate**	**RPD**
Sample Date	22-Oct-20	22-Oct-20		27-Oct-20	27-Oct-20		27-Oct-20	27-Oct-20		27-Oct-20	27-Oct-20		20-Oct-20	20-Oct-20		20-Oct-20	20-Oct-20		29-Oct-20	29-Oct-20	
Sample Depth (m)	0.4	0.4		0.4	0.4		0.9	0.9		2.1	2.1		0.8	0.8		2.3	2.3		1.5	1.5	
Lab Number	2463453.21	2463453.22		2463453.31	2463453.32		2463453.33	2463453.34		2463453.37	2463453.38		2461227.2	2461227.3		2461227.27	2461227.28		2464741.60	2464741.70	
Soil Observed	CLAY	CLAY		Clayey SILT	Clayey SILT		Silty CLAY	Silty CLAY		CLAY	CLAY		CLAY	CLAY		Silty SAND	Silty SAND		CLAY	CLAY	
Heavy Metals (mg/kg dry wt)																					
Total Recoverable Arsenic	< 2	< 2		3	5	50.0	2	2	0.0	< 2	< 2		< 2	< 2		< 2	< 2		2	7	111.1
Total Recoverable Cadmium	< 0.10	< 0.10		0.14	0.15	6.9	0.25	0.28	11.3	0.13	0.11	16.7	< 0.10	< 0.10		< 0.10	< 0.10		< 0.10	< 0.10	
Total Recoverable Chromium	18	17	5.7	20	26	26.1	26	26	0.0	19	19	0.0	12	10	18.2	28	27	3.6	28	38	30.3
Total Recoverable Copper	3	3	0.0	59	169	96.5	23	22	4.4	9	8	11.8	5	5	0.0	35	36	2.8	15	27	57.1
Total Recoverable Lead	4.7	4.3	8.9	10.8	12.9	17.7	16.5	16	3.1	8	8.1	1.2	8	7.2	10.5	4.6	4.7	2.2	14.6	26	56.2
Total Recoverable Mercury	< 0.10	< 0.10		< 0.10	< 0.10		0.1	0.21	71.0	0.13	0.1	26.1	< 0.10	< 0.10		< 0.10	< 0.10		0.1	0.13	26.1
Total Recoverable Nickel	5	5	0.0	16	25	43.9	28	27	3.6	12	12	0.0	9	8	11.8	75	72	4.1	21	53	86.5
Total Recoverable Zinc	10	10	0.0	59	73	21.2	42	40	4.9	31	41	27.8	25	23	8.3	69	71	2.9	32	50	43.9
BTEX in Soil by Headspace GC-MS																					
Benzene	-	-		-	-		-	-		-	-		< 0.06	< 0.06		-	-		-	-	
Toluene	-	-		-	-		-	-		-	-		< 0.06	< 0.06		-	-		-	-	
Ethylbenzene	-	-		-	-		-	-		-	-		< 0.06	< 0.06		-	-		-	-	
m&p-Xylene	-	-		-	-		-	-		-	-		< 0.12	< 0.12		-	-		-	-	
o-Xylene	-	-		-	-		-	-		-	-		< 0.06	< 0.06		-	-		-	-	
Polycyclic Aromatic Hydrocarbons (mg/kg dry wt)																					
Total of Reported PAHs in Soil	-	-		-	-		-	-		-	-		< 0.4	< 0.4		-	-		-	-	
1-Methylnaphthalene	-	-		-	-		-	-		-	-		< 0.014	< 0.014		-	-		-	-	
2-Methylnaphthalene	-	-		-	-		-	-		-	-		< 0.014	< 0.014		-	-		-	-	
Acenaphthylene	-	-		-	-		-	-		-	-		< 0.014	< 0.014		-	-		-	-	
Acenaphthene	-	-		-	-		-	-		-	-		< 0.014	< 0.014		-	-		-	-	
Anthracene	-	-		-	-		-	-		-	-		< 0.014	< 0.014		-	-		-	-	
Benzo[a]anthracene	-	-		-	-		-	-		-	-		< 0.014	< 0.014		-	-		-	-	
Benzo[a]pyrene (BAP)	-	-		-	-		-	-		-	-		< 0.014	< 0.014		-	-		-	-	
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	-	-		-	-		-	-		-	-		< 0.04	< 0.04		-	-		-	-	
Benzo[a]pyrene Toxic Equivalence (TEF)	-	-		-	-		-	-		-	-		< 0.04	< 0.04		-	-		-	-	
Benzo[b]fluoranthene + Benzo[j]fluoranthene	-	-		-	-		-	-		-	-		< 0.014	< 0.014		-	-		-	-	
Benzo[e]pyrene	-	-		-	-		-	-		-	-		< 0.014	< 0.014		-	-		-	-	
Benzo[g,h,i]perylene	-	-		-	-		-	-		-	-		< 0.014	< 0.014		-	-		-	-	
Benzo[k]fluoranthene	-	-		-	-		-	-		-	-		< 0.014	< 0.014		-	-		-	-	
Chrysene	-	-		-	-		-	-		-	-		< 0.014	< 0.014		-	-		-	-	
Dibenzo[a,h]anthracene	-	-		-	-		-	-		-	-		< 0.014	< 0.014		-	-		-	-	
Fluoranthene	-	-		-	-		-	-		-	-		< 0.014	< 0.014		-	-		-	-	
Fluorene	-	-		-	-		-	-		-	-		< 0.014	< 0.014		-	-		-	-	
Indeno(1,2,3-c,d)pyrene	-	-		-	-		-	-		-	-		< 0.014	< 0.014		-	-		-	-	
Naphthalene	-	-		-	-		-	-		-	-		< 0.07	< 0.07		-	-		-	-	
Perylene	-	-		-	-		-	-		-	-		< 0.014	< 0.014		-	-		-	-	
Phenanthrene	-	-		-	-		-	-		-	-		< 0.014	< 0.014		-	-		-	-	
Pyrene	-	-		-	-		-	-		-	-		< 0.014	< 0.014		-	-		-	-	
Total Petroleum Hydrocarbons (mg/kg dry wt)																					
C7 - C9	< 8	< 8		< 8	< 8		< 11	< 11		< 9	< 9		< 9	< 8		< 8	< 8		< 9	< 8	
C10 - C14	< 20	< 20		< 20	< 20		< 30	< 30		< 20	< 20		< 20	< 20		< 20	< 20		< 20	< 20	
C15 - C36	< 40	< 40		40	42	4.9	60	92	42.1	< 40	< 40		< 40	< 40		< 40	< 40		40	89	76.0
Total hydrocarbons (C7 - C36)	< 70	< 70		< 70	< 70		80	94	16.1	< 70	< 70		< 70	< 70		< 70	< 70		70	90	25.0
Max			8.9			96.5			71.0			27.8			18.2			4.1			111.1
Min			0.0			4.9			0.0			0.0			0.0			2.2			25.0
Ave			2.9			33.4			15.7			11.9			9.8			3.1			56.9

RPD Formula

(ABS(Sample 1 - Sample 2)/((Sample 1 + Sample 2)/2))*100

Notes:

If either the sample data value OR the quality sample data value is '<' (not both '<' but just one of the values) then remove the '<' from that one value for the calculation. HOWEVER, if both the sample data value AND the quality sample data value are '<' then do not prefrom the RPD calculation on the samples for that analyte

105A-109A May Road - Soil Analytical Results			
Sample Name	**GW202**	**GWB**	**RPD**
Sample Date	6-Nov-20	6-Nov-20	
Lab Number	2472579.2	2472579.5	
Total Heavy Metals (g/m^3)			
Total Recoverable Arsenic	0.0012	0.0013	8.0
Total Recoverable Cadmium	< 0.000053	< 0.000053	
Total Recoverable Chromium	0.0073	0.0073	0.0
Total Recoverable Copper	0.0066	0.0073	10.1
Total Recoverable Lead	0.0026	0.0026	0.0
Total Recoverable Nickel	0.0077	0.0085	9.9
Total Recoverable Zinc	0.011	0.016	37.0
Dissolved Heavy Metals (g/m^3)			
Dissolved Arsenic	< 0.0010	-	
Dissolved Cadmium	< 0.00005	-	
Dissolved Chromium	< 0.0005	-	
Dissolved Copper	0.0028	-	
Dissolved Lead	< 0.00010	-	
Dissolved Nickel	0.0052	-	
Dissolved Zinc	0.0041	-	
Total Petroleum Hydrocarbons (g/m^3)			
C7 - C9	< 0.10	< 0.10	
C10 - C14	< 0.2	< 0.2	
C15 - C36	< 0.4	< 0.4	
Total hydrocarbons (C7 - C36)	< 0.7	< 0.7	
Max			37.0
Min			0.0
Ave			10.8

RPD Formula

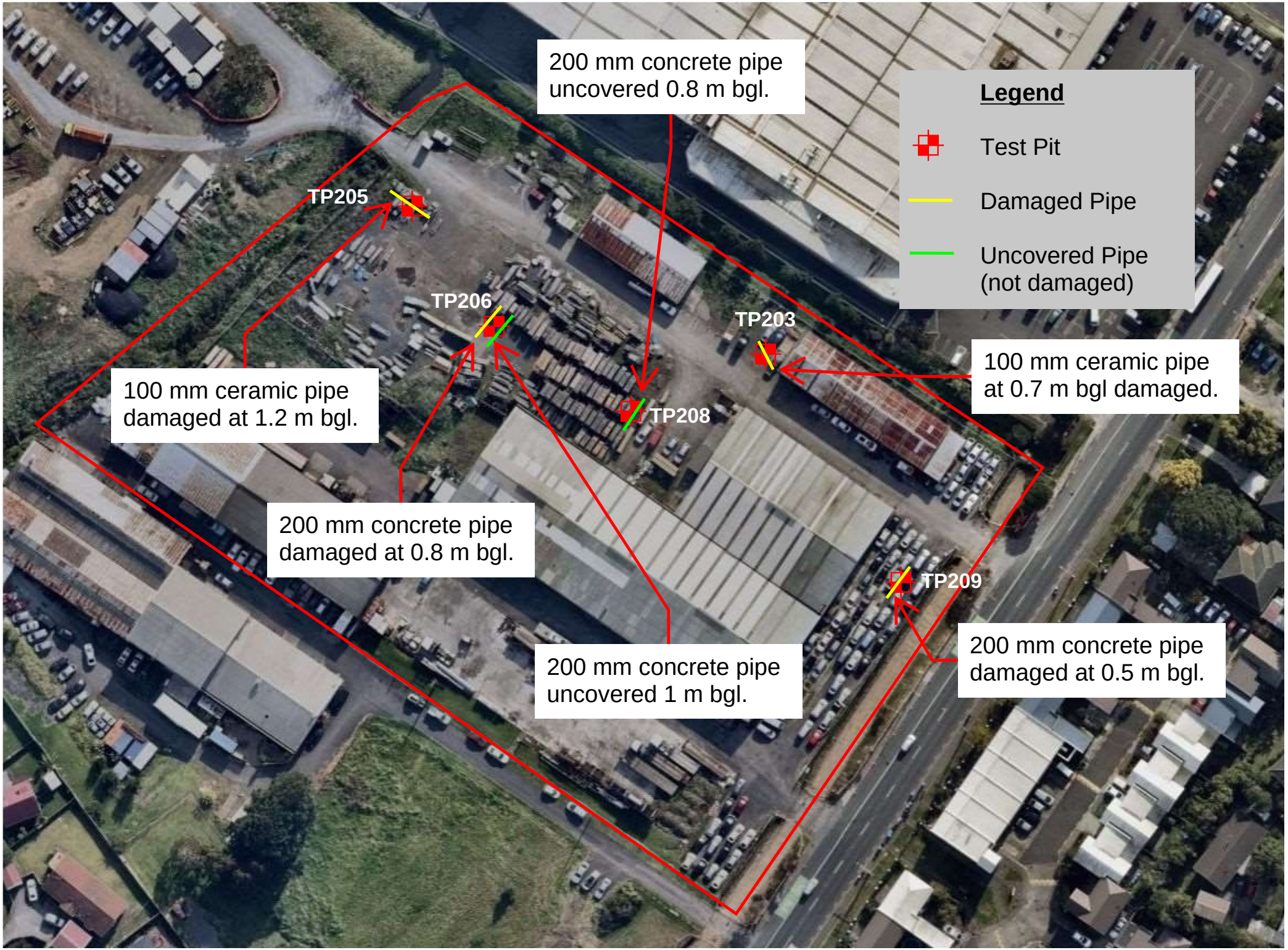
(ABS(Sample 1 - Sample 2)/((Sample 1 + Sample 2)/2))*100

Notes:

If either the sample data value OR the quality sample data value is '<' (not both '<' but just one of the values) then remove the '<' from that one value for the calculation. HOWEVER, if both the sample data value AND the quality sample data value are '<' then do not prefrom the RPD calculation on the samples for that analyte

D

Appendix D – Service Pipe Location Plans


200 mm concrete pipe uncovered 0.8 m bgl.
Legend
Test Pit
Damaged Pipe
Uncovered Pipe (not damaged)
TP205
TP206
TP203
TP208
TP209
100 mm ceramic pipe damaged at 1.2 m bgl.
100 mm ceramic pipe at 0.7 m bgl damaged.
200 mm concrete pipe damaged at 0.8 m bgl.
200 mm concrete pipe uncovered 1 m bgl.
200 mm concrete pipe damaged at 0.5 m bgl.

E

Appendix E – Test Pit, Borehole and Hand Auger Soil Logs

Environmental Test Pit Log

Test Pit ID: TP101

Sheet 1 of 1

Project:	105 May Road	**Project Number:**	3126366
Site Location:	105-119 May Road, Mount Roskill	**Client:**	May 1 Limited
Location:	119 May Road, at the end of the drive in the immediate grassed area.	**Coordinate System:**	NZTM2000
		Northing:	5913487.2
		Easting:	1754220.0
		Vertical Datum:	Auckland (1946)
		Ground Level (mRL):	50.50
		Location Method:	Auckland Council GIS

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES	0.0	50.0		SILT, some organics, trace clay, trace fine sand; dark brown; dry; non-plastic. Organics: fresh rootlets and amorphous.	Top Soil
						Fine to coarse GRAVEL, some cobbles; redish black; dry; non-plastic. Gravel and cobbles: basalt.	Fill
						Silty CLAY, some organics; greyish brown mottled orange; moist; high plasticity. Organics: rootlets.	Holocene Alluvium
		ES	0.5	50.0			
						CLAY, minor organics; grey mottled orange; moist; high plasticity. Organics: rootlets.	
		ES	1.0	49.5			
						CLAY; grey; moist; high plasticity.	
			1.5	49.0			
			2.0	48.5			
						Fibrous PEAT, some organics; black; wet; non-plastic. Organics: rootlets and large (>10 cm long) wood fragments.	
		ES	2.5	48.0			
			3.0	47.5		3.00m - End of test pit	
			3.5	47.0			
			4.0	46.5			
			4.5	46.0			

Date Started:	21/10/2020	**Logged By:**	HL	**Comments:**
Method:		**Contractor:**	Abernathy	Hole terminated at target depth.
Face Orientation:		**Equipment:**	15 Ton Excavator	Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

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

Environmental Test Pit Log

Test Pit ID: TP102

Sheet 1 of 1

Project:	105 May Road	**Project Number:**	3126366
Site Location:	105-119 May Road, Mount Roskill	**Client:**	May 1 Limited
Location:	119 May Road, two thirds of the way down the drive in the immediate grassed area.	**Coordinate System:**	NZTM2000
		Northing:	5913476.7
		Easting:	1754240.2
		Vertical Datum:	Auckland (1946)
		Ground Level (mRL):	50.50
		Location Method:	Auckland Council GIS

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES	0			SILT, some clay, some organics, minor fine sand; trace fine-medium glass; light brown; moist; high plasticity. Organics: rootlets.	Top Soil
						Silty CLAY, some organics; grey mottled orange; moist; high plasticity. Organics: rootlets.	Holocene Alluvium
			0.5	50.0		Silty CLAY, some organics; grey mottled orange mottled light grey; moist; high plasticity. Organics: rootlets.	
		ES					
			1.0	49.5		Clayey SILT, minor organics; light grey mottled orange; moist; low plasticity. Organics: rootlets.	
		ES					
			1.5	49.0			
			2.0	48.5		Fibrous PEAT, some organics; black; wet; non-plastic. Organics: rootlets and large (>10 cm long) wood fragments.	
						2.40m - End of test pit	
			2.5	48.0			
			3.0	47.5			
			3.5	47.0			
			4.0	46.5			
			4.5	46.0			

Date Started:	21/10/2020	**Logged By:**	HL
Method:		**Contractor:**	Abernathy
Face Orientation:		**Equipment:**	15 Ton Excavator

Comments:
Hole terminated at target depth.
Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

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

Environmental Test Pit Log

Test Pit ID: TP103

Sheet 1 of 1

Project:	105 May Road	**Project Number:**	3126366
Site Location:	105-119 May Road, Mount Roskill	**Client:**	May 1 Limited
Location:	119 May Road, half way down drive in the immediate grassed area.	**Coordinate System:**	NZTM2000
		Northing:	5913466.0
		Easting:	1754255.3
		Vertical Datum:	Auckland (1946)
		Ground Level (mRL):	50.50
		Location Method:	Auckland Council GIS

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				Clayey SILT, some organics, minor fine sand, minor fine-medium glass; light brown mottled grey mottled orange; moist; high plasticity. Organics: rootlets.	Top Soil
						Fine to coarse GRAVEL, some cobbles, some boulders; brown mottled grey mottled red; dry; non-plastic. Gravel, cobble and boulder: concrete, brick, glass, ceramic.	Fill
						CLAY, some silt, some organics; grey mottled orange; moist; high plasticity. Organics: rootlets.	Holocene Alluvium
		ES	0.5	50.0			
			1.0	49.5			
						CLAY, some silt; grey; wet; high plasticity.	
		ES	1.5	49.0			
			2.0	48.5			
						Fibrous PEAT, some organics; black; wet; non-plastic. Organics: rootlets and large (>10 cm long) wood fragments.	
			2.5	48.0			
▼						Silty SAND, minor clay; dark bluish grey; saturated; non-plastic.	
			3.0	47.5		3.00m - End of test pit	
			3.5	47.0			
			4.0	46.5			
			4.5	46.0			

Date Started:	21/10/2020	**Logged By:**	HL	**Comments:**
Method:		**Contractor:**	Abernathy	Hole terminated due to substantial groundwater intrusion. Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.
Face Orientation:		**Equipment:**	15 Ton Excavator	

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

Environmental Test Pit Log

Test Pit ID: TP104

Sheet 1 of 1

Project:	105 May Road	**Project Number:**	3126366
Site Location:	105-119 May Road, Mount Roskill	**Client:**	May 1 Limited
Location:	119 May Road, one third of the way down the driveway, 15 m from the drive within the grassed area.	**Coordinate System:**	NZTM2000
		Northing:	5913438.1
		Easting:	1754248.9
		Vertical Datum:	Auckland (1946)
		Ground Level (mRL):	50.50
		Location Method:	Auckland Council GIS

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
						Bituminous material; black; dry; non-plastic.	Asphalt
						Sandy fine to coarse GRAVEL; dark bluish grey; dry; non-plastic.	Holocene Alluvium
		ES					
			0.5	50.0		Silty CLAY, some cobbles; light grey mottled yellowish orange; moist; high plasticity. Cobble: brick.	Fill
		ES				Silty CLAY; light grey mottled yellowish orange; moist; high plasticity.	Holocene Alluvium
			1.0	49.5			
			1.5	49.0			
						Sandy SILT, minor fine gravel, minor clay; dark bluish grey; moist; low plasticity.	
▼			2.0	48.5			
		ES				2.20m - End of test pit	
			2.5	48.0			
			3.0	47.5			
			3.5	47.0			
			4.0	46.5			
			4.5	46.0			

Date Started:	20/10/2020	**Logged By:**	HL
Method:		**Contractor:**	Abernathy
Face Orientation:		**Equipment:**	15 Ton Excavator

Comments:
Hole terminated due to substantial groundwater intrusion.
Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

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

Environmental Test Pit Log

Test Pit ID: TP105

Sheet 1 of 1

Project:	105 May Road	**Project Number:**	3126366
Site Location:	105-119 May Road, Mount Roskill	**Client:**	May 1 Limited
Location:	119 May Road, one third of the way down the driveway, 30 m from the drive within the grassed area.	**Coordinate System:**	NZTM2000
		Northing:	5913421.2
		Easting:	1754246.9
		Vertical Datum:	Auckland (1946)
		Ground Level (mRL):	50.50
		Location Method:	Auckland Council GIS

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
			0.0	50.5		SILT, some organics, trace sand; light brown; dry; non-plastic. Organics: rootlets.	Top Soil
						Sandy fine to coarse GRAVEL, some organics; brownish grey; dry; non-plastic. Organics: large (>30 cm long) wood fragments.	Fill
		ES					
			0.5	50.0		Silty CLAY, minor organics, trace fine sand; orange mottled light grey mottled yellow; moist; high plasticity. Organics: large (>30 cm long) roots.	Holocene Alluvium
		ES	1.0	49.5			
			1.5	49.0		Silty SAND; bluish grey; saturated; non-plastic.	
		ES					
▼			2.0	48.5		Silty SAND, some fine gravel; bluish grey; saturated; non-plastic.	
			2.5	48.0		2.50m - End of test pit	
			3.0	47.5			
			3.5	47.0			
			4.0	46.5			
			4.5	46.0			

Date Started:	20/10/2020	**Logged By:**	HL	**Comments:**
Method:		**Contractor:**	Abernathy	Hole terminated due to substantial groundwater intrusion. Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.
Face Orientation:		**Equipment:**	15 Ton Excavator	

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

Environmental Test Pit Log

Test Pit ID: TP106

Sheet 1 of 1

Project:	105 May Road	**Project Number:**	3126366
Site Location:	105-119 May Road, Mount Roskill	**Client:**	May 1 Limited
Location:	119 May Road, at the start of the driveway, 30m from the drive in the grassed area.	**Coordinate System:**	NZTM2000
		Northing:	5913403.6
		Easting:	1754248.8
		Vertical Datum:	Auckland (1946)
		Ground Level (mRL):	50.50
		Location Method:	Auckland Council GIS

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
			0.0	50.5		SILT, some organics, trace sand; light brown; dry; non-plastic. Organics: rootlets.	Top Soil
		ES				Sandy fine to coarse GRAVEL; brownish grey; dry; non-plastic.	Fill
						Silty CLAY, minor cobbles, trace fine sand; orange mottled light grey mottled yellow; moist; high plasticity. Cobble: brick.	
		ES	0.5	50.0		Silty CLAY, trace fine sand; orange mottled light grey mottled yellow; moist; high plasticity.	Holocene Alluvium
▼			1.0	49.5			
		ES	1.5	49.0		Silty SAND, some fine to medium gravel; grey mottled yellow; wet; non-plastic.	Holocene Alluvium
						SILT, some clay; light grey mottled yellow; saturated; high plasticity.	
		ES	2.0	48.5		2.00m - End of test pit	
			2.5	48.0			
			3.0	47.5			
			3.5	47.0			
			4.0	46.5			
			4.5	46.0			

Date Started:	20/10/2020	**Logged By:**	HL	**Comments:**
Method:		**Contractor:**	Abernathy	Hole terminated due to substantial groundwater intrusion. Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.
Face Orientation:		**Equipment:**	15 Ton Excavator	

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

Environmental Test Pit Log

Test Pit ID: TP107

Sheet 1 of 1

Project:	105 May Road	**Project Number:**	3126366
Site Location:	105-119 May Road, Mount Roskill	**Client:**	May 1 Limited
Location:	119 May Road, half way down driveway, 30m from the drive in the grassed area.	**Coordinate System:**	NZTM2000
		Northing:	5913431.6
		Easting:	1754225.1
		Vertical Datum:	Auckland (1946)
		Ground Level (mRL):	50.50
		Location Method:	Auckland Council GIS

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES	0.0	50.0		Clayey SILT, some organics, minor cobbles, trace fine to medium gravel; brown mottled orange; moist; high plasticity. Organics, gravel and cobble: rootlets, glass and brick.	Fill
			0.5	50.0		Silty CLAY, minor organics, trace fine to medium gravel; grey mottled orange mottled yellow; moist; high plasticity. Organics and gravel: rootlets, glass and brick.	
		ES	1.0	49.5		Silty CLAY, minor organics; grey mottled orange mottled yellow; moist; high plasticity. Organics: rootlets.	Holocene Alluvium
			1.5	49.0			
▼			2.0	48.5		Sandy SILT, minor clay, minor fine to coarse gravel; dark bluish grey; saturated; low plasticity.	Holocene Alluvium
		ES	2.30	48.2		2.30m - End of test pit	
			2.5	48.0			
			3.0	47.5			
			3.5	47.0			
			4.0	46.5			
			4.5	46.0			

Date Started:	20/10/2020	**Logged By:**	HL	**Comments:**
Method:		**Contractor:**	Abernathy	Hole terminated due to substantial groundwater intrusion. Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.
Face Orientation:		**Equipment:**	15 Ton Excavator	

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

Environmental Test Pit Log

Test Pit ID: TP108

Sheet 1 of 1

Project:	105 May Road	**Project Number:**	3126366
Site Location:	105-119 May Road, Mount Roskill	**Client:**	May 1 Limited
Location:	119 May Road, two thirds of the way down the driveway, 30 m from the drive within the grassed area.	**Coordinate System:**	NZTM2000
		Northing:	5913444.0
		Easting:	1754215.8
		Vertical Datum:	Auckland (1946)
		Ground Level (mRL):	50.50
		Location Method:	Auckland Council GIS

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				Clayey SILT, some organics, some cobbles, minor fine to coarse gravel, minor cobbles; brown mottled grey mottled orange; moist; high plasticity. Organics: rootlets. Gravel and cobble: glass, concrete, metal.	Fill
			0.5	50.0		Silty CLAY, minor organics; dark grey mottled orange mottled yellow; moist; high plasticity. Organics: rootlets.	Holocene Alluvium
						CLAY, minor silt, minor organics; light grey mottled orange, moist, high plasticity. Organics: rootlets.	
			1.0	49.5			
		ES					
			1.5	49.0			
			2.0	48.5		Fibrous PEAT, some organics; black; wet; non-plastic. Organics: rootlets and large (>30 cm long) wood fragments.	
			2.5	48.0			
		ES	3.0	47.5		3.00m - End of test pit	
			3.5	47.0			
			4.0	46.5			
			4.5	46.0			

Date Started:	20/10/2020	**Logged By:**	HL	**Comments:**
Method:		**Contractor:**	Abernathy	Hole terminated at target depth.
Face Orientation:		**Equipment:**	15 Ton Excavator	Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

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

Environmental Test Pit Log

Test Pit ID: TP109

Sheet 1 of 1

Project:	105 May Road	**Project Number:**	3126366
Site Location:	105-119 May Road, Mount Roskill	**Client:**	May 1 Limited
Location:	119 May Road, at the end of the driveway, 30 m from the drive within the grassed area.	**Coordinate System:**	NZTM2000
		Northing:	5913456.6
		Easting:	1754202.1
		Vertical Datum:	Auckland (1946)
		Ground Level (mRL):	50.50
		Location Method:	Auckland Council GIS

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				SILT, some organics, minor clay, minor medium to coarse gravel; brown; moist; low plasticity. Organics: rootlets. Gravel: brick.	Fill
			0.5	50.0		Silty CLAY, minor organics; grey mottled orange mottled yellow; moist; high plasticity. Organics: rootlets.	Holocene Alluvium
						CLAY, minor silt, minor organics; light grey mottled orange; moist; high plasticity. Organics: rootlets.	
		ES	1.0	49.5		Sandy SILT, minor clay, trace organics; whitish grey; moist; non-plastic. Organics: rootlets.	
		ES				Fibrous PEAT, some organics; black; wet; non-plastic. Organics: rootlets and large (>20 cm long) wood fragments.	
▼			1.5	49.0		Silty SAND, trace clay; dark bluish grey; saturated; non-plastic.	
		ES	2.0	48.5			
			2.5	48.0		2.40m - End of test pit	
			3.0	47.5			
			3.5	47.0			
			4.0	46.5			
			4.5	46.0			

Date Started:	20/10/2020	**Logged By:**	HL
Method:		**Contractor:**	Abernathy
Face Orientation:		**Equipment:**	15 Ton Excavator

Comments:
Hole terminated due to substantial groundwater intrusion.
Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

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

Environmental Test Pit Log

Test Pit ID: TP110

Project:	105 May Road	**Project Number:**	3126366
Site Location:	105-119 May Road, Mount Roskill	**Client:**	May 1 Limited
Location:	119 May Road, at the end of the driveway, 15 m from the drive within the grassed area.	**Coordinate System:**	NZTM2000
		Northing:	5913473.0
		Easting:	1754210.3
		Vertical Datum:	Auckland (1946)
		Ground Level (mRL):	50.50
		Location Method:	Auckland Council GIS

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				Clayey SILT, some organics, minor fine sand; brown; dry; non-plastic. Organics: rootlets.	Top Soil
			0.5	50.0		CLAY, some organics, minor silt; grey mottled orange; moist; non-plastic. Organics (rootlets).	Holocene Alluvium
			1.0	49.5		CLAY, some organics, minor silt; grey mottled orange; moist; non-plastic. Organics (rootlets).	Holocene Alluvium
		ES				Sandy SILT, minor clay, trace organics; whitish grey; moist; non-plastic. Organics: rootlets.	Holocene Alluvium
			1.5	49.0		CLAY, some organics, minor silt; grey mottled orange; moist; non-plastic. Organics (rootlets).	Holocene Alluvium
			2.0	48.5		Fibrous PEAT, some organics; black; wet; non-plastic. Organics: rootlets and large (>30 cm long) wood fragments.	Holocene Alluvium
			2.5	48.0		Silty SAND, minor clay; dark bluish grey; saturated; non-plastic.	Holocene Alluvium
▼		ES	3.0	47.5		3.10m - End of test pit	Holocene Alluvium
			3.5	47.0			
			4.0	46.5			
			4.5	46.0			

Date Started:	20/10/2020	**Logged By:**	HL
Method:		**Contractor:**	Abernathy
Face Orientation:		**Equipment:**	15 Ton Excavator

Comments:
Hole terminated due to substantial groundwater intrusion.
Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

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

Environmental Test Pit Log

Test Pit ID: TP111

Sheet 1 of 1

Project:	105 May Road	**Project Number:**	3126366
Site Location:	105-119 May Road, Mount Roskill	**Client:**	May 1 Limited
Location:	119 May Road, two thirds of the way down the driveway, 10 m from the drive within the grassed area.	**Coordinate System:**	NZTM2000
		Northing:	5913471.1
		Easting:	1754227.3
		Vertical Datum:	Auckland (1946)
		Ground Level (mRL):	50.50
		Location Method:	Auckland Council GIS

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES	0.0	50.5		Silty CLAY, some organics, some cobbles, trace fine to coarse gravel; greyish brown mottled orange; moist; high plasticity. Organics, cobble and gravel: rootlets, rock, bitumen, concrete, large (>30 cm long) wood fragments, glass, ceramic, brick, and fibre cement sheet.	Fill
		ES	0.5	50.0		Silty CLAY, some organics, some boulders; yellowish brown mottled orange; moist; high plasticity. Organics and boulder: rootlets and concrete.	
		ES	1.0	49.5		Silty CLAY; grey mottled light grey mottled orange; moist; high plasticity.	Holocene Alluvium
		ES	1.5	49.0		Silty CLAY, minor organics; light grey mottled orange; moist; high plasticity. Organics: rootlets.	
		ES	2.0	48.5		CLAY, minor organics; grey; moist; high plasticity. Organics: rootlets.	
			2.5	48.0		Fibrous PEAT, some organics; black; wet; non-plastic. Organics: rootlets and large (>30 cm long) roots and wood fragments.	
			3.0	47.5		2.40m - End of test pit	
			3.5	47.0			
			4.0	46.5			
			4.5	46.0			

Date Started:	21/10/2020	**Logged By:**	HL	**Comments:**	
Method:		**Contractor:**	Abernathy	Hole terminated at target depth.	
Face Orientation:		**Equipment:**	15 Ton Excavator	Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.	

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

Environmental Test Pit Log

Test Pit ID: TP112

Sheet 1 of 1

Project:	105 May Road	**Project Number:**	3126366
Site Location:	105-119 May Road, Mount Roskill	**Client:**	May 1 Limited
Location:	119 May Road, two thirds of the way down the driveway, 20 m from the drive within the grassed area.	**Coordinate System:**	NZTM2000
		Northing:	5913452.0
		Easting:	1754222.9
		Vertical Datum:	Auckland (1946)
		Ground Level (mRL):	50.50
		Location Method:	Auckland Council GIS

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				Clayey SILT, some sand, some organics, some medium to coarse gravel; brown; moist; high plasticity. Organics and gravel: rootlets, rock, glass, plastic, brick, and ceramic.	Fill
						Coarse GRAVEL, minor silt; brownish green; dry; non-plastic. Gravel: glass.	
			0.5	50.0		Silty CLAY, some organics; grey mottled orange; moist; low plasticity. Organics: rootlets.	Holocene Alluvium
		ES				Clayey SILT; grey speckled orange mottled light grey; moist; low plasticity.	
						CLAY, some silt, trace fine gravel; light grey mottled orange; moist; high plasticity.	
			1.0	49.5			
			1.5	49.0			
		ES					
			2.0	48.5			
						Fibrous PEAT, some organics; black; wet; non-plastic. Organics: rootlets and large (>10 cm long) wood fragments.	
			2.5	48.0			
			3.0	47.5			
		ES	3.5	47.0			
						3.60m - End of test pit	
			4.0	46.5			
			4.5	46.0			

Date Started:	21/10/2020	**Logged By:**	HL
Method:		**Contractor:**	Abernathy
Face Orientation:		**Equipment:**	15 Ton Excavator

Comments:
Hole terminated at target depth.
Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

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

Environmental Test Pit Log

Test Pit ID: TP113

Sheet 1 of 1

Project:	105 May Road	**Project Number:**	3126366
Site Location:	105-119 May Road, Mount Roskill	**Client:**	May 1 Limited
Location:	119 May Road, half way down driveway, 15m from the drive in the grassed area.	**Coordinate System:**	NZTM2000
		Northing:	5913452.0
		Easting:	1754235.5
		Vertical Datum:	Auckland (1946)
		Ground Level (mRL):	50.50
		Location Method:	Auckland Council GIS

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES	0.0	50.5		Clayey SILT, some sand, some organics, trace medium to coarse gravel; brown; moist; high plasticity. Organics and gravel: rootlets, glass and brick.	Fill
			0.5	50.0		Silty CLAY, some organics; light grey mottled orange; moist; high plasticity. Organics: rootlets.	Holocene Alluvium
		ES	1.0	49.5			
			1.5	49.0			
▼			2.0	48.5		Silty SAND, some clay; dark bluish grey; saturated; non-plastic.	
		ES	2.45	48.05		2.45m - End of test pit	
			2.5	48.0			
			3.0	47.5			
			3.5	47.0			
			4.0	46.5			
			4.5	46.0			

Date Started:	21/10/2020	**Logged By:**	HL	**Comments:**
Method:		**Contractor:**	Abernathy	Hole terminated due to substantial groundwater intrusion. Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.
Face Orientation:		**Equipment:**	15 Ton Excavator	

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

Environmental Test Pit Log

Test Pit ID: TP114

Sheet 1 of 1

Project:	105 May Road	**Project Number:**	3126366
Site Location:	105-119 May Road, Mount Roskill	**Client:**	May 1 Limited
Location:	119 May Road, at the start of the drive in the immediate grassed area.	**Coordinate System:**	NZTM2000
		Northing:	5913443.3
		Easting:	1754279.7
		Vertical Datum:	Auckland (1946)
		Ground Level (mRL):	50.50
		Location Method:	Auckland Council GIS

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES	0.0	50.5		Clayey SILT, some organics, trace fine sand; brown speckled orange; moist; non-plastic. Organics: rootlets.	Top Soil
		ES	0.5	50.0		Silty CLAY, minor organics; light grey mottled orange mottled dark brown; moist; low plasticity. Organics: rootlets.	Holocene Alluvium
		ES	1.0	49.5		Clayey SILT; light grey mottled orange; moist; high plasticity.	
			1.5	49.0		Silty CLAY, minor organics; light grey; wet; high plasticity. Organics: rootlets.	
▼		ES	2.0	48.5		2.00m - End of test pit	
			2.5	48.0			
			3.0	47.5			
			3.5	47.0			
			4.0	46.5			
			4.5	46.0			

Date Started:	20/10/2020	**Logged By:**	HL
Method:		**Contractor:**	Abernathy
Face Orientation:		**Equipment:**	15 Ton Excavator

Comments:
Hole terminated due to substantial groundwater intrusion.
Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

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

Environmental Test Pit Log

Test Pit ID: TP115

Sheet 1 of 1

Project:	105 May Road	**Project Number:**	3126366
Site Location:	105-119 May Road, Mount Roskill	**Client:**	May 1 Limited
Location:	119 May Road, at the start of the driveway, 15 m from the drive in the grassed area.	**Coordinate System:**	NZTM2000
		Northing:	5913432.8
		Easting:	1754268.0
		Vertical Datum:	Auckland (1946)
		Ground Level (mRL):	50.50
		Location Method:	Auckland Council GIS

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				Clayey SILT, some organics; brown, moist; low plasticity. Organics: rootlets.	Top Soil
		ES	0.5	50.0		Clayey SILT, some organics, trace fine sand; light grey mottled orange mottled yellow; moist; low plasticity. Organics: rootlets.	Holocene Alluvium
		ES	1.0	49.5		Silty CLAY, minor organics; light grey mottled orange; moist; high plasticity. Organics: rootlets.	
			1.5	49.0			
		ES	2.0	48.5		Clayey SILT, minor organics; dark bluish grey; moist; high plasticity. Organics: rootlets.	
▼			2.5	48.0		Sandy fine to coarse GRAVEL, some silt; dark bluish grey; saturated; low plasticity.	
						2.60m - End of test pit	
			3.0	47.5			
			3.5	47.0			
			4.0	46.5			
			4.5	46.0			

Date Started:	20/10/2020	**Logged By:**	HL	**Comments:**
Method:		**Contractor:**	Abernathy	Hole terminated due to substantial groundwater intrusion. Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.
Face Orientation:		**Equipment:**	15 Ton Excavator	

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

Environmental Test Pit Log

Test Pit ID: TP201

Sheet 1 of 1

Project:	105 May Road	**Project Number:**	3126366
Site Location:	105-119 May Road, Mount Roskill	**Client:**	May 1 Limited
Location:	105A-109A May Road, 130 m down the northern driveway, in the gravel area 5 m north.	**Coordinate System:**	NZTM2000
		Northing:	5913610.4
		Easting:	1754260.8
		Vertical Datum:	Auckland (1946)
		Ground Level (mRL):	50.00
		Location Method:	Auckland Council GIS

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
						Fine to coarse GRAVEL, some cobbles; redish black; dry; non-plastic. Gravel and cobble: basalt, concrete, metal and plastic.	Fill
			0.5	49.5		CLAY, some silt; brown mottled orange; moist; low plasticity.	Holocene Alluvium
		ES				CLAY, minor silt; orange mottled grey mottled dark grey; moist; high plasticity.	
			1.0	49.0		CLAY, trace silt; grey mottled orange; moist; high plasticity.	
		ES				CLAY, minor silt; orange mottled grey; moist; high plasticity.	
			1.5	48.5			
		ES					
			2.0	48.0		CLAY; brown; wet; high plasticity.	
						Silty SAND, some organics, minor clay; whitish grey; moist; non-plastic. Organics: rootlets.	
			2.5	47.5		Fibrous PEAT, some organics; black; wet; non-plastic. Organics: rootlets and large (>20 cm long) wood fragments.	
			3.0	47.0			
			3.5	46.5			
			4.0	46.0			
		ES				Sandy SILT, some Clay; bluish grey; saturated; low plasticity.	
▼			4.5	45.5		4.40m - End of test pit	

Date Started:	27/10/2020	**Logged By:**	HL
Method:		**Contractor:**	Abernathy
Face Orientation:		**Equipment:**	15 Ton Excavator

Comments:
Hole terminated at target depth.
Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

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

Environmental Test Pit Log

Test Pit ID: TP202

Sheet 1 of 1

Project:	105 May Road	**Project Number:**	3126366
Site Location:	105-119 May Road, Mount Roskill	**Client:**	May 1 Limited
Location:	105A-109A May Road, 100 m down the northern driveway, in the gravel area 5 m north.	**Coordinate System:**	NZTM2000
		Northing:	5913588.8
		Easting:	1754293.3
		Vertical Datum:	Auckland (1946)
		Ground Level (mRL):	50.00
		Location Method:	Auckland Council GIS

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
			0			Fine to coarse GRAVEL, some cobbles; redish black; dry; non-plastic. Gravel and cobble: basalt, concrete, metal, wood and plastic.	Fill
		ES	0.5	49.5		Silty CLAY, some organics, trace fine to medium gravel; brown mottled orange mottled light grey; moist; low plasticity. Organics and gravel: rootlets and glass.	
		ES	1.0	49.0		CLAY, minor silt; orange mottle grey; moist; high plasticity.	Holocene Alluvium
		ES	1.5	48.5		Silty SAND, some organics, minor clay; whitish grey; moist; non-plastic. Organics: rootlets.	
						Dark grey BASALT.	Basalt
						1.65m - End of test pit	
			2.0	48.0			
			2.5	47.5			
			3.0	47.0			
			3.5	46.5			
			4.0	46.0			
			4.5	45.5			

Date Started:	27/10/2020	**Logged By:**	HL
Method:		**Contractor:**	Abernathy
Face Orientation:		**Equipment:**	15 Ton Excavator

Comments:
Hole terminated due to instability and access issues.
Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

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

Environmental Test Pit Log

Test Pit ID: TP203

Sheet 1 of 1

Project:	105 May Road	**Project Number:**	3126366
Site Location:	105-119 May Road, Mount Roskill	**Client:**	May 1 Limited
Location:	105A-109A May Road, 90 m down the northern driveway, in the gravel area 5 m north.	**Coordinate System:**	NZTM2000
		Northing:	5913572.3
		Easting:	1754304.1
		Vertical Datum:	Auckland (1946)
		Ground Level (mRL):	50.00
		Location Method:	Auckland Council GIS

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
			0.0	50.0		Fine to coarse GRAVEL, some cobbles; redish black; dry; non-plastic. Gravel and cobble: basalt.	Fill
		ES	0.5	49.5		Clayey SILT, some fine gravel; redish brown; moist; low plasticity.	Holocene Alluvium
						Silty CLAY; orange mottled grey; moist; high plasticity.	
						0.70m - End of test pit	
			1.0	49.0			
			1.5	48.5			
			2.0	48.0			
			2.5	47.5			
			3.0	47.0			
			3.5	46.5			
			4.0	46.0			
			4.5	45.5			

Date Started:	27/10/2020	**Logged By:**	HL
Method:		**Contractor:**	Abernathy
Face Orientation:		**Equipment:**	15 Ton Excavator

Comments:
Hole terminated due to uncovering a ceramic service pipe.
Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

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

Environmental Test Pit Log

Test Pit ID: TP204

Project:	105 May Road	**Project Number:**	3126366
Site Location:	105-119 May Road, Mount Roskill	**Client:**	May 1 Limited
Location:	105A-109A May Road, 5 m down the northern driveway, in the car yard 5 m north.	**Coordinate System:**	NZTM2000
		Northing:	5913544.6
		Easting:	1754351.9
		Vertical Datum:	Auckland (1946)
		Ground Level (mRL):	50.00
		Location Method:	Auckland Council GIS

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
			0	50.0		Bituminous material; black; dry; non-plastic.	Asphalt
						Fine to coarse GRAVEL, some cobbles; redish black; dry; non-plastic. Gravel and cobble: basalt.	Fill
		ES	0.5	49.5		Silty CLAY, minor medium to coarse gravel; dark grey mottled grey mottled orange; moist; high plasticity. Gravel: glass and wood.	
		ES	1.0	49.0		Silty CLAY, bluish grey mottled light grey; moist; high plasticity.	Holocene Alluvium
		ES	1.5	48.5		Fibrous PEAT, some organics; black; wet; non-plastic. Organics: rootlets and large (>1 m long) wood fragments.	
						Silty SAND, some organics, minor clay; whitish grey; moist; non-plastic. Organics: rootlets.	
			2.0	48.0		Fibrous PEAT, some organics; black; wet; non-plastic. Organics: rootlets and large (>1 m long) wood fragments.	
			2.5	47.5			
			3.0	47.0			
			3.5	46.5		3.50m - End of test pit	
			4.0	46.0			
			4.5	45.5			

Date Started:	23/10/2020	**Logged By:**	HL	**Comments:**
Method:		**Contractor:**	Abernathy	Hole terminated due to instability and access issues.
Face Orientation:		**Equipment:**	15 Ton Excavator	Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

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

Environmental Test Pit Log

Test Pit ID: TP205

Sheet 1 of 1

Project:	105 May Road	**Project Number:**	3126366
Site Location:	105-119 May Road, Mount Roskill	**Client:**	May 1 Limited
Location:	105A-109A May Road, 140 m down the northern driveway, in the gravel area 5 m south.	**Coordinate System:**	NZTM2000
		Northing:	5913605.5
		Easting:	1754227.5
		Vertical Datum:	Auckland (1946)
		Ground Level (mRL):	50.00
		Location Method:	Auckland Council GIS

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
			0			Fine to coarse GRAVEL, some cobbles; redish black; dry; non-plastic. Gravel and cobble: basalt, concrete and metal.	Fill
		ES	0.5	49.5		CLAY, some silt; orange mottled grey mottled light grey; moist; high plasticity.	Holocene Alluvium
		ES	1.0	49.0		Silty CLAY; dark brown; moist; high plasticity.	
			1.2			1.20m - End of test pit	
			1.5	48.5			
			2.0	48.0			
			2.5	47.5			
			3.0	47.0			
			3.5	46.5			
			4.0	46.0			
			4.5	45.5			

Date Started:	27/10/2020	**Logged By:**	HL	**Comments:**
Method:		**Contractor:**	Abernathy	Hole terminated due to uncovering a ceramic service pipe. Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.
Face Orientation:		**Equipment:**	15 Ton Excavator	

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

Environmental Test Pit Log

Test Pit ID: TP206

Sheet 1 of 1

Project:	105 May Road	**Project Number:**	3126366
Site Location:	105-119 May Road, Mount Roskill	**Client:**	May 1 Limited
Location:	105A-109A May Road, 130 m down the northern driveway, in the timber yard 5 m south.	**Coordinate System:**	NZTM2000
		Northing:	5913577.1
		Easting:	1754248.7
		Vertical Datum:	Auckland (1946)
		Ground Level (mRL):	50.00
		Location Method:	Auckland Council GIS

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
			0			Fine to coarse GRAVEL; grey; dry; non-plastic.	Fill
						Fine to coarse GRAVEL, some cobbles; redish black; dry; non-plastic. Gravel and cobble: basalt.	
		ES	0.5	49.5		Clayey SILT, minor sand; grey mottled orange mottled dark grey; moist; high plasticity. Strong hydrocarbon odour.	
						Clayey SILT, some coarse gravel, minor sand; dark grey mottled orange mottled grey; moist; high plasticity. Gravel: lifting wire. Strong hydrocarbon odour.	
			1.0	49.0		Fine to coarse GRAVEL, some cobbles; redish black; dry; non-plastic. Gravel and cobble: basalt.	
		ES				Clayey SILT, minor sand; dark grey mottled orange mottled grey; moist; high plasticity. Strong hydrocarbon odour.	Holocene Alluvium
						1.30m - End of test pit	
			1.5	48.5			
			2.0	48.0			
			2.5	47.5			
			3.0	47.0			
			3.5	46.5			
			4.0	46.0			
			4.5	45.5			

Date Started:	23/10/2020	**Logged By:**	HL	**Comments:**
Method:		**Contractor:**	Abernathy	Hole terminated due to uncovering a concrete service pipe. Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.
Face Orientation:		**Equipment:**	15 Ton Excavator	

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

Environmental Test Pit Log

Test Pit ID: TP207

Sheet 1 of 1

Project:	105 May Road	**Project Number:**	3126366
Site Location:	105-119 May Road, Mount Roskill	**Client:**	May 1 Limited
Location:	105A-109A May Road, 150 m down the southern most driveway, in the asphalt area 10 m south.	**Coordinate System:**	NZTM2000
		Northing:	5913555.9
		Easting:	1754166.0
		Vertical Datum:	Auckland (1946)
		Ground Level (mRL):	50.00
		Location Method:	Auckland Council GIS

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
			0	50.0		Bituminous material; black; dry; non-plastic.	Asphalt
						Fine to coarse GRAVEL, some cobbles; redish black; dry; non-plastic. Gravel and cobble: basalt.	Fill
		ES	0.5	49.5		CLAY, some silt, some organics; bluish grey mottled orange; moist; high plasticity. Organics: rootlets.	Holocene Alluvium
			1.0	49.0		Silty SAND, some organics, minor clay; whitish grey; moist; non-plastic. Organics: rootlets.	
		ES	1.5	48.5		CLAY, some silt; bluish grey mottled dark grey mottled orange; wet; high plasticity.	
			2.0	48.0			
		ES	2.5	47.5			
			3.0	47.0			
			3.5	46.5			
			4.0	46.0			
			4.5	45.5		Silty CLAY; orange; wet; high plasticity.	
		ES				4.60m - End of test pit	

Date Started:	23/10/2020	**Logged By:**	HL
Method:		**Contractor:**	Abernathy
Face Orientation:		**Equipment:**	15 Ton Excavator

Comments:
Hole terminated at target depth.
Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

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

Environmental Test Pit Log

Test Pit ID: TP208

Sheet 1 of 1

Project:	105 May Road	**Project Number:**	3126366
Site Location:	105-119 May Road, Mount Roskill	**Client:**	May 1 Limited
Location:	105A-109A May Road, 100 m down the northern driveway, in the timber yard 10 m south.	**Coordinate System:**	NZTM2000
		Northing:	5913559.5
		Easting:	1754279.9
		Vertical Datum:	Auckland (1946)
		Ground Level (mRL):	50.00
		Location Method:	Auckland Council GIS

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
			0	50.0		Fine to medium GRAVEL; redish black; dry; non-plastic. Gravel: basalt.	Fill
		ES	0.5	49.5		Clayey SILT, some fine gravel; dark grey mottled brown; moist; low plasticity.	Holocene Alluvium
		ES				CLAY, some silt; dark grey; moist; high plasticity. Strong hydrocarbon odour.	
			1.0	49.0		0.90m - End of test pit	
			1.5	48.5			
			2.0	48.0			
			2.5	47.5			
			3.0	47.0			
			3.5	46.5			
			4.0	46.0			
			4.5	45.5			

Date Started:	22/10/2020	**Logged By:**	HL	**Comments:**
Method:		**Contractor:**	Abernathy	Hole terminated due to uncovering a concrete service pipe. Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.
Face Orientation:		**Equipment:**	15 Ton Excavator	

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

Environmental Test Pit Log

Test Pit ID: TP209

Sheet 1 of 1

Project:	105 May Road	**Project Number:**	3126366
Site Location:	105-119 May Road, Mount Roskill	**Client:**	May 1 Limited
Location:	105A-109A May Road, 10 m down the northern driveway, in the car yard 5 m south.	**Coordinate System:**	NZTM2000
		Northing:	5913521.6
		Easting:	1754330.3
		Vertical Datum:	Auckland (1946)
		Ground Level (mRL):	50.50
		Location Method:	Auckland Council GIS

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
			0.0	50.0		Bituminous material; black; dry; non-plastic.	Asphalt
						Fine to medium GRAVEL; redish black; dry; non-plastic. Gravel: basalt.	Fill
		ES	0.5	50.0		CLAY; grey mottled greenish blue; moist; high plasticity.	Holocene Alluvium
						0.50m - End of test pit	
			1.0	49.5			
			1.5	49.0			
			2.0	48.5			
			2.5	48.0			
			3.0	47.5			
			3.5	47.0			
			4.0	46.5			
			4.5	46.0			

Date Started:	22/10/2020	**Logged By:**	HL	**Comments:**
Method:		**Contractor:**	Abernathy	Hole terminated due to uncovering a concrete service pipe. Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.
Face Orientation:		**Equipment:**	15 Ton Excavator	

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

Environmental Test Pit Log

Test Pit ID: TP210

Sheet 1 of 1

Project:	105 May Road	**Project Number:**	3126366
Site Location:	105-119 May Road, Mount Roskill	**Client:**	May 1 Limited
Location:	105A-109A May Road, 140 m down the northern driveway, in the gravel area 20 m south.	**Coordinate System:**	NZTM2000
		Northing:	5913583.5
		Easting:	1754212.3
		Vertical Datum:	Auckland (1946)
		Ground Level (mRL):	50.00
		Location Method:	Auckland Council GIS

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
			0.0			Fine to coarse GRAVEL, some cobbles; redish black; dry; non-plastic. Gravel and cobble: basalt and concrete.	Fill
		ES	0.5	49.5		CLAY, some silt; brown mottled grey mottled orange; moist; high plasticity.	Holocene Alluvium
			1.0	49.0			
		ES				Silty CLAY; dark brown; moist; high plasticity.	
			1.5	48.5		CLAY, some silt; grey mottled orangish brown; moist; high plasticity.	
		ES					
			2.0	48.0			
		ES	2.5	47.5		Silty SAND, some organics, minor clay; whitish grey; moist; non-plastic. Organics: rootlets.	
			3.0	47.0		Fibrous PEAT, some organics; black; wet; non-plastic. Organics: rootlets and large (>50 cm long) wood fragments.	
			3.5	46.5			
			4.0	46.0			
						Clayey SILT; bluish grey; moist; low plasticity.	
			4.5	45.5		4.30m - End of test pit	

Date Started:	27/10/2020	**Logged By:**	HL
Method:		**Contractor:**	Abernathy
Face Orientation:		**Equipment:**	15 Ton Excavator

Comments:
Hole terminated at target depth.
Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

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

Environmental Test Pit Log

Test Pit ID: TP211

Sheet 1 of 1

Project:	105 May Road	**Project Number:**	3126366
Site Location:	105-119 May Road, Mount Roskill	**Client:**	May 1 Limited
Location:	105A-109A May Road, 100 m down the northern driveway, in the timber yard 20 m south.	**Coordinate System:**	NZTM2000
		Northing:	5913546.6
		Easting:	1754276.4
		Vertical Datum:	Auckland (1946)
		Ground Level (mRL):	50.00
		Location Method:	Auckland Council GIS

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
			0.0	50.0		Fine to medium GRAVEL; redish black; dry; non-plastic. Gravel: basalt.	Fill
		ES	0.5	49.5		Clayey SILT, some fine gravel; brown; moist; low plasticity.	Holocene Alluvium
						Clay; bluish grey mottled orange; moist; high plasticity.	
		ES	1.0	49.0			
			1.5	48.5			
			2.0	48.0		Silty SAND, minor clay; greyish white, moist, non-plastic.	
		ES	2.5	47.5		Fibrous PEAT, some organics; black; wet; non-plastic. Organics: rootlets and large (>20 cm long) wood fragments.	
			3.0	47.0		3.10m - End of test pit	
			3.5	46.5			
			4.0	46.0			
			4.5	45.5			

Date Started:	22/10/2020	**Logged By:**	HL
Method:		**Contractor:**	Abernathy
Face Orientation:		**Equipment:**	15 Ton Excavator

Comments:
Hole terminated due to instability and access issues.
Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

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

Environmental Test Pit Log

Test Pit ID: TP211 Stockpile

Sheet 1 of 1

Project:	105 May Road	**Project Number:**	3126366
Site Location:	105-119 May Road, Mount Roskill	**Client:**	May 1 Limited
Location:	105A-109A May Road, 100 m down the northern driveway, in the timber yard 20 m south.	**Coordinate System:**	NZTM2000
		Northing:	5913546.6
		Easting:	1754276.4
		Vertical Datum:	Auckland (1946)
		Ground Level (mRL):	50.00
		Location Method:	Auckland Council GIS

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES	0			Silty fine to coarse GRAVEL, some organics, minor cobbles, minor sand; brown; dry; non-plastic. Organics, gravel and cobble: rootlets, metal, concrete, cement fibre sheet, large (>20 cm long) wood fragments and brick.	Fill
		ES	0.5	49.5			
		ES					
			1.0	49.0		0.90m - End of test pit	
			1.5	48.5			
			2.0	48.0			
			2.5	47.5			
			3.0	47.0			
			3.5	46.5			
			4.0	46.0			
			4.5	45.5			

Date Started:	22/10/2020	**Logged By:**	HL
Method:		**Contractor:**	Abernathy
Face Orientation:		**Equipment:**	15 Ton Excavator

Comments:
Hole terminated at target depth.
Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

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

Environmental Test Pit Log

Test Pit ID: TP212

Sheet 1 of 1

Project:	105 May Road	**Project Number:**	3126366
Site Location:	105-119 May Road, Mount Roskill	**Client:**	May 1 Limited
Location:	105A-109A May Road, in the grassed area 140 m down the southern most driveway.	**Coordinate System:**	NZTM2000
		Northing:	5913568.0
		Easting:	1754202.0
		Vertical Datum:	Auckland (1946)
		Ground Level (mRL):	50.00
		Location Method:	Auckland Council GIS

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
			0	50.0		Bituminous material; black; dry; non-plastic.	Asphalt
						Fine to coarse GRAVEL; redish black; dry; non-plastic. Gravel: basalt.	Fill
		ES	0.5	49.5		CLAY; some silt; brownish grey mottled orange; moist; high plasticity.	Holocene Alluvium
		ES	1.0	49.0		Clayey SILT, some sand; brown; wet; high plasticity.	
						Clayey SILT, some sand; bluish grey; wet; high plasticity.	
		ES	1.5	48.5			
			2.0	48.0		CLAY, some silt; brown; wet; high plasticity.	
		ES				Fibrous PEAT, some organics; black; wet; non-plastic. Organics: rootlets and large (>20 cm long) wood fragments.	
			2.5	47.5		2.60m - End of test pit	
			3.0	47.0			
			3.5	46.5			
			4.0	46.0			
			4.5	45.5			

Date Started:	21/10/2020	**Logged By:**	HL
Method:		**Contractor:**	Abernathy
Face Orientation:		**Equipment:**	15 Ton Excavator

Comments:
Hole terminated due to instability and access issues.
Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

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

Environmental Test Pit Log

Test Pit ID: TP212 Stockpile

Project:	105 May Road	**Project Number:**	3126366
Site Location:	105-119 May Road, Mount Roskill	**Client:**	May 1 Limited
Location:	105A-109A May Road, in the grassed area 140 m down the southern most driveway.	**Coordinate System:**	NZTM2000
		Northing:	5913568.0
		Easting:	1754202.0
		Vertical Datum:	Auckland (1946)
		Ground Level (mRL):	50.00
		Location Method:	Auckland Council GIS

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
			0			Fine to coarse GRAVEL, some silt; brown; dry; non-plastic.	
		ES	0.5	49.5		Fine to coarse GRAVEL, some silt; brown; dry; non-plastic. Gravel: rock and cement fibre sheet.	Fill
		ES	1.0	49.0		1.10m - End of test pit	
		ES					
			1.5	48.5			
			2.0	48.0			
			2.5	47.5			
			3.0	47.0			
			3.5	46.5			
			4.0	46.0			
			4.5	45.5			

Date Started:	21/10/2020	**Logged By:**	HL
Method:		**Contractor:**	Abernathy
Face Orientation:		**Equipment:**	15 Ton Excavator

Comments:
Hole terminated at target depth.
Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

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

Environmental Test Pit Log

Test Pit ID: TP213

Sheet 1 of 1

Project:	105 May Road	**Project Number:**	3126366
Site Location:	105-119 May Road, Mount Roskill	**Client:**	May 1 Limited
Location:	105A-109A May Road, 110 m down the southern most driveway, in the grassed area 10 m north.	**Coordinate System:**	NZTM2000
		Northing:	5913549.9
		Easting:	1754236.2
		Vertical Datum:	Auckland (1946)
		Ground Level (mRL):	50.00
		Location Method:	Auckland Council GIS

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
						Bituminous material; black; dry; non-plastic.	Asphalt
						Fine to coarse GRAVEL, some cobbles; redish black; dry; non-plastic. Gravel and cobble: basalt and metal.	Fill
						CLAY, trace organics; light brown mottles grey mottled orange; moist; high plasticity. Organics: rootlets.	Holocene Alluvium
		ES	0.5	49.5		Clayey SILT, some cobbles, minor fine to coarse gravel, trace organics; bluish grey mottled light grey mottled brown; moist; high plasticity. Organics, gravel and cobble: rootlets, rock, and large (>20 cm long) wood, metal and plastic fragments.	Fill
						Silty CLAY; dark brown; moist; high plasticity.	Holocene Alluvium
		ES	1.0	49.0		CLAY, minor silt; bluish grey mottled brown mottled orange; moist; high plasticity.	
		ES	1.5	48.5			
			2.0	48.0		CLAY, trace silt; brown mottled grey; wet; high plasticity.	
		ES				Silty SAND, some organics, minor clay; whitish grey; moist; non-plastic. Organics: rootlets.	
			2.5	47.5		Fibrous PEAT, some organics; black; wet; non-plastic. Organics: rootlets and large (>20 cm long) wood fragments.	
			3.0	47.0			
			3.5	46.5			
			4.0	46.0			
			4.5	45.5		4.20m - End of test pit	

Date Started:	27/10/2020	**Logged By:**	HL
Method:		**Contractor:**	Abernathy
Face Orientation:		**Equipment:**	15 Ton Excavator

Comments:
Hole terminated at target depth.
Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

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

Environmental Test Pit Log

Test Pit ID: TP214

Sheet 1 of 1

Project:	105 May Road	**Project Number:**	3126366
Site Location:	105-119 May Road, Mount Roskill	**Client:**	May 1 Limited
Location:	105A-109A May Road, 10 m down the southern most driveway, in the asphalt area 5 m north.	**Coordinate System:**	NZTM2000
		Northing:	5913489.7
		Easting:	1754312.1
		Vertical Datum:	Auckland (1946)
		Ground Level (mRL):	50.50
		Location Method:	Auckland Council GIS

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
						Bituminous material; black; dry; non-plastic.	Asphalt
						Fine to medium GRAVEL; redish black; dry; non-plastic. Gravel: basalt.	Fill
			0.5	50.0		CLAY; grey mottled green mottled orange; moist; high plasticity.	Holocene Alluvium
		ES					
			1.0	49.5			
						CLAY, trace organics; brownish grey; moist; high plasticity. Organics (rootlets).	
		ES	1.5	49.0			
			2.0	48.5			
						SAND, some silt, minor organics; light grey; moist; non-plastic. Organics: rootlets.	
		ES					
			2.5	48.0		Fibrous PEAT, some organics; black; wet; non-plastic. Organics: rootlets and large (>1 m long) wood fragments.	
		ES	3.0	47.5			
			3.5	47.0			
			4.0	46.5		3.90m - End of test pit	
			4.5	46.0			

Date Started:	22/10/2020	**Logged By:**	HL	**Comments:**	
Method:		**Contractor:**	Abernathy	Hole terminated at target depth.	
Face Orientation:		**Equipment:**	15 Ton Excavator	Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.	

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

Environmental Test Pit Log

Test Pit ID: TP215

Sheet 1 of 1

Project:	105 May Road	**Project Number:**	3126366
Site Location:	105-119 May Road, Mount Roskill	**Client:**	May 1 Limited
Location:	105A-109A May Road, 100 m down the southern most driveway.	**Coordinate System:**	NZTM2000
		Northing:	5913525.1
		Easting:	1754238.0
		Vertical Datum:	Auckland (1946)
		Ground Level (mRL):	50.50
		Location Method:	Auckland Council GIS

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
			0.0	50.5		Bituminous material; black; dry; non-plastic.	Asphalt
						Fine to coarse GRAVEL, some cobbles; redish black; dry; non-plastic. Gravel and cobble: basalt and metal.	Fill
		ES	0.5	50.0		CLAY, some silt; grey mottled dark grey mottled orange; moist; high plasticity.	Holocene Alluvium
						ORGANICS, some silt; dark yellow mottled grey mottled brown; moist; non-plastic. Organics: straw.	Fill
		ES	1.0	49.5		CLAY, minor silt, minor organics; dark grey mottled light grey; moist; high plasticity. Organics: rootlets.	Holocene Alluvium
						CLAY, trace silt; bluish grey mottled orange; moist; high plasticity.	Holocene Alluvium
		ES	1.5	49.0			
			2.0	48.5		Silty SAND, some organics, minor clay; whitish grey; moist; non-plastic. Organics: rootlets.	
						CLAY, some organics; dark brown mottled grey; wet; high plasticity. Organics: rootlets and small (<5 cm long) wood fragments.	
		ES	2.5	48.0			
						Fibrous PEAT, some organics; black; wet; non-plastic. Organics: rootlets and large (>10 cm long) wood fragments.	
			3.0	47.5			
			3.5	47.0			
			4.0	46.5			
			4.5	46.0		4.50m - End of test pit	

Date Started:	23/10/2020	**Logged By:**	HL	**Comments:**	
Method:		**Contractor:**	Abernathy	Hole terminated at target depth.	
Face Orientation:		**Equipment:**	15 Ton Excavator	Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.	

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

Environmental Test Pit Log

Test Pit ID: TP216

Sheet 1 of 1

Project:	105 May Road	**Project Number:**	3126366
Site Location:	105-119 May Road, Mount Roskill	**Client:**	May 1 Limited
Location:	105A-109A May Road, 80 m down the southern most driveway.	**Coordinate System:**	NZTM2000
		Northing:	5913498.8
		Easting:	1754272.4
		Vertical Datum:	Auckland (1946)
		Ground Level (mRL):	50.50
		Location Method:	Auckland Council GIS

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
			0.0	50.5		Bituminous material; black; dry; non-plastic.	Asphalt
						Fine to coarse GRAVEL, some cobbles; redish black; dry; non-plastic. Gravel and cobble: basalt.	Fill
		ES	0.5	50.0		Clayey SILT, bluish grey mottled orange; moist; non-plastic.	Holocene Alluvium
			1.0	49.5		Silty CLAY, bluish grey mottled dark grey; moist; high plasticity.	
		ES	1.5	49.0		Silty SAND, some organics, minor clay; whitish grey; moist; non-plastic. Organics: rootlets.	
		ES	2.0	48.5			
			2.5	48.0		Fibrous PEAT, some organics; black; wet; non-plastic. Organics: rootlets and large (>10 cm long) wood fragments.	
		ES	3.0	47.5			
			3.5	47.0			
▼			4.0	46.5		Sandy SILT, minor fine gravel, minor clay; dark bluish grey; saturated; low plasticity.	
			4.5	46.0		4.40m - End of test pit	

Date Started:	23/10/2020	**Logged By:**	HL
Method:		**Contractor:**	Abernathy
Face Orientation:		**Equipment:**	15 Ton Excavator

Comments:
Hole terminated at target depth.
Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

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

Environmental Test Pit Log

Test Pit ID: TP217

Sheet 1 of 1

Project:	105 May Road	**Project Number:**	3126366
Site Location:	105-119 May Road, Mount Roskill	**Client:**	May 1 Limited
Location:	105A-109A May Road, 10 m down the southern most driveway, in the asphalt area 5 m south.	**Coordinate System:**	NZTM2000
		Northing:	5913472.0
		Easting:	1754292.6
		Vertical Datum:	Auckland (1946)
		Ground Level (mRL):	50.50
		Location Method:	Auckland Council GIS

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
			0.0	50.0		Bituminous material; black; dry; non-plastic.	Asphalt
▼						Fine to medium GRAVEL; redish black; wet; non-plastic. Gravel: basalt.	Fill
			0.5	50.0		CLAY; grey mottled green mottled orange; moist; high plasticity.	Holocene Alluvium
		ES				0.80m - End of test pit	
			1.0	49.5			
			1.5	49.0			
			2.0	48.5			
			2.5	48.0			
			3.0	47.5			
			3.5	47.0			
			4.0	46.5			
			4.5	46.0			

Date Started:	22/10/2020	**Logged By:**	HL	**Comments:**
Method:		**Contractor:**	Abernathy	Hole terminated due to substantial groundwater intrusion. Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.
Face Orientation:		**Equipment:**	15 Ton Excavator	

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

Environmental Test Pit Log

Test Pit ID: TP218 Stockpile

Sheet 1 of 1

Project:	105 May Road	**Project Number:**	3126366
Site Location:	105-119 May Road, Mount Roskill	**Client:**	May 1 Limited
Location:	105A-109A May Road, 120 m down the southern most driveway, in the stockpile 10 m north.	**Coordinate System:**	NZTM2000
		Northing:	5913565.0
		Easting:	1754229.4
		Vertical Datum:	Auckland (1946)
		Ground Level (mRL):	50.00
		Location Method:	Auckland Council GIS

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES	0.5	49.5		SILT, some clay, some medium to coarse gravel, minor cobble, minor organics; brown mottled grey; dry; non-plastic. Organics, gravel and cobble: rootlets, glass, plastic, metal, ceramic, concrete and wood.	Fill
			1.0	49.0			
			1.5	48.5			
		ES	2.0	48.0		2.00m - End of test pit	
			2.5	47.5			
			3.0	47.0			
			3.5	46.5			
			4.0	46.0			
			4.5	45.5			

Date Started:	23/10/2020	**Logged By:**	HL
Method:		**Contractor:**	Abernathy
Face Orientation:		**Equipment:**	15 Ton Excavator

Comments:
Hole terminated at target depth.
Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

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

Environmental Hand Auger Log

Hand Auger ID: Building Adjacent to TP201

Sheet 1 of 1

Project:	105 May Road	**Project Number:**	3126366
Site Location:	105-119 May Road, Mount Roskill	**Client:**	May 1 Limited
Location:	105A-109A May Road, 120 m down the northern driveway, in the gravel area 5 m north.	**Coordinate System:**	NZTM2000
		Northing:	5913602.2
		Easting:	1754264.3
		Vertical Datum:	Auckland (1946)
		Ground Level (mRL):	50.00
		Location Method:	Auckland Council GIS

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES	0.5	49.5		Fine to coarse GRAVEL, some cobbles; redish black; dry; non-plastic. Gravel and cobble: basalt, concrete and plastic.	Fill
						0.60m - End of hand auger	
			1.0	49.0			
			1.5	48.5			
			2.0	48.0			
			2.5	47.5			
			3.0	47.0			
			3.5	46.5			
			4.0	46.0			
			4.5	45.5			

Date Started: 27/10/2020
Logged By: HL
Diameter:

Comments:
Hole terminated at target depth.

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

Environmental Hand Auger Log

Hand Auger ID: Stockpile 10m from TP213

Sheet 1 of 1

Project:	105 May Road	**Project Number:**	3126366
Site Location:	105-119 May Road, Mount Roskill	**Client:**	May 1 Limited
Location:	105A-109A May Road, 120 m down the southern most driveway, in the grassed area 5 m north.	**Coordinate System:**	NZTM2000
		Northing:	5913560.9
		Easting:	1754223.3
		Vertical Datum:	Auckland (1946)
		Ground Level (mRL):	50.00
		Location Method:	Auckland Council GIS

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES	0.5	49.5		Clayey SILT, some organics, minor fine to coarse gravel; brown speckled grey; dry; non-plastic. Organics and gravel: rootlets, glass, rubber, wood, plastic and concrete.	Fill
						0.40m - End of hand auger	
			1.0	49.0			
			1.5	48.5			
			2.0	48.0			
			2.5	47.5			
			3.0	47.0			
			3.5	46.5			
			4.0	46.0			
			4.5	45.5			

Date Started: 23/10/2020
Logged By: HL
Diameter:

Comments:
Hole terminated at target depth.

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

Environmental Hand Auger Log

Hand Auger ID: Stockpile by TP217

Sheet 1 of 1

Project:	105 May Road	**Project Number:**	3126366
Site Location:	105-119 May Road, Mount Roskill	**Client:**	May 1 Limited
Location:	105A-109A May Road, 10 m down the southern most driveway, in the stockpile 10 m south.	**Coordinate System:**	NZTM2000
		Northing:	5913473.7
		Easting:	1754286.6
		Vertical Datum:	Auckland (1946)
		Ground Level (mRL):	50.50
		Location Method:	Auckland Council GIS

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES	0.5	50.0		Clayey SILT, some organics, minor medium to coarse gravel; brown; moist; non-plastic. Organics and gravel: rootlets, metal, concrete, glass, and plastic.	Fill
			1.0	49.5		0.40m - End of hand auger	
			1.5	49.0			
			2.0	48.5			
			2.5	48.0			
			3.0	47.5			
			3.5	47.0			
			4.0	46.5			
			4.5	46.0			

Date Started: 22/10/2020
Logged By: HL
Diameter:

Comments:
Hole terminated at target depth.

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

Environmental Machine Borehole Log

Borehole ID: BH201

Sheet 1 of 1

Project:	105 May Road	**Project Number:**	3126366
Site Location:	105-119 May Road, Mount Roskill	**Client:**	May 1 Limited
Location:	105A-109A May Road, 140 m down the northern driveway, in the gravel area 5 m north.	**Coordinate System:**	NZTM2000
		Northing:	5913620.8
		Easting:	1754237.9
		Vertical Datum:	NZVD 2016
		Ground Level (mRL):	49.74
		Location Method:	Survey

Installations	Drilling: GWL	Drilling: Method	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
				ES	0	49.5		SILT, some organics, minor fine to coarse gravel; dry; non-plastic. Organics and gravel: rootlets, basalt and concrete.	Fill
					0.5	49.0		0.30-1.50m: no recovery. Gravel caught on capture.	Holocene Alluvium
					1.0	48.5			
				ES	1.5	48.0		CLAY, some silt, minor fine to coarse gravel; brown mottled orange; wet; high plasticity.	
					2.0	47.5		Fibrous PEAT, some organics; black; wet; non-plastic. Organics: rootlets and large (>10 cm long) wood fragments.	
		RC		ES	2.5	47.0			
					3.0	46.5			
					3.5	46.0		Silty CLAY, minor sand, minor fine gravel, trace organics; brown mottled grey; saturated; high plasticity. Organics: rootlets.	
				ES	4.0	45.5			
				ES	4.5	45.0		Dark grey BASALT.	Basalt
					5.0	44.5			
					5.5	44.0			

Date Started:	29/10/2020	**Date End:**	29/10/2020	Comments:
Logged By:	HL	**Drilled By:**	Pro-Drill Auck Ltd	Hole terminated after the in-situ basalt rock layer was uncovered.
Inclination:	90	**Equipment:**	Drill Rig	
Diameter:	100 mm	**Method:**	RC	

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

Environmental Machine Borehole Log

Borehole ID: BH202

Sheet 1 of 1

Project:	105 May Road	**Project Number:**	3126366
Site Location:	105-119 May Road, Mount Roskill	**Client:**	May 1 Limited
Location:	105A-109A May Road, 150 m down the southern most driveway.	**Coordinate System:**	NZTM2000
		Northing:	5913564.4
		Easting:	1754182.2
		Vertical Datum:	NZVD 2016
		Ground Level (mRL):	49.82
		Location Method:	Survey

Installations	Drilling: GWL	Drilling: Method	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
					0	49.5		Bituminous material; black; dry; non-plastic.	ASP
				ES				Fine to coarse GRAVEL, some fine to coarse sand, minor silt; redish black; moist; non-plastic. Gravel: basalt.	Fill
					0.5			Silty CLAY, trace fine sand; bluish grey mottled yellowish orange; moist; high plasticity.	Holocene Alluvium
				ES		49.0			
					1.0			Silty CLAY; greyish brown mottled greenish grey; moist; high plasticity.	
	▼					48.5		CLAY, some silt; bluish grey mottled light grey; moist; high plasticity.	
		RC			1.5			1.50-1.70m: no recovery.	
						48.0		Silty CLAY, trace fine to coarse sand, trace organics; dark greyish brown; wet; non-plastic. Organics: rootlets.	
					2.0				
						47.5			
					2.5			2.50-3.00m: no recovery.	
						47.0			
					3.0			Silty CLAY, trace fine to coarse sand, trace organics; dark greyish brown; saturated; non-plastic. Organics: rootlets.	
				ES		46.5			
					3.5				
						46.0			
					4.0				
						45.5			
				ES	4.5			Clayey SILT, trace fine to coarse sand, trace organics; greyish brown mottled orangish brown; saturated; non-plastic. Organics: rootlets.	
						45.0			
					5.0				
						44.5			
					5.5				
						44.0			

Date Started:	29/10/2020	**Date End:**	29/10/2020	Comments:
Logged By:	HL	**Drilled By:**	Pro-Drill Auck Ltd	Hole terminated at target depth.
Inclination:	90	**Equipment:**	Drill Rig	ASP - Asphalt
Diameter:	100 mm	**Method:**	RC	

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

Environmental Machine Borehole Log

Borehole ID: BH203

Sheet 1 of 1

Project:	105 May Road	**Project Number:**	3126366
Site Location:	105-119 May Road, Mount Roskill	**Client:**	May 1 Limited
Location:	105A-109A May Road, 5 m down the northern driveway, in the car yard 5 m south.	**Coordinate System:**	NZTM2000
		Northing:	5913513.5
		Easting:	1754321.8
		Vertical Datum:	NZVD 2016
		Ground Level (mRL):	50.01
		Location Method:	Survey

Installations	Drilling: GWL	Drilling: Method	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
								Bituminous material; black; dry; non-plastic.	ASP
				ES				Fine to coarse GRAVEL, some cobbles; dark grey; wet; non-plastic. Gravel and cobble: basalt.	Fill
					0.5	49.5		Clayey SILT; orangish brown mottled light brown; moist; high plasticity.	Holocene Alluvium
				ES	1.0	49.0		Clayey SILT; bluish grey mottled orangish brown; moist; high plasticity.	
				ES	1.5	48.5			
	▼				2.0	48.0		Fibrous PEAT, some organics; black; wet; non-plastic. Organics: rootlets and large (>10 cm long) wood fragments.	
		RC			2.5	47.5			
					3.0	47.0			
				ES	3.5	46.5			
					4.0	46.0		SILT, minor clay, trace organics, trace fine gravel; dark brown; wet; high plasticity.	
				ES	4.5	45.5			
					5.0	45.0			
					5.5	44.5			

Date Started:	29/10/2020	**Date End:**	29/10/2020	Comments:
Logged By:	HL	**Drilled By:**	Pro-Drill Auck Ltd	Hole terminated at target depth.
Inclination:	90	**Equipment:**	Drill Rig	ASP - Asphalt
Diameter:	100 mm	**Method:**	RC	

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

Environmental Machine Borehole Log

Borehole ID: BH204

Sheet 1 of 1

Project:	105 May Road	**Project Number:**	3126366
Site Location:	105-119 May Road, Mount Roskill	**Client:**	May 1 Limited
Location:	105A-109A May Road, 130 m down the northern driveway, in the gravel lot 10 m south.	**Coordinate System:**	NZTM2000
		Northing:	5913583.9
		Easting:	1754235.4
		Vertical Datum:	NZVD 2016
		Ground Level (mRL):	49.80
		Location Method:	Survey

Installations	Drilling: GWL	Drilling: Method	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
					0.0	49.5		Fine to coarse GRAVEL; grey; dry; non-plastic.	Fill
		PT			0.5	49.0		Silty CLAY, some gravel, some sand; greyish brown; wet; non-plastic.	Holocene Alluvium
					1.0	48.5			
					1.5	48.0			
				ES	2.0	47.5			
					2.5	47.0		Silty CLAY, some organics; dark brown; wet; low plasticity. Organics: bark and wood fragments.	
				ES	3.0	46.5			
					3.5	46.0		Clayey SILT, trace organics; brownish grey mottled light green; wet; high plasticity. Organics: wood fragments.	
				ES	4.0	45.5			
					4.5	45.0		Sandy GRAVEL, some silt; greyish blue; wet; non-plastic.	
					5.0	44.5			
					5.5	44.0			

Date Started:	29/03/2021	**Date End:**	29/03/2021	Comments:
Logged By:	HL	**Drilled By:**	Pro-Drill Auck Ltd	Hole terminated at target depth.
Inclination:	90	**Equipment:**	Drill Rig	
Diameter:	50 mm	**Method:**	PT	

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

Environmental Machine Borehole Log

Borehole ID: BH205

Sheet 1 of 1

Project:	105 May Road	**Project Number:**	3126366
Site Location:	105-119 May Road, Mount Roskill	**Client:**	May 1 Limited
Location:	105A-109A May Road, 60 m down the northern driveway, in the gravel lot 10 m south.	**Coordinate System:**	NZTM2000
		Northing:	5913544.9
		Easting:	1754283.3
		Vertical Datum:	NZVD 2016
		Ground Level (mRL):	49.99
		Location Method:	Survey

Installations	Drilling: GWL	Drilling: Method	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
					0.0	49.5		Fine to coarse GRAVEL, some cobble; grey; dry; non-plastic.	Fill
								Fine GRAVEL; orangish brown; dry; non-plastic.	
					0.5	49.5		CLAY; grey mottled brown; moist; high-plasticity.	Holocene Alluvium
				ES	1.0	49.0		Silty CLAY; orangish brown mottled grey; moist; high plasticity.	
					1.5	48.5			
				ES	2.0	48.0		CLAY; brown; moist; high plasticity.	
		PT			2.5	47.5			
				ES	3.0	47.0		Fibrous PEAT, some organics; dark brown; wet; non-plastic. Organics: rootlets, bark and wood fragments.	
					3.5	46.5			
				ES	4.0	46.0		Clayey SILT, some organics; brown; wet; low plasticity. Organics: fine wood fragments.	
					4.5	45.5			
				ES	5.0	45.0			
					5.5	44.5			

Date Started:	29/03/2021	**Date End:**	29/03/2021	Comments:
Logged By:	HL	**Drilled By:**	Pro-Drill Auck Ltd	Hole terminated at target depth.
Inclination:	90	**Equipment:**	Drill Rig	
Diameter:		**Method:**	PT	

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

Environmental Machine Borehole Log

Borehole ID: BH206

Sheet 1 of 1

Project:	105 May Road	**Project Number:**	3126366
Site Location:	105-119 May Road, Mount Roskill	**Client:**	May 1 Limited
Location:	105A-109A May Road, 5 m down the northern driveway, in the asphalt lot 5 m north.	**Coordinate System:**	NZTM2000
		Northing:	5913543.8
		Easting:	1754345.7
		Vertical Datum:	NZVD 2016
		Ground Level (mRL):	50.03
		Location Method:	Survey

Installations	Drilling: GWL	Drilling: Method	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
					0.0	50.0		Bituminous material; black; dry; non-plastic.	Asphalt
								Fine to coarse GRAVEL, some cobble; grey; dry; non-plastic.	Fill
								Silty CLAY; brown mottled dark grey; moist; high plasticity.	Holocene Alluvium
				ES	0.5	49.5			
								0.7-1.5m: no recovery.	
					1.0	49.0			
					1.5	48.5		1.5-2.5m: some core loss, only 400mm of core recovered. Silty SAND; greyish brown; moist; non-plastic. Transitioning to; Sandy SILT; pale greyish brown; moist; non-plastic. Transitioning to; Fibrous PEAT, some organics; dark brown; moist; non-plastic. Organics: bark and wood fragments.	
		PT		ES	2.0	48.0			
					2.5	47.5		2.5-2.8m: no recovery.	
					3.0	47.0		Fibrous PEAT, some organics; brown; moist; non-plastic. Organics: wood and bark fragments.	
				ES					
					3.5	46.5		Silty CLAY, minor sand; brown mottled grey; saturated; low-plasticity.	
				ES	4.0	46.0			
					4.5	45.5			
				ES				SAND; grey; moist; non-plastic.	
					5.0	45.0			
					5.5	44.5			

Date Started:	29/03/2021	**Date End:**	29/03/2021	Comments:
Logged By:	HL	**Drilled By:**	Pro-Drill Auck Ltd	Hole terminated at target depth.
Inclination:	90	**Equipment:**	Drill rig	
Diameter:		**Method:**	PT	

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

Environmental Machine Borehole Log

Borehole ID: BH207

Sheet 1 of 1

Project:	105 May Road	**Project Number:**	3126366
Site Location:	105-119 May Road, Mount Roskill	**Client:**	May 1 Limited
Location:	105A-109A May Road, 100 m down the southern driveway.	**Coordinate System:**	NZTM2000
		Northing:	5913527.1
		Easting:	1754234.4
		Vertical Datum:	NZVD 2016
		Ground Level (mRL):	49.99
		Location Method:	Survey

Installations	Drilling: GWL	Drilling: Method	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
					0.0	49.99		Bituminous material; black; dry; non-plastic.	ASP
								Fine to coarse GRAVEL, some cobble; grey; dry; non-plastic.	Fill
	▼				0.5	49.5		Silty CLAY, trace organics; blueish grey; saturated; low plasticity. Organics: dry rootlets.	Holocene Alluvium
				ES					
					1.0	49.0			
					1.5	48.5			
				ES					
					2.0	48.0		SILT; brownish grey; saturated; low plasticity.	
								Silty CLAY, some organics; brownish grey; saturated; low plasticity. Organics: dry rootlets.	
		PT			2.5	47.5			
					3.0	47.0		Fibrous PEAT, some organics; brownish black; saturated; non-plastic. Organics: wood fragments.	
				ES					
					3.5	46.5			
					4.0	46.0		Clayey SILT, minor organics, minor sand; greyish brown; saturated; low plasticity. Organics: small wood fragments.	
				ES					
					4.5	45.5			
				ES					
					5.0	45.0			
					5.5	44.5			

Date Started:	29/03/2021	**Date End:**	29/03/2021	Comments:
Logged By:	HL	**Drilled By:**	Pro-Drill Auck Ltd	Hole terminated at target depth.
Inclination:	90	**Equipment:**	Drill rig	ASP - Asphalt
Diameter:		**Method:**	PT	

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

Environmental Machine Borehole Log

Borehole ID: BH208

Sheet 1 of 1

Project:	105 May Road	**Project Number:**	3126366
Site Location:	105-119 May Road, Mount Roskill	**Client:**	May 1 Limited
Location:	105A-109A May Road, 15 m down the southern driveway, in the grass area 10 m south.	**Coordinate System:**	NZTM2000
		Northing:	5913465.7
		Easting:	1754276.5
		Vertical Datum:	NZVD 2016
		Ground Level (mRL):	50.10
		Location Method:	Survey

Installations	Drilling: GWL	Drilling: Method	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
					0.0	50.0		Fine to coarse GRAVEL, some cobble; grey; dry; non-plastic.	Fill
				ES	0.5	49.5		Silty CLAY, minor organics; orangeish brown mottled light grey; moist; high plasticity. Organics: rootlets.	Holocene Alluvium
		PT			1.0	49.0			
					1.5	48.5		Silty CLAY, minor organics; dark grey; moist; high plasticity. Organics: rootlets.	
				ES				Fibrous PEAT, some organics; brownish black; moist; non-plastic. Organics: wood fragments.	
					2.0	48.0			
				ES	2.5	47.5			
					3.0	47.0		Silty SAND, some very fine gravel; grey; moist; non-plastic.	
				ES	3.5	46.5			
					4.0	46.0			
					4.5	45.5			
				ES					
					5.0	45.0			
					5.5	44.5			

Date Started:	30/03/2021	**Date End:**	30/03/2021	Comments:
Logged By:	HL	**Drilled By:**	Pro-Drill Auck Ltd	Hole terminated at target depth.
Inclination:	90	**Equipment:**	Drill rig	
Diameter:		**Method:**	PT	

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

F

Appendix F – Hill Laboratories Analytical Results

Hill Laboratories
TRIED, TESTED AND TRUSTED

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

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Certificate of Analysis

Client:	Beca Limited	**Lab No:**	2463453	SUPv1
Contact:	Vicky Kennaugh	**Date Received:**	30-Oct-2020	
	C/- Beca Limited	**Date Reported:**	04-Nov-2020	
	PO Box 6345	**Quote No:**	107787	
	Wellesley Street	**Order No:**	20:162	
	Auckland 1141	**Client Reference:**	3126366	
		Submitted By:	Vicky Kennaugh	

Sample Type: Soil

Sample Name:		TP201 (0.5) 27-Oct-2020	TP201 (4.2) 27-Oct-2020	TP202 (0.4) 27-Oct-2020	TP202 (1.6) 27-Oct-2020
Lab Number:		2463453.1	2463453.4	2463453.5	2463453.7
Individual Tests					
Dry Matter	g/100g as rcvd	79.5 ± 5.0	15.1 ± 5.0	79.0 ± 5.0	77.8 ± 5.0
Heavy Metals with Mercury, Screen Level					
Total Recoverable Arsenic	mg/kg dry wt	4.0 ± 1.5	9.0 ± 1.9	2.8 ± 1.4	< 2 ± 1.4
Total Recoverable Cadmium	mg/kg dry wt	1.06 ± 0.17	< 0.3 ± 0.072	0.286 ± 0.077	< 0.10 ± 0.067
Total Recoverable Chromium	mg/kg dry wt	23.7 ± 3.9	8.3 ± 1.9	28.6 ± 4.7	13.0 ± 2.4
Total Recoverable Copper	mg/kg dry wt	197 ± 27	90 ± 13	40.4 ± 5.7	6.0 ± 1.6
Total Recoverable Lead	mg/kg dry wt	1,000 ± 150	< 0.9 ± 0.30	168 ± 26	11.5 ± 1.8
Total Recoverable Mercury	mg/kg dry wt	< 0.10 ± 0.067	< 0.3 ± 0.074	0.123 ± 0.068	< 0.10 ± 0.067
Total Recoverable Nickel	mg/kg dry wt	59.6 ± 7.8	45.0 ± 5.9	29.1 ± 4.0	12.9 ± 2.2
Total Recoverable Zinc	mg/kg dry wt	274 ± 20	61.4 ± 5.1	220 ± 16	15.3 ± 2.9
Total Petroleum Hydrocarbons in Soil					
C7 - C9	mg/kg dry wt	< 8 ± 5.4	< 80 ± 18	< 8 ± 5.4	< 8 ± 5.4
C10 - C14	mg/kg dry wt	< 20 ± 7.6	< 160 ± 25	< 20 ± 7.6	< 20 ± 7.6
C15 - C36	mg/kg dry wt	< 40 ± 9.3	1,455 ± 90	196 ± 18	< 40 ± 9.3
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 70 ± 14	1,515 ± 95	196 ± 20	< 70 ± 14

Sample Name:		TP203 (0.4) 27-Oct-2020	TP204 (0.4) 23-Oct-2020	TP204 (1.5) 23-Oct-2020	TP205 (0.4) 27-Oct-2020
Lab Number:		2463453.8	2463453.9	2463453.11	2463453.12
Individual Tests					
Dry Matter	g/100g as rcvd	78.9 ± 5.0	86.3 ± 5.0	54.1 ± 5.0	74.0 ± 5.0
Heavy Metals with Mercury, Screen Level					
Total Recoverable Arsenic	mg/kg dry wt	< 2 ± 1.4	< 2 ± 1.4	< 2 ± 1.4	2.3 ± 1.4
Total Recoverable Cadmium	mg/kg dry wt	0.276 ± 0.076	0.123 ± 0.068	0.296 ± 0.077	< 0.10 ± 0.067
Total Recoverable Chromium	mg/kg dry wt	56.1 ± 8.8	34.4 ± 5.5	50.4 ± 8.0	15.2 ± 2.7
Total Recoverable Copper	mg/kg dry wt	57.4 ± 8.0	22.8 ± 3.4	40.8 ± 5.8	15.6 ± 2.5
Total Recoverable Lead	mg/kg dry wt	8.7 ± 1.4	9.2 ± 1.4	8.1 ± 1.3	11.7 ± 1.8
Total Recoverable Mercury	mg/kg dry wt	< 0.10 ± 0.067	< 0.10 ± 0.067	0.100 ± 0.067	< 0.10 ± 0.067
Total Recoverable Nickel	mg/kg dry wt	184 ± 24	65.4 ± 8.5	32.7 ± 4.4	41.3 ± 5.5
Total Recoverable Zinc	mg/kg dry wt	107.8 ± 8.1	63.4 ± 5.2	96.2 ± 7.3	29.8 ± 3.4
Total Petroleum Hydrocarbons in Soil					
C7 - C9	mg/kg dry wt	< 8 ± 5.4	< 8 ± 5.4	< 11 ± 5.6	< 8 ± 5.4
C10 - C14	mg/kg dry wt	< 20 ± 7.6	< 20 ± 7.6	< 30 ± 7.9	< 20 ± 7.6
C15 - C36	mg/kg dry wt	< 40 ± 9.3	< 40 ± 9.3	< 50 ± 9.7	< 40 ± 9.3
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 70 ± 14	< 70 ± 14	< 80 ± 14	< 70 ± 14

Sample Type: Soil					
Sample Name:		TP206 (0.5) 23-Oct-2020	TP206 (1.2) 23-Oct-2020	TP207 (0.5) 23-Oct-2020	TP207 (1.3) 23-Oct-2020
Lab Number:		2463453.13	2463453.14	2463453.15	2463453.16
Individual Tests					
Dry Matter	g/100g as rcvd	76.0 ± 5.0	77.3 ± 5.0	73.5 ± 5.0	89.0 ± 5.0
Heavy Metals with Mercury, Screen Level					
Total Recoverable Arsenic	mg/kg dry wt	< 2 ± 1.4	< 2 ± 1.4	< 2 ± 1.4	< 2 ± 1.4
Total Recoverable Cadmium	mg/kg dry wt	< 0.10 ± 0.067	< 0.10 ± 0.067	0.117 ± 0.068	< 0.10 ± 0.067
Total Recoverable Chromium	mg/kg dry wt	15.6 ± 2.8	21.0 ± 3.6	35.1 ± 5.6	7.0 ± 1.7
Total Recoverable Copper	mg/kg dry wt	13.9 ± 2.3	4.9 ± 1.5	12.2 ± 2.2	2.6 ± 1.4
Total Recoverable Lead	mg/kg dry wt	8.2 ± 1.3	6.07 ± 0.95	7.7 ± 1.2	1.95 ± 0.40
Total Recoverable Mercury	mg/kg dry wt	< 0.10 ± 0.067	< 0.10 ± 0.067	< 0.10 ± 0.067	< 0.10 ± 0.067
Total Recoverable Nickel	mg/kg dry wt	13.3 ± 2.2	8.8 ± 1.8	12.6 ± 2.1	8.8 ± 1.8
Total Recoverable Zinc	mg/kg dry wt	41.2 ± 4.0	14.5 ± 2.9	288 ± 21	< 4 ± 2.7
BTEX in Soil by Headspace GC-MS					
Benzene	mg/kg dry wt	< 0.06 ± 0.034	< 0.06 ± 0.034	< 0.06 ± 0.035	< 0.05 ± 0.034
Toluene	mg/kg dry wt	< 0.06 ± 0.034	< 0.06 ± 0.034	< 0.06 ± 0.035	< 0.05 ± 0.034
Ethylbenzene	mg/kg dry wt	< 0.06 ± 0.034	< 0.06 ± 0.034	< 0.06 ± 0.035	< 0.05 ± 0.034
m&p-Xylene	mg/kg dry wt	< 0.11 ± 0.068	< 0.11 ± 0.068	< 0.12 ± 0.070	< 0.10 ± 0.067
o-Xylene	mg/kg dry wt	< 0.06 ± 0.034	< 0.06 ± 0.034	< 0.06 ± 0.035	< 0.05 ± 0.034
Polycyclic Aromatic Hydrocarbons Screening in Soil*					
Total of Reported PAHs in Soil	mg/kg dry wt	< 0.4	< 0.4	< 0.4	< 0.3
1-Methylnaphthalene	mg/kg dry wt	< 0.013 ± 0.032	< 0.013 ± 0.032	< 0.014 ± 0.032	< 0.012 ± 0.032
2-Methylnaphthalene	mg/kg dry wt	< 0.013 ± 0.032	< 0.013 ± 0.032	< 0.014 ± 0.032	< 0.012 ± 0.032
Acenaphthylene	mg/kg dry wt	< 0.013 ± 0.0067	< 0.013 ± 0.0068	< 0.014 ± 0.0068	< 0.012 ± 0.0067
Acenaphthene	mg/kg dry wt	< 0.013 ± 0.0070	< 0.013 ± 0.0071	< 0.014 ± 0.0071	< 0.012 ± 0.0068
Anthracene	mg/kg dry wt	< 0.013 ± 0.0072	< 0.013 ± 0.0072	< 0.014 ± 0.0073	< 0.012 ± 0.0069
Benzo[a]anthracene	mg/kg dry wt	< 0.013 ± 0.0071	< 0.013 ± 0.0071	< 0.014 ± 0.0072	< 0.012 ± 0.0069
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.013 ± 0.0067	< 0.013 ± 0.0067	< 0.014 ± 0.0067	< 0.012 ± 0.0067
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	< 0.04 ± 0.0097	< 0.04 ± 0.0097	< 0.04 ± 0.0097	< 0.03 ± 0.0096
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	< 0.04 ± 0.0097	< 0.04 ± 0.0097	< 0.04 ± 0.0097	< 0.03 ± 0.0096
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.013 ± 0.0070	< 0.013 ± 0.0070	< 0.014 ± 0.0070	< 0.012 ± 0.0068
Benzo[e]pyrene	mg/kg dry wt	< 0.013 ± 0.0067	< 0.013 ± 0.0067	< 0.014 ± 0.0067	< 0.012 ± 0.0067
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.013 ± 0.0068	< 0.013 ± 0.0068	< 0.014 ± 0.0068	< 0.012 ± 0.0067
Benzo[k]fluoranthene	mg/kg dry wt	< 0.013 ± 0.0068	< 0.013 ± 0.0068	< 0.014 ± 0.0069	< 0.012 ± 0.0068
Chrysene	mg/kg dry wt	< 0.013 ± 0.0069	< 0.013 ± 0.0069	< 0.014 ± 0.0069	< 0.012 ± 0.0069
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.013 ± 0.0068	< 0.013 ± 0.0069	< 0.014 ± 0.0069	< 0.012 ± 0.0068
Fluoranthene	mg/kg dry wt	< 0.013 ± 0.0068	< 0.013 ± 0.0068	< 0.014 ± 0.0068	< 0.012 ± 0.0067
Fluorene	mg/kg dry wt	< 0.013 ± 0.0068	< 0.013 ± 0.0068	< 0.014 ± 0.0068	< 0.012 ± 0.0068
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.013 ± 0.0068	< 0.013 ± 0.0068	< 0.014 ± 0.0068	< 0.012 ± 0.0067
Naphthalene	mg/kg dry wt	< 0.07 ± 0.035	< 0.07 ± 0.035	< 0.07 ± 0.036	< 0.06 ± 0.034
Perylene	mg/kg dry wt	< 0.013 ± 0.0067	0.0262 ± 0.0069	< 0.014 ± 0.0067	< 0.012 ± 0.0067
Phenanthrene	mg/kg dry wt	< 0.013 ± 0.0069	< 0.013 ± 0.0069	< 0.014 ± 0.0069	< 0.012 ± 0.0068
Pyrene	mg/kg dry wt	< 0.013 ± 0.0068	< 0.013 ± 0.0069	< 0.014 ± 0.0069	< 0.012 ± 0.0068
Total Petroleum Hydrocarbons in Soil					
C7 - C9	mg/kg dry wt	< 8 ± 5.4	< 8 ± 5.4	< 9 ± 5.4	< 8 ± 5.4
C10 - C14	mg/kg dry wt	< 20 ± 7.6	< 20 ± 7.6	< 20 ± 7.6	< 20 ± 7.6
C15 - C36	mg/kg dry wt	< 40 ± 9.3	< 40 ± 9.4	< 40 ± 9.3	< 40 ± 9.3
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 70 ± 14	< 70 ± 14	< 70 ± 14	< 70 ± 14

Sample Name:		TP208 (0.4) 22-Oct-2020	TP208 (0.8) 22-Oct-2020	TP209 (0.4) 22-Oct-2020	TP209 (0.4 DUP) 22-Oct-2020
Lab Number:		2463453.19	2463453.20	2463453.21	2463453.22
Individual Tests					
Dry Matter	g/100g as rcvd	77.3 ± 5.0	70.4 ± 5.0	79.4 ± 5.0	82.3 ± 5.0

Sample Type: Soil					
Sample Name:		TP208 (0.4) 22-Oct-2020	TP208 (0.8) 22-Oct-2020	TP209 (0.4) 22-Oct-2020	TP209 (0.4 DUP) 22-Oct-2020
Lab Number:		2463453.19	2463453.20	2463453.21	2463453.22
Heavy Metals with Mercury, Screen Level					
Total Recoverable Arsenic	mg/kg dry wt	< 2 ± 1.4	< 2 ± 1.4	< 2 ± 1.4	< 2 ± 1.4
Total Recoverable Cadmium	mg/kg dry wt	0.134 ± 0.068	< 0.10 ± 0.067	< 0.10 ± 0.067	< 0.10 ± 0.067
Total Recoverable Chromium	mg/kg dry wt	46.7 ± 7.4	26.9 ± 4.4	17.8 ± 3.1	16.9 ± 3.0
Total Recoverable Copper	mg/kg dry wt	51.6 ± 7.2	8.7 ± 1.8	3.3 ± 1.4	3.2 ± 1.4
Total Recoverable Lead	mg/kg dry wt	11.8 ± 1.8	6.9 ± 1.1	4.72 ± 0.76	4.29 ± 0.70
Total Recoverable Mercury	mg/kg dry wt	< 0.10 ± 0.067	< 0.10 ± 0.067	< 0.10 ± 0.067	< 0.10 ± 0.067
Total Recoverable Nickel	mg/kg dry wt	120 ± 16	14.4 ± 2.3	5.2 ± 1.5	5.3 ± 1.5
Total Recoverable Zinc	mg/kg dry wt	81.0 ± 6.3	20.1 ± 3.1	10.1 ± 2.8	9.6 ± 2.8
BTEX in Soil by Headspace GC-MS					
Benzene	mg/kg dry wt	< 0.06 ± 0.034	< 0.07 ± 0.035	-	-
Toluene	mg/kg dry wt	< 0.06 ± 0.034	< 0.07 ± 0.035	-	-
Ethylbenzene	mg/kg dry wt	0.071 ± 0.037	< 0.07 ± 0.035	-	-
m&p-Xylene	mg/kg dry wt	< 0.11 ± 0.068	< 0.13 ± 0.071	-	-
o-Xylene	mg/kg dry wt	< 0.06 ± 0.034	< 0.07 ± 0.035	-	-
Polycyclic Aromatic Hydrocarbons Screening in Soil*					
Total of Reported PAHs in Soil	mg/kg dry wt	0.8	1.9	-	-
1-Methylnaphthalene	mg/kg dry wt	0.062 ± 0.035	0.163 ± 0.051	-	-
2-Methylnaphthalene	mg/kg dry wt	0.087 ± 0.038	0.244 ± 0.068	-	-
Acenaphthylene	mg/kg dry wt	< 0.013 ± 0.0067	< 0.014 ± 0.0068	-	-
Acenaphthene	mg/kg dry wt	< 0.013 ± 0.0070	< 0.014 ± 0.0072	-	-
Anthracene	mg/kg dry wt	< 0.013 ± 0.0072	< 0.014 ± 0.0073	-	-
Benzo[a]anthracene	mg/kg dry wt	0.0162 ± 0.0075	< 0.014 ± 0.0072	-	-
Benzo[a]pyrene (BAP)	mg/kg dry wt	0.0185 ± 0.0068	< 0.014 ± 0.0067	-	-
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	< 0.04 ± 0.0097	< 0.04 ± 0.0097	-	-
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	< 0.04 ± 0.0097	< 0.04 ± 0.0097	-	-
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	0.0224 ± 0.0079	< 0.014 ± 0.0070	-	-
Benzo[e]pyrene	mg/kg dry wt	0.0169 ± 0.0068	< 0.014 ± 0.0067	-	-
Benzo[g,h,i]perylene	mg/kg dry wt	0.0146 ± 0.0069	< 0.014 ± 0.0069	-	-
Benzo[k]fluoranthene	mg/kg dry wt	< 0.013 ± 0.0068	< 0.014 ± 0.0069	-	-
Chrysene	mg/kg dry wt	0.0128 ± 0.0069	< 0.014 ± 0.0070	-	-
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.013 ± 0.0068	< 0.014 ± 0.0069	-	-
Fluoranthene	mg/kg dry wt	0.0333 ± 0.0074	< 0.014 ± 0.0068	-	-
Fluorene	mg/kg dry wt	< 0.013 ± 0.0068	< 0.014 ± 0.0068	-	-
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	0.0145 ± 0.0068	< 0.014 ± 0.0068	-	-
Naphthalene	mg/kg dry wt	0.46 ± 0.12	1.47 ± 0.37	-	-
Perylene	mg/kg dry wt	< 0.013 ± 0.0067	< 0.014 ± 0.0067	-	-
Phenanthrene	mg/kg dry wt	0.0141 ± 0.0069	< 0.014 ± 0.0069	-	-
Pyrene	mg/kg dry wt	0.0346 ± 0.0080	< 0.014 ± 0.0069	-	-
Total Petroleum Hydrocarbons in Soil					
C7 - C9	mg/kg dry wt	< 8 ± 5.4	< 9 ± 5.4	< 8 ± 5.4	< 8 ± 5.4
C10 - C14	mg/kg dry wt	31.9 ± 9.2	55 ± 12	< 20 ± 7.6	< 20 ± 7.6
C15 - C36	mg/kg dry wt	< 40 ± 9.4	< 40 ± 9.7	< 40 ± 9.3	< 40 ± 9.3
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 70 ± 15	79 ± 16	< 70 ± 14	< 70 ± 14

Sample Name:		TP210 (0.5) 27-Oct-2020	TP210 (2.4) 27-Oct-2020	TP211 (0.3) 22-Oct-2020	TP213 (0.4) 27-Oct-2020
Lab Number:		2463453.23	2463453.26	2463453.27	2463453.31
Individual Tests					
Dry Matter	g/100g as rcvd	72.8 ± 5.0	71.8 ± 5.0	72.6 ± 5.0	75.9 ± 5.0
Heavy Metals with Mercury, Screen Level					
Total Recoverable Arsenic	mg/kg dry wt	2.9 ± 1.4	< 2 ± 1.4	< 2 ± 1.4	3.5 ± 1.5
Total Recoverable Cadmium	mg/kg dry wt	< 0.10 ± 0.067	< 0.10 ± 0.067	0.104 ± 0.067	0.136 ± 0.068
Total Recoverable Chromium	mg/kg dry wt	15.0 ± 2.7	10.8 ± 2.2	32.6 ± 5.3	20.1 ± 3.4

Sample Type: Soil					
Sample Name:		TP210 (0.5) 27-Oct-2020	TP210 (2.4) 27-Oct-2020	TP211 (0.3) 22-Oct-2020	TP213 (0.4) 27-Oct-2020
Lab Number:		2463453.23	2463453.26	2463453.27	2463453.31
Heavy Metals with Mercury, Screen Level					
Total Recoverable Copper	mg/kg dry wt	6.6 ± 1.6	5.9 ± 1.6	33.3 ± 4.8	58.6 ± 8.1
Total Recoverable Lead	mg/kg dry wt	6.36 ± 0.99	7.3 ± 1.2	5.44 ± 0.86	10.8 ± 1.7
Total Recoverable Mercury	mg/kg dry wt	0.127 ± 0.068	0.108 ± 0.067	< 0.10 ± 0.067	< 0.10 ± 0.067
Total Recoverable Nickel	mg/kg dry wt	8.0 ± 1.7	12.5 ± 2.1	67.9 ± 8.8	16.1 ± 2.5
Total Recoverable Zinc	mg/kg dry wt	10.8 ± 2.8	20.6 ± 3.1	75.6 ± 6.0	59.2 ± 5.0
Total Petroleum Hydrocarbons in Soil					
C7 - C9	mg/kg dry wt	< 8 ± 5.4	< 9 ± 5.4	< 8 ± 5.4	< 8 ± 5.4
C10 - C14	mg/kg dry wt	< 20 ± 7.6	< 20 ± 7.6	< 20 ± 7.6	< 20 ± 7.6
C15 - C36	mg/kg dry wt	< 40 ± 9.3	< 40 ± 9.3	< 40 ± 9.3	< 40 ± 9.3
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 70 ± 14	< 70 ± 14	< 70 ± 14	< 70 ± 14

Sample Name:		TP213 (0.4 DUP) 27-Oct-2020	TP213 (0.9) 27-Oct-2020	TP213 (0.9 DUP) 27-Oct-2020	TP213 (2.1) 27-Oct-2020
Lab Number:		2463453.32	2463453.33	2463453.34	2463453.37
Individual Tests					
Dry Matter	g/100g as rcvd	74.2 ± 5.0	57.5 ± 5.0	56.0 ± 5.0	69.4 ± 5.0
Heavy Metals with Mercury, Screen Level					
Total Recoverable Arsenic	mg/kg dry wt	5.0 ± 1.5	2.3 ± 1.4	< 2 ± 1.4	< 2 ± 1.4
Total Recoverable Cadmium	mg/kg dry wt	0.154 ± 0.069	0.249 ± 0.074	0.285 ± 0.077	0.128 ± 0.068
Total Recoverable Chromium	mg/kg dry wt	26.0 ± 4.3	26.2 ± 4.3	25.9 ± 4.3	19.0 ± 3.3
Total Recoverable Copper	mg/kg dry wt	169 ± 24	22.8 ± 3.4	21.9 ± 3.3	9.4 ± 1.9
Total Recoverable Lead	mg/kg dry wt	12.9 ± 2.0	16.5 ± 2.5	16.0 ± 2.5	8.0 ± 1.3
Total Recoverable Mercury	mg/kg dry wt	< 0.10 ± 0.067	< 0.10 ± 0.067	0.212 ± 0.073	0.130 ± 0.068
Total Recoverable Nickel	mg/kg dry wt	24.7 ± 3.5	28.4 ± 3.9	27.3 ± 3.8	12.3 ± 2.1
Total Recoverable Zinc	mg/kg dry wt	72.8 ± 5.8	42.5 ± 4.0	40.5 ± 3.9	31.2 ± 3.5
Total Petroleum Hydrocarbons in Soil					
C7 - C9	mg/kg dry wt	< 8 ± 5.4	< 11 ± 5.5	< 11 ± 5.6	< 9 ± 5.4
C10 - C14	mg/kg dry wt	< 20 ± 7.6	< 30 ± 7.8	< 30 ± 7.9	< 20 ± 7.7
C15 - C36	mg/kg dry wt	42.1 ± 9.4	59.5 ± 9.8	92 ± 11	< 40 ± 9.4
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 70 ± 14	< 80 ± 14	94 ± 15	< 70 ± 14

Sample Name:		TP213 (2.1 DUP) 27-Oct-2020	TP214 (2.2) 22-Oct-2020	TP214 (2.9) 22-Oct-2020	TP215 (0.4) 23-Oct-2020
Lab Number:		2463453.38	2463453.41	2463453.42	2463453.43
Individual Tests					
Dry Matter	g/100g as rcvd	67.7 ± 5.0	76.1 ± 5.0	19.3 ± 5.0	82.2 ± 5.0
Heavy Metals with Mercury, Screen Level					
Total Recoverable Arsenic	mg/kg dry wt	< 2 ± 1.4	< 2 ± 1.4	10.1 ± 2.0	< 2 ± 1.4
Total Recoverable Cadmium	mg/kg dry wt	0.108 ± 0.067	< 0.10 ± 0.067	0.288 ± 0.077	< 0.10 ± 0.067
Total Recoverable Chromium	mg/kg dry wt	19.0 ± 3.3	< 2 ± 1.4	24.3 ± 4.0	14.0 ± 2.6
Total Recoverable Copper	mg/kg dry wt	7.9 ± 1.7	< 2 ± 1.4	40.4 ± 5.7	4.4 ± 1.5
Total Recoverable Lead	mg/kg dry wt	8.1 ± 1.3	1.22 ± 0.32	2.73 ± 0.49	4.81 ± 0.77
Total Recoverable Mercury	mg/kg dry wt	0.102 ± 0.067	< 0.10 ± 0.067	0.184 ± 0.071	< 0.10 ± 0.067
Total Recoverable Nickel	mg/kg dry wt	12.1 ± 2.1	< 2 ± 1.4	48.1 ± 6.3	8.5 ± 1.7
Total Recoverable Zinc	mg/kg dry wt	41.4 ± 4.0	8.5 ± 2.8	92.2 ± 7.0	12.5 ± 2.8
BTEX in Soil by Headspace GC-MS					
Benzene	mg/kg dry wt	-	-	-	< 0.05 ± 0.034
Toluene	mg/kg dry wt	-	-	-	< 0.05 ± 0.034
Ethylbenzene	mg/kg dry wt	-	-	-	< 0.05 ± 0.034
m&p-Xylene	mg/kg dry wt	-	-	-	< 0.10 ± 0.067
o-Xylene	mg/kg dry wt	-	-	-	< 0.05 ± 0.034
Polycyclic Aromatic Hydrocarbons Screening in Soil*					
Total of Reported PAHs in Soil	mg/kg dry wt	-	-	-	< 0.3
1-Methylnaphthalene	mg/kg dry wt	-	-	-	< 0.012 ± 0.032
2-Methylnaphthalene	mg/kg dry wt	-	-	-	< 0.012 ± 0.032
Acenaphthylene	mg/kg dry wt	-	-	-	< 0.012 ± 0.0067

Sample Type: Soil					
Sample Name:		TP213 (2.1 DUP) 27-Oct-2020	TP214 (2.2) 22-Oct-2020	TP214 (2.9) 22-Oct-2020	TP215 (0.4) 23-Oct-2020
Lab Number:		2463453.38	2463453.41	2463453.42	2463453.43
Polycyclic Aromatic Hydrocarbons Screening in Soil*					
Acenaphthene	mg/kg dry wt	-	-	-	< 0.012 ± 0.0069
Anthracene	mg/kg dry wt	-	-	-	< 0.012 ± 0.0070
Benzo[a]anthracene	mg/kg dry wt	-	-	-	< 0.012 ± 0.0070
Benzo[a]pyrene (BAP)	mg/kg dry wt	-	-	-	< 0.012 ± 0.0067
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	-	-	-	< 0.03 ± 0.0096
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	-	-	-	< 0.03 ± 0.0096
Benzo[b]fluoranthene + Benzo[j]fluoranthene	mg/kg dry wt	-	-	-	< 0.012 ± 0.0069
Benzo[e]pyrene	mg/kg dry wt	-	-	-	< 0.012 ± 0.0067
Benzo[g,h,i]perylene	mg/kg dry wt	-	-	-	< 0.012 ± 0.0068
Benzo[k]fluoranthene	mg/kg dry wt	-	-	-	< 0.012 ± 0.0068
Chrysene	mg/kg dry wt	-	-	-	< 0.012 ± 0.0069
Dibenzo[a,h]anthracene	mg/kg dry wt	-	-	-	< 0.012 ± 0.0068
Fluoranthene	mg/kg dry wt	-	-	-	< 0.012 ± 0.0068
Fluorene	mg/kg dry wt	-	-	-	< 0.012 ± 0.0068
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	-	-	-	< 0.012 ± 0.0067
Naphthalene	mg/kg dry wt	-	-	-	< 0.06 ± 0.035
Perylene	mg/kg dry wt	-	-	-	0.0276 ± 0.0070
Phenanthrene	mg/kg dry wt	-	-	-	< 0.012 ± 0.0068
Pyrene	mg/kg dry wt	-	-	-	< 0.012 ± 0.0068
Total Petroleum Hydrocarbons in Soil					
C7 - C9	mg/kg dry wt	< 9 ± 5.4	< 8 ± 5.4	< 60 ± 14	< 8 ± 5.4
C10 - C14	mg/kg dry wt	< 20 ± 7.6	< 20 ± 7.6	< 120 ± 20	< 20 ± 7.6
C15 - C36	mg/kg dry wt	< 40 ± 9.4	< 40 ± 9.3	1,590 ± 130	< 40 ± 9.3
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 70 ± 14	< 70 ± 14	1,660 ± 130	< 70 ± 14

Sample Name:		TP215 (1.5) 23-Oct-2020	TP216 (1.2) 23-Oct-2020	TP216 (3.1) 23-Oct-2020	TP217 (0.7) 22-Oct-2020
Lab Number:		2463453.45	2463453.48	2463453.50	2463453.51
Individual Tests					
Dry Matter	g/100g as rcvd	59.8 ± 5.0	70.0 ± 5.0	16.2 ± 5.0	69.7 ± 5.0
Heavy Metals with Mercury, Screen Level					
Total Recoverable Arsenic	mg/kg dry wt	< 2 ± 1.4	3.8 ± 1.5	3.6 ± 1.5	< 2 ± 1.4
Total Recoverable Cadmium	mg/kg dry wt	< 0.10 ± 0.067	< 0.10 ± 0.067	< 0.10 ± 0.067	< 0.10 ± 0.067
Total Recoverable Chromium	mg/kg dry wt	33.2 ± 5.4	39.3 ± 6.3	5.0 ± 1.6	20.2 ± 3.4
Total Recoverable Copper	mg/kg dry wt	14.7 ± 2.4	29.6 ± 4.3	34.9 ± 5.0	5.7 ± 1.6
Total Recoverable Lead	mg/kg dry wt	10.8 ± 1.7	7.4 ± 1.2	1.39 ± 0.34	6.19 ± 0.97
Total Recoverable Mercury	mg/kg dry wt	0.115 ± 0.068	< 0.10 ± 0.067	< 0.10 ± 0.067	< 0.10 ± 0.067
Total Recoverable Nickel	mg/kg dry wt	23.3 ± 3.3	24.8 ± 3.5	14.3 ± 2.3	13.0 ± 2.2
Total Recoverable Zinc	mg/kg dry wt	39.2 ± 3.9	68.6 ± 5.6	14.6 ± 2.9	47.2 ± 4.3
BTEX in Soil by Headspace GC-MS					
Benzene	mg/kg dry wt	< 0.08 ± 0.038	-	-	-
Toluene	mg/kg dry wt	< 0.08 ± 0.037	-	-	-
Ethylbenzene	mg/kg dry wt	< 0.08 ± 0.038	-	-	-
m&p-Xylene	mg/kg dry wt	< 0.16 ± 0.077	-	-	-
o-Xylene	mg/kg dry wt	< 0.08 ± 0.038	-	-	-
Polycyclic Aromatic Hydrocarbons Screening in Soil*					
Total of Reported PAHs in Soil	mg/kg dry wt	< 0.4	-	-	-
1-Methylnaphthalene	mg/kg dry wt	< 0.017 ± 0.032	-	-	-
2-Methylnaphthalene	mg/kg dry wt	< 0.017 ± 0.032	-	-	-
Acenaphthylene	mg/kg dry wt	< 0.017 ± 0.0068	-	-	-
Acenaphthene	mg/kg dry wt	< 0.017 ± 0.0076	-	-	-
Anthracene	mg/kg dry wt	< 0.017 ± 0.0078	-	-	-
Benzo[a]anthracene	mg/kg dry wt	< 0.017 ± 0.0075	-	-	-

Sample Type: Soil					
Sample Name:		TP215 (1.5) 23-Oct-2020	TP216 (1.2) 23-Oct-2020	TP216 (3.1) 23-Oct-2020	TP217 (0.7) 22-Oct-2020
Lab Number:		2463453.45	2463453.48	2463453.50	2463453.51
Polycyclic Aromatic Hydrocarbons Screening in Soil*					
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.017 ± 0.0068	-	-	-
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	< 0.04 ± 0.0098	-	-	-
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	< 0.04 ± 0.0098	-	-	-
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.017 ± 0.0072	-	-	-
Benzo[e]pyrene	mg/kg dry wt	< 0.017 ± 0.0068	-	-	-
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.017 ± 0.0070	-	-	-
Benzo[k]fluoranthene	mg/kg dry wt	< 0.017 ± 0.0070	-	-	-
Chrysene	mg/kg dry wt	< 0.017 ± 0.0071	-	-	-
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.017 ± 0.0070	-	-	-
Fluoranthene	mg/kg dry wt	< 0.017 ± 0.0068	-	-	-
Fluorene	mg/kg dry wt	< 0.017 ± 0.0069	-	-	-
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.017 ± 0.0068	-	-	-
Naphthalene	mg/kg dry wt	< 0.09 ± 0.037	-	-	-
Perylene	mg/kg dry wt	0.0170 ± 0.0068	-	-	-
Phenanthrene	mg/kg dry wt	< 0.017 ± 0.0070	-	-	-
Pyrene	mg/kg dry wt	< 0.017 ± 0.0070	-	-	-
Total Petroleum Hydrocarbons in Soil					
C7 - C9	mg/kg dry wt	< 10 ± 5.5	< 9 ± 5.4	< 80 ± 17	< 9 ± 5.4
C10 - C14	mg/kg dry wt	< 20 ± 7.8	< 20 ± 7.6	< 150 ± 24	< 20 ± 7.6
C15 - C36	mg/kg dry wt	< 40 ± 9.5	< 40 ± 9.3	1,259 ± 63	< 40 ± 9.4
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 70 ± 14	< 70 ± 14	1,284 ± 69	< 70 ± 14

Sample Name:		TP218 Stockpile (0.0)	TP205 (1.0)	Stockpile 10m from TP213 (0.3E)	Stockpile by TP217 (0.3N)
Lab Number:		2463453.52	2463453.54	2463453.55	2463453.57
Individual Tests					
Dry Matter	g/100g as rcvd	86.0 ± 5.0	68.9 ± 5.0	74.2 ± 5.0	67.9 ± 5.0
Heavy Metals with Mercury, Screen Level					
Total Recoverable Arsenic	mg/kg dry wt	27.6 ± 4.4	< 2 ± 1.4	8.7 ± 1.9	7.6 ± 1.8
Total Recoverable Cadmium	mg/kg dry wt	0.367 ± 0.083	< 0.10 ± 0.067	0.303 ± 0.078	0.491 ± 0.094
Total Recoverable Chromium	mg/kg dry wt	52.2 ± 8.2	22.7 ± 3.8	69 ± 11	125 ± 20
Total Recoverable Copper	mg/kg dry wt	94 ± 13	8.7 ± 1.8	48.1 ± 6.7	68.0 ± 9.4
Total Recoverable Lead	mg/kg dry wt	71 ± 11	10.1 ± 1.6	58.1 ± 8.7	472 ± 71
Total Recoverable Mercury	mg/kg dry wt	< 0.10 ± 0.067	< 0.10 ± 0.067	0.163 ± 0.070	0.328 ± 0.083
Total Recoverable Nickel	mg/kg dry wt	89 ± 12	11.8 ± 2.0	121 ± 16	138 ± 18
Total Recoverable Zinc	mg/kg dry wt	331 ± 24	17.3 ± 3.0	169 ± 13	238 ± 17
Total Petroleum Hydrocarbons in Soil					
C7 - C9	mg/kg dry wt	< 8 ± 5.4	< 9 ± 5.4	< 8 ± 5.4	< 9 ± 5.4
C10 - C14	mg/kg dry wt	< 20 ± 7.6	< 20 ± 7.7	< 20 ± 7.6	< 20 ± 7.6
C15 - C36	mg/kg dry wt	530 ± 29	< 40 ± 9.4	195 ± 20	175 ± 17
Total hydrocarbons (C7 - C36)	mg/kg dry wt	535 ± 31	< 70 ± 14	198 ± 22	177 ± 20

Sample Name:		TP218 Stockpile (0.5)	TP212 Stockpile (0.5)	TP212 Stockpile (0.0)	TP212 (2.25)
Lab Number:		2463453.61	2463453.62	2463453.63	2463453.65
Individual Tests					
Dry Matter	g/100g as rcvd	89.5 ± 5.0	92.2 ± 5.0	90.8 ± 5.0	70.3 ± 5.0
Heavy Metals with Mercury, Screen Level					
Total Recoverable Arsenic	mg/kg dry wt	22.5 ± 3.6	14.2 ± 2.5	8.1 ± 1.8	< 2 ± 1.4
Total Recoverable Cadmium	mg/kg dry wt	0.300 ± 0.078	0.182 ± 0.070	0.240 ± 0.074	< 0.10 ± 0.067
Total Recoverable Chromium	mg/kg dry wt	57.8 ± 9.1	34.6 ± 5.6	39.0 ± 6.2	20.1 ± 3.4
Total Recoverable Copper	mg/kg dry wt	85 ± 12	49.5 ± 6.9	53.0 ± 7.4	5.4 ± 1.5
Total Recoverable Lead	mg/kg dry wt	80 ± 12	47.6 ± 7.2	47.4 ± 7.1	6.34 ± 0.99
Total Recoverable Mercury	mg/kg dry wt	0.111 ± 0.068	< 0.10 ± 0.067	< 0.10 ± 0.067	0.110 ± 0.068

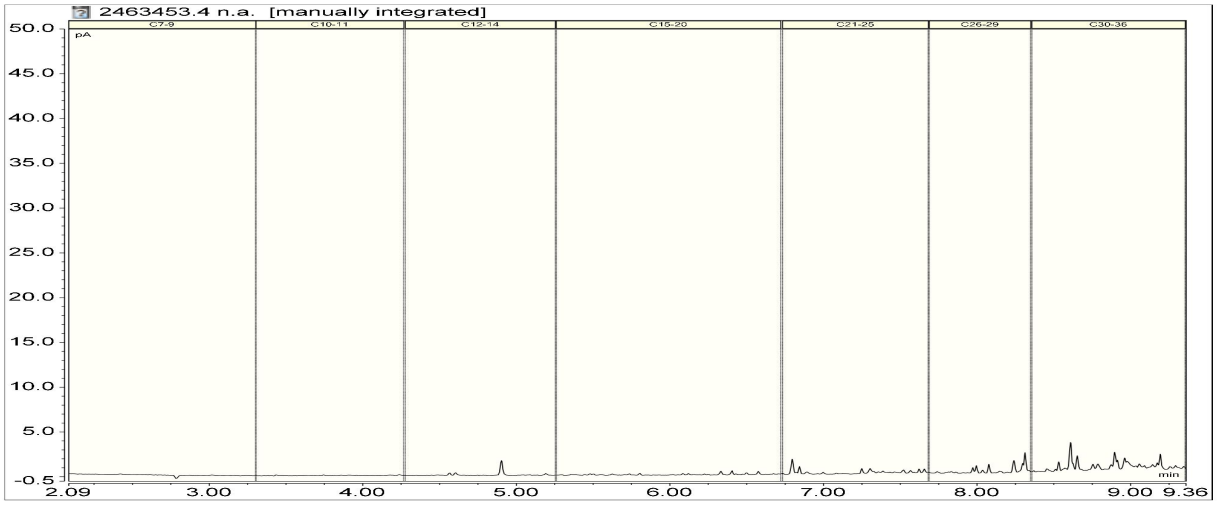
Sample Type: Soil					
Sample Name:		TP218 Stockpile (0.5)	TP212 Stockpile (0.5)	TP212 Stockpile (0.0)	TP212 (2.25)
Lab Number:		2463453.61	2463453.62	2463453.63	2463453.65
Heavy Metals with Mercury, Screen Level					
Total Recoverable Nickel	mg/kg dry wt	89 ± 12	98 ± 13	131 ± 17	9.1 ± 1.8
Total Recoverable Zinc	mg/kg dry wt	247 ± 18	113.9 ± 8.5	137 ± 11	18.7 ± 3.0
Total Petroleum Hydrocarbons in Soil					
C7 - C9	mg/kg dry wt	< 8 ± 5.4	< 8 ± 5.4	< 8 ± 5.4	< 9 ± 5.4
C10 - C14	mg/kg dry wt	< 20 ± 7.6	< 20 ± 7.6	< 20 ± 7.6	< 20 ± 7.6
C15 - C36	mg/kg dry wt	120 ± 12	58.2 ± 9.6	44.4 ± 9.5	< 40 ± 9.3
Total hydrocarbons (C7 - C36)	mg/kg dry wt	120 ± 15	< 70 ± 14	< 70 ± 14	< 70 ± 14

Sample Name:		TP212 (0.4)			
Lab Number:		2463453.66			
Individual Tests					
Dry Matter	g/100g as rcvd	75.1 ± 5.0	-	-	-
Heavy Metals with Mercury, Screen Level					
Total Recoverable Arsenic	mg/kg dry wt	< 2 ± 1.4	-	-	-
Total Recoverable Cadmium	mg/kg dry wt	< 0.10 ± 0.067	-	-	-
Total Recoverable Chromium	mg/kg dry wt	28.7 ± 4.7	-	-	-
Total Recoverable Copper	mg/kg dry wt	6.2 ± 1.6	-	-	-
Total Recoverable Lead	mg/kg dry wt	8.2 ± 1.3	-	-	-
Total Recoverable Mercury	mg/kg dry wt	< 0.10 ± 0.067	-	-	-
Total Recoverable Nickel	mg/kg dry wt	9.1 ± 1.8	-	-	-
Total Recoverable Zinc	mg/kg dry wt	14.5 ± 2.9	-	-	-
Total Petroleum Hydrocarbons in Soil					
C7 - C9	mg/kg dry wt	< 8 ± 5.4	-	-	-
C10 - C14	mg/kg dry wt	< 20 ± 7.6	-	-	-
C15 - C36	mg/kg dry wt	< 40 ± 9.3	-	-	-
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 70 ± 14	-	-	-

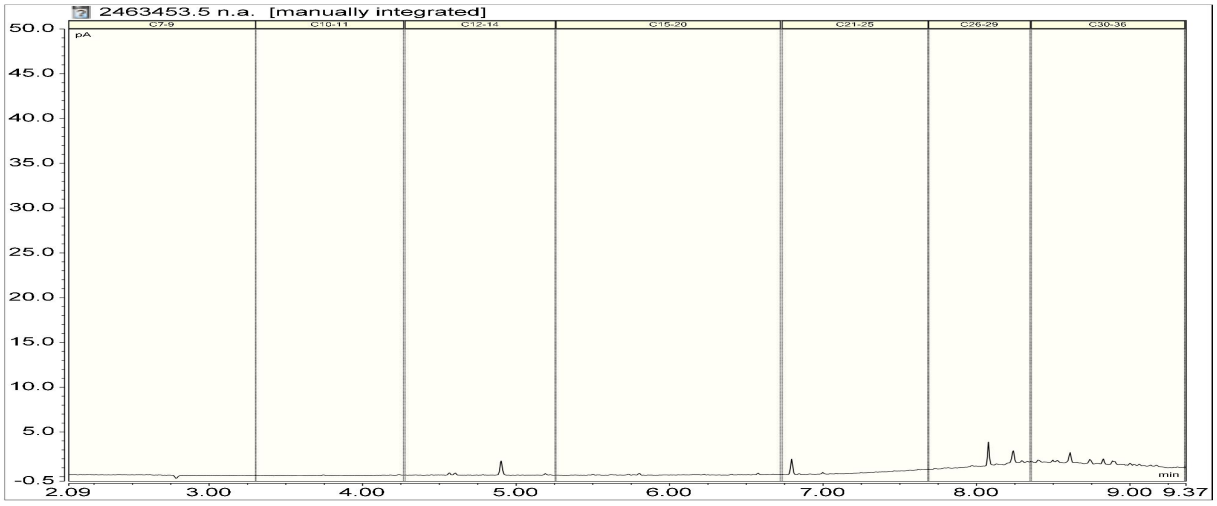
The reported uncertainty is an expanded uncertainty with a level of confidence of approximately 95 percent (i.e. two standard deviations, calculated using a coverage factor of 2). Reported uncertainties are calculated from the performance of typical matrices, and do not include variation due to sampling.

For further information on uncertainty of measurement at Hill Laboratories, refer to the technical note on our website: www.hill-laboratories.com/files/Intro_To_UOM.pdf, or contact the laboratory.

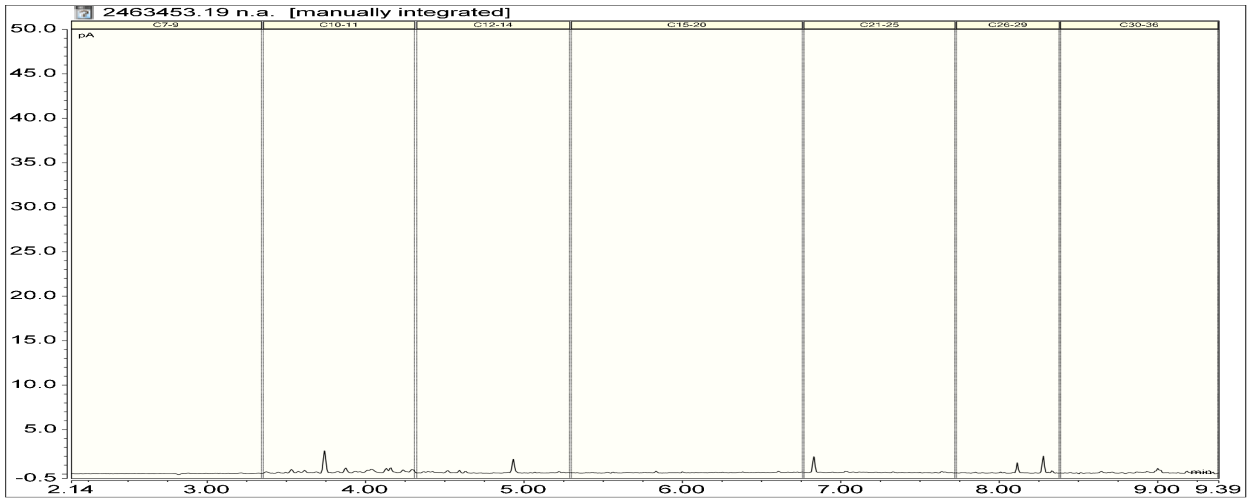
2463453.4
TP201 (4.2) 27-Oct-2020
Client Chromatogram for TPH by FID



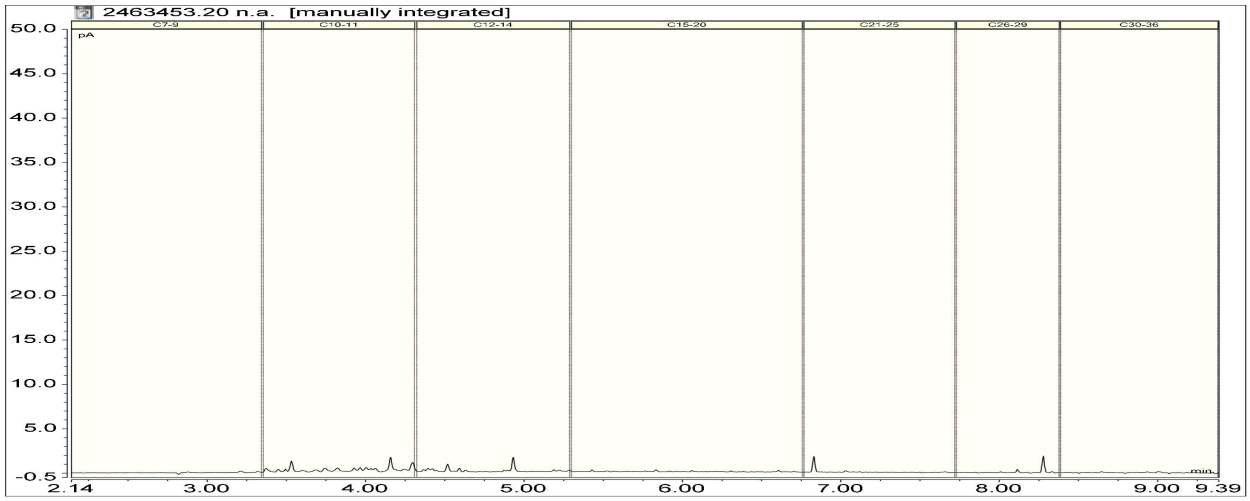
2463453.5
TP202 (0.4) 27-Oct-2020
Client Chromatogram for TPH by FID



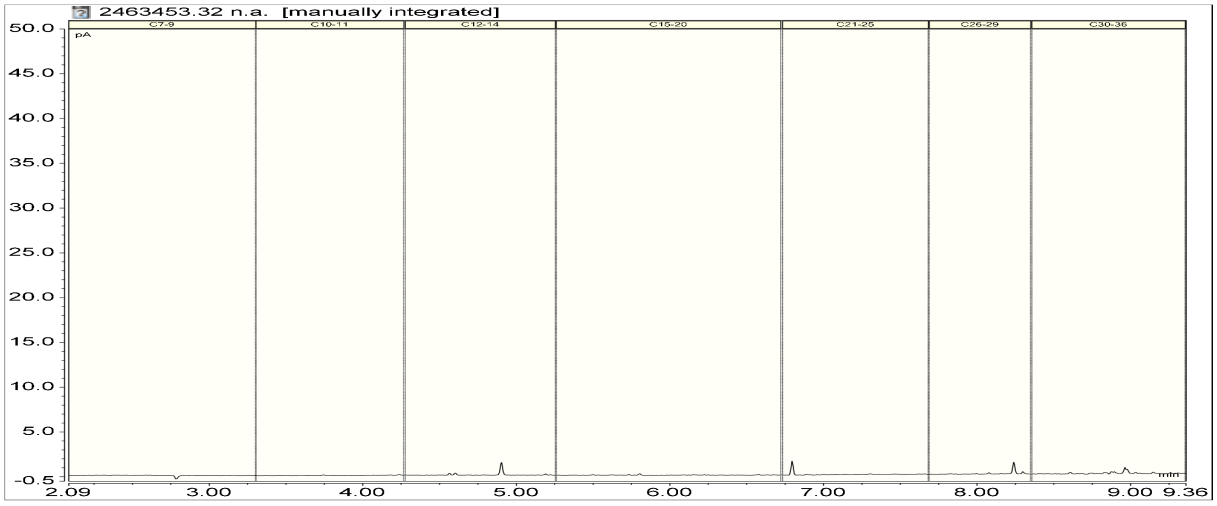
2463453.19
TP208 (0.4) 22-Oct-2020
Client Chromatogram for TPH by FID



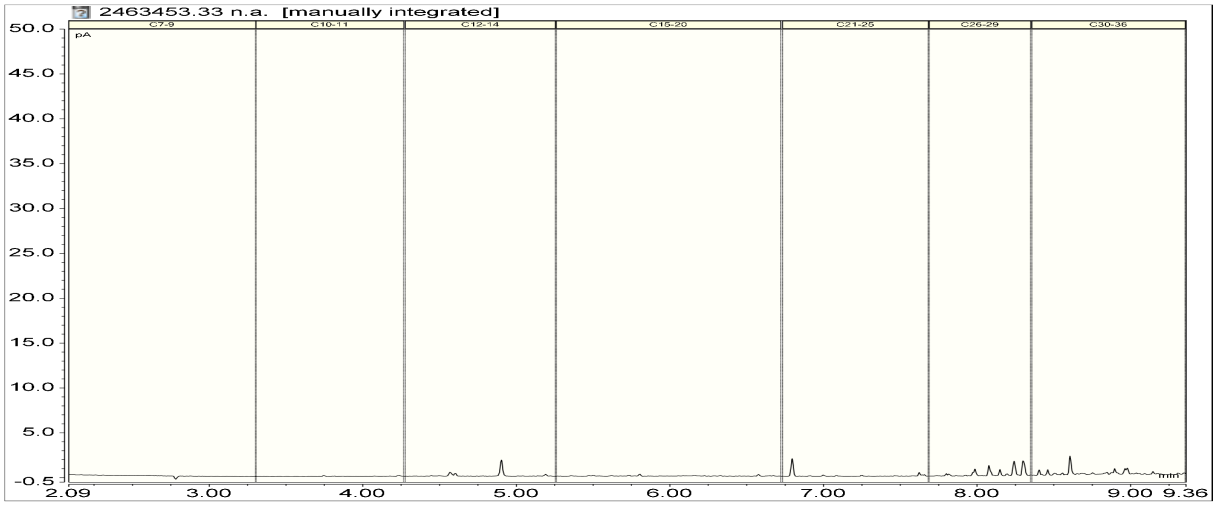
2463453.20
TP208 (0.8) 22-Oct-2020
Client Chromatogram for TPH by FID



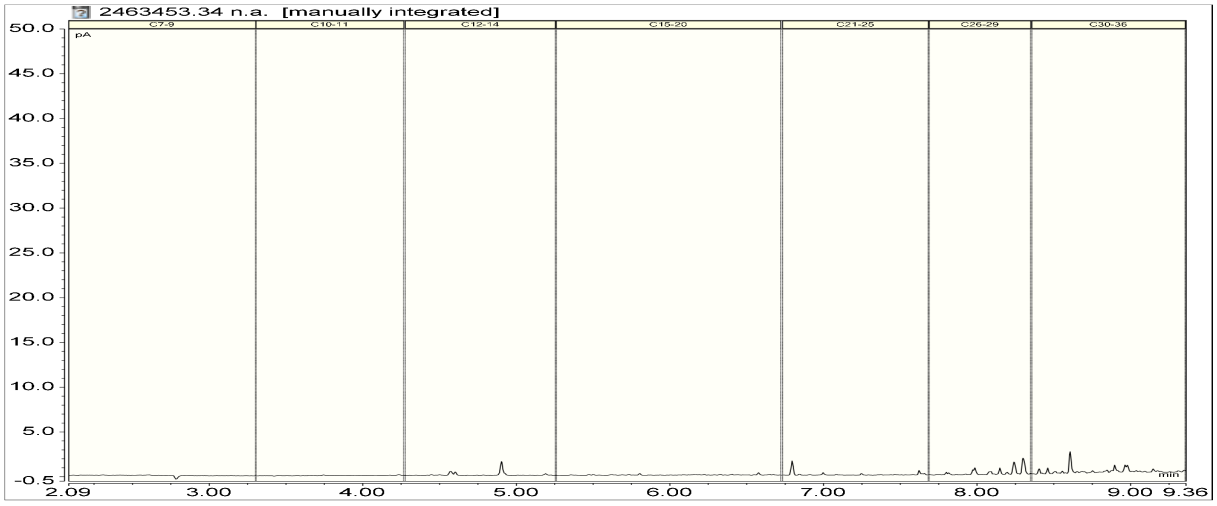
2463453.32
TP213 (0.4 DUP) 27-Oct-2020
Client Chromatogram for TPH by FID



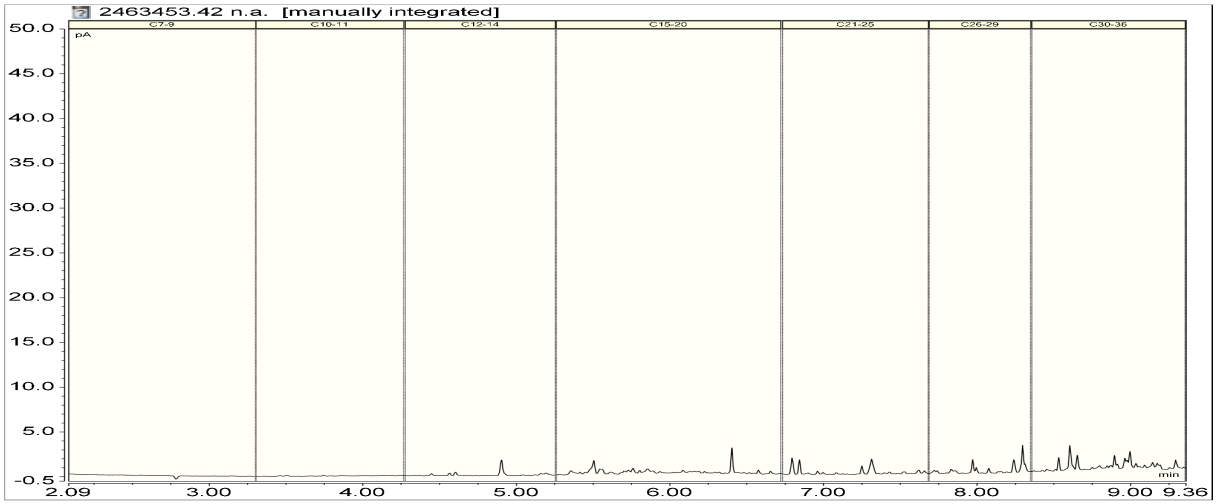
2463453.33
TP213 (0.9) 27-Oct-2020
Client Chromatogram for TPH by FID



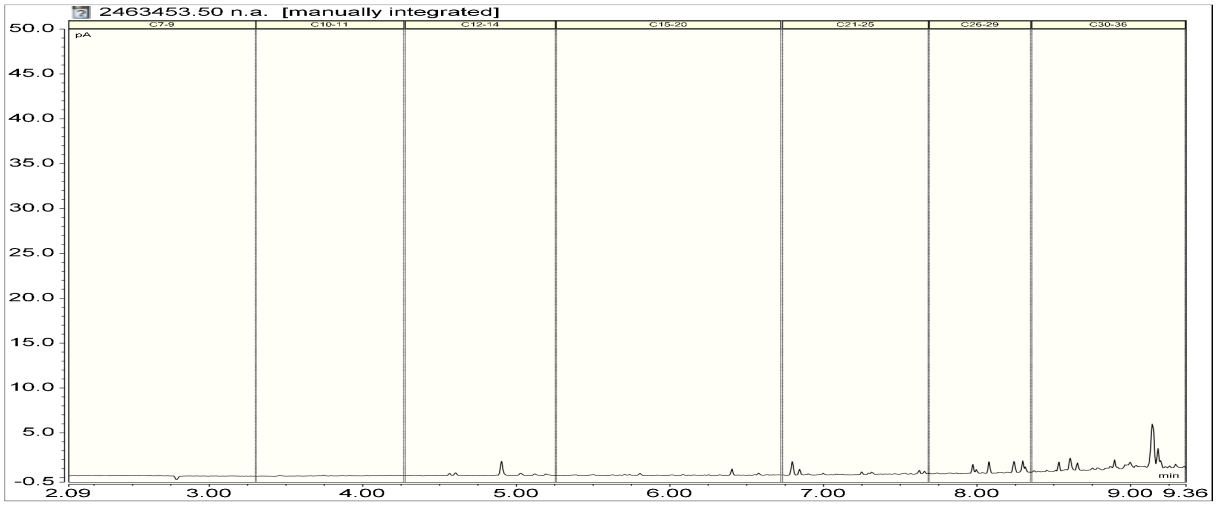
2463453.34
TP213 (0.9 DUP) 27-Oct-2020
Client Chromatogram for TPH by FID



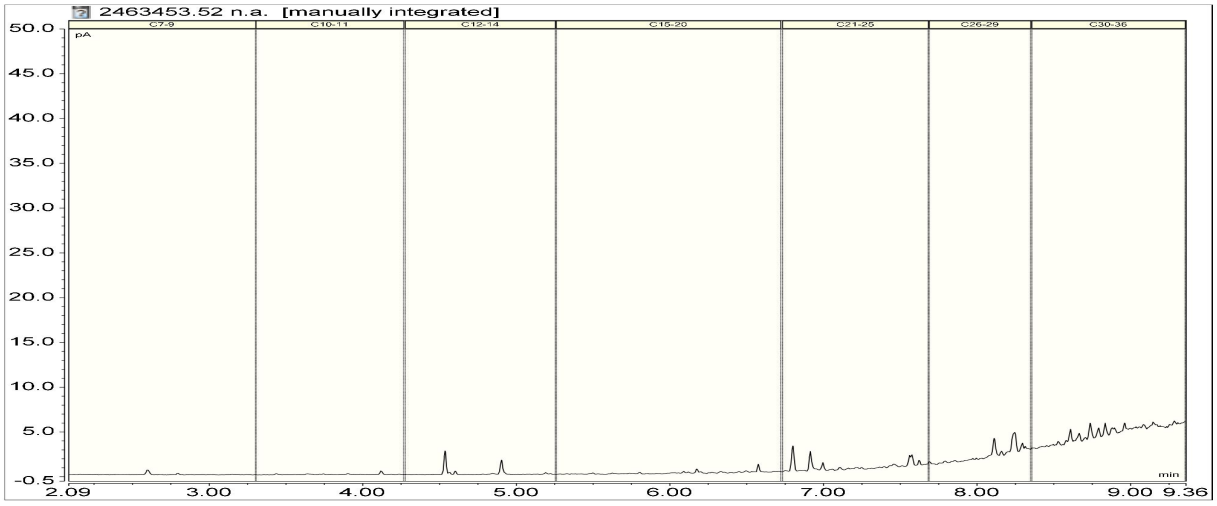
2463453.42
TP214 (2.9) 22-Oct-2020
Client Chromatogram for TPH by FID



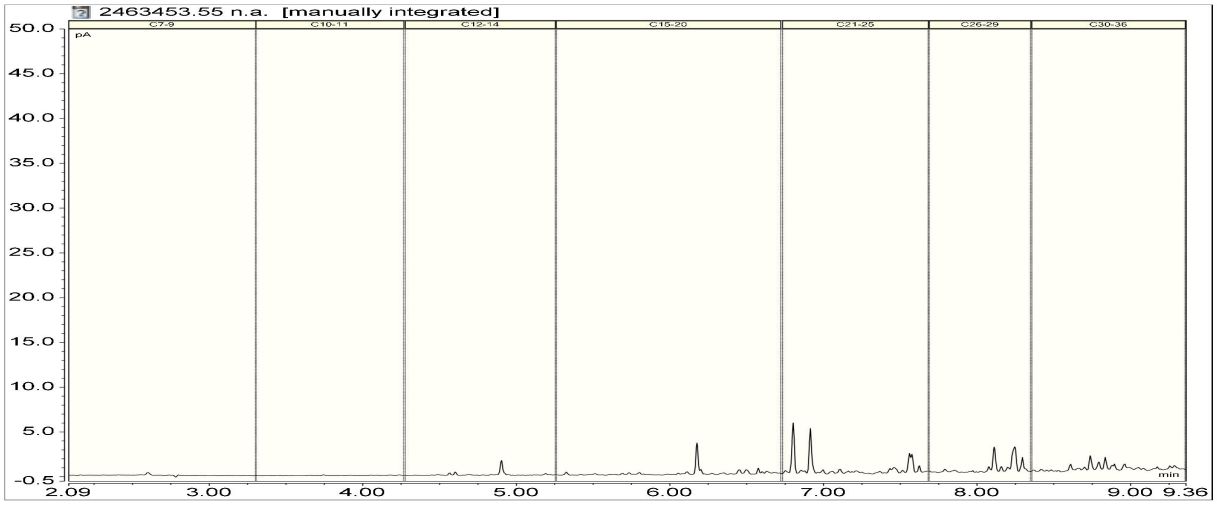
2463453.50
TP216 (3.1) 23-Oct-2020
Client Chromatogram for TPH by FID



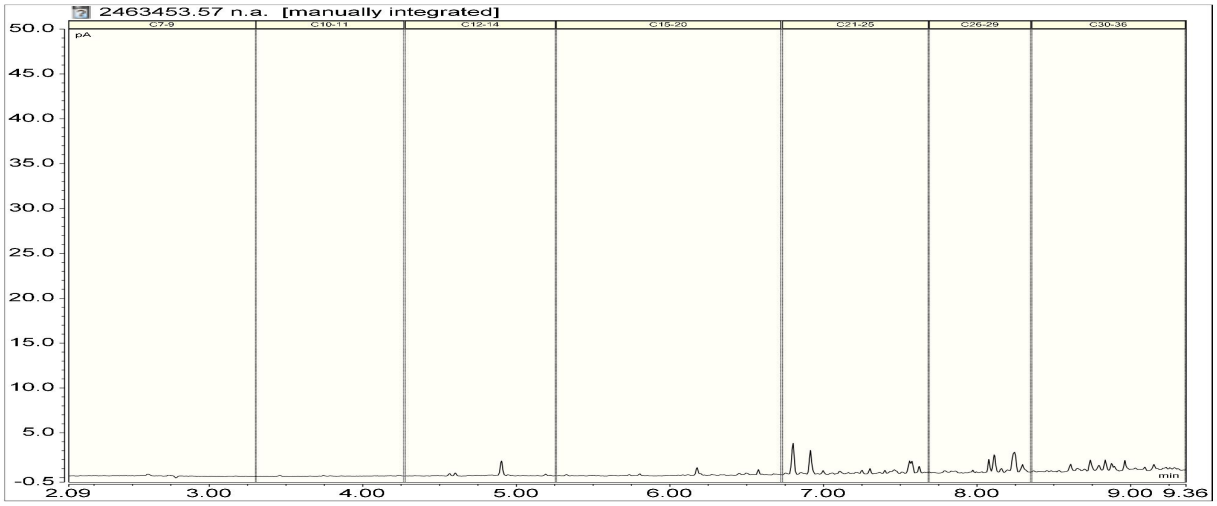
2463453.52
TP218 Stockpile (0.0)
Client Chromatogram for TPH by FID



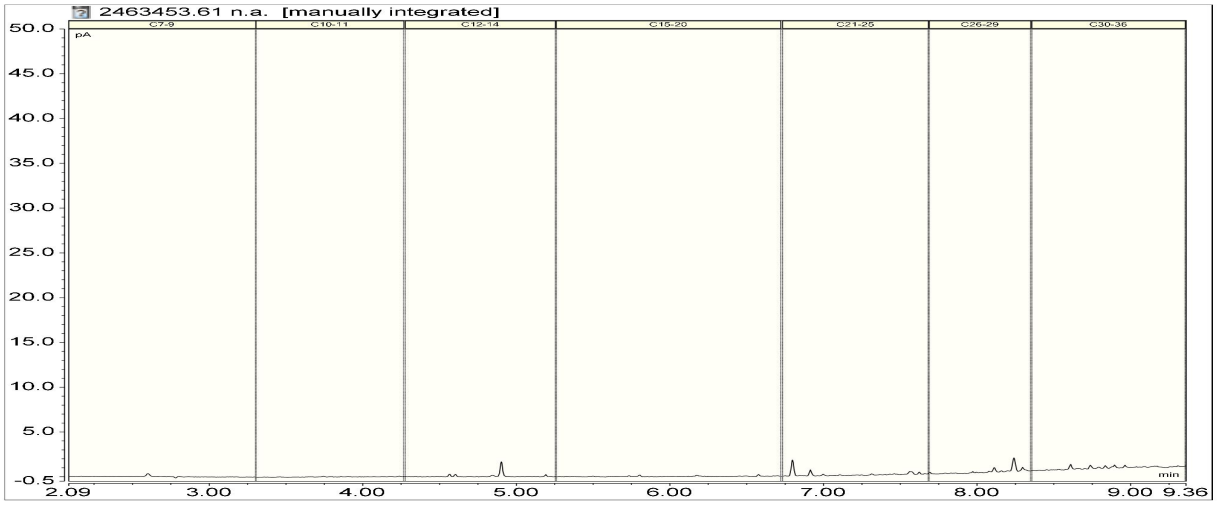
2463453.55
Stockpile 10m from TP213 (0.3E)
Client Chromatogram for TPH by FID



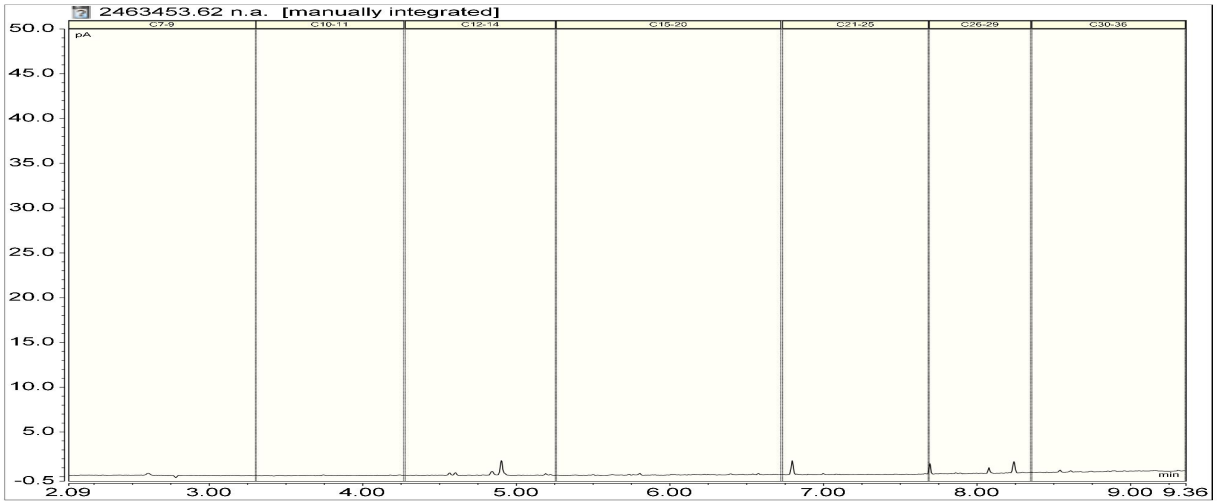
2463453.57
Stockpile by TP217 (0.3N)
Client Chromatogram for TPH by FID



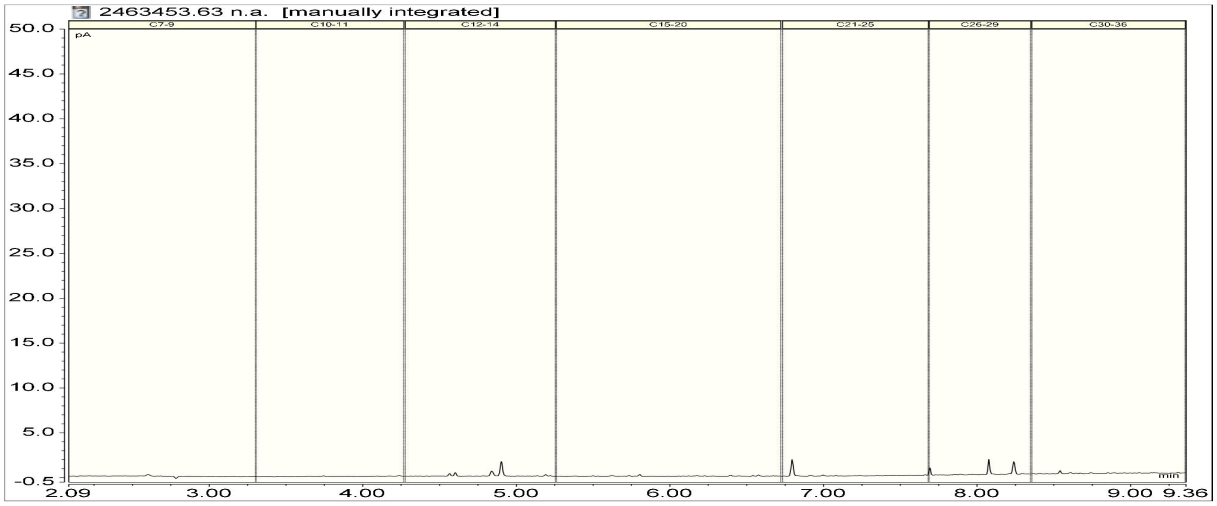
2463453.61
TP218 Stockpile (0.5)
Client Chromatogram for TPH by FID



2463453.62
TP212 Stockpile (0.5)
Client Chromatogram for TPH by FID



2463453.63
TP212 Stockpile (0.0)
Client Chromatogram for TPH by FID



Summary of Methods

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

Sample Type: Soil

Test	Method Description	Default Detection Limit	Sample No
Individual Tests			
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%.	-	1, 4-5, 7-9, 11-16, 19-23, 26-27, 31-34, 37-38, 41-43, 45, 48, 50-52, 54-55, 57, 61-63, 65-66
Total of Reported PAHs in Soil	Sonication extraction, GC-MS analysis. In-house based on US EPA 8270.	0.03 mg/kg dry wt	13-16, 19-20, 43, 45

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Dry Matter (Env)	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	1, 4-5, 7-9, 11-16, 19-23, 26-27, 31-34, 37-38, 41-43, 45, 48, 50-52, 54-55, 57, 61-63, 65-66
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	BaP Potency Equivalence calculated from; Benzo(a)anthracene x 0.1 + Benzo(b)fluoranthene x 0.1 + Benzo(j)fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Benzo(a)pyrene x 1.0 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Fluoranthene x 0.01 + Indeno(1,2,3-c,d)pyrene x 0.1. Ministry for the Environment. 2011. Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health. Wellington: Ministry for the Environment.	0.002 mg/kg dry wt	13-16, 19-20, 43, 45
Benzo[a]pyrene Toxic Equivalence (TEF)*	Benzo[a]pyrene Toxic Equivalence (TEF) calculated from; Benzo[a]pyrene x 1.0 + Benzo(a)anthracene x 0.1 + Benzo(b) fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Indeno(1,2,3-c,d)pyrene x 0.1. Guidelines for assessing and managing contaminated gasworks sites in New Zealand (GMG) (MfE, 1997).	0.002 mg/kg dry wt	13-16, 19-20, 43, 45
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1, 4-5, 7-9, 11-16, 19-23, 26-27, 31-34, 37-38, 41-43, 45, 48, 50-52, 54-55, 57, 61-63, 65-66
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	13-16, 19-20, 43, 45
Polycyclic Aromatic Hydrocarbons Screening in Soil*	Sonication extraction, GC-MS analysis. Tested on as received sample. In-house based on US EPA 8270.	0.002 - 0.05 mg/kg dry wt	13-16, 19-20, 43, 45
TPH + PAH + BTEX profile	Sonication extraction, GC-FID and GC-MS analysis. Tested on as received sample. In-house based on US EPA 8015 and US EPA 8270.	0.002 - 70 mg/kg dry wt	13-16, 19-20, 43, 45
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.	-	4-5, 19-20, 32-34, 42, 50, 52, 55, 57, 61-63
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	8 mg/kg dry wt	1, 4-5, 7-9, 11-16, 19-23, 26-27, 31-34, 37-38, 41-43, 45, 48, 50-52, 54-55, 57, 61-63, 65-66
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, 4-5, 7-9, 11-16, 19-23, 26-27, 31-34, 37-38, 41-43, 45, 48, 50-52, 54-55, 57, 61-63, 65-66

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
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, 4-5, 7-9, 11-16, 19-23, 26-27, 31-34, 37-38, 41-43, 45, 48, 50-52, 54-55, 57, 61-63, 65-66
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, 4-5, 7-9, 11-16, 19-23, 26-27, 31-34, 37-38, 41-43, 45, 48, 50-52, 54-55, 57, 61-63, 65-66

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

Testing was completed between 03-Nov-2020 and 04-Nov-2020. For completion dates of individual analyses please contact the laboratory.

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

Ara Heron BSc (Tech)
Client Services Manager - Environmental

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TRIED, TESTED AND TRUSTED

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Certificate of Analysis

Client:	Beca Limited	**Lab No:**	2464737 A2Pv1
Contact:	Vicky Kennaugh C/- Beca Limited PO Box 6345 Wellesley Street Auckland 1141	**Date Received:**	31-Oct-2020
		Date Reported:	10-Nov-2020
		Quote No:	107787
		Order No:	20:162
		Client Reference:	3126366
		Submitted By:	Vicky Kennaugh

Sample Type: Soil

Sample Name:		TP201 (0.5) 27-Oct-2020	TP202 (0.4) 27-Oct-2020	TP203 (0.4) 27-Oct-2020	TP204 (0.4) 23-Oct-2020	TP205 (0.4) 27-Oct-2020
Lab Number:		2464737.1	2464737.5	2464737.8	2464737.9	2464737.12
Asbestos Presence / Absence		Amosite (Brown Asbestos) and Chrysotile (White Asbestos) detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.
Description of Asbestos Form		Fibre cement	-	-	-	-
Asbestos in ACM as % of Total Sample*	% w/w	0.030	< 0.001	< 0.001	< 0.001	< 0.001
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Asbestos as Fibrous Asbestos as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Asbestos as Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
As Received Weight	g	886.7	923.3	673.4	889.0	909.0
Dry Weight	g	738.3	707.8	536.7	694.2	691.2
Moisture	%	17	23	20	22	24
Sample Fraction >10mm	g dry wt	150.4	210.6	53.6	89.1	14.6
Sample Fraction <10mm to >2mm	g dry wt	188.3	228.4	210.7	156.7	224.4
Sample Fraction <2mm	g dry wt	398.5	266.7	271.5	446.0	449.9
<2mm Subsample Weight	g dry wt	58.6	59.1	53.6	52.0	57.0
Weight of Asbestos in ACM (Non-Friable)	g dry wt	0.2211	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Weight of Asbestos as Fibrous Asbestos (Friable)	g dry wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Weight of Asbestos as Asbestos Fines (Friable)*	g dry wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001

Sample Name:		TP206 (0.5) 23-Oct-2020	TP207 (0.5) 23-Oct-2020	TP208 (0.4) 22-Oct-2020	TP209 (0.4) 22-Oct-2020	TP210 (0.5) 27-Oct-2020
Lab Number:		2464737.13	2464737.15	2464737.19	2464737.21	2464737.23
Asbestos Presence / Absence		Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.
Description of Asbestos Form		-	-	-	-	-
Asbestos in ACM as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Asbestos as Fibrous Asbestos as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Asbestos as Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
As Received Weight	g	1,024.6	921.6	902.8	1,143.7	861.8
Dry Weight	g	759.7	662.8	702.8	943.4	604.6

Sample Type: Soil						
Sample Name:		TP206 (0.5) 23-Oct-2020	TP207 (0.5) 23-Oct-2020	TP208 (0.4) 22-Oct-2020	TP209 (0.4) 22-Oct-2020	TP210 (0.5) 27-Oct-2020
Lab Number:		2464737.13	2464737.15	2464737.19	2464737.21	2464737.23
Moisture	%	26	28	22	18	30
Sample Fraction >10mm	g dry wt	20.3	237.2	16.5	27.0	69.2
Sample Fraction <10mm to >2mm	g dry wt	180.1	238.7	231.7	166.8	275.6
Sample Fraction <2mm	g dry wt	557.8	185.0	453.3	746.5	258.8
<2mm Subsample Weight	g dry wt	57.8	51.1	59.0	59.1	59.3
Weight of Asbestos in ACM (Non-Friable)	g dry wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Weight of Asbestos as Fibrous Asbestos (Friable)	g dry wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Weight of Asbestos as Asbestos Fines (Friable)*	g dry wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001

Sample Name:		TP211 (0.3) 22-Oct-2020	TP213 (0.4) 27-Oct-2020	TP213 (0.9) 27-Oct-2020	TP214 (0.6) 22-Oct-2020	TP215 (0.4) 23-Oct-2020
Lab Number:		2464737.27	2464737.31	2464737.33	2464737.39	2464737.43
Asbestos Presence / Absence		Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.
Description of Asbestos Form		-	-	-	-	-
Asbestos in ACM as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Asbestos as Fibrous Asbestos as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Asbestos as Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
As Received Weight	g	886.2	941.0	507.6	986.1	969.3
Dry Weight	g	665.8	693.2	302.7	698.3	801.4
Moisture	%	25	26	40	29	17
Sample Fraction >10mm	g dry wt	< 0.1	62.0	< 0.1	< 0.1	< 0.1
Sample Fraction <10mm to >2mm	g dry wt	93.6	98.2	84.7	229.4	130.7
Sample Fraction <2mm	g dry wt	569.9	532.6	217.1	467.2	668.4
<2mm Subsample Weight	g dry wt	52.1	57.6	53.6	55.8	56.4
Weight of Asbestos in ACM (Non-Friable)	g dry wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Weight of Asbestos as Fibrous Asbestos (Friable)	g dry wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Weight of Asbestos as Asbestos Fines (Friable)*	g dry wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001

Sample Name:		TP216 (0.4) 23-Oct-2020	TP217 (0.7) 22-Oct-2020	TP218 Stockpile (0.0)	TP210 Building (0.5)	Stockpile 10m From TP213 (0.3E)
Lab Number:		2464737.47	2464737.51	2464737.52	2464737.53	2464737.56
Asbestos Presence / Absence		Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Chrysotile (White Asbestos) detected.	Asbestos NOT detected.
Description of Asbestos Form		-	-	-	Loose fibres	-
Asbestos in ACM as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Asbestos as Fibrous Asbestos as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Asbestos as Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
As Received Weight	g	946.8	1,012.2	795.4	944.7	571.6
Dry Weight	g	828.6	716.4	707.9	854.2	412.4
Moisture	%	12	29	11	10	28
Sample Fraction >10mm	g dry wt	4.9	< 0.1	257.9	360.9	19.8
Sample Fraction <10mm to >2mm	g dry wt	109.9	177.0	201.2	233.5	74.5

Sample Type: Soil						
Sample Name:		TP216 (0.4) 23-Oct-2020	TP217 (0.7) 22-Oct-2020	TP218 Stockpile (0.0)	TP210 Building (0.5)	Stockpile 10m From TP213 (0.3E)
Lab Number:		2464737.47	2464737.51	2464737.52	2464737.53	2464737.56
Sample Fraction <2mm	g dry wt	712.0	537.9	248.2	259.2	317.6
<2mm Subsample Weight	g dry wt	58.3	50.1	54.9	51.9	56.6
Weight of Asbestos in ACM (Non-Friable)	g dry wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Weight of Asbestos as Fibrous Asbestos (Friable)	g dry wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Weight of Asbestos as Asbestos Fines (Friable)*	g dry wt	< 0.00001	< 0.00001	< 0.00001	0.00005	< 0.00001

Sample Name:		Stockpile By TP217 (0.3N)	TP212 Stockpile (0.5)	TP212 Stockpile (0.0)	TP212 (0.4)	BH202 (0.5-0.7) 29-Oct-2020
Lab Number:		2464737.58	2464737.62	2464737.63	2464737.66	2464737.67
Asbestos Presence / Absence		Asbestos NOT detected.	Amosite (Brown Asbestos) and Chrysotile (White Asbestos) detected.	Amosite (Brown Asbestos) and Chrysotile (White Asbestos) detected.	Asbestos NOT detected.	Asbestos NOT detected.
Description of Asbestos Form		-	ACM debris	Fibre cement and Loose fibres	-	-
Asbestos in ACM as % of Total Sample*	% w/w	< 0.001	< 0.001	0.035	< 0.001	< 0.001
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	% w/w	< 0.001	0.005	< 0.001	< 0.001	< 0.001
Asbestos as Fibrous Asbestos as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Asbestos as Asbestos Fines as % of Total Sample*	% w/w	< 0.001	0.005	< 0.001	< 0.001	< 0.001
As Received Weight	g	581.4	1,077.4	1,149.0	888.2	749.6
Dry Weight	g	410.5	1,004.6	1,060.9	677.1	545.5
Moisture	%	29	7	8	24	27
Sample Fraction >10mm	g dry wt	136.9	212.8	414.6	< 0.1	< 0.1
Sample Fraction <10mm to >2mm	g dry wt	45.4	411.2	344.6	114.0	143.2
Sample Fraction <2mm	g dry wt	227.4	380.0	300.9	560.3	400.2
<2mm Subsample Weight	g dry wt	50.4	55.1	56.7	57.9	58.3
Weight of Asbestos in ACM (Non-Friable)	g dry wt	< 0.00001	< 0.00001	0.3667	< 0.00001	< 0.00001
Weight of Asbestos as Fibrous Asbestos (Friable)	g dry wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Weight of Asbestos as Asbestos Fines (Friable)*	g dry wt	< 0.00001	0.04617	0.00103	< 0.00001	< 0.00001

Sample Name:		BH201 (0-0.3) 29-Oct-2020	BH203 (0.1-0.3) 29-Oct-2020			
Lab Number:		2464737.69	2464737.72			
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	758.6	1,269.0	-	-	-
Dry Weight	g	692.9	1,175.0	-	-	-
Moisture	%	9	7	-	-	-
Sample Fraction >10mm	g dry wt	117.2	497.1	-	-	-
Sample Fraction <10mm to >2mm	g dry wt	258.1	346.5	-	-	-
Sample Fraction <2mm	g dry wt	317.3	329.0	-	-	-

Sample Type: Soil						
Sample Name:		BH201 (0-0.3) 29-Oct-2020	BH203 (0.1-0.3) 29-Oct-2020			
Lab Number:		2464737.69	2464737.72			
<2mm Subsample Weight	g dry wt	55.8	56.4	-	-	-
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 Laboratories, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Individual Tests			
Wgt of Asbestos as Asbestos Fines in <10mm >2mm Fraction*	Measurement on analytical balance, from the <10mm >2mm Fraction. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.00001 g dry wt	1, 5, 8-9, 12-13, 15, 19, 21, 23, 27, 31, 33, 39, 43, 47, 51-53, 56, 58, 62-63, 66-67, 69, 72
New Zealand Guidelines Semi Quantitative Asbestos in Soil			
As Received Weight	Measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	1, 5, 8-9, 12-13, 15, 19, 21, 23, 27, 31, 33, 39, 43, 47, 51-53, 56, 58, 62-63, 66-67, 69, 72
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	1, 5, 8-9, 12-13, 15, 19, 21, 23, 27, 31, 33, 39, 43, 47, 51-53, 56, 58, 62-63, 66-67, 69, 72

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Moisture	Sample dried at 100 to 105°C. Calculation = (As received weight - Dry weight) / as received weight x 100.	1 %	1, 5, 8-9, 12-13, 15, 19, 21, 23, 27, 31, 33, 39, 43, 47, 51-53, 56, 58, 62-63, 66-67, 69, 72
Sample Fraction >10mm	Sample dried at 100 to 105°C, 10mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g dry wt	1, 5, 8-9, 12-13, 15, 19, 21, 23, 27, 31, 33, 39, 43, 47, 51-53, 56, 58, 62-63, 66-67, 69, 72
Sample Fraction <10mm to >2mm	Sample dried at 100 to 105°C, 10mm and 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g dry wt	1, 5, 8-9, 12-13, 15, 19, 21, 23, 27, 31, 33, 39, 43, 47, 51-53, 56, 58, 62-63, 66-67, 69, 72
Sample Fraction <2mm	Sample dried at 100 to 105°C, 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g dry wt	1, 5, 8-9, 12-13, 15, 19, 21, 23, 27, 31, 33, 39, 43, 47, 51-53, 56, 58, 62-63, 66-67, 69, 72
Asbestos Presence / Absence	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0.01%	1, 5, 8-9, 12-13, 15, 19, 21, 23, 27, 31, 33, 39, 43, 47, 51-53, 56, 58, 62-63, 66-67, 69, 72
Description of Asbestos Form	Description of asbestos form and/or shape if present.	-	1, 5, 8-9, 12-13, 15, 19, 21, 23, 27, 31, 33, 39, 43, 47, 51-53, 56, 58, 62-63, 66-67, 69, 72
Weight of Asbestos in ACM (Non-Friable)	Measurement on analytical balance, from the >10mm Fraction. Weight of asbestos based on assessment of ACM form. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 5, 8-9, 12-13, 15, 19, 21, 23, 27, 31, 33, 39, 43, 47, 51-53, 56, 58, 62-63, 66-67, 69, 72
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, 5, 8-9, 12-13, 15, 19, 21, 23, 27, 31, 33, 39, 43, 47, 51-53, 56, 58, 62-63, 66-67, 69, 72

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Weight of Asbestos as Fibrous Asbestos (Friable)	Measurement on analytical balance, from the >10mm Fraction. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 5, 8-9, 12-13, 15, 19, 21, 23, 27, 31, 33, 39, 43, 47, 51-53, 56, 58, 62-63, 66-67, 69, 72
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, 5, 8-9, 12-13, 15, 19, 21, 23, 27, 31, 33, 39, 43, 47, 51-53, 56, 58, 62-63, 66-67, 69, 72
Weight of Asbestos as Asbestos Fines (Friable)*	Measurement on analytical balance, from the <10mm Fractions. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 5, 8-9, 12-13, 15, 19, 21, 23, 27, 31, 33, 39, 43, 47, 51-53, 56, 58, 62-63, 66-67, 69, 72
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, 5, 8-9, 12-13, 15, 19, 21, 23, 27, 31, 33, 39, 43, 47, 51-53, 56, 58, 62-63, 66-67, 69, 72
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, 5, 8-9, 12-13, 15, 19, 21, 23, 27, 31, 33, 39, 43, 47, 51-53, 56, 58, 62-63, 66-67, 69, 72

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

Testing was completed between 08-Nov-2020 and 10-Nov-2020. 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.

Rhodri Williams BSc (Hons)
Technical Manager - Asbestos

Hill Laboratories
TRIED, TESTED AND TRUSTED

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W www.hill-laboratories.com

Certificate of Analysis

Client:	Beca Limited	**Lab No:**	2464741	SUPv1
Contact:	Vicky Kennaugh	**Date Received:**	31-Oct-2020	
	C/- Beca Limited	**Date Reported:**	09-Nov-2020	
	PO Box 6345	**Quote No:**	107787	
	Wellesley Street	**Order No:**	20:162	
	Auckland 1141	**Client Reference:**	3126366	
		Submitted By:	Vicky Kennaugh	

Sample Type: Soil

Sample Name:		BH202(0.5-0.7) 29-Oct-2020	BH202(3.2-3.5) 29-Oct-2020	BH201(0-0.3) 29-Oct-2020	BH201(1.5-1.8) 29-Oct-2020
Lab Number:		2464741.2	2464741.3	2464741.5	2464741.6
Individual Tests					
Dry Matter	g/100g as rcvd	71.3 ± 5.0	69.9 ± 5.0	85.6 ± 5.0	71.8 ± 5.0
Heavy Metals with Mercury, Screen Level					
Total Recoverable Arsenic	mg/kg dry wt	2.8 ± 1.4	< 2 ± 1.4	9.0 ± 1.9	< 2 ± 1.4
Total Recoverable Cadmium	mg/kg dry wt	< 0.10 ± 0.067	< 0.10 ± 0.067	0.123 ± 0.068	< 0.10 ± 0.067
Total Recoverable Chromium	mg/kg dry wt	18.3 ± 3.2	30.8 ± 5.0	54.8 ± 8.6	27.7 ± 4.5
Total Recoverable Copper	mg/kg dry wt	8.6 ± 1.8	24.5 ± 3.6	37.4 ± 5.3	15.2 ± 2.5
Total Recoverable Lead	mg/kg dry wt	4.65 ± 0.75	5.23 ± 0.83	37.2 ± 5.6	14.6 ± 2.2
Total Recoverable Mercury	mg/kg dry wt	0.116 ± 0.068	< 0.10 ± 0.067	0.227 ± 0.074	< 0.10 ± 0.067
Total Recoverable Nickel	mg/kg dry wt	28.3 ± 3.9	68.5 ± 8.9	92 ± 12	21.4 ± 3.1
Total Recoverable Zinc	mg/kg dry wt	9.6 ± 2.8	66.1 ± 5.4	77.7 ± 6.1	32.0 ± 3.5
Total Petroleum Hydrocarbons in Soil					
C7 - C9	mg/kg dry wt	< 9 ± 5.4	< 9 ± 5.4	< 8 ± 5.4	< 9 ± 5.4
C10 - C14	mg/kg dry wt	< 20 ± 7.6	< 20 ± 7.6	< 20 ± 7.6	< 20 ± 7.6
C15 - C36	mg/kg dry wt	< 40 ± 9.3	< 40 ± 9.3	208 ± 17	< 40 ± 9.3
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 70 ± 14	< 70 ± 14	210 ± 19	< 70 ± 14

Sample Name:		BH201(1.5-1.8 DUP) 29-Oct-2020	BH201(2.5-2.7) 29-Oct-2020	BH203(3.4-3.6) 29-Oct-2020	BH203 (1.5-1.7) 29-Oct-2020
Lab Number:		2464741.7	2464741.8	2464741.13	2464741.20
Individual Tests					
Dry Matter	g/100g as rcvd	76.0 ± 5.0	20.8 ± 5.0	16.8 ± 5.0	72.3 ± 5.0
Heavy Metals with Mercury, Screen Level					
Total Recoverable Arsenic	mg/kg dry wt	6.7 ± 1.7	9.2 ± 1.9	< 5 ± 1.5	< 2 ± 1.4
Total Recoverable Cadmium	mg/kg dry wt	< 0.10 ± 0.067	0.207 ± 0.072	< 0.3 ± 0.072	< 0.10 ± 0.067
Total Recoverable Chromium	mg/kg dry wt	37.7 ± 6.0	17.2 ± 3.0	< 5 ± 1.5	54.6 ± 8.6
Total Recoverable Copper	mg/kg dry wt	26.8 ± 3.9	144 ± 20	17.7 ± 2.8	21.0 ± 3.2
Total Recoverable Lead	mg/kg dry wt	26.3 ± 4.0	2.87 ± 0.51	< 0.9 ± 0.29	7.0 ± 1.1
Total Recoverable Mercury	mg/kg dry wt	0.129 ± 0.068	0.265 ± 0.078	< 0.3 ± 0.073	< 0.10 ± 0.067
Total Recoverable Nickel	mg/kg dry wt	53.2 ± 7.0	33.8 ± 4.6	7.3 ± 1.7	45.6 ± 6.0
Total Recoverable Zinc	mg/kg dry wt	50.4 ± 4.5	39.8 ± 3.9	18.6 ± 3.0	44.5 ± 4.1
Total Petroleum Hydrocarbons in Soil					
C7 - C9	mg/kg dry wt	< 8 ± 5.4	< 60 ± 14	< 70 ± 16	< 9 ± 5.4
C10 - C14	mg/kg dry wt	< 20 ± 7.6	< 120 ± 20	< 140 ± 23	< 20 ± 7.6
C15 - C36	mg/kg dry wt	89 ± 11	1,820 ± 150	1,410 ± 110	< 40 ± 9.3
Total hydrocarbons (C7 - C36)	mg/kg dry wt	90 ± 14	1,860 ± 150	1,430 ± 110	< 70 ± 14

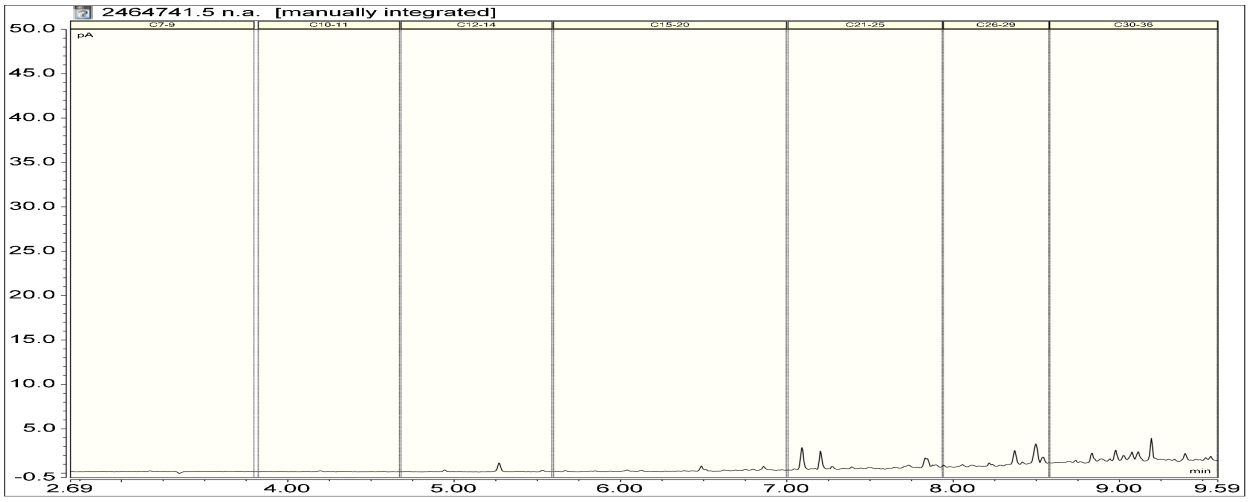
Sample Type: Aqueous

Sample Type: Aqueous				
Sample Name:	BHA 29-Oct-2020	BHB 29-Oct-2020	BHC 29-Oct-2020	
Lab Number:	2464741.15	2464741.16	2464741.17	
Individual Tests				
Poly- and Perfluorinated Alkyl Substances in Water*‡	See attached report	See attached report	See attached report	-

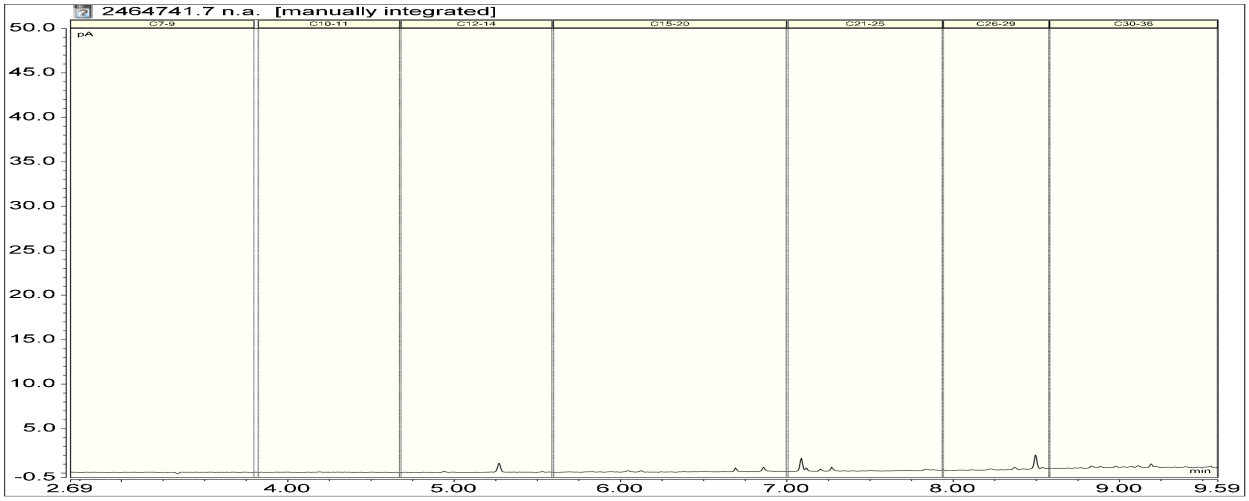
The reported uncertainty is an expanded uncertainty with a level of confidence of approximately 95 percent (i.e. two standard deviations, calculated using a coverage factor of 2). Reported uncertainties are calculated from the performance of typical matrices, and do not include variation due to sampling.

For further information on uncertainty of measurement at Hill Laboratories, refer to the technical note on our website: www.hill-laboratories.com/files/Intro_To_UOM.pdf, or contact the laboratory.

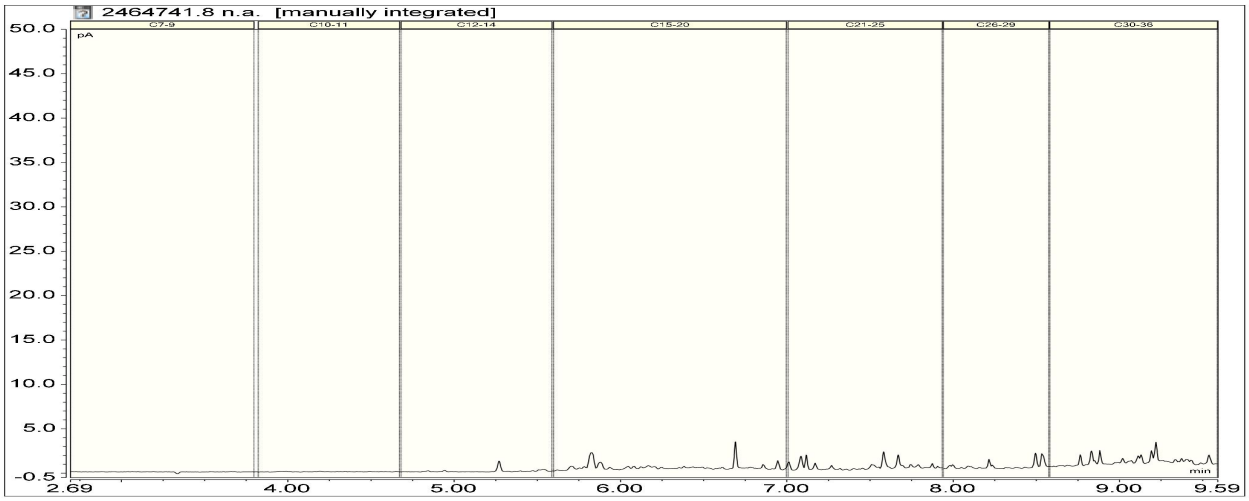
2464741.5
BH201(0-0.3) 29-Oct-2020
Client Chromatogram for TPH by FID



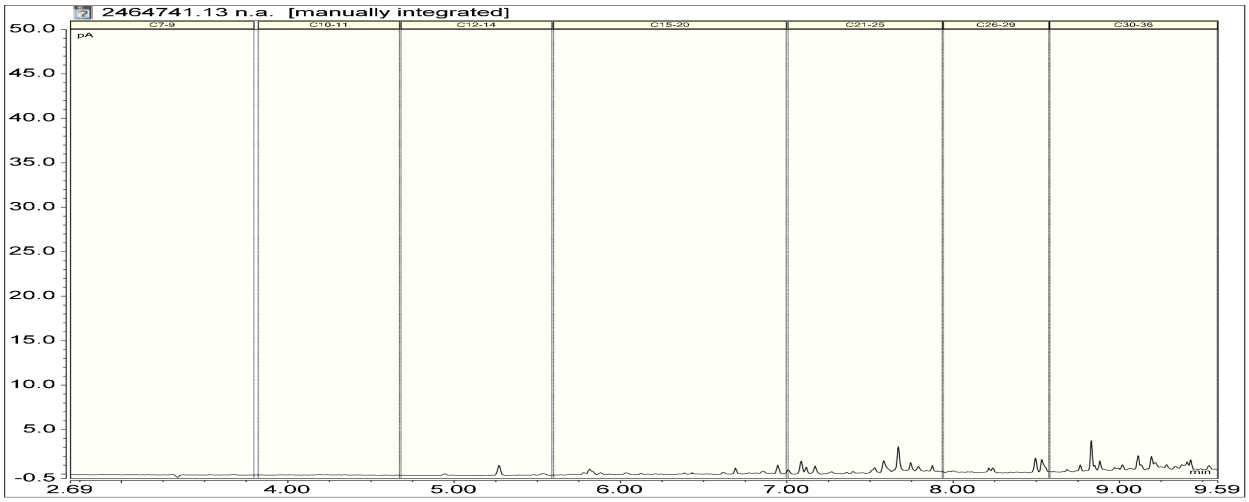
2464741.7
BH201(1.5-1.8 DUP) 29-Oct-2020
Client Chromatogram for TPH by FID



2464741.8
BH201(2.5-2.7) 29-Oct-2020
Client Chromatogram for TPH by FID



2464741.13
BH203(3.4-3.6) 29-Oct-2020
Client Chromatogram for TPH by FID



Analyst's Comments

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

Appendix No.1 - Asure Quality 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 Laboratories, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Soil

Test	Method Description	Default Detection Limit	Sample No
Individual Tests			
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%.	-	2-3, 5-8, 13, 20
Dry Matter (Env)	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	2-3, 5-8, 13, 20
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	2-3, 5-8, 13, 20

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Total Petroleum Hydrocarbons in Soil			
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	5, 7-8, 13
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	8 mg/kg dry wt	2-3, 5-8, 13, 20
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	2-3, 5-8, 13, 20
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	2-3, 5-8, 13, 20
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	2-3, 5-8, 13, 20

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Individual Tests			
Poly- and Perfluorinated Alkyl Substances in Water*	Analysis by LC-MS/MS. Subcontracted to AsureQuality, Lower Hutt.	-	15-17

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

Testing was completed between 04-Nov-2020 and 09-Nov-2020. For completion dates of individual analyses please contact the laboratory.

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

Ara Heron BSc (Tech)
Client Services Manager - Environmental

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Certificate of Analysis

Submission Reference: EnvSubAQ_LH 320
Final Report

Environment Client Service Managers
Hill Laboratories - Hamilton
Private Bag 3205
Hamilton 3240
New Zealand

PO Number: 154834

Report Issued: 09-Nov-2020 **AsureQuality Reference: 20-300548** **Sample(s) Received:** 04-Nov-2020 07:30

Testing Period: 04-Nov-2020 to 09-Nov-2020

Temp. on Receipt: 12 °C

Results

The tests were performed on the samples as received.

Customer Sample Name: 2464741.15 **Lab ID:** 20-300548-1

Sample Condition: Acceptable **Sampled Date**: 31-Oct-2020

Test	Result	Unit	Method Reference
Poly- and Perfluorinated Alkyl Substances (PFAS) in Water			
Perfluoroalkylsulfonic acids			
PFPrS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFBS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFPeS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
di-PFHxS (1)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
mono-PFHxS (1)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
L-PFHxS (1)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Total PFHxS (3)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFHpS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
di-PFOS (5)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
mono-PFOS (5)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
L-PFOS (5)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Total PFOS (7)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Sum PFHxS+PFOS (1)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFNS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFDS	NR	µg/L	AsureQuality Method (LC-MS/MS)
Perfluoroalkylcarboxylic acids			
PFBA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFPeA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFHxA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFHpA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFOA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFNA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFDA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFUnDA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFDoDA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)

AsureQuality Reference: 20-300548 **Report Issued:** 09-Nov-2020

Test	Result	Unit	Method Reference
PFTrDA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFTeDA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamides			
PFOSA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
NEtFOSA-M	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSA-M	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamidoacetic acids			
NEtFOSAA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSAA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamidoethanols			
NEtFOSE-M	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSE-M	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Telomere Sulfonic acids			
4:2 FTS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
6:2 FTS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
8:2 FTS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Internal Standards			
M3PFBS	113	%	AsureQuality Method (LC-MS/MS)
M3PFHxS	110	%	AsureQuality Method (LC-MS/MS)
M8PFOS	110	%	AsureQuality Method (LC-MS/MS)
M4PFBA	110	%	AsureQuality Method (LC-MS/MS)
M5PFPeA	106	%	AsureQuality Method (LC-MS/MS)
M5PFHxA	108	%	AsureQuality Method (LC-MS/MS)
MPFHpA	104	%	AsureQuality Method (LC-MS/MS)
M8PFOA	107	%	AsureQuality Method (LC-MS/MS)
M9PFNA	105	%	AsureQuality Method (LC-MS/MS)
M6PFDA	113	%	AsureQuality Method (LC-MS/MS)
M7PFUnDA	120	%	AsureQuality Method (LC-MS/MS)
MPFDoDA	97	%	AsureQuality Method (LC-MS/MS)
MPFTeDA	52	%	AsureQuality Method (LC-MS/MS)
MPFOSA	128	%	AsureQuality Method (LC-MS/MS)
DNEtFOSA	88	%	AsureQuality Method (LC-MS/MS)
DNMeFOSA	107	%	AsureQuality Method (LC-MS/MS)
DNEtFOSAA	109	%	AsureQuality Method (LC-MS/MS)
DNMeFOSAA	122	%	AsureQuality Method (LC-MS/MS)
DNEtFOSE	94	%	AsureQuality Method (LC-MS/MS)
DNMeFOSE	107	%	AsureQuality Method (LC-MS/MS)
M4:2FTS	114	%	AsureQuality Method (LC-MS/MS)
M6:2FTS	118	%	AsureQuality Method (LC-MS/MS)
M8:2FTS	123	%	AsureQuality Method (LC-MS/MS)

Customer Sample Name: 2464741.16 **Lab ID:** 20-300548-2

Sample Condition: Acceptable **Sampled Date**: 31-Oct-2020

Test	Result	Unit	Method Reference
Poly- and Perfluorinated Alkyl Substances (PFAS) in Water			
Perfluoroalkylsulfonic acids			
PFPrS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFBS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFPeS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
di-PFHxS (1)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)

AsureQuality Reference: 20-300548 **Report Issued:** 09-Nov-2020

Test	Result	Unit	Method Reference
mono-PFHxS (1)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
L-PFHxS (1)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Total PFHxS (3)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFHpS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
di-PFOS (5)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
mono-PFOS (5)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
L-PFOS (5)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Total PFOS (7)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Sum PFHxS+PFOS (1)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFNS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFDS	NR	µg/L	AsureQuality Method (LC-MS/MS)
Perfluoroalkylcarboxylic acids			
PFBA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFPeA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFHxA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFHpA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFOA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFNA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFDA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFUnDA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFDoDA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFTrDA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFTeDA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamides			
PFOSA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
NEtFOSA-M	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSA-M	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamidoacetic acids			
NEtFOSAA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSAA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamidoethanols			
NEtFOSE-M	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSE-M	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Telomere Sulfonic acids			
4:2 FTS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
6:2 FTS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
8:2 FTS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Internal Standards			
M3PFBS	111	%	AsureQuality Method (LC-MS/MS)
M3PFHxS	102	%	AsureQuality Method (LC-MS/MS)
M8PFOS	89	%	AsureQuality Method (LC-MS/MS)
M4PFBA	114	%	AsureQuality Method (LC-MS/MS)
M5PFPeA	106	%	AsureQuality Method (LC-MS/MS)
M5PFHxA	104	%	AsureQuality Method (LC-MS/MS)
MPFHpA	102	%	AsureQuality Method (LC-MS/MS)
M8PFOA	98	%	AsureQuality Method (LC-MS/MS)
M9PFNA	94	%	AsureQuality Method (LC-MS/MS)
M6PFDA	94	%	AsureQuality Method (LC-MS/MS)
M7PFUnDA	83	%	AsureQuality Method (LC-MS/MS)

Test	Result	Unit	Method Reference
MPFDoDA	69	%	AsureQuality Method (LC-MS/MS)
MPFTeDA	39	%	AsureQuality Method (LC-MS/MS)
MPFOSA	107	%	AsureQuality Method (LC-MS/MS)
DNEtFOSA	65	%	AsureQuality Method (LC-MS/MS)
DNMeFOSA	84	%	AsureQuality Method (LC-MS/MS)
DNEtFOSAA	85	%	AsureQuality Method (LC-MS/MS)
DNMeFOSAA	95	%	AsureQuality Method (LC-MS/MS)
DNEtFOSE	72	%	AsureQuality Method (LC-MS/MS)
DNMeFOSE	91	%	AsureQuality Method (LC-MS/MS)
M4:2FTS	110	%	AsureQuality Method (LC-MS/MS)
M6:2FTS	117	%	AsureQuality Method (LC-MS/MS)
M8:2FTS	114	%	AsureQuality Method (LC-MS/MS)

Customer Sample Name: 2464741.17 **Lab ID:** 20-300548-3

Sample Condition: Acceptable **Sampled Date**: 31-Oct-2020

Test	Result	Unit	Method Reference
Poly- and Perfluorinated Alkyl Substances (PFAS) in Water			
Perfluoroalkylsulfonic acids			
PFPrS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFBS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFPeS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
di-PFHxS (1)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
mono-PFHxS (1)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
L-PFHxS (1)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Total PFHxS (3)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFHpS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
di-PFOS (5)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
mono-PFOS (5)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
L-PFOS (5)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Total PFOS (7)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Sum PFHxS+PFOS (1)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFNS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFDS	NR	µg/L	AsureQuality Method (LC-MS/MS)
Perfluoroalkylcarboxylic acids			
PFBA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFPeA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFHxA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFHpA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFOA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFNA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFDA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFUnDA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFDoDA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFTrDA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFTeDA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamides			
PFOSA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
NEtFOSA-M	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSA-M	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)

Test	Result	Unit	Method Reference
Perfluorooctanesulfonamidoacetic acids			
NEtFOSAA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSAA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamidoethanols			
NEtFOSE-M	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSE-M	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Telomere Sulfonic acids			
4:2 FTS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
6:2 FTS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
8:2 FTS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Internal Standards			
M3PFBS	100	%	AsureQuality Method (LC-MS/MS)
M3PFHxS	65	%	AsureQuality Method (LC-MS/MS)
M8PFOS	37	%	AsureQuality Method (LC-MS/MS)
M4PFBA	113	%	AsureQuality Method (LC-MS/MS)
M5PFPeA	104	%	AsureQuality Method (LC-MS/MS)
M5PFHxA	101	%	AsureQuality Method (LC-MS/MS)
MPFHpA	85	%	AsureQuality Method (LC-MS/MS)
M8PFOA	67	%	AsureQuality Method (LC-MS/MS)
M9PFNA	56	%	AsureQuality Method (LC-MS/MS)
M6PFDA	47	%	AsureQuality Method (LC-MS/MS)
M7PFUnDA	35	%	AsureQuality Method (LC-MS/MS)
MPFDoDA	26 (R)	%	AsureQuality Method (LC-MS/MS)
MPFTeDA	21 (R)	%	AsureQuality Method (LC-MS/MS)
MPFOSA	86	%	AsureQuality Method (LC-MS/MS)
DNEtFOSA	41	%	AsureQuality Method (LC-MS/MS)
DNMeFOSA	61	%	AsureQuality Method (LC-MS/MS)
DNEtFOSAA	40	%	AsureQuality Method (LC-MS/MS)
DNMeFOSAA	49	%	AsureQuality Method (LC-MS/MS)
DNEtFOSE	52	%	AsureQuality Method (LC-MS/MS)
DNMeFOSE	74	%	AsureQuality Method (LC-MS/MS)
M4:2FTS	108	%	AsureQuality Method (LC-MS/MS)
M6:2FTS	101	%	AsureQuality Method (LC-MS/MS)
M8:2FTS	70	%	AsureQuality Method (LC-MS/MS)

R = Recovery outside method limits

QC Results

Blank

Relates to sample(s) 20-300548-1, 20-300548-2, 20-300548-3

Test	Result	Unit	Method Reference
Poly- and Perfluorinated Alkyl Substances (PFAS) in Water			
Perfluoroalkylsulfonic acids			
PFPrS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFBS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFPeS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
di-PFHxS (1)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
mono-PFHxS (1)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
L-PFHxS (1)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)

AsureQuality Reference: 20-300548 **Report Issued:** 09-Nov-2020

Test	Result	Unit	Method Reference
Total PFHxS (3)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFHpS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
di-PFOS (5)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
mono-PFOS (5)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
L-PFOS (5)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Total PFOS (7)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Sum PFHxS+PFOS (1)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFNS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFDS	NR	µg/L	AsureQuality Method (LC-MS/MS)
Perfluoroalkylcarboxylic acids			
PFBA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFPeA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFHxA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFHpA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFOA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFNA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFDA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFUnDA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFDoDA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFTrDA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFTeDA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamides			
PFOSA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
NEtFOSA-M	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSA-M	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamidoacetic acids			
NEtFOSAA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSAA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamidoethanols			
NEtFOSE-M	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSE-M	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Telomere Sulfonic acids			
4:2 FTS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
6:2 FTS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
8:2 FTS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Internal Standards			
M3PFBS	123	%	AsureQuality Method (LC-MS/MS)
M3PFHxS	112	%	AsureQuality Method (LC-MS/MS)
M8PFOS	93	%	AsureQuality Method (LC-MS/MS)
M4PFBA	124	%	AsureQuality Method (LC-MS/MS)
M5PFPeA	122	%	AsureQuality Method (LC-MS/MS)
M5PFHxA	121	%	AsureQuality Method (LC-MS/MS)
MPFHpA	112	%	AsureQuality Method (LC-MS/MS)
M8PFOA	110	%	AsureQuality Method (LC-MS/MS)
M9PFNA	95	%	AsureQuality Method (LC-MS/MS)
M6PFDA	97	%	AsureQuality Method (LC-MS/MS)

AsureQuality Reference: 20-300548 **Report Issued:** 09-Nov-2020

Test	Result	Unit	Method Reference
M7PFUnDA	75	%	AsureQuality Method (LC-MS/MS)
MPFDoDA	60	%	AsureQuality Method (LC-MS/MS)
MPFTeDA	28 (R)	%	AsureQuality Method (LC-MS/MS)
MPFOSA	93	%	AsureQuality Method (LC-MS/MS)
DNEtFOSA	56	%	AsureQuality Method (LC-MS/MS)
DNMeFOSA	73	%	AsureQuality Method (LC-MS/MS)
DNEtFOSAA	91	%	AsureQuality Method (LC-MS/MS)
DNMeFOSAA	100	%	AsureQuality Method (LC-MS/MS)
DNEtFOSE	69	%	AsureQuality Method (LC-MS/MS)
DNMeFOSE	87	%	AsureQuality Method (LC-MS/MS)
M4:2FTS	122	%	AsureQuality Method (LC-MS/MS)
M6:2FTS	118	%	AsureQuality Method (LC-MS/MS)
M8:2FTS	110	%	AsureQuality Method (LC-MS/MS)

R = Recovery outside method limits

Analysis Summary

Wellington Laboratory

Analysis	Method	Accreditation	Authorised by
Poly- and Perfluorinated Alkyl Substances (PFAS) in Water			
DX-PFCS01, 03-SUITE_B	AsureQuality Method (LC-MS/MS)	IANZ	Amelie Sellier

di-PFHxS (1) = Concentration determined using a branched di-PFHxS isomer standard (399>80 transition)

mono-PFHxS (1) = Concentration determined using a branched mono-PFHxS isomer standard (399>80 transition)

L-PFHxS (1) = Concentration determined using the linear PFHxS isomer standard (399>80 transition)

Total PFHxS (3) = The numerical sum of di-PFHxS (1), mono-PFHxS (1), and L-PFHxS (1)

di-PFOS (5) = Concentration determined using a branched di-PFOS isomer standard (499>80 transition)

mono-PFOS (5) = Concentration determined using a branched mono-PFOS isomer standard (499>80 transition)

L-PFOS (5) = Concentration determined using the linear PFOS isomer standard (499>230 transition)

Total PFOS (7) = The numerical sum of di-PFOS (5), mono-PFOS (5), and L-PFOS (5)

Sum PFHxS+PFOS (1) = The numerical sum of Total PFHxS (3) and Total PFOS (7)

For all Totals, where a component is detected below the LOR, the value of zero is used in the calculation of the sum. The result represents the lower-bound concentration present in the sample.

Reported results are corrected for internal standard recovery

Results that are prefixed with '<' indicate the lowest level at which the analyte can be reported, and that in this case the analyte was not observed above this limit.

NR = Not Reportable

Amelie Sellier

Scientist

Accreditation

Appendix

Analyte LOR Summary

Poly- and Perfluorinated Alkyl Substances (PFAS) in Water - AsureQuality Method (LC-MS/MS)

Analyte	LOR
Perfluoroalkylsulfonic acids	
PFPrS	0.0010 µg/L
PFBS	0.0010 µg/L
PFPeS	0.0010 µg/L
di-PFHxS (1)	0.0010 µg/L
mono-PFHxS (1)	0.0010 µg/L
L-PFHxS (1)	0.0010 µg/L
Total PFHxS (3)	0.0010 µg/L
PFHpS	0.0010 µg/L
di-PFOS (5)	0.0010 µg/L
mono-PFOS (5)	0.0010 µg/L
L-PFOS (5)	0.0010 µg/L
Total PFOS (7)	0.0010 µg/L
Sum PFHxS+PFOS (1)	0.0010 µg/L
PFNS	0.0010 µg/L
PFDS	NR µg/L
Perfluoroalkylcarboxylic acids	
PFBA	0.0010 µg/L
PFPeA	0.0010 µg/L
PFHxA	0.0010 µg/L
PFHpA	0.0010 µg/L
PFOA	0.0010 µg/L
PFNA	0.0010 µg/L
PFDA	0.0010 µg/L
PFUnDA	0.0010 µg/L
PFDoDA	0.0010 µg/L
PFTrDA	0.0010 µg/L
PFTeDA	0.0010 µg/L
Perfluorooctanesulfonamides	
PFOSA	0.0010 µg/L
NEtFOSA-M	0.0010 µg/L
NMeFOSA-M	0.0010 µg/L
Perfluorooctanesulfonamidoacetic acids	
NEtFOSAA	0.0010 µg/L
NMeFOSAA	0.0010 µg/L
Perfluorooctanesulfonamidoethanols	
NEtFOSE-M	0.0010 µg/L
NMeFOSE-M	0.0010 µg/L
Telomere Sulfonic acids	
4:2 FTS	0.0010 µg/L
6:2 FTS	0.0010 µg/L
8:2 FTS	0.0010 µg/L

Analyte Definitions

Poly- and Perfluorinated Alkyl Substances (PFAS) in Water - AsureQuality Method (LC-MS/MS)

Analyte	Full Name
Perfluoroalkylsulfonic acids	
PFPrS	Perfluoro-1-propanesulfonic acid
PFBS	Perfluoro-1-butanesulfonic acid
PFPeS	Perfluoro-1-pentanesulfonic acid
di-PFHxS (1)	Total Perfluorodimethylbutane sulfonic acids
mono-PFHxS (1)	Total Perfluoromethylpentane sulfonic acids
L-PFHxS (1)	Linear Perfluorohexanesulfonic acid
PFHpS	Perfluoro-1-heptanesulfonic acid
di-PFOS (5)	Total Perfluorodimethylhexane sulfonic acids
mono-PFOS (5)	Total Perfluoromethylheptane sulfonic acids
L-PFOS (5)	Linear Perfluorooctanesulfonic acid
PFNS	Perfluoro-1-nonanesulfonic acid
PFDS	Perfluoro-1-decanesulfonic acid
Perfluoroalkylcarboxylic acids	
PFBA	Perfluoro-n-butanoic acid
PFPeA	Perfluoro-n-pentanoic acid
PFHxA	Perfluoro-n-hexanoic acid
PFHpA	Perfluoro-n-heptanoic acid
PFOA	Perfluoro-n-octanoic acid
PFNA	Perfluoro-n-nonanoic acid
PFDA	Perfluoro-n-decanoic acid
PFUnDA	Perfluoro-n-undecanoic acid
PFDoDA	Perfluoro-n-dodecanoic acid
PFTrDA	Perfluoro-n-tridecanoic acid
PFTeDA	Perfluoro-n-tetradecanoic acid
Perfluorooctanesulfonamides	
PFOSA	Perfluoro-1-octanesulfonamide
NEtFOSA-M	N-ethylperfluoro-1-octanesulfonamide
NMeFOSA-M	N-methylperfluoro-1-octanesulfonamide
Perfluorooctanesulfonamidoacetic acids	
NEtFOSAA	N-ethylperfluoro-1-octanesulfonamidoacetic acid
NMeFOSAA	N-methylperfluoro-1-octanesulfonamidoacetic acid
Perfluorooctanesulfonamidoethanols	
NEtFOSE-M	2-(N-ethylperfluoro-1-octanesulfonamido)-ethanol
NMeFOSE-M	2-(N-methylperfluoro-1-octanesulfonamido)-ethanol
Telomere Sulfonic acids	
4:2 FTS	1H,1H,2H,2H-perfluoro-1-hexanesulfonic acid
6:2 FTS	1H,1H,2H,2H-perfluoro-1-octanesulfonic acid
8:2 FTS	1H,1H,2H,2H-perfluoro-1-decanesulfonic acid
Internal Standards	
M3PFBS	Perfluoro-1-[2,3,4-13C3]butanesulfonic acid
M3PFHxS	Perfluoro-1-[1,2,3-13C3]hexanesulfonic acid
M8PFOS	Perfluoro-1-[13C8]octanesulfonic acid
M4PFBA	Perfluoro-n-[1,2,3,4-13C4]butanoic acid
M5PFPeA	Perfluoro-n-[1,2,3,4,5-13C5]pentanoic acid
M5PFHxA	Perfluoro-n-[1,2,3,4,6-13C5]hexanoic acid
MPFHpA	Perfluoro-n-[-1,2,3,4-13C4]heptanoic acid
M8PFOA	Perfluoro-n-[13C8]octanoic acid
M9PFNA	Perfluoro-n-[13C9]nonanoic acid
M6PFDA	Perfluoro-n-[1,2,3,4,5,6-13C6]decanoic acid
M7PFUnDA	Perfluoro-n-[1,2,3,4,5,6,7-13C7]undecanoic acid
MPFDoDA	Perfluoro-n-[1,2-13C2]dodecanoic acid
MPFTeDA	Perfluoro-n-[1,2-13C2]tetradecanoic acid

Analyte	Full Name
MPFOSA	Perfluoro-1-[13C8]octanesulfonamide
DNEtFOSA	N-ethyl-D5-perfluoro-1-octanesulfonamide
DNMeFOSA	N-methyl-D3-perfluoro-1-octanesulfonamide
DNEtFOSAA	N-ethyl-D5-perfluoro-1-octanesulfonamidoacetic acid
DNMeFOSAA	N-methyl-D3-perfluoro-1-octanesulfonamidoacetic acid
DNEtFOSE	2-(N-ethyl-D5-perfluoro-1-octanesulfonamido)ethan-D4-ol
DNMeFOSE	2-(N-methyl-D3-perfluoro-1-octanesulfonamido)ethan-D4-ol
M4:2FTS	1H,1H,2H,2H-perfluoro-1-[1,2-13C2]-hexane sulfonic acid
M6:2FTS	1H,1H,2H,2H-perfluoro-1-[1,2-13C2]-octane sulfonic acid
M8:2FTS	1H,1H,2H,2H-perfluoro-1-[1,2-13C2]-decane sulfonic acid

LOR = Limit of Reporting LOD = Limit of Detection NR = Not Reportable

Hill Laboratories
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Certificate of Analysis

Client:	Beca Limited	**Lab No:**	2464945	A2Pv1
Contact:	Vicky Kennaugh	**Date Received:**	31-Oct-2020	
	C/- Beca Limited	**Date Reported:**	03-Nov-2020	
	PO Box 6345	**Quote No:**	96766	
	Wellesley Street	**Order No:**	20:162	
	Auckland 1141	**Client Reference:**	3126366	
		Add. Client Ref:	Sampled: 21-22/10/20	
		Submitted By:	Vicky Kennaugh	

Sample Type: Building Material

Sample Name	Lab Number	Sample Category	Sample Weight on receipt (g)	Asbestos Presence / Absence	Description of Asbestos in Non Homogeneous Samples
TP211 Stockpile (0)	2464945.1	Fibre Cement	105.08	Amosite (Brown Asbestos) detected. Chrysotile (White Asbestos) detected.	-
TP212 Stockpile (0)	2464945.2	Fibre Cement	10.62	Amosite (Brown Asbestos) detected. Chrysotile (White Asbestos) detected.	-
TP211 Stockpile (0) #2	2464945.3	Other	98.95	Asbestos NOT detected. Organic fibres detected.	-
Sample 1m from TP212	2464945.4	Fibre Cement	4.78	Amosite (Brown Asbestos) detected. Chrysotile (White Asbestos) detected. Crocidolite (Blue Asbestos) detected.	-

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.

Summary of Methods

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

Sample Type: Building Material

Test	Method Description	Default Detection Limit	Sample No
Asbestos in Bulk Material			
Sample Category	Assessment of sample type. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland.	-	1-4
Sample Weight on receipt	Sample weight. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland.	0.01 g	1-4
Asbestos Presence / Absence	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0.01%	1-4
Description of Asbestos in Non Homogenous Samples	Form, dimensions and/or weight of asbestos fibres present. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	-	1-4

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

Dates of testing are available on request. For completion dates of individual analyses please contact the laboratory.

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

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

Danielle Carter BSc, PGDipSci, MSc
Laboratory Technician - Asbestos

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Certificate of Analysis

Client:	Beca Limited	**Lab No:**	2461227	SUPv1
Contact:	Vicky Kennaugh	**Date Received:**	23-Oct-2020	
	C/- Beca Limited	**Date Reported:**	30-Oct-2020	
	PO Box 6345	**Quote No:**	107787	
	Wellesley Street	**Order No:**	20:162	
	Auckland 1141	**Client Reference:**	3126366	
		Submitted By:	Vicky Kennaugh	

Sample Type: Soil

Sample Name:		TP101 (0.55) 20-Oct-2020	TP102 (1.35) 20-Oct-2020	TP103 (3) 20-Oct-2020	TP104 (0.2) 20-Oct-2020
Lab Number:		2461227.1	2461227.5	2461227.8	2461227.9
Individual Tests					
Dry Matter	g/100g as rcvd	76.1 ± 5.0	68.6 ± 5.0	77.9 ± 5.0	93.7 ± 5.0
Heavy Metals with Mercury, Screen Level					
Total Recoverable Arsenic	mg/kg dry wt	< 2 ± 1.4	< 2 ± 1.4	< 2 ± 1.4	< 2 ± 1.4
Total Recoverable Cadmium	mg/kg dry wt	1.19 ± 0.18	< 0.10 ± 0.067	0.147 ± 0.069	< 0.10 ± 0.067
Total Recoverable Chromium	mg/kg dry wt	16.9 ± 3.0	15.4 ± 2.8	30.2 ± 4.9	810 ± 130
Total Recoverable Copper	mg/kg dry wt	25.3 ± 3.7	5.5 ± 1.6	4.2 ± 1.5	72 ± 10
Total Recoverable Lead	mg/kg dry wt	15.8 ± 2.4	8.0 ± 1.3	4.73 ± 0.76	4.82 ± 0.77
Total Recoverable Mercury	mg/kg dry wt	< 0.10 ± 0.067	< 0.10 ± 0.067	< 0.10 ± 0.067	< 0.10 ± 0.067
Total Recoverable Nickel	mg/kg dry wt	6.8 ± 1.6	14.1 ± 2.3	10.6 ± 1.9	122 ± 16
Total Recoverable Zinc	mg/kg dry wt	52.0 ± 4.6	35.2 ± 3.7	41.5 ± 4.0	105.0 ± 7.9
BTEX in Soil by Headspace GC-MS					
Benzene	mg/kg dry wt	< 0.06 ± 0.034	-	-	-
Toluene	mg/kg dry wt	< 0.06 ± 0.034	-	-	-
Ethylbenzene	mg/kg dry wt	< 0.06 ± 0.034	-	-	-
m&p-Xylene	mg/kg dry wt	< 0.11 ± 0.069	-	-	-
o-Xylene	mg/kg dry wt	< 0.06 ± 0.034	-	-	-
Polycyclic Aromatic Hydrocarbons Screening in Soil*					
Total of Reported PAHs in Soil	mg/kg dry wt	< 0.4	-	-	-
1-Methylnaphthalene	mg/kg dry wt	< 0.014 ± 0.032	-	-	-
2-Methylnaphthalene	mg/kg dry wt	< 0.014 ± 0.032	-	-	-
Acenaphthylene	mg/kg dry wt	< 0.014 ± 0.0068	-	-	-
Acenaphthene	mg/kg dry wt	< 0.014 ± 0.0071	-	-	-
Anthracene	mg/kg dry wt	< 0.014 ± 0.0072	-	-	-
Benzo[a]anthracene	mg/kg dry wt	0.0212 ± 0.0083	-	-	-
Benzo[a]pyrene (BAP)	mg/kg dry wt	0.0276 ± 0.0070	-	-	-
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	0.0356 ± 0.0099	-	-	-
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	0.0351 ± 0.0099	-	-	-
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	0.0241 ± 0.0081	-	-	-
Benzo[e]pyrene	mg/kg dry wt	0.0169 ± 0.0068	-	-	-
Benzo[g,h,i]perylene	mg/kg dry wt	0.0168 ± 0.0071	-	-	-
Benzo[k]fluoranthene	mg/kg dry wt	< 0.014 ± 0.0069	-	-	-
Chrysene	mg/kg dry wt	0.0196 ± 0.0073	-	-	-
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.014 ± 0.0069	-	-	-
Fluoranthene	mg/kg dry wt	0.0471 ± 0.0082	-	-	-
Fluorene	mg/kg dry wt	< 0.014 ± 0.0068	-	-	-

Sample Type: Soil					
Sample Name:		TP101 (0.55) 20-Oct-2020	TP102 (1.35) 20-Oct-2020	TP103 (3) 20-Oct-2020	TP104 (0.2) 20-Oct-2020
Lab Number:		2461227.1	2461227.5	2461227.8	2461227.9
Polycyclic Aromatic Hydrocarbons Screening in Soil*					
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	0.0170 ± 0.0068	-	-	-
Naphthalene	mg/kg dry wt	< 0.07 ± 0.035	-	-	-
Perylene	mg/kg dry wt	< 0.014 ± 0.0067	-	-	-
Phenanthrene	mg/kg dry wt	0.0214 ± 0.0073	-	-	-
Pyrene	mg/kg dry wt	0.0453 ± 0.0088	-	-	-
Total Petroleum Hydrocarbons in Soil					
C7 - C9	mg/kg dry wt	< 8 ± 5.4	< 9 ± 5.4	< 8 ± 5.4	< 8 ± 5.4
C10 - C14	mg/kg dry wt	< 20 ± 7.6	< 20 ± 7.6	< 20 ± 7.6	< 20 ± 7.6
C15 - C36	mg/kg dry wt	< 40 ± 9.3	< 40 ± 9.4	< 40 ± 9.3	< 40 ± 9.3
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 70 ± 14	< 70 ± 14	< 70 ± 14	< 70 ± 14

Sample Name:		TP104 (0.8) 20-Oct-2020	TP105 (0.3) 20-Oct-2020	TP105 (0.7) 20-Oct-2020	TP106 (0.5) 20-Oct-2020
Lab Number:		2461227.10	2461227.12	2461227.13	2461227.16
Individual Tests					
Dry Matter	g/100g as rcvd	75.3 ± 5.0	94.2 ± 5.0	73.1 ± 5.0	69.3 ± 5.0
Heavy Metals with Mercury, Screen Level					
Total Recoverable Arsenic	mg/kg dry wt	< 2 ± 1.4	4.1 ± 1.5	4.7 ± 1.5	< 2 ± 1.4
Total Recoverable Cadmium	mg/kg dry wt	< 0.10 ± 0.067	< 0.10 ± 0.067	< 0.10 ± 0.067	< 0.10 ± 0.067
Total Recoverable Chromium	mg/kg dry wt	18.3 ± 3.2	318 ± 50	28.7 ± 4.7	46.6 ± 7.4
Total Recoverable Copper	mg/kg dry wt	3.8 ± 1.5	47.5 ± 6.6	5.3 ± 1.5	24.1 ± 3.6
Total Recoverable Lead	mg/kg dry wt	6.8 ± 1.1	10.8 ± 1.7	6.34 ± 0.99	7.6 ± 1.2
Total Recoverable Mercury	mg/kg dry wt	< 0.10 ± 0.067	< 0.10 ± 0.067	< 0.10 ± 0.067	< 0.10 ± 0.067
Total Recoverable Nickel	mg/kg dry wt	6.4 ± 1.6	65.1 ± 8.5	8.9 ± 1.8	27.5 ± 3.8
Total Recoverable Zinc	mg/kg dry wt	14.9 ± 2.9	71.0 ± 5.7	16.7 ± 2.9	40.3 ± 3.9
Total Petroleum Hydrocarbons in Soil					
C7 - C9	mg/kg dry wt	< 8 ± 5.4	< 8 ± 5.4	< 9 ± 5.4	< 9 ± 5.4
C10 - C14	mg/kg dry wt	< 20 ± 7.6	< 20 ± 7.6	< 20 ± 7.6	< 20 ± 7.6
C15 - C36	mg/kg dry wt	< 40 ± 9.3	< 40 ± 9.3	< 40 ± 9.3	< 40 ± 9.3
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 70 ± 14	< 70 ± 14	< 70 ± 14	< 70 ± 14

Sample Name:		TP106 (1.9) 20-Oct-2020	TP107 (0.1) 20-Oct-2020	TP107 (0.9) 20-Oct-2020	TP108 (2.9) 20-Oct-2020
Lab Number:		2461227.18	2461227.19	2461227.20	2461227.23
Individual Tests					
Dry Matter	g/100g as rcvd	74.2 ± 5.0	71.8 ± 5.0	77.3 ± 5.0	30.9 ± 5.0
Heavy Metals with Mercury, Screen Level					
Total Recoverable Arsenic	mg/kg dry wt	< 2 ± 1.4	9.6 ± 2.0	< 2 ± 1.4	3.4 ± 1.4
Total Recoverable Cadmium	mg/kg dry wt	< 0.10 ± 0.067	< 0.10 ± 0.067	< 0.10 ± 0.067	0.161 ± 0.069
Total Recoverable Chromium	mg/kg dry wt	6.4 ± 1.7	40.1 ± 6.4	11.1 ± 2.2	36.8 ± 5.9
Total Recoverable Copper	mg/kg dry wt	5.3 ± 1.5	19.7 ± 3.0	2.5 ± 1.4	50.8 ± 7.1
Total Recoverable Lead	mg/kg dry wt	5.81 ± 0.91	19.9 ± 3.0	6.19 ± 0.97	4.41 ± 0.71
Total Recoverable Mercury	mg/kg dry wt	0.100 ± 0.067	< 0.10 ± 0.067	< 0.10 ± 0.067	< 0.10 ± 0.067
Total Recoverable Nickel	mg/kg dry wt	5.8 ± 1.6	30.6 ± 4.2	8.0 ± 1.7	74.2 ± 9.6
Total Recoverable Zinc	mg/kg dry wt	4.2 ± 2.7	47.7 ± 4.3	18.8 ± 3.0	80.2 ± 6.3
Total Petroleum Hydrocarbons in Soil					
C7 - C9	mg/kg dry wt	< 8 ± 5.4	< 9 ± 5.4	< 8 ± 5.4	< 19 ± 6.6
C10 - C14	mg/kg dry wt	< 20 ± 7.6	< 20 ± 7.6	< 20 ± 7.6	< 40 ± 9.3
C15 - C36	mg/kg dry wt	< 40 ± 9.3	< 40 ± 9.3	< 40 ± 9.3	258 ± 19
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 70 ± 14	< 70 ± 14	< 70 ± 14	258 ± 22

Sample Name:		TP109 (0.8) 20-Oct-2020	TP109 (0.8 DUP) 20-Oct-2020	TP109 (1.1) 20-Oct-2020	TP109 (2.3) 20-Oct-2020
Lab Number:		2461227.24	2461227.25	2461227.26	2461227.27
Individual Tests					
Dry Matter	g/100g as rcvd	73.1 ± 5.0	74.9 ± 5.0	73.9 ± 5.0	78.0 ± 5.0

Sample Type: Soil					
Sample Name:		TP109 (0.8) 20-Oct-2020	TP109 (0.8 DUP) 20-Oct-2020	TP109 (1.1) 20-Oct-2020	TP109 (2.3) 20-Oct-2020
Lab Number:		2461227.24	2461227.25	2461227.26	2461227.27
Heavy Metals with Mercury, Screen Level					
Total Recoverable Arsenic	mg/kg dry wt	< 2 ± 1.4	< 2 ± 1.4	< 2 ± 1.4	< 2 ± 1.4
Total Recoverable Cadmium	mg/kg dry wt	< 0.10 ± 0.067	< 0.10 ± 0.067	< 0.10 ± 0.067	< 0.10 ± 0.067
Total Recoverable Chromium	mg/kg dry wt	12.1 ± 2.3	9.9 ± 2.1	4.6 ± 1.5	27.7 ± 4.5
Total Recoverable Copper	mg/kg dry wt	5.0 ± 1.5	4.7 ± 1.5	2.6 ± 1.4	34.6 ± 4.9
Total Recoverable Lead	mg/kg dry wt	8.0 ± 1.3	7.2 ± 1.2	4.77 ± 0.76	4.56 ± 0.73
Total Recoverable Mercury	mg/kg dry wt	< 0.10 ± 0.067	< 0.10 ± 0.067	< 0.10 ± 0.067	< 0.10 ± 0.067
Total Recoverable Nickel	mg/kg dry wt	9.2 ± 1.8	7.8 ± 1.7	5.4 ± 1.5	74.8 ± 9.7
Total Recoverable Zinc	mg/kg dry wt	25.2 ± 3.2	22.7 ± 3.1	13.7 ± 2.9	68.9 ± 5.6
BTEX in Soil by Headspace GC-MS					
Benzene	mg/kg dry wt	< 0.06 ± 0.035	< 0.06 ± 0.035	< 0.06 ± 0.035	-
Toluene	mg/kg dry wt	< 0.06 ± 0.035	< 0.06 ± 0.034	< 0.06 ± 0.035	-
Ethylbenzene	mg/kg dry wt	< 0.06 ± 0.035	< 0.06 ± 0.035	< 0.06 ± 0.035	-
m&p-Xylene	mg/kg dry wt	< 0.12 ± 0.070	< 0.12 ± 0.069	< 0.12 ± 0.070	-
o-Xylene	mg/kg dry wt	< 0.06 ± 0.035	< 0.06 ± 0.035	< 0.06 ± 0.035	-
Polycyclic Aromatic Hydrocarbons Screening in Soil*					
Total of Reported PAHs in Soil	mg/kg dry wt	< 0.4	< 0.4	< 0.4	-
1-Methylnaphthalene	mg/kg dry wt	< 0.014 ± 0.032	< 0.014 ± 0.032	< 0.014 ± 0.032	-
2-Methylnaphthalene	mg/kg dry wt	< 0.014 ± 0.032	< 0.014 ± 0.032	< 0.014 ± 0.032	-
Acenaphthylene	mg/kg dry wt	< 0.014 ± 0.0068	< 0.014 ± 0.0068	< 0.014 ± 0.0068	-
Acenaphthene	mg/kg dry wt	< 0.014 ± 0.0072	< 0.014 ± 0.0071	< 0.014 ± 0.0071	-
Anthracene	mg/kg dry wt	< 0.014 ± 0.0073	< 0.014 ± 0.0072	< 0.014 ± 0.0072	-
Benzo[a]anthracene	mg/kg dry wt	< 0.014 ± 0.0072	< 0.014 ± 0.0071	< 0.014 ± 0.0071	-
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.014 ± 0.0067	< 0.014 ± 0.0067	< 0.014 ± 0.0067	-
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	< 0.04 ± 0.0097	< 0.04 ± 0.0097	< 0.04 ± 0.0097	-
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	< 0.04 ± 0.0097	< 0.04 ± 0.0097	< 0.04 ± 0.0097	-
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.014 ± 0.0070	< 0.014 ± 0.0070	< 0.014 ± 0.0070	-
Benzo[e]pyrene	mg/kg dry wt	< 0.014 ± 0.0067	< 0.014 ± 0.0067	< 0.014 ± 0.0067	-
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.014 ± 0.0069	< 0.014 ± 0.0068	< 0.014 ± 0.0068	-
Benzo[k]fluoranthene	mg/kg dry wt	< 0.014 ± 0.0069	< 0.014 ± 0.0069	< 0.014 ± 0.0069	-
Chrysene	mg/kg dry wt	< 0.014 ± 0.0069	< 0.014 ± 0.0069	< 0.014 ± 0.0069	-
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.014 ± 0.0069	< 0.014 ± 0.0069	< 0.014 ± 0.0069	-
Fluoranthene	mg/kg dry wt	< 0.014 ± 0.0068	< 0.014 ± 0.0068	< 0.014 ± 0.0068	-
Fluorene	mg/kg dry wt	< 0.014 ± 0.0068	< 0.014 ± 0.0068	< 0.014 ± 0.0068	-
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.014 ± 0.0068	< 0.014 ± 0.0068	< 0.014 ± 0.0068	-
Naphthalene	mg/kg dry wt	< 0.07 ± 0.036	< 0.07 ± 0.035	< 0.07 ± 0.035	-
Perylene	mg/kg dry wt	< 0.014 ± 0.0067	< 0.014 ± 0.0067	< 0.014 ± 0.0067	-
Phenanthrene	mg/kg dry wt	< 0.014 ± 0.0069	< 0.014 ± 0.0069	< 0.014 ± 0.0069	-
Pyrene	mg/kg dry wt	< 0.014 ± 0.0069	< 0.014 ± 0.0069	< 0.014 ± 0.0069	-
Total Petroleum Hydrocarbons in Soil					
C7 - C9	mg/kg dry wt	< 9 ± 5.4	< 8 ± 5.4	< 8 ± 5.4	< 8 ± 5.4
C10 - C14	mg/kg dry wt	< 20 ± 7.6	< 20 ± 7.6	< 20 ± 7.6	< 20 ± 7.6
C15 - C36	mg/kg dry wt	< 40 ± 9.3	< 40 ± 9.3	< 40 ± 9.3	< 40 ± 9.3
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 70 ± 14	< 70 ± 14	< 70 ± 14	< 70 ± 14

Sample Name:		TP109 (2.3 DUP) 20-Oct-2020	TP110 (1.1) 20-Oct-2020	TP111 (0) 20-Oct-2020	TP111 (1.2) 20-Oct-2020
Lab Number:		2461227.28	2461227.29	2461227.31	2461227.33
Individual Tests					
Dry Matter	g/100g as rcvd	79.2 ± 5.0	72.5 ± 5.0	70.7 ± 5.0	74.7 ± 5.0
Heavy Metals with Mercury, Screen Level					
Total Recoverable Arsenic	mg/kg dry wt	< 2 ± 1.4	< 2 ± 1.4	7.4 ± 1.8	< 2 ± 1.4
Total Recoverable Cadmium	mg/kg dry wt	< 0.10 ± 0.067	< 0.10 ± 0.067	0.103 ± 0.067	< 0.10 ± 0.067
Total Recoverable Chromium	mg/kg dry wt	27.0 ± 4.4	15.1 ± 2.7	33.2 ± 5.4	25.2 ± 4.2

Sample Type: Soil					
Sample Name:		TP109 (2.3 DUP) 20-Oct-2020	TP110 (1.1) 20-Oct-2020	TP111 (0) 20-Oct-2020	TP111 (1.2) 20-Oct-2020
Lab Number:		2461227.28	2461227.29	2461227.31	2461227.33
Heavy Metals with Mercury, Screen Level					
Total Recoverable Copper	mg/kg dry wt	36.1 ± 5.1	4.2 ± 1.5	21.6 ± 3.3	5.3 ± 1.5
Total Recoverable Lead	mg/kg dry wt	4.72 ± 0.76	8.1 ± 1.3	19.2 ± 2.9	8.0 ± 1.3
Total Recoverable Mercury	mg/kg dry wt	< 0.10 ± 0.067	< 0.10 ± 0.067	< 0.10 ± 0.067	< 0.10 ± 0.067
Total Recoverable Nickel	mg/kg dry wt	71.8 ± 9.3	6.1 ± 1.6	48.0 ± 6.3	11.8 ± 2.0
Total Recoverable Zinc	mg/kg dry wt	70.6 ± 5.7	15.4 ± 2.9	55.0 ± 4.7	24.2 ± 3.2
BTEX in Soil by Headspace GC-MS					
Benzene	mg/kg dry wt	-	< 0.06 ± 0.035	-	-
Toluene	mg/kg dry wt	-	< 0.06 ± 0.035	-	-
Ethylbenzene	mg/kg dry wt	-	< 0.06 ± 0.035	-	-
m&p-Xylene	mg/kg dry wt	-	< 0.12 ± 0.070	-	-
o-Xylene	mg/kg dry wt	-	< 0.06 ± 0.035	-	-
Polycyclic Aromatic Hydrocarbons Screening in Soil*					
Total of Reported PAHs in Soil	mg/kg dry wt	-	< 0.4	-	-
1-Methylnaphthalene	mg/kg dry wt	-	< 0.014 ± 0.032	-	-
2-Methylnaphthalene	mg/kg dry wt	-	< 0.014 ± 0.032	-	-
Acenaphthylene	mg/kg dry wt	-	< 0.014 ± 0.0068	-	-
Acenaphthene	mg/kg dry wt	-	< 0.014 ± 0.0072	-	-
Anthracene	mg/kg dry wt	-	< 0.014 ± 0.0073	-	-
Benzo[a]anthracene	mg/kg dry wt	-	< 0.014 ± 0.0072	-	-
Benzo[a]pyrene (BAP)	mg/kg dry wt	-	< 0.014 ± 0.0067	-	-
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	-	< 0.04 ± 0.0097	-	-
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	-	< 0.04 ± 0.0097	-	-
Benzo[b]fluoranthene + Benzo[j]fluoranthene	mg/kg dry wt	-	< 0.014 ± 0.0070	-	-
Benzo[e]pyrene	mg/kg dry wt	-	< 0.014 ± 0.0067	-	-
Benzo[g,h,i]perylene	mg/kg dry wt	-	< 0.014 ± 0.0069	-	-
Benzo[k]fluoranthene	mg/kg dry wt	-	< 0.014 ± 0.0069	-	-
Chrysene	mg/kg dry wt	-	< 0.014 ± 0.0070	-	-
Dibenzo[a,h]anthracene	mg/kg dry wt	-	< 0.014 ± 0.0069	-	-
Fluoranthene	mg/kg dry wt	-	< 0.014 ± 0.0068	-	-
Fluorene	mg/kg dry wt	-	< 0.014 ± 0.0068	-	-
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	-	< 0.014 ± 0.0068	-	-
Naphthalene	mg/kg dry wt	-	< 0.07 ± 0.036	-	-
Perylene	mg/kg dry wt	-	< 0.014 ± 0.0067	-	-
Phenanthrene	mg/kg dry wt	-	< 0.014 ± 0.0069	-	-
Pyrene	mg/kg dry wt	-	< 0.014 ± 0.0069	-	-
Total Petroleum Hydrocarbons in Soil					
C7 - C9	mg/kg dry wt	< 8 ± 5.4	< 9 ± 5.4	< 9 ± 5.4	< 8 ± 5.4
C10 - C14	mg/kg dry wt	< 20 ± 7.6	< 20 ± 7.6	< 20 ± 7.6	< 20 ± 7.6
C15 - C36	mg/kg dry wt	< 40 ± 9.3	< 40 ± 9.3	192 ± 18	< 40 ± 9.3
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 70 ± 14	< 70 ± 14	193 ± 20	< 70 ± 14

Sample Name:		TP112 (0.3) 20-Oct-2020	TP112 (0.7) 20-Oct-2020	TP113 (0.2) 20-Oct-2020	TP113 (2.35) 20-Oct-2020
Lab Number:		2461227.35	2461227.36	2461227.39	2461227.41
Individual Tests					
Dry Matter	g/100g as rcvd	78.0 ± 5.0	80.0 ± 5.0	74.0 ± 5.0	67.4 ± 5.0
Heavy Metals with Mercury, Screen Level					
Total Recoverable Arsenic	mg/kg dry wt	6.3 ± 1.7	< 2 ± 1.4	6.5 ± 1.7	< 2 ± 1.4
Total Recoverable Cadmium	mg/kg dry wt	< 0.10 ± 0.067	< 0.10 ± 0.067	0.111 ± 0.068	< 0.10 ± 0.067
Total Recoverable Chromium	mg/kg dry wt	47.3 ± 7.5	11.4 ± 2.2	49.0 ± 7.8	36.1 ± 5.8
Total Recoverable Copper	mg/kg dry wt	28.4 ± 4.1	2.4 ± 1.4	22.4 ± 3.4	39.4 ± 5.6
Total Recoverable Lead	mg/kg dry wt	15.9 ± 2.4	4.08 ± 0.67	177 ± 27	5.34 ± 0.84
Total Recoverable Mercury	mg/kg dry wt	< 0.10 ± 0.067	< 0.10 ± 0.067	< 0.10 ± 0.067	< 0.10 ± 0.067

Sample Type: Soil					
Sample Name:		TP112 (0.3) 20-Oct-2020	TP112 (0.7) 20-Oct-2020	TP113 (0.2) 20-Oct-2020	TP113 (2.35) 20-Oct-2020
Lab Number:		2461227.35	2461227.36	2461227.39	2461227.41
Heavy Metals with Mercury, Screen Level					
Total Recoverable Nickel	mg/kg dry wt	57.2 ± 7.5	4.5 ± 1.5	43.7 ± 5.8	84 ± 11
Total Recoverable Zinc	mg/kg dry wt	47.7 ± 4.3	6.5 ± 2.7	79.6 ± 6.2	72.1 ± 5.8
Total Petroleum Hydrocarbons in Soil					
C7 - C9	mg/kg dry wt	< 8 ± 5.4	< 8 ± 5.4	< 9 ± 5.4	< 9 ± 5.4
C10 - C14	mg/kg dry wt	< 20 ± 7.6	< 20 ± 7.6	< 20 ± 7.6	< 20 ± 7.7
C15 - C36	mg/kg dry wt	< 40 ± 9.3	< 40 ± 9.3	66.9 ± 9.9	< 40 ± 9.4
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 70 ± 14	< 70 ± 14	< 70 ± 14	< 70 ± 14

Sample Name:		TP114 (0.2) 20-Oct-2020	TP114 (1.1) 20-Oct-2020	TP115 (0.4) 20-Oct-2020	TP115 (2) 20-Oct-2020
Lab Number:		2461227.42	2461227.44	2461227.47	2461227.49
Individual Tests					
Dry Matter	g/100g as rcvd	81.4 ± 5.0	68.3 ± 5.0	78.3 ± 5.0	68.8 ± 5.0
Heavy Metals with Mercury, Screen Level					
Total Recoverable Arsenic	mg/kg dry wt	< 2 ± 1.4	< 2 ± 1.4	< 2 ± 1.4	< 2 ± 1.4
Total Recoverable Cadmium	mg/kg dry wt	< 0.10 ± 0.067	< 0.10 ± 0.067	< 0.10 ± 0.067	< 0.10 ± 0.067
Total Recoverable Chromium	mg/kg dry wt	16.9 ± 3.0	28.3 ± 4.6	18.0 ± 3.1	49.4 ± 7.8
Total Recoverable Copper	mg/kg dry wt	10.7 ± 2.0	6.6 ± 1.6	3.8 ± 1.5	34.1 ± 4.9
Total Recoverable Lead	mg/kg dry wt	22.4 ± 3.4	7.5 ± 1.2	9.6 ± 1.5	6.18 ± 0.96
Total Recoverable Mercury	mg/kg dry wt	< 0.10 ± 0.067	< 0.10 ± 0.067	< 0.10 ± 0.067	< 0.10 ± 0.067
Total Recoverable Nickel	mg/kg dry wt	15.1 ± 2.4	10.6 ± 1.9	5.2 ± 1.5	75.7 ± 9.8
Total Recoverable Zinc	mg/kg dry wt	27.9 ± 3.3	23.0 ± 3.2	12.6 ± 2.8	192 ± 14
Total Petroleum Hydrocarbons in Soil					
C7 - C9	mg/kg dry wt	< 8 ± 5.4	< 9 ± 5.4	< 8 ± 5.4	< 9 ± 5.4
C10 - C14	mg/kg dry wt	< 20 ± 7.6	< 20 ± 7.7	< 20 ± 7.6	< 20 ± 7.6
C15 - C36	mg/kg dry wt	< 40 ± 9.3	< 40 ± 9.4	< 40 ± 9.3	< 40 ± 9.3
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 70 ± 14	< 70 ± 14	< 70 ± 14	< 70 ± 14

Sample Name:		TP101 (0) 19-Oct-2020	TP102 (0) 19-Oct-2020	TP103 (0) 19-Oct-2020	TP108 (0) 19-Oct-2020
Lab Number:		2461227.53	2461227.54	2461227.55	2461227.56
Individual Tests					
Dry Matter	g/100g as rcvd	43.4 ± 5.0	67.0 ± 5.0	66.2 ± 5.0	73.9 ± 5.0
Heavy Metals with Mercury, Screen Level					
Total Recoverable Arsenic	mg/kg dry wt	4.6 ± 1.5	5.0 ± 1.5	6.9 ± 1.7	5.7 ± 1.6
Total Recoverable Cadmium	mg/kg dry wt	0.513 ± 0.097	0.257 ± 0.075	< 0.10 ± 0.067	< 0.10 ± 0.067
Total Recoverable Chromium	mg/kg dry wt	21.2 ± 3.6	16.6 ± 2.9	40.0 ± 6.4	29.3 ± 4.8
Total Recoverable Copper	mg/kg dry wt	33.7 ± 4.8	15.1 ± 2.5	20.5 ± 3.1	15.7 ± 2.6
Total Recoverable Lead	mg/kg dry wt	30.6 ± 4.6	40.5 ± 6.1	19.7 ± 3.0	16.5 ± 2.5
Total Recoverable Mercury	mg/kg dry wt	< 0.10 ± 0.067	< 0.10 ± 0.067	< 0.10 ± 0.067	< 0.10 ± 0.067
Total Recoverable Nickel	mg/kg dry wt	36.9 ± 5.0	10.2 ± 1.9	30.0 ± 4.1	22.7 ± 3.2
Total Recoverable Zinc	mg/kg dry wt	227 ± 17	40.8 ± 4.0	50.8 ± 4.5	37.3 ± 3.8
Total Petroleum Hydrocarbons in Soil					
C7 - C9	mg/kg dry wt	< 30 ± 7.6	< 9 ± 5.5	< 9 ± 5.5	< 8 ± 5.4
C10 - C14	mg/kg dry wt	< 60 ± 11	< 20 ± 7.7	< 20 ± 7.7	< 20 ± 7.6
C15 - C36	mg/kg dry wt	618 ± 27	< 40 ± 9.4	83 ± 11	< 40 ± 9.3
Total hydrocarbons (C7 - C36)	mg/kg dry wt	622 ± 30	< 70 ± 14	86 ± 14	< 70 ± 14

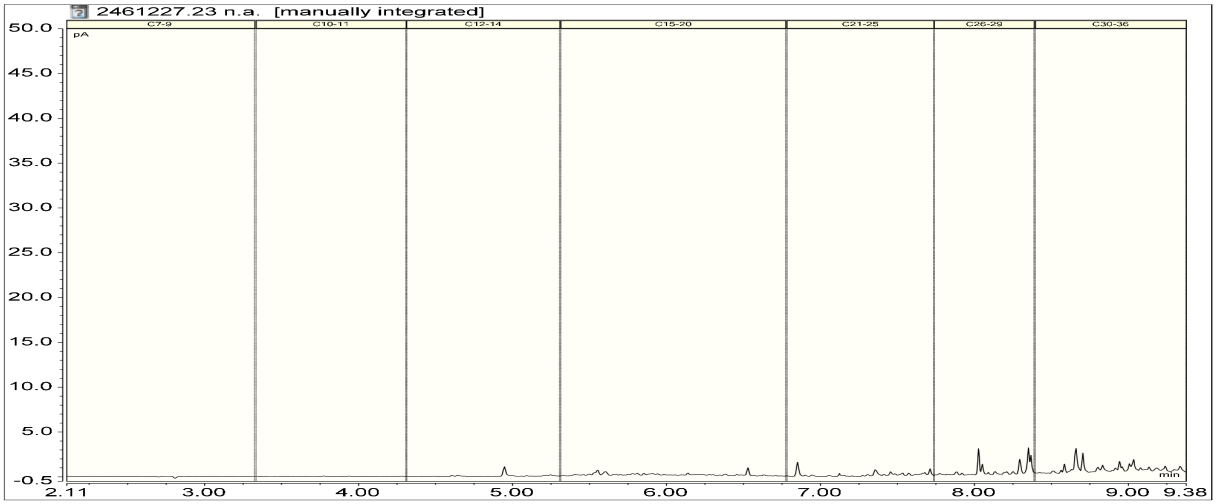
Sample Name:		TP109 (0) 19-Oct-2020	TP110 (0) 19-Oct-2020		
Lab Number:		2461227.57	2461227.58		
Individual Tests					
Dry Matter	g/100g as rcvd	59.9 ± 5.0	71.7 ± 5.0	-	-
Heavy Metals with Mercury, Screen Level					
Total Recoverable Arsenic	mg/kg dry wt	2.9 ± 1.4	5.3 ± 1.6	-	-
Total Recoverable Cadmium	mg/kg dry wt	0.228 ± 0.073	0.372 ± 0.083	-	-
Total Recoverable Chromium	mg/kg dry wt	16.5 ± 2.9	25.3 ± 4.2	-	-

Sample Type: Soil					
Sample Name:		TP109 (0) 19-Oct-2020	TP110 (0) 19-Oct-2020		
Lab Number:		2461227.57	2461227.58		
Heavy Metals with Mercury, Screen Level					
Total Recoverable Copper	mg/kg dry wt	57.3 ± 8.0	35.8 ± 5.1	-	-
Total Recoverable Lead	mg/kg dry wt	23.6 ± 3.6	28.7 ± 4.3	-	-
Total Recoverable Mercury	mg/kg dry wt	< 0.10 ± 0.067	< 0.10 ± 0.067	-	-
Total Recoverable Nickel	mg/kg dry wt	7.1 ± 1.6	32.3 ± 4.4	-	-
Total Recoverable Zinc	mg/kg dry wt	48.5 ± 4.4	90.4 ± 6.9	-	-
Total Petroleum Hydrocarbons in Soil					
C7 - C9	mg/kg dry wt	< 10 ± 5.5	< 9 ± 5.4	-	-
C10 - C14	mg/kg dry wt	< 20 ± 7.8	< 20 ± 7.6	-	-
C15 - C36	mg/kg dry wt	< 40 ± 9.5	198 ± 10	-	-
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 70 ± 14	199 ± 14	-	-

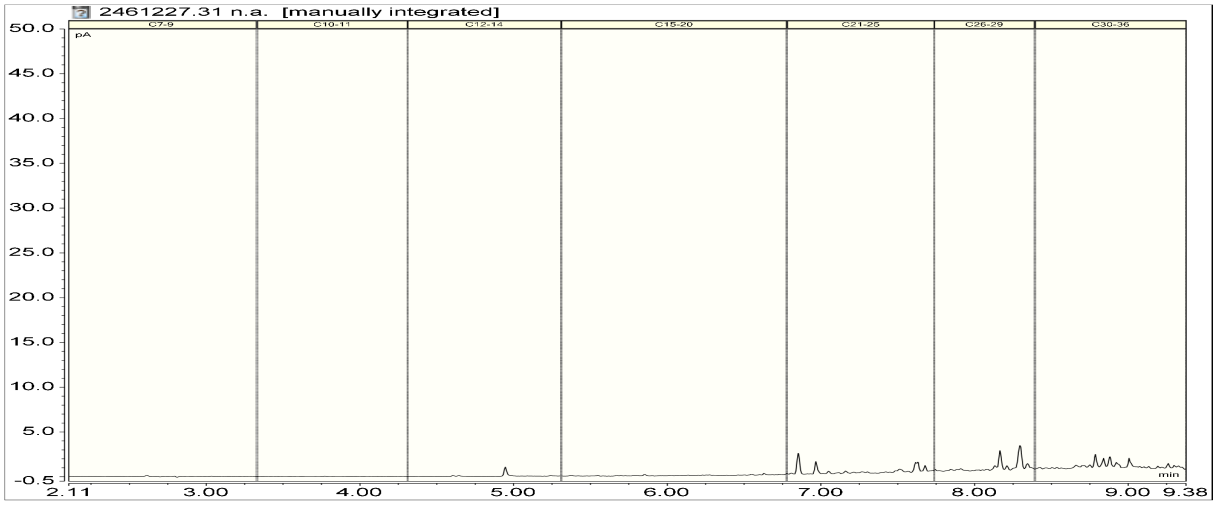
The reported uncertainty is an expanded uncertainty with a level of confidence of approximately 95 percent (i.e. two standard deviations, calculated using a coverage factor of 2). Reported uncertainties are calculated from the performance of typical matrices, and do not include variation due to sampling.

For further information on uncertainty of measurement at Hill Laboratories, refer to the technical note on our website: www.hill-laboratories.com/files/Intro_To_UOM.pdf, or contact the laboratory.

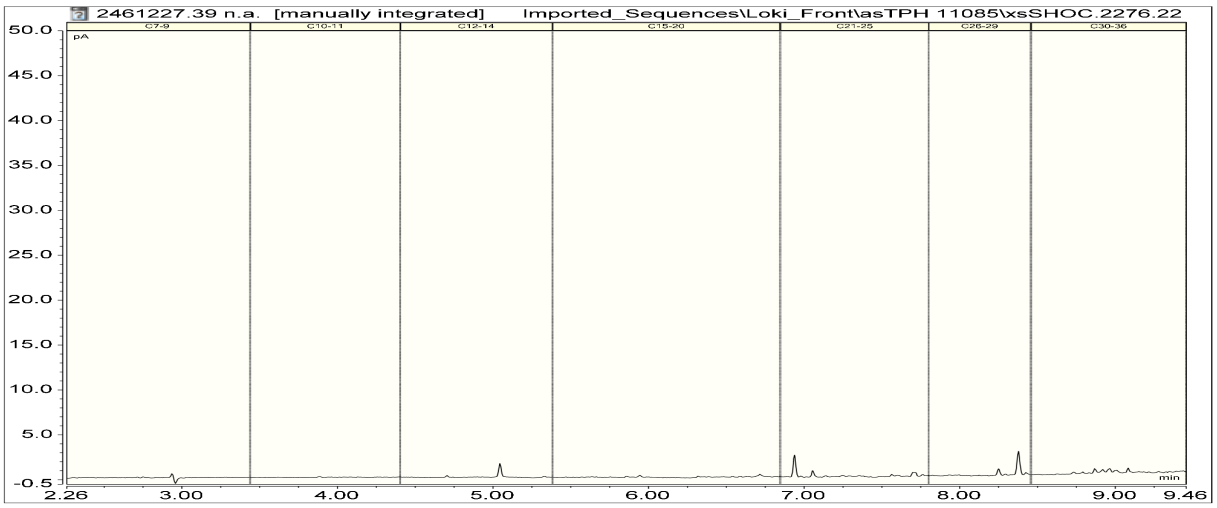
2461227.23
TP108 (2.9) 20-Oct-2020
Client Chromatogram for TPH by FID



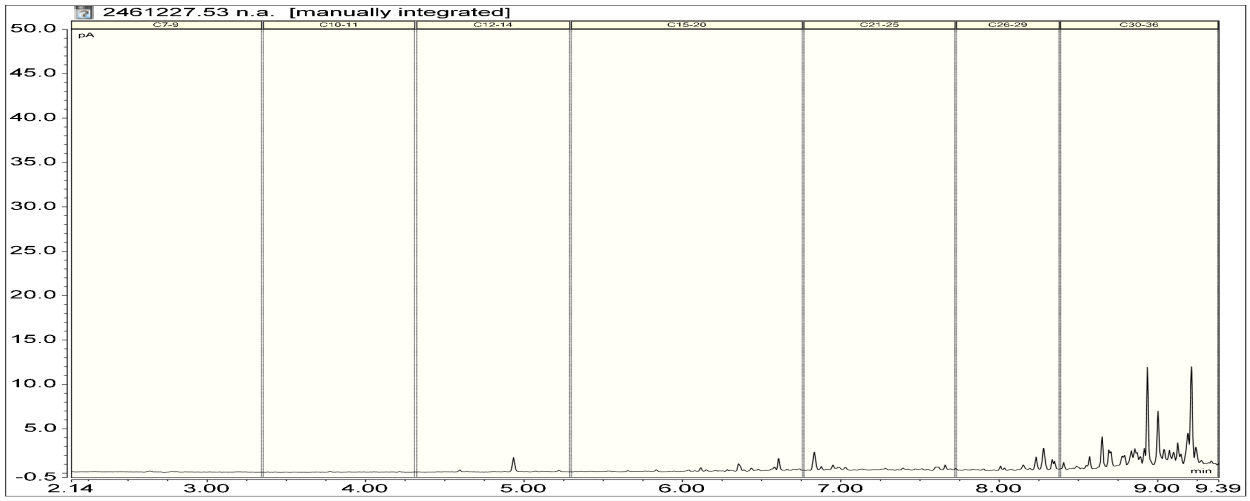
2461227.31
TP111 (0) 20-Oct-2020
Client Chromatogram for TPH by FID



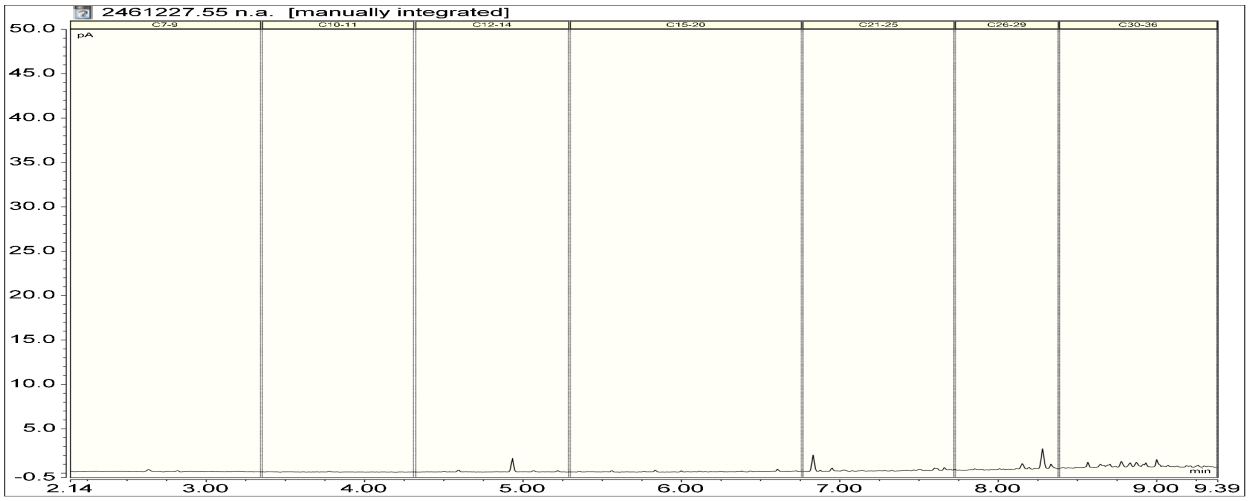
2461227.39
TP113 (0.2) 20-Oct-2020
Client Chromatogram for TPH by FID



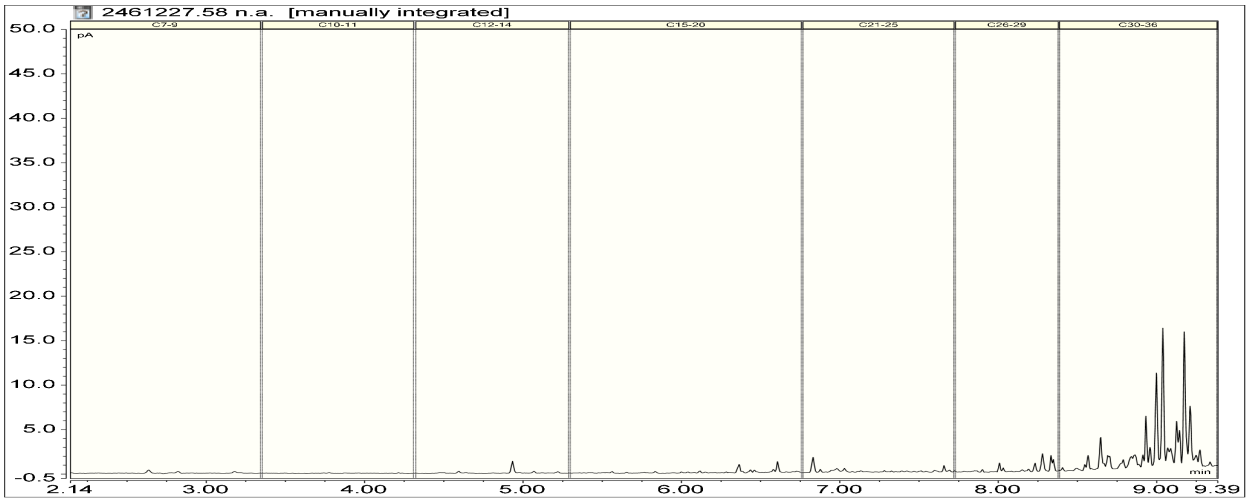
2461227.53
TP101 (0) 19-Oct-2020
Client Chromatogram for TPH by FID



2461227.55
TP103 (0) 19-Oct-2020
Client Chromatogram for TPH by FID



2461227.58
TP110 (0) 19-Oct-2020
Client Chromatogram for TPH by FID



Summary of Methods

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

Sample Type: Soil

Test	Method Description	Default Detection Limit	Sample No
Individual Tests			
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%.	-	1, 5, 8-10, 12-13, 16, 18-20, 23-29, 31, 33, 35-36, 39, 41-42, 44, 47, 49, 53-58
Total of Reported PAHs in Soil	Sonication extraction, GC-MS analysis. In-house based on US EPA 8270.	0.03 mg/kg dry wt	1, 24-26, 29

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Dry Matter (Env)	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	1, 5, 8-10, 12-13, 16, 18-20, 23-29, 31, 33, 35-36, 39, 41-42, 44, 47, 49, 53-58
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	BaP Potency Equivalence calculated from; Benzo(a)anthracene x 0.1 + Benzo(b)fluoranthene x 0.1 + Benzo(j)fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Benzo(a)pyrene x 1.0 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Fluoranthene x 0.01 + Indeno(1,2,3-c,d)pyrene x 0.1. Ministry for the Environment. 2011. Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health. Wellington: Ministry for the Environment.	0.002 mg/kg dry wt	1, 24-26, 29
Benzo[a]pyrene Toxic Equivalence (TEF)*	Benzo[a]pyrene Toxic Equivalence (TEF) calculated from; Benzo[a]pyrene x 1.0 + Benzo(a)anthracene x 0.1 + Benzo(b) fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Indeno(1,2,3-c,d)pyrene x 0.1. Guidelines for assessing and managing contaminated gasworks sites in New Zealand (GMG) (MfE, 1997).	0.002 mg/kg dry wt	1, 24-26, 29
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1, 5, 8-10, 12-13, 16, 18-20, 23-29, 31, 33, 35-36, 39, 41-42, 44, 47, 49, 53-58
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, 24-26, 29
Polycyclic Aromatic Hydrocarbons Screening in Soil*	Sonication extraction, GC-MS analysis. Tested on as received sample. In-house based on US EPA 8270.	0.002 - 0.05 mg/kg dry wt	1, 24-26, 29
TPH + PAH + BTEX profile	Sonication extraction, GC-FID and GC-MS analysis. Tested on as received sample. In-house based on US EPA 8015 and US EPA 8270.	0.002 - 70 mg/kg dry wt	1, 24-26, 29
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.	-	23, 31, 39, 53, 55, 58
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	8 mg/kg dry wt	1, 5, 8-10, 12-13, 16, 18-20, 23-29, 31, 33, 35-36, 39, 41-42, 44, 47, 49, 53-58
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	1, 5, 8-10, 12-13, 16, 18-20, 23-29, 31, 33, 35-36, 39, 41-42, 44, 47, 49, 53-58
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	1, 5, 8-10, 12-13, 16, 18-20, 23-29, 31, 33, 35-36, 39, 41-42, 44, 47, 49, 53-58

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	1, 5, 8-10, 12-13, 16, 18-20, 23-29, 31, 33, 35-36, 39, 41-42, 44, 47, 49, 53-58

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

Testing was completed between 28-Oct-2020 and 30-Oct-2020. For completion dates of individual analyses please contact the laboratory.

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

Ara Heron BSc (Tech)
Client Services Manager - Environmental

Hill Laboratories
TRIED, TESTED AND TRUSTED

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Certificate of Analysis

Client:	Beca Limited	**Lab No:**	2461296	A2Pv3
Contact:	Vicky Kennaugh	**Date Received:**	24-Oct-2020	
	C/- Beca Limited	**Date Reported:**	09-Nov-2020	**(Amended)**
	PO Box 6345	**Quote No:**	107787	
	Wellesley Street	**Order No:**	20:162	
	Auckland 1141	**Client Reference:**	3126366	
		Submitted By:	Vicky Kennaugh	

Sample Type: Soil

Sample Name:		TP101 (0) 20-Oct-2020	TP102 (0) 21-Oct-2020	TP103 (0) 21-Oct-2020	TP103 (0.5) 21-Oct-2020	TP104 (0.2) 20-Oct-2020
Lab Number:		2461296.1	2461296.5	2461296.8	2461296.9	2461296.12
Asbestos Presence / Absence		Asbestos NOT detected.	Asbestos NOT detected.	Chrysotile (White Asbestos) detected.	Asbestos NOT detected.	Asbestos NOT detected.
Description of Asbestos Form		-	-	Loose fibres	-	-
Asbestos in ACM as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Asbestos as Fibrous Asbestos as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Asbestos as Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
As Received Weight	g	245.6	428.9	471.9	834.6	1,079.0
Dry Weight	g	106.0	289.8	343.9	598.4	1,042.8
Moisture	%	57	32	27	28	3
Sample Fraction >10mm	g dry wt	2.7	< 0.1	26.5	< 0.1	564.6
Sample Fraction <10mm to >2mm	g dry wt	31.3	31.8	69.4	247.2	398.3
Sample Fraction <2mm	g dry wt	71.4	257.6	247.2	349.1	79.4
<2mm Subsample Weight	g dry wt	51.3	55.5	54.6	56.6	58.1
Weight of Asbestos in ACM (Non-Friable)	g dry wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Weight of Asbestos as Fibrous Asbestos (Friable)	g dry wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Weight of Asbestos as Asbestos Fines (Friable)*	g dry wt	< 0.00001	< 0.00001	0.00005	< 0.00001	< 0.00001

Sample Name:		TP104 (0.8) 20-Oct-2020	TP105 (0.3) 20-Oct-2020	TP106 (0.5) 20-Oct-2020	TP107 (0.1) 20-Oct-2020	TP107 (0.9) 20-Oct-2020
Lab Number:		2461296.13	2461296.15	2461296.19	2461296.22	2461296.23
Asbestos Presence / Absence		Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Amosite (Brown Asbestos) and Chrysotile (White Asbestos) detected.	Asbestos NOT detected.
Description of Asbestos Form		-	-	-	ACM debris and Loose fibres	-
Asbestos in ACM as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	0.005	< 0.001
Asbestos as Fibrous Asbestos as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Asbestos as Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	0.005	< 0.001

Sample Type: Soil						
Sample Name:		TP104 (0.8) 20-Oct-2020	TP105 (0.3) 20-Oct-2020	TP106 (0.5) 20-Oct-2020	TP107 (0.1) 20-Oct-2020	TP107 (0.9) 20-Oct-2020
Lab Number:		2461296.13	2461296.15	2461296.19	2461296.22	2461296.23
As Received Weight	g	956.8	942.4	587.1	964.2	914.8
Dry Weight	g	717.3	898.0	406.8	730.3	673.1
Moisture	%	25	5	31	24	26
Sample Fraction >10mm	g dry wt	< 0.1	459.1	< 0.1	61.4	< 0.1
Sample Fraction <10mm to >2mm	g dry wt	134.5	306.7	71.8	225.4	88.3
Sample Fraction <2mm	g dry wt	581.9	131.9	334.6	443.1	583.8
<2mm Subsample Weight	g dry wt	58.8	56.4	56.1	51.0	55.3
Weight of Asbestos in ACM (Non-Friable)	g dry wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Weight of Asbestos as Fibrous Asbestos (Friable)	g dry wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Weight of Asbestos as Asbestos Fines (Friable)*	g dry wt	< 0.00001	< 0.00001	< 0.00001	0.03697	< 0.00001

Sample Name:		TP109 (0) 20-Oct-2020	TP108 (0) 20-Oct-2020	TP110 (0) 20-Oct-2020	TP111 (0) 20-Oct-2020	TP111 (0.6) 21-Oct-2020
Lab Number:		2461296.27	2461296.28	2461296.32	2461296.35	2461296.36
Asbestos Presence / Absence		Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Chrysotile (White Asbestos) detected.	Chrysotile (White Asbestos) detected.
Description of Asbestos Form		-	-	-	Loose fibres	Loose fibres
Asbestos in ACM as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Asbestos as Fibrous Asbestos as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Asbestos as Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
As Received Weight	g	412.8	591.0	372.9	1,004.4	927.9
Dry Weight	g	240.8	449.8	265.3	764.9	708.2
Moisture	%	42	24	29	24	24
Sample Fraction >10mm	g dry wt	< 0.1	< 0.1	0.8	73.3	96.6
Sample Fraction <10mm to >2mm	g dry wt	65.2	98.7	45.6	112.0	261.7
Sample Fraction <2mm	g dry wt	175.4	350.4	218.7	578.6	346.6
<2mm Subsample Weight	g dry wt	57.6	54.3	50.4	55.6	56.1
Weight of Asbestos in ACM (Non-Friable)	g dry wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Weight of Asbestos as Fibrous Asbestos (Friable)	g dry wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Weight of Asbestos as Asbestos Fines (Friable)*	g dry wt	< 0.00001	< 0.00001	< 0.00001	0.00031	0.00003

Sample Name:		TP111 (1.2) 21-Oct-2020	TP112 (0.3) 21-Oct-2020	TP112 (0.7) 21-Oct-2020	TP113 (0.2) 21-Oct-2020	TP113 (1.1) 21-Oct-2020
Lab Number:		2461296.37	2461296.39	2461296.40	2461296.43	2461296.44
Asbestos Presence / Absence		Asbestos NOT detected.	Amosite (Brown Asbestos) and Chrysotile (White Asbestos) detected.	Asbestos NOT detected.	Amosite (Brown Asbestos) and Chrysotile (White Asbestos) detected.	Asbestos NOT detected.
Description of Asbestos Form		-	ACM debris	-	ACM debris and Loose fibres	-
Asbestos in ACM as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	0.004	< 0.001
Asbestos as Fibrous Asbestos as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Asbestos as Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	0.004	< 0.001
As Received Weight	g	839.9	907.2	871.2	946.9	848.0

Sample Type: Soil						
Sample Name:		TP111 (1.2) 21-Oct-2020	TP112 (0.3) 21-Oct-2020	TP112 (0.7) 21-Oct-2020	TP113 (0.2) 21-Oct-2020	TP113 (1.1) 21-Oct-2020
Lab Number:		2461296.37	2461296.39	2461296.40	2461296.43	2461296.44
Dry Weight	g	631.6	719.5	700.9	693.9	642.8
Moisture	%	25	21	20	27	24
Sample Fraction >10mm	g dry wt	< 0.1	122.8	< 0.1	45.9	< 0.1
Sample Fraction <10mm to >2mm	g dry wt	155.4	254.8	234.9	176.0	190.4
Sample Fraction <2mm	g dry wt	472.7	341.8	464.3	472.1	450.9
<2mm Subsample Weight	g dry wt	56.0	57.8	57.3	57.2	54.9
Weight of Asbestos in ACM (Non-Friable)	g dry wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Weight of Asbestos as Fibrous Asbestos (Friable)	g dry wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Weight of Asbestos as Asbestos Fines (Friable)*	g dry wt	< 0.00001	0.00230	< 0.00001	0.02727	< 0.00001

Sample Name:		TP114 (0.2) 20-Oct-2020	TP114 (0.6) 20-Oct-2020	TP115 (0.1) 20-Oct-2020		
Lab Number:		2461296.46	2461296.47	2461296.50		
Asbestos Presence / Absence		Chrysotile (White Asbestos) detected.	Asbestos NOT detected.	Asbestos NOT detected.	-	-
Description of Asbestos Form		Loose fibres	-	-	-	-
Asbestos in ACM as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	-	-
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	% w/w	0.002	< 0.001	< 0.001	-	-
Asbestos as Fibrous Asbestos as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	-	-
Asbestos as Asbestos Fines as % of Total Sample*	% w/w	0.002	< 0.001	< 0.001	-	-
As Received Weight	g	626.2	615.6	409.5	-	-
Dry Weight	g	504.7	510.3	281.7	-	-
Moisture	%	19	17	31	-	-
Sample Fraction >10mm	g dry wt	5.6	< 0.1	1.1	-	-
Sample Fraction <10mm to >2mm	g dry wt	67.2	23.4	12.4	-	-
Sample Fraction <2mm	g dry wt	431.7	485.2	267.9	-	-
<2mm Subsample Weight	g dry wt	54.2	58.9	54.0	-	-
Weight of Asbestos in ACM (Non-Friable)	g dry wt	< 0.00001	< 0.00001	< 0.00001	-	-
Weight of Asbestos as Fibrous Asbestos (Friable)	g dry wt	< 0.00001	< 0.00001	< 0.00001	-	-
Weight of Asbestos as Asbestos Fines (Friable)*	g dry wt	0.00885	< 0.00001	< 0.00001	-	-

Glossary of Terms

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

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

The following assumptions have been made:

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

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

Analyst's Comments

Amended Report: This certificate of analysis replaces report '2461296-A2Pv2' issued on 04-Nov-2020 at 11:29 am. Reason for amendment: Additional testing added as per clients request.

Summary of Methods

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

Sample Type: Soil

Test	Method Description	Default Detection Limit	Sample No
Individual Tests			
Wgt of Asbestos as Asbestos Fines in <10mm >2mm Fraction*	Measurement on analytical balance, from the <10mm >2mm Fraction. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.00001 g dry wt	1, 5, 8-9, 12-13, 15, 19, 22-23, 27-28, 32, 35-37, 39-40, 43-44, 46-47, 50
New Zealand Guidelines Semi Quantitative Asbestos in Soil			
As Received Weight	Measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	1, 5, 8-9, 12-13, 15, 19, 22-23, 27-28, 32, 35-37, 39-40, 43-44, 46-47, 50
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	1, 5, 8-9, 12-13, 15, 19, 22-23, 27-28, 32, 35-37, 39-40, 43-44, 46-47, 50
Moisture	Sample dried at 100 to 105°C. Calculation = (As received weight - Dry weight) / as received weight x 100.	1 %	1, 5, 8-9, 12-13, 15, 19, 22-23, 27-28, 32, 35-37, 39-40, 43-44, 46-47, 50
Sample Fraction >10mm	Sample dried at 100 to 105°C, 10mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g dry wt	1, 5, 8-9, 12-13, 15, 19, 22-23, 27-28, 32, 35-37, 39-40, 43-44, 46-47, 50
Sample Fraction <10mm to >2mm	Sample dried at 100 to 105°C, 10mm and 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g dry wt	1, 5, 8-9, 12-13, 15, 19, 22-23, 27-28, 32, 35-37, 39-40, 43-44, 46-47, 50
Sample Fraction <2mm	Sample dried at 100 to 105°C, 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g dry wt	1, 5, 8-9, 12-13, 15, 19, 22-23, 27-28, 32, 35-37, 39-40, 43-44, 46-47, 50

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Asbestos Presence / Absence	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0.01%	1, 5, 8-9, 12-13, 15, 19, 22-23, 27-28, 32, 35-37, 39-40, 43-44, 46-47, 50
Description of Asbestos Form	Description of asbestos form and/or shape if present.	-	1, 5, 8-9, 12-13, 15, 19, 22-23, 27-28, 32, 35-37, 39-40, 43-44, 46-47, 50
Weight of Asbestos in ACM (Non-Friable)	Measurement on analytical balance, from the >10mm Fraction. Weight of asbestos based on assessment of ACM form. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 5, 8-9, 12-13, 15, 19, 22-23, 27-28, 32, 35-37, 39-40, 43-44, 46-47, 50
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, 5, 8-9, 12-13, 15, 19, 22-23, 27-28, 32, 35-37, 39-40, 43-44, 46-47, 50
Weight of Asbestos as Fibrous Asbestos (Friable)	Measurement on analytical balance, from the >10mm Fraction. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 5, 8-9, 12-13, 15, 19, 22-23, 27-28, 32, 35-37, 39-40, 43-44, 46-47, 50
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, 5, 8-9, 12-13, 15, 19, 22-23, 27-28, 32, 35-37, 39-40, 43-44, 46-47, 50
Weight of Asbestos as Asbestos Fines (Friable)*	Measurement on analytical balance, from the <10mm Fractions. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 5, 8-9, 12-13, 15, 19, 22-23, 27-28, 32, 35-37, 39-40, 43-44, 46-47, 50
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, 5, 8-9, 12-13, 15, 19, 22-23, 27-28, 32, 35-37, 39-40, 43-44, 46-47, 50
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, 5, 8-9, 12-13, 15, 19, 22-23, 27-28, 32, 35-37, 39-40, 43-44, 46-47, 50

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

Testing was completed between 29-Oct-2020 and 09-Nov-2020. For completion dates of individual analyses please contact the laboratory.

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

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Rhodri Williams BSc (Hons)
Technical Manager - Asbestos

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Certificate of Analysis

Client:	Beca Limited	**Lab No:**	2461298	A2Pv1
Contact:	Vicky Kennaugh	**Date Received:**	24-Oct-2020	
	C/- Beca Limited	**Date Reported:**	29-Oct-2020	
	PO Box 6345	**Quote No:**	107787	
	Wellesley Street	**Order No:**	20:156	
	Auckland 1141	**Client Reference:**	3126366	
		Add. Client Ref:	Sampled: 21/10/20	
		Submitted By:	Vicky Kennaugh	

Sample Type: Building Material

Sample Name	Lab Number	Sample Category	Sample Weight on receipt (g)	Asbestos Presence / Absence	Description of Asbestos in Non Homogeneous Samples
TP111 (0m)	2461298.1	Fibre Cement	12.70	Amosite (Brown Asbestos) detected. Chrysotile (White Asbestos) detected. Crocidolite (Blue Asbestos) detected.	-

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.

Summary of Methods

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

Sample Type: Building Material

Test	Method Description	Default Detection Limit	Sample No
Asbestos in Bulk Material			
Sample Category	Assessment of sample type. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland.	-	1
Sample Weight on receipt	Sample weight. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland.	0.01 g	1
Asbestos Presence / Absence	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0.01%	1
Description of Asbestos in Non Homogenous Samples	Form, dimensions and/or weight of asbestos fibres present. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	-	1

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

Dates of testing are available on request. For completion dates of individual analyses please contact the laboratory.

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

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Danielle Carter BSc, PGDipSci, MSc
Laboratory Technician - Asbestos

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Certificate of Analysis

Client:	Beca Limited	**Lab No:**	2472579 SPv1
Contact:	Vicky Kennaugh C/- Beca Limited PO Box 6345 Wellesley Street Auckland 1141	**Date Received:**	13-Nov-2020
		Date Reported:	20-Nov-2020
		Quote No:	107787
		Order No:	20:170
		Client Reference:	3126366/100/DC
		Submitted By:	Henry Lissaman

Sample Type: Aqueous

Sample Name:	GW201 09-Nov-2020 9:05 am	GW202 06-Nov-2020 3:07 pm	GW203 06-Nov-2020 4:35 pm	GWA 06-Nov-2020 4:25 pm	GWB 06-Nov-2020 3:07 pm
Lab Number:	2472579.1	2472579.2	2472579.3	2472579.4	2472579.5
Individual Tests					
Poly- and Perfluorinated Alkyl Substances in Water*‡	See attached report	See attached report	See attached report	See attached report	See attached report
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn					
Dissolved Arsenic g/m³	< 0.0010	< 0.0010	< 0.0010	-	-
Dissolved Cadmium g/m³	< 0.00005	< 0.00005	< 0.00005	-	-
Dissolved Chromium g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
Dissolved Copper g/m³	0.0006	0.0028	0.0010	-	-
Dissolved Lead g/m³	< 0.00010	< 0.00010	< 0.00010	-	-
Dissolved Nickel g/m³	< 0.0005	0.0052	0.0012	-	-
Dissolved Zinc g/m³	< 0.0010	0.0041	0.0024	-	-
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn					
Total Arsenic g/m³	< 0.0011	0.0012	0.0023	-	0.0013
Total Cadmium g/m³	< 0.000053	< 0.000053	< 0.000053	-	< 0.000053
Total Chromium g/m³	0.0021	0.0073	0.027	-	0.0073
Total Copper g/m³	0.00157	0.0066	0.0189	-	0.0073
Total Lead g/m³	0.00042	0.0026	0.0061	-	0.0026
Total Nickel g/m³	0.00146	0.0077	0.0145	-	0.0085
Total Zinc g/m³	0.0030	0.0110	0.032	-	0.0160
Total Petroleum Hydrocarbons in Water					
C7 - C9 g/m³	< 0.10	< 0.10	< 0.10	-	< 0.10
C10 - C14 g/m³	< 0.2	< 0.2	< 0.2	-	< 0.2
C15 - C36 g/m³	< 0.4	< 0.4	< 0.4	-	< 0.4
Total hydrocarbons (C7 - C36) g/m³	< 0.7	< 0.7	< 0.7	-	< 0.7

Sample Name:	GWC 06-Nov-2020 3:45 pm				
Lab Number:	2472579.6				
Individual Tests					
Poly- and Perfluorinated Alkyl Substances in Water*‡	See attached report	-	-	-	-

Analyst's Comments

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

Appendix No.1 - AsureQuality 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 Laboratories, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Individual Tests			
Poly- and Perfluorinated Alkyl Substances in Water*	Analysis by LC-MS/MS. Subcontracted to AsureQuality, Lower Hutt.	-	1-6
Total Digestion	Nitric acid digestion. APHA 3030 E (modified) 23rd ed. 2017.	-	1-3, 5
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B 23rd ed. 2017.	-	1-3
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn	0.45µm Filtration, ICP-MS, trace level. APHA 3125 B 23rd ed. 2017.	0.00005 - 0.0010 g/m^3	1-3
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 23rd ed. 2017 / US EPA 200.8.	0.000053 - 0.0011 g/m^3	1-3, 5
Total Petroleum Hydrocarbons in Water			
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	0.10 g/m^3	1-3, 5
C10 - C14	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	0.2 g/m^3	1-3, 5
C15 - C36	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	0.4 g/m^3	1-3, 5
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	0.7 g/m^3	1-3, 5

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

Testing was completed between 18-Nov-2020 and 20-Nov-2020. For completion dates of individual analyses please contact the laboratory.

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

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Carole Rodgers-Carroll BA, NZCS
Client Services Manager - Environmental

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Certificate of Analysis

Submission Reference: EnvSubAQ_LH 323
Final Report

Environment Client Service Managers
Hill Laboratories - Hamilton
Private Bag 3205
Hamilton 3240
New Zealand

PO Number: 154899

Report Issued: 19-Nov-2020 **AsureQuality Reference: 20-312648** **Sample(s) Received:** 14-Nov-2020 10:00

Testing Period: 16-Nov-2020 to 19-Nov-2020

Results

The tests were performed on the samples as received.

Customer Sample Name: 2472579.1 **Lab ID:** 20-312648-1

Sample Condition: Acceptable **Sampled Date**: 13-Nov-2020

Test	Result	Unit	Method Reference
Poly- and Perfluorinated Alkyl Substances (PFAS) in Water - High Level			
Perfluoroalkylsulfonic acids			
PFPrS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFBS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFPeS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
di-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
mono-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
L-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Total PFHxS (3)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFHpS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
di-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
mono-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
L-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Total PFOS (7)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Sum PFHxS+PFOS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFNS	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
PFDS	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Perfluoroalkylcarboxylic acids			
PFBA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFPeA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFHxA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFHpA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFOA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFNA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFDA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFUnDA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFDoDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFTrDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFTeDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)

AsureQuality Reference: 20-312648 **Report Issued:** 19-Nov-2020

Test	Result	Unit	Method Reference
Perfluorooctanesulfonamides			
PFOSA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
NEtFOSA-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSA-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamidoacetic acids			
NEtFOSAA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSAA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamidoethanols			
NEtFOSE-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSE-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Telomere Sulfonic acids			
4:2 FTS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
6:2 FTS	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
8:2 FTS	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Internal Standards			
M3PFBS	104	%	AsureQuality Method (LC-MS/MS)
M3PFHxS	98	%	AsureQuality Method (LC-MS/MS)
M8PFOS	100	%	AsureQuality Method (LC-MS/MS)
M4PFBA	101	%	AsureQuality Method (LC-MS/MS)
M5PFPeA	104	%	AsureQuality Method (LC-MS/MS)
M5PFHxA	104	%	AsureQuality Method (LC-MS/MS)
MPFHpA	101	%	AsureQuality Method (LC-MS/MS)
M8PFOA	110	%	AsureQuality Method (LC-MS/MS)
M9PFNA	108	%	AsureQuality Method (LC-MS/MS)
M6PFDA	95	%	AsureQuality Method (LC-MS/MS)
M7PFUnDA	97	%	AsureQuality Method (LC-MS/MS)
MPFDoDA	109	%	AsureQuality Method (LC-MS/MS)
MPFTeDA	95	%	AsureQuality Method (LC-MS/MS)
MPFOSA	106	%	AsureQuality Method (LC-MS/MS)
DNEtFOSA	105	%	AsureQuality Method (LC-MS/MS)
DNMeFOSA	100	%	AsureQuality Method (LC-MS/MS)
DNEtFOSAA	110	%	AsureQuality Method (LC-MS/MS)
DNMeFOSAA	110	%	AsureQuality Method (LC-MS/MS)
DNEtFOSE	107	%	AsureQuality Method (LC-MS/MS)
DNMeFOSE	105	%	AsureQuality Method (LC-MS/MS)
M4:2FTS	101	%	AsureQuality Method (LC-MS/MS)
M6:2FTS	107	%	AsureQuality Method (LC-MS/MS)
M8:2FTS	101	%	AsureQuality Method (LC-MS/MS)

Customer Sample Name: 2472579.2 **Lab ID:** 20-312648-2

Sample Condition: Acceptable **Sampled Date**: 13-Nov-2020

Test	Result	Unit	Method Reference
Poly- and Perfluorinated Alkyl Substances (PFAS) in Water - High Level			
Perfluoroalkylsulfonic acids			
PFPrS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFBS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFPeS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
di-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
mono-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
L-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)

AsureQuality Reference: 20-312648 **Report Issued:** 19-Nov-2020

Test	Result	Unit	Method Reference
Total PFHxS (3)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFHpS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
di-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
mono-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
L-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Total PFOS (7)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Sum PFHxS+PFOS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFNS	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
PFDS	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Perfluoroalkylcarboxylic acids			
PFBA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFPeA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFHxA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFHpA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFOA	0.060	µg/L	AsureQuality Method (LC-MS/MS)
PFNA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFDA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFUnDA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFDoDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFTrDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFTeDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamides			
PFOSA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
NEtFOSA-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSA-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamidoacetic acids			
NEtFOSAA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSAA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamidoethanols			
NEtFOSE-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSE-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Telomere Sulfonic acids			
4:2 FTS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
6:2 FTS	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
8:2 FTS	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Internal Standards			
M3PFBS	109	%	AsureQuality Method (LC-MS/MS)
M3PFHxS	103	%	AsureQuality Method (LC-MS/MS)
M8PFOS	98	%	AsureQuality Method (LC-MS/MS)
M4PFBA	105	%	AsureQuality Method (LC-MS/MS)
M5PFPeA	105	%	AsureQuality Method (LC-MS/MS)
M5PFHxA	111	%	AsureQuality Method (LC-MS/MS)
MPFHpA	108	%	AsureQuality Method (LC-MS/MS)
M8PFOA	110	%	AsureQuality Method (LC-MS/MS)
M9PFNA	106	%	AsureQuality Method (LC-MS/MS)
M6PFDA	104	%	AsureQuality Method (LC-MS/MS)
M7PFUnDA	102	%	AsureQuality Method (LC-MS/MS)
MPFDoDA	105	%	AsureQuality Method (LC-MS/MS)
MPFTeDA	98	%	AsureQuality Method (LC-MS/MS)

AsureQuality Reference: 20-312648 **Report Issued:** 19-Nov-2020

Test	Result	Unit	Method Reference
MPFOSA	107	%	AsureQuality Method (LC-MS/MS)
DNEtFOSA	106	%	AsureQuality Method (LC-MS/MS)
DNMeFOSA	99	%	AsureQuality Method (LC-MS/MS)
DNEtFOSAA	102	%	AsureQuality Method (LC-MS/MS)
DNMeFOSAA	113	%	AsureQuality Method (LC-MS/MS)
DNEtFOSE	107	%	AsureQuality Method (LC-MS/MS)
DNMeFOSE	105	%	AsureQuality Method (LC-MS/MS)
M4:2FTS	106	%	AsureQuality Method (LC-MS/MS)
M6:2FTS	114	%	AsureQuality Method (LC-MS/MS)
M8:2FTS	102	%	AsureQuality Method (LC-MS/MS)

Customer Sample Name: 2472579.3 **Lab ID:** 20-312648-3

Sample Condition: Acceptable **Sampled Date**: 13-Nov-2020

Test	Result	Unit	Method Reference
Poly- and Perfluorinated Alkyl Substances (PFAS) in Water - High Level			
Perfluoroalkylsulfonic acids			
PFPrS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFBS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFPeS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
di-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
mono-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
L-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Total PFHxS (3)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFHpS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
di-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
mono-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
L-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Total PFOS (7)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Sum PFHxS+PFOS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFNS	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
PFDS	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Perfluoroalkylcarboxylic acids			
PFBA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFPeA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFHxA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFHpA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFOA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFNA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFDA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFUnDA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFDoDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFTrDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFTeDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamides			
PFOSA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
NEtFOSA-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSA-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamidoacetic acids			
NEtFOSAA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSAA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)

Test	Result	Unit	Method Reference
Perfluorooctanesulfonamidoethanols			
NEtFOSE-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSE-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Telomere Sulfonic acids			
4:2 FTS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
6:2 FTS	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
8:2 FTS	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Internal Standards			
M3PFBS	105	%	AsureQuality Method (LC-MS/MS)
M3PFHxS	98	%	AsureQuality Method (LC-MS/MS)
M8PFOS	102	%	AsureQuality Method (LC-MS/MS)
M4PFBA	98	%	AsureQuality Method (LC-MS/MS)
M5PFPeA	104	%	AsureQuality Method (LC-MS/MS)
M5PFHxA	107	%	AsureQuality Method (LC-MS/MS)
MPFHpA	102	%	AsureQuality Method (LC-MS/MS)
M8PFOA	105	%	AsureQuality Method (LC-MS/MS)
M9PFNA	105	%	AsureQuality Method (LC-MS/MS)
M6PFDA	99	%	AsureQuality Method (LC-MS/MS)
M7PFUnDA	102	%	AsureQuality Method (LC-MS/MS)
MPFDoDA	103	%	AsureQuality Method (LC-MS/MS)
MPFTeDA	105	%	AsureQuality Method (LC-MS/MS)
MPFOSA	99	%	AsureQuality Method (LC-MS/MS)
DNEtFOSA	105	%	AsureQuality Method (LC-MS/MS)
DNMeFOSA	95	%	AsureQuality Method (LC-MS/MS)
DNEtFOSAA	102	%	AsureQuality Method (LC-MS/MS)
DNMeFOSAA	106	%	AsureQuality Method (LC-MS/MS)
DNEtFOSE	105	%	AsureQuality Method (LC-MS/MS)
DNMeFOSE	103	%	AsureQuality Method (LC-MS/MS)
M4:2FTS	100	%	AsureQuality Method (LC-MS/MS)
M6:2FTS	108	%	AsureQuality Method (LC-MS/MS)
M8:2FTS	107	%	AsureQuality Method (LC-MS/MS)

Customer Sample Name: 2472579.4 **Lab ID:** 20-312648-4

Sample Condition: Acceptable **Sampled Date**: 13-Nov-2020

Test	Result	Unit	Method Reference
Poly- and Perfluorinated Alkyl Substances (PFAS) in Water - High Level			
Perfluoroalkylsulfonic acids			
PFPrS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFBS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFPeS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
di-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
mono-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
L-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Total PFHxS (3)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFHpS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
di-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
mono-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
L-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Total PFOS (7)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Sum PFHxS+PFOS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)

AsureQuality Reference: 20-312648 **Report Issued:** 19-Nov-2020

Test	Result	Unit	Method Reference
PFNS	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
PFDS	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Perfluoroalkylcarboxylic acids			
PFBA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFPeA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFHxA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFHpA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFOA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFNA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFDA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFUnDA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFDoDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFTrDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFTeDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamides			
PFOSA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
NEtFOSA-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSA-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamidoacetic acids			
NEtFOSAA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSAA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamidoethanols			
NEtFOSE-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSE-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Telomere Sulfonic acids			
4:2 FTS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
6:2 FTS	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
8:2 FTS	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Internal Standards			
M3PFBS	107	%	AsureQuality Method (LC-MS/MS)
M3PFHxS	94	%	AsureQuality Method (LC-MS/MS)
M8PFOS	103	%	AsureQuality Method (LC-MS/MS)
M4PFBA	101	%	AsureQuality Method (LC-MS/MS)
M5PFPeA	108	%	AsureQuality Method (LC-MS/MS)
M5PFHxA	105	%	AsureQuality Method (LC-MS/MS)
MPFHpA	105	%	AsureQuality Method (LC-MS/MS)
M8PFOA	109	%	AsureQuality Method (LC-MS/MS)
M9PFNA	112	%	AsureQuality Method (LC-MS/MS)
M6PFDA	104	%	AsureQuality Method (LC-MS/MS)
M7PFUnDA	100	%	AsureQuality Method (LC-MS/MS)
MPFDoDA	106	%	AsureQuality Method (LC-MS/MS)
MPFTeDA	108	%	AsureQuality Method (LC-MS/MS)
MPFOSA	104	%	AsureQuality Method (LC-MS/MS)
DNEtFOSA	102	%	AsureQuality Method (LC-MS/MS)
DNMeFOSA	96	%	AsureQuality Method (LC-MS/MS)
DNEtFOSAA	106	%	AsureQuality Method (LC-MS/MS)
DNMeFOSAA	113	%	AsureQuality Method (LC-MS/MS)
DNEtFOSE	105	%	AsureQuality Method (LC-MS/MS)
DNMeFOSE	106	%	AsureQuality Method (LC-MS/MS)

Test	Result	Unit	Method Reference
M4:2FTS	105	%	AsureQuality Method (LC-MS/MS)
M6:2FTS	106	%	AsureQuality Method (LC-MS/MS)
M8:2FTS	101	%	AsureQuality Method (LC-MS/MS)

Customer Sample Name: 2472579.5 **Lab ID:** 20-312648-5

Sample Condition: Acceptable **Sampled Date**: 13-Nov-2020

Test	Result	Unit	Method Reference
Poly- and Perfluorinated Alkyl Substances (PFAS) in Water - High Level			
Perfluoroalkylsulfonic acids			
PFPrS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFBS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFPeS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
di-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
mono-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
L-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Total PFHxS (3)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFHpS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
di-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
mono-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
L-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Total PFOS (7)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Sum PFHxS+PFOS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFNS	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
PFDS	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Perfluoroalkylcarboxylic acids			
PFBA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFPeA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFHxA	0.027	µg/L	AsureQuality Method (LC-MS/MS)
PFHpA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFOA	0.059	µg/L	AsureQuality Method (LC-MS/MS)
PFNA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFDA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFUnDA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFDoDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFTrDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFTeDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamides			
PFOSA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
NEtFOSA-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSA-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamidoacetic acids			
NEtFOSAA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSAA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamidoethanols			
NEtFOSE-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSE-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Telomere Sulfonic acids			
4:2 FTS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
6:2 FTS	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
8:2 FTS	<0.10	µg/L	AsureQuality Method (LC-MS/MS)

AsureQuality Reference: 20-312648 **Report Issued:** 19-Nov-2020

Test	Result	Unit	Method Reference
Internal Standards			
M3PFBS	104	%	AsureQuality Method (LC-MS/MS)
M3PFHxS	98	%	AsureQuality Method (LC-MS/MS)
M8PFOS	101	%	AsureQuality Method (LC-MS/MS)
M4PFBA	99	%	AsureQuality Method (LC-MS/MS)
M5PFPeA	107	%	AsureQuality Method (LC-MS/MS)
M5PFHxA	108	%	AsureQuality Method (LC-MS/MS)
MPFHpA	100	%	AsureQuality Method (LC-MS/MS)
M8PFOA	102	%	AsureQuality Method (LC-MS/MS)
M9PFNA	107	%	AsureQuality Method (LC-MS/MS)
M6PFDA	98	%	AsureQuality Method (LC-MS/MS)
M7PFUnDA	96	%	AsureQuality Method (LC-MS/MS)
MPFDoDA	100	%	AsureQuality Method (LC-MS/MS)
MPFTeDA	100	%	AsureQuality Method (LC-MS/MS)
MPFOSA	102	%	AsureQuality Method (LC-MS/MS)
DNEtFOSA	103	%	AsureQuality Method (LC-MS/MS)
DNMeFOSA	99	%	AsureQuality Method (LC-MS/MS)
DNEtFOSAA	103	%	AsureQuality Method (LC-MS/MS)
DNMeFOSAA	104	%	AsureQuality Method (LC-MS/MS)
DNEtFOSE	106	%	AsureQuality Method (LC-MS/MS)
DNMeFOSE	106	%	AsureQuality Method (LC-MS/MS)
M4:2FTS	99	%	AsureQuality Method (LC-MS/MS)
M6:2FTS	105	%	AsureQuality Method (LC-MS/MS)
M8:2FTS	103	%	AsureQuality Method (LC-MS/MS)

Customer Sample Name: 2472579.6 **Lab ID:** 20-312648-6

Sample Condition: Acceptable **Sampled Date**: 13-Nov-2020

Test	Result	Unit	Method Reference
Poly- and Perfluorinated Alkyl Substances (PFAS) in Water - High Level			
Perfluoroalkylsulfonic acids			
PFPrS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFBS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFPeS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
di-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
mono-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
L-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Total PFHxS (3)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFHpS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
di-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
mono-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
L-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Total PFOS (7)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Sum PFHxS+PFOS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFNS	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
PFDS	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Perfluoroalkylcarboxylic acids			
PFBA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFPeA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFHxA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)

AsureQuality Reference: 20-312648 **Report Issued:** 19-Nov-2020

Test	Result	Unit	Method Reference
PFHpA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFOA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFNA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFDA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFUnDA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFDoDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFTrDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFTeDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamides			
PFOSA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
NEtFOSA-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSA-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamidoacetic acids			
NEtFOSAA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSAA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamidoethanols			
NEtFOSE-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSE-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Telomere Sulfonic acids			
4:2 FTS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
6:2 FTS	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
8:2 FTS	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Internal Standards			
M3PFBS	109	%	AsureQuality Method (LC-MS/MS)
M3PFHxS	100	%	AsureQuality Method (LC-MS/MS)
M8PFOS	100	%	AsureQuality Method (LC-MS/MS)
M4PFBA	105	%	AsureQuality Method (LC-MS/MS)
M5PFPeA	110	%	AsureQuality Method (LC-MS/MS)
M5PFHxA	111	%	AsureQuality Method (LC-MS/MS)
MPFHpA	106	%	AsureQuality Method (LC-MS/MS)
M8PFOA	110	%	AsureQuality Method (LC-MS/MS)
M9PFNA	109	%	AsureQuality Method (LC-MS/MS)
M6PFDA	98	%	AsureQuality Method (LC-MS/MS)
M7PFUnDA	98	%	AsureQuality Method (LC-MS/MS)
MPFDoDA	103	%	AsureQuality Method (LC-MS/MS)
MPFTeDA	100	%	AsureQuality Method (LC-MS/MS)
MPFOSA	107	%	AsureQuality Method (LC-MS/MS)
DNEtFOSA	105	%	AsureQuality Method (LC-MS/MS)
DNMeFOSA	100	%	AsureQuality Method (LC-MS/MS)
DNEtFOSAA	105	%	AsureQuality Method (LC-MS/MS)
DNMeFOSAA	106	%	AsureQuality Method (LC-MS/MS)
DNEtFOSE	109	%	AsureQuality Method (LC-MS/MS)
DNMeFOSE	110	%	AsureQuality Method (LC-MS/MS)
M4:2FTS	112	%	AsureQuality Method (LC-MS/MS)
M6:2FTS	111	%	AsureQuality Method (LC-MS/MS)
M8:2FTS	108	%	AsureQuality Method (LC-MS/MS)

Customer Sample Name: Duplicate of 20-312648-6A **Lab ID:** 20-312648-7

Sample Description: 2472579.6 Duplicate

Sample Condition: Acceptable **Sampled Date**: 13-Nov-2020

AsureQuality Reference: 20-312648 **Report Issued:** 19-Nov-2020

Test	Result	Unit	Method Reference
Poly- and Perfluorinated Alkyl Substances (PFAS) in Water - High Level			
Perfluoroalkylsulfonic acids			
PFPrS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFBS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFPeS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
di-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
mono-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
L-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Total PFHxS (3)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFHpS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
di-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
mono-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
L-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Total PFOS (7)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Sum PFHxS+PFOS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFNS	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
PFDS	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Perfluoroalkylcarboxylic acids			
PFBA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFPeA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFHxA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFHpA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFOA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFNA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFDA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFUnDA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFDoDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFTrDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFTeDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamides			
PFOSA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
NEtFOSA-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSA-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamidoacetic acids			
NEtFOSAA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSAA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamidoethanols			
NEtFOSE-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSE-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Telomere Sulfonic acids			
4:2 FTS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
6:2 FTS	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
8:2 FTS	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Internal Standards			
M3PFBS	108	%	AsureQuality Method (LC-MS/MS)
M3PFHxS	100	%	AsureQuality Method (LC-MS/MS)
M8PFOS	102	%	AsureQuality Method (LC-MS/MS)
M4PFBA	104	%	AsureQuality Method (LC-MS/MS)
M5PFPeA	105	%	AsureQuality Method (LC-MS/MS)

Test	Result	Unit	Method Reference
M5PFHxA	107	%	AsureQuality Method (LC-MS/MS)
MPFHpA	102	%	AsureQuality Method (LC-MS/MS)
M8PFOA	109	%	AsureQuality Method (LC-MS/MS)
M9PFNA	113	%	AsureQuality Method (LC-MS/MS)
M6PFDA	103	%	AsureQuality Method (LC-MS/MS)
M7PFUnDA	92	%	AsureQuality Method (LC-MS/MS)
MPFDoDA	106	%	AsureQuality Method (LC-MS/MS)
MPFTeDA	107	%	AsureQuality Method (LC-MS/MS)
MPFOSA	106	%	AsureQuality Method (LC-MS/MS)
DNEtFOSA	109	%	AsureQuality Method (LC-MS/MS)
DNMeFOSA	98	%	AsureQuality Method (LC-MS/MS)
DNEtFOSAA	104	%	AsureQuality Method (LC-MS/MS)
DNMeFOSAA	104	%	AsureQuality Method (LC-MS/MS)
DNEtFOSE	110	%	AsureQuality Method (LC-MS/MS)
DNMeFOSE	108	%	AsureQuality Method (LC-MS/MS)
M4:2FTS	96	%	AsureQuality Method (LC-MS/MS)
M6:2FTS	109	%	AsureQuality Method (LC-MS/MS)
M8:2FTS	105	%	AsureQuality Method (LC-MS/MS)

QC Results

Blank

Relates to sample(s) 20-312648-1, 20-312648-2, 20-312648-3, 20-312648-4, 20-312648-5, 20-312648-6, 20-312648-7

Test	Result	Unit	Method Reference
Poly- and Perfluorinated Alkyl Substances (PFAS) in Water - High Level			
Perfluoroalkylsulfonic acids			
PFPrS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFBS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFPeS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
di-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
mono-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
L-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Total PFHxS (3)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFHpS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
di-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
mono-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
L-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Total PFOS (7)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Sum PFHxS+PFOS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFNS	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
PFDS	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Perfluoroalkylcarboxylic acids			
PFBA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFPeA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFHxA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFHpA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFOA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFNA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)

AsureQuality Reference: 20-312648 **Report Issued:** 19-Nov-2020

Test	Result	Unit	Method Reference
PFDA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFUnDA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFDoDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFTrDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFTeDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamides			
PFOSA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
NEtFOSA-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSA-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamidoacetic acids			
NEtFOSAA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSAA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamidoethanols			
NEtFOSE-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSE-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Telomere Sulfonic acids			
4:2 FTS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
6:2 FTS	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
8:2 FTS	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Internal Standards			
M3PFBS	105	%	AsureQuality Method (LC-MS/MS)
M3PFHxS	100	%	AsureQuality Method (LC-MS/MS)
M8PFOS	97	%	AsureQuality Method (LC-MS/MS)
M4PFBA	103	%	AsureQuality Method (LC-MS/MS)
M5PFPeA	106	%	AsureQuality Method (LC-MS/MS)
M5PFHxA	109	%	AsureQuality Method (LC-MS/MS)
MPFHpA	108	%	AsureQuality Method (LC-MS/MS)
M8PFOA	102	%	AsureQuality Method (LC-MS/MS)
M9PFNA	110	%	AsureQuality Method (LC-MS/MS)
M6PFDA	101	%	AsureQuality Method (LC-MS/MS)
M7PFUnDA	102	%	AsureQuality Method (LC-MS/MS)
MPFDoDA	108	%	AsureQuality Method (LC-MS/MS)
MPFTeDA	109	%	AsureQuality Method (LC-MS/MS)
MPFOSA	102	%	AsureQuality Method (LC-MS/MS)
DNEtFOSA	103	%	AsureQuality Method (LC-MS/MS)
DNMeFOSA	98	%	AsureQuality Method (LC-MS/MS)
DNEtFOSAA	109	%	AsureQuality Method (LC-MS/MS)
DNMeFOSAA	106	%	AsureQuality Method (LC-MS/MS)
DNEtFOSE	106	%	AsureQuality Method (LC-MS/MS)
DNMeFOSE	104	%	AsureQuality Method (LC-MS/MS)
M4:2FTS	105	%	AsureQuality Method (LC-MS/MS)
M6:2FTS	105	%	AsureQuality Method (LC-MS/MS)
M8:2FTS	103	%	AsureQuality Method (LC-MS/MS)

Analysis Summary

Wellington Laboratory

Analysis	Method	Accreditation	Authorised by
Poly- and Perfluorinated Alkyl Substances (PFAS) in Water - High Level			
DX-PFCS01, 05-HIGHLEVEL	AsureQuality Method (LC-MS/MS)	IANZ	Amelie Sellier

di-PFHxS (1) = Concentration determined using a branched di-PFHxS isomer standard (399>80 transition)

mono-PFHxS (1) = Concentration determined using a branched mono-PFHxS isomer standard (399>80 transition)

L-PFHxS (1) = Concentration determined using the linear PFHxS isomer standard (399>80 transition)

Total PFHxS (3) = The numerical sum of di-PFHxS (1), mono-PFHxS (1), and L-PFHxS (1)

di-PFOS (5) = Concentration determined using a branched di-PFOS isomer standard (499>80 transition)

mono-PFOS (5) = Concentration determined using a branched mono-PFOS isomer standard (499>80 transition)

L-PFOS (5) = Concentration determined using the linear PFOS isomer standard (499>230 transition)

Total PFOS (7) = The numerical sum of di-PFOS (5), mono-PFOS (5), and L-PFOS (5)

Sum PFHxS+PFOS (1) = The numerical sum of Total PFHxS (3) and Total PFOS (7)

For all Totals, where a component is detected below the LOR, the value of zero is used in the calculation of the sum. The result represents the lower-bound concentration present in the sample.

Reported results are corrected for internal standard recovery

Results that are prefixed with '<' indicate the lowest level at which the analyte can be reported, and that in this case the analyte was not observed above this limit.

Amelie Sellier

Scientist

Accreditation

Appendix

Analyte LOR Summary

Poly- and Perfluorinated Alkyl Substances (PFAS) in Water - High Level - AsureQuality Method (LC-MS/MS)

Analyte	LOR
Perfluoroalkylsulfonic acids	
PFPrS	0.025 µg/L
PFBS	0.025 µg/L
PFPeS	0.025 µg/L
di-PFHxS (1)	0.025 µg/L
mono-PFHxS (1)	0.025 µg/L
L-PFHxS (1)	0.025 µg/L
Total PFHxS (3)	0.025 µg/L
PFHpS	0.025 µg/L
di-PFOS (5)	0.025 µg/L
mono-PFOS (5)	0.025 µg/L
L-PFOS (5)	0.025 µg/L
Total PFOS (7)	0.025 µg/L
Sum PFHxS+PFOS (1)	0.025 µg/L
PFNS	0.050 µg/L
PFDS	0.10 µg/L
Perfluoroalkylcarboxylic acids	
PFBA	0.10 µg/L
PFPeA	0.10 µg/L
PFHxA	0.025 µg/L
PFHpA	0.025 µg/L
PFOA	0.025 µg/L
PFNA	0.025 µg/L
PFDA	0.025 µg/L
PFUnDA	0.025 µg/L
PFDoDA	0.10 µg/L
PFTrDA	0.10 µg/L
PFTeDA	0.10 µg/L
Perfluorooctanesulfonamides	
PFOSA	0.025 µg/L
NEtFOSA-M	0.10 µg/L
NMeFOSA-M	0.10 µg/L
Perfluorooctanesulfonamidoacetic acids	
NEtFOSAA	0.025 µg/L
NMeFOSAA	0.025 µg/L
Perfluorooctanesulfonamidoethanols	
NEtFOSE-M	0.10 µg/L
NMeFOSE-M	0.10 µg/L
Telomere Sulfonic acids	
4:2 FTS	0.025 µg/L
6:2 FTS	0.050 µg/L
8:2 FTS	0.10 µg/L

Analyte Definitions

Poly- and Perfluorinated Alkyl Substances (PFAS) in Water - High Level - AsureQuality Method (LC-MS/MS)

Analyte	Full Name
Perfluoroalkylsulfonic acids	
PFPrS	Perfluoro-1-propanesulfonic acid
PFBS	Perfluoro-1-butanesulfonic acid
PFPeS	Perfluoro-1-pentanesulfonic acid
di-PFHxS (1)	Total Perfluorodimethylbutane sulfonic acids
mono-PFHxS (1)	Total Perfluoromethylpentane sulfonic acids
L-PFHxS (1)	Linear Perfluorohexanesulfonic acid
PFHpS	Perfluoro-1-heptanesulfonic acid
di-PFOS (5)	Total Perfluorodimethylhexane sulfonic acids
mono-PFOS (5)	Total Perfluoromethylheptane sulfonic acids
L-PFOS (5)	Linear Perfluorooctanesulfonic acid
PFNS	Perfluoro-1-nonanesulfonic acid
PFDS	Perfluoro-1-decanesulfonic acid
Perfluoroalkylcarboxylic acids	
PFBA	Perfluoro-n-butanoic acid
PFPeA	Perfluoro-n-pentanoic acid
PFHxA	Perfluoro-n-hexanoic acid
PFHpA	Perfluoro-n-heptanoic acid
PFOA	Perfluoro-n-octanoic acid
PFNA	Perfluoro-n-nonanoic acid
PFDA	Perfluoro-n-decanoic acid
PFUnDA	Perfluoro-n-undecanoic acid
PFDoDA	Perfluoro-n-dodecanoic acid
PFTrDA	Perfluoro-n-tridecanoic acid
PFTeDA	Perfluoro-n-tetradecanoic acid
Perfluorooctanesulfonamides	
PFOSA	Perfluoro-1-octanesulfonamide
NEtFOSA-M	N-ethylperfluoro-1-octanesulfonamide
NMeFOSA-M	N-methylperfluoro-1-octanesulfonamide
Perfluorooctanesulfonamidoacetic acids	
NEtFOSAA	N-ethylperfluoro-1-octanesulfonamidoacetic acid
NMeFOSAA	N-methylperfluoro-1-octanesulfonamidoacetic acid
Perfluorooctanesulfonamidoethanols	
NEtFOSE-M	2-(N-ethylperfluoro-1-octanesulfonamido)-ethanol
NMeFOSE-M	2-(N-methylperfluoro-1-octanesulfonamido)-ethanol
Telomere Sulfonic acids	
4:2 FTS	1H,1H,2H,2H-perfluoro-1-hexanesulfonic acid
6:2 FTS	1H,1H,2H,2H-perfluoro-1-octanesulfonic acid
8:2 FTS	1H,1H,2H,2H-perfluoro-1-decanesulfonic acid
Internal Standards	
M3PFBS	Perfluoro-1-[2,3,4-13C3]butanesulfonic acid
M3PFHxS	Perfluoro-1-[1,2,3-13C3]hexanesulfonic acid
M8PFOS	Perfluoro-1-[13C8]octanesulfonic acid
M4PFBA	Perfluoro-n-[1,2,3,4-13C4]butanoic acid
M5PFPeA	Perfluoro-n-[1,2,3,4,5-13C5]pentanoic acid
M5PFHxA	Perfluoro-n-[1,2,3,4,6-13C5]hexanoic acid
MPFHpA	Perfluoro-n-[-1,2,3,4-13C4]heptanoic acid
M8PFOA	Perfluoro-n-[13C8]octanoic acid
M9PFNA	Perfluoro-n-[13C9]nonanoic acid
M6PFDA	Perfluoro-n-[1,2,3,4,5,6-13C6]decanoic acid
M7PFUnDA	Perfluoro-n-[1,2,3,4,5,6,7-13C7]undecanoic acid
MPFDoDA	Perfluoro-n-[1,2-13C2]dodecanoic acid
MPFTeDA	Perfluoro-n-[1,2-13C2]tetradecanoic acid

Analyte	Full Name
MPFOSA	Perfluoro-1-[13C8]octanesulfonamide
DNEtFOSA	N-ethyl-D5-perfluoro-1-octanesulfonamide
DNMeFOSA	N-methyl-D3-perfluoro-1-octanesulfonamide
DNEtFOSAA	N-ethyl-D5-perfluoro-1-octanesulfonamidoacetic acid
DNMeFOSAA	N-methyl-D3-perfluoro-1-octanesulfonamidoacetic acid
DNEtFOSE	2-(N-ethyl-D5-perfluoro-1-octanesulfonamido)ethan-D4-ol
DNMeFOSE	2-(N-methyl-D3-perfluoro-1-octanesulfonamido)ethan-D4-ol
M4:2FTS	1H,1H,2H,2H-perfluoro-1-[1,2-13C2]-hexane sulfonic acid
M6:2FTS	1H,1H,2H,2H-perfluoro-1-[1,2-13C2]-octane sulfonic acid
M8:2FTS	1H,1H,2H,2H-perfluoro-1-[1,2-13C2]-decane sulfonic acid

LOR = Limit of Reporting LOD = Limit of Detection NR = Not Reportable

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Certificate of Analysis

Client:	Beca Limited	**Lab No:**	2582797 SPv1
Contact:	Vicky Kennaugh	**Date Received:**	13-Apr-2021
	C/- Beca Limited	**Date Reported:**	21-Apr-2021
	PO Box 6345	**Quote No:**	107787
	Wellesley Street	**Order No:**	21:046
	Auckland 1141	**Client Reference:**	3126366/100/DC
		Submitted By:	Vicky Kennaugh

Sample Type: Aqueous

Sample Name:	SW1 12-Apr-2021	SW2 12-Apr-2021	SW3 12-Apr-2021	SW4 12-Apr-2021	GW1 12-Apr-2021
Lab Number:	2582797.1	2582797.2	2582797.3	2582797.4	2582797.5
Poly- and Perfluorinated Alkyl Substances in Water‡	See attached report	See attached report	See attached report	See attached report	See attached report

Sample Name:	GW4 (BH204) 12-Apr-2021	GW5 12-Apr-2021	GW6 (BH201) 12-Apr-2021	GW7 (BH206) 12-Apr-2021	GW8 (BH203) 12-Apr-2021
Lab Number:	2582797.8	2582797.9	2582797.10	2582797.11	2582797.12
Poly- and Perfluorinated Alkyl Substances in Water‡	See attached report	See attached report	See attached report	See attached report	See attached report

Sample Name:	GW9 (BH205) 12-Apr-2021	GW10 (BH208) 13-Apr-2021	GW11 (BH207) 13-Apr-2021	GW12 (BH202) 13-Apr-2021	
Lab Number:	2582797.13	2582797.14	2582797.15	2582797.16	
Poly- and Perfluorinated Alkyl Substances in Water‡	See attached report	See attached report	See attached report	See attached report	-

Analyst's Comments

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

Appendix No.1 - AsureQuality 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 Laboratories, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Poly- and Perfluorinated Alkyl Substances in Water	Analysis by LC-MS/MS. Subcontracted to AsureQuality, Lower Hutt.	-	1-5, 8-16

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

Testing was completed on 21-Apr-2021. For completion dates of individual analyses please contact the laboratory.

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

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

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Certificate of Analysis

Submission Reference: EnvSubAQ_LH 383
Final Report

Environment Client Service Managers
Hill Laboratories - Hamilton
Private Bag 3205
Hamilton 3240
New Zealand

PO Number: 155830

Report Issued: 20-Apr-2021 **AsureQuality Reference: 21-110291** **Sample(s) Received:** 15-Apr-2021 10:59

Testing Period: 15-Apr-2021 to 20-Apr-2021
Date of analysis is available on request.

Results

The tests were performed on the samples as received.

Customer Sample Name: 2582797.1 **Lab ID:** 21-110291-1

Sample Condition: Acceptable **Sampled Date**: 13-Apr-2021

Test	Result	Unit	Method Reference
Poly- and Perfluorinated Alkyl Substances (PFAS) in Water - High Level			
Perfluoroalkylsulfonic acids			
PFPrS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFBS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFPeS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
di-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
mono-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
L-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Total PFHxS (3)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFHpS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
di-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
mono-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
L-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Total PFOS (7)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Sum PFHxS+PFOS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFNS	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
PFDS	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFECHS *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Perfluoroalkylcarboxylic acids			
PFBA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFPeA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFHxA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFHpA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFOA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFNA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFDA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFUnDA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)

AsureQuality Reference: 21-110291 **Report Issued:** 20-Apr-2021

Test	Result	Unit	Method Reference
PFDoDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFTrDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFTeDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
P37DMOA *	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamides			
PFOSA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
NEtFOSA-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSA-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamidoacetic acids			
NEtFOSAA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSAA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamidoethanols			
NEtFOSE-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSE-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Telomere Sulfonic acids			
4:2 FTS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
6:2 FTS	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
8:2 FTS	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
10:2 FTS *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Telomere Carboxylic acids			
FPrPA (3:3FTA) *	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
FPePA (5:3FTA) *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
FHpPA (7:3FTA) *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Miscellaneous			
F-53B (major) *	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
F-53B (minor) *	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
Sum F-53B *	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
ADONA *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
HFPO-DA (GenX) *	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
Internal Standards			
M3PFBS	99	%	AsureQuality Method (LC-MS/MS)
M3PFHxS	101	%	AsureQuality Method (LC-MS/MS)
M8PFOS	102	%	AsureQuality Method (LC-MS/MS)
M4PFBA	106	%	AsureQuality Method (LC-MS/MS)
M5PFPeA	102	%	AsureQuality Method (LC-MS/MS)
M5PFHxA	105	%	AsureQuality Method (LC-MS/MS)
MPFHpA	104	%	AsureQuality Method (LC-MS/MS)
M8PFOA	111	%	AsureQuality Method (LC-MS/MS)
M9PFNA	99	%	AsureQuality Method (LC-MS/MS)
M6PFDA	107	%	AsureQuality Method (LC-MS/MS)
M7PFUnDA	115	%	AsureQuality Method (LC-MS/MS)
MPFDoDA	108	%	AsureQuality Method (LC-MS/MS)
MPFTeDA	104	%	AsureQuality Method (LC-MS/MS)
MPFOSA	103	%	AsureQuality Method (LC-MS/MS)
DNEtFOSA	106	%	AsureQuality Method (LC-MS/MS)
DNMeFOSA	107	%	AsureQuality Method (LC-MS/MS)
DNEtFOSAA	110	%	AsureQuality Method (LC-MS/MS)
DNMeFOSAA	105	%	AsureQuality Method (LC-MS/MS)
DNEtFOSE	107	%	AsureQuality Method (LC-MS/MS)
DNMeFOSE	108	%	AsureQuality Method (LC-MS/MS)

AsureQuality Reference: 21-110291 **Report Issued:** 20-Apr-2021

Test	Result	Unit	Method Reference
M4:2FTS	101	%	AsureQuality Method (LC-MS/MS)
M6:2FTS	108	%	AsureQuality Method (LC-MS/MS)
M8:2FTS	102	%	AsureQuality Method (LC-MS/MS)
M3HFPO-DA *	107	%	AsureQuality Method (LC-MS/MS)

Customer Sample Name: 2582797.2 **Lab ID:** 21-110291-2

Sample Condition: Acceptable **Sampled Date**: 13-Apr-2021

Test	Result	Unit	Method Reference
Poly- and Perfluorinated Alkyl Substances (PFAS) in Water - High Level			
Perfluoroalkylsulfonic acids			
PFPrS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFBS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFPeS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
di-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
mono-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
L-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Total PFHxS (3)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFHpS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
di-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
mono-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
L-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Total PFOS (7)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Sum PFHxS+PFOS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFNS	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
PFDS	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFECHS *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Perfluoroalkylcarboxylic acids			
PFBA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFPeA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFHxA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFHpA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFOA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFNA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFDA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFUnDA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFDoDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFTrDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFTeDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
P37DMOA *	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamides			
PFOSA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
NEtFOSA-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSA-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamidoacetic acids			
NEtFOSAA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSAA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamidoethanols			
NEtFOSE-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSE-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)

AsureQuality Reference: 21-110291 **Report Issued:** 20-Apr-2021

Test	Result	Unit	Method Reference
Telomere Sulfonic acids			
4:2 FTS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
6:2 FTS	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
8:2 FTS	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
10:2 FTS *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Telomere Carboxylic acids			
FPrPA (3:3FTA) *	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
FPePA (5:3FTA) *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
FHpPA (7:3FTA) *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Miscellaneous			
F-53B (major) *	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
F-53B (minor) *	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
Sum F-53B *	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
ADONA *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
HFPO-DA (GenX) *	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
Internal Standards			
M3PFBS	102	%	AsureQuality Method (LC-MS/MS)
M3PFHxS	102	%	AsureQuality Method (LC-MS/MS)
M8PFOS	102	%	AsureQuality Method (LC-MS/MS)
M4PFBA	108	%	AsureQuality Method (LC-MS/MS)
M5PFPeA	106	%	AsureQuality Method (LC-MS/MS)
M5PFHxA	109	%	AsureQuality Method (LC-MS/MS)
MPFHpA	106	%	AsureQuality Method (LC-MS/MS)
M8PFOA	110	%	AsureQuality Method (LC-MS/MS)
M9PFNA	101	%	AsureQuality Method (LC-MS/MS)
M6PFDA	111	%	AsureQuality Method (LC-MS/MS)
M7PFUnDA	111	%	AsureQuality Method (LC-MS/MS)
MPFDoDA	109	%	AsureQuality Method (LC-MS/MS)
MPFTeDA	108	%	AsureQuality Method (LC-MS/MS)
MPFOSA	104	%	AsureQuality Method (LC-MS/MS)
DNEtFOSA	108	%	AsureQuality Method (LC-MS/MS)
DNMeFOSA	107	%	AsureQuality Method (LC-MS/MS)
DNEtFOSAA	112	%	AsureQuality Method (LC-MS/MS)
DNMeFOSAA	106	%	AsureQuality Method (LC-MS/MS)
DNEtFOSE	106	%	AsureQuality Method (LC-MS/MS)
DNMeFOSE	107	%	AsureQuality Method (LC-MS/MS)
M4:2FTS	98	%	AsureQuality Method (LC-MS/MS)
M6:2FTS	96	%	AsureQuality Method (LC-MS/MS)
M8:2FTS	91	%	AsureQuality Method (LC-MS/MS)
M3HFPO-DA *	121	%	AsureQuality Method (LC-MS/MS)

Customer Sample Name: 2582797.3 **Lab ID:** 21-110291-3

Sample Condition: Acceptable **Sampled Date**: 13-Apr-2021

Test	Result	Unit	Method Reference
Poly- and Perfluorinated Alkyl Substances (PFAS) in Water - High Level			
Perfluoroalkylsulfonic acids			
PFPrS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFBS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFPeS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
di-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)

AsureQuality Reference: 21-110291 **Report Issued:** 20-Apr-2021

Test	Result	Unit	Method Reference
mono-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
L-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Total PFHxS (3)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFHpS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
di-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
mono-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
L-PFOS (5)	0.069	µg/L	AsureQuality Method (LC-MS/MS)
Total PFOS (7)	0.069	µg/L	AsureQuality Method (LC-MS/MS)
Sum PFHxS+PFOS (1)	0.069	µg/L	AsureQuality Method (LC-MS/MS)
PFNS	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
PFDS	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFECHS *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Perfluoroalkylcarboxylic acids			
PFBA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFPeA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFHxA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFHpA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFOA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFNA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFDA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFUnDA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFDoDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFTrDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFTeDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
P37DMOA *	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamides			
PFOSA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
NEtFOSA-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSA-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamidoacetic acids			
NEtFOSAA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSAA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamidoethanols			
NEtFOSE-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSE-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Telomere Sulfonic acids			
4:2 FTS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
6:2 FTS	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
8:2 FTS	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
10:2 FTS *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Telomere Carboxylic acids			
FPrPA (3:3FTA) *	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
FPePA (5:3FTA) *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
FHpPA (7:3FTA) *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Miscellaneous			
F-53B (major) *	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
F-53B (minor) *	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
Sum F-53B *	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
ADONA *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
HFPO-DA (GenX) *	<0.050	µg/L	AsureQuality Method (LC-MS/MS)

AsureQuality Reference: 21-110291 **Report Issued:** 20-Apr-2021

Test	Result	Unit	Method Reference
Internal Standards			
M3PFBS	104	%	AsureQuality Method (LC-MS/MS)
M3PFHxS	103	%	AsureQuality Method (LC-MS/MS)
M8PFOS	103	%	AsureQuality Method (LC-MS/MS)
M4PFBA	107	%	AsureQuality Method (LC-MS/MS)
M5PFPeA	102	%	AsureQuality Method (LC-MS/MS)
M5PFHxA	106	%	AsureQuality Method (LC-MS/MS)
MPFHpA	106	%	AsureQuality Method (LC-MS/MS)
M8PFOA	105	%	AsureQuality Method (LC-MS/MS)
M9PFNA	105	%	AsureQuality Method (LC-MS/MS)
M6PFDA	104	%	AsureQuality Method (LC-MS/MS)
M7PFUnDA	100	%	AsureQuality Method (LC-MS/MS)
MPFDoDA	106	%	AsureQuality Method (LC-MS/MS)
MPFTeDA	100	%	AsureQuality Method (LC-MS/MS)
MPFOSA	104	%	AsureQuality Method (LC-MS/MS)
DNEtFOSA	104	%	AsureQuality Method (LC-MS/MS)
DNMeFOSA	103	%	AsureQuality Method (LC-MS/MS)
DNEtFOSAA	110	%	AsureQuality Method (LC-MS/MS)
DNMeFOSAA	103	%	AsureQuality Method (LC-MS/MS)
DNEtFOSE	105	%	AsureQuality Method (LC-MS/MS)
DNMeFOSE	102	%	AsureQuality Method (LC-MS/MS)
M4:2FTS	100	%	AsureQuality Method (LC-MS/MS)
M6:2FTS	96	%	AsureQuality Method (LC-MS/MS)
M8:2FTS	98	%	AsureQuality Method (LC-MS/MS)
M3HFPO-DA *	107	%	AsureQuality Method (LC-MS/MS)

Customer Sample Name: 2582797.4 **Lab ID:** 21-110291-4

Sample Condition: Acceptable **Sampled Date**: 13-Apr-2021

Test	Result	Unit	Method Reference
Poly- and Perfluorinated Alkyl Substances (PFAS) in Water - High Level			
Perfluoroalkylsulfonic acids			
PFPrS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFBS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFPeS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
di-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
mono-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
L-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Total PFHxS (3)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFHpS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
di-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
mono-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
L-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Total PFOS (7)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Sum PFHxS+PFOS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFNS	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
PFDS	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFECHS *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Perfluoroalkylcarboxylic acids			
PFBA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFPeA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)

AsureQuality Reference: 21-110291 **Report Issued:** 20-Apr-2021

Test	Result	Unit	Method Reference
PFHxA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFHpA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFOA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFNA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFDA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFUnDA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFDoDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFTrDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFTeDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
P37DMOA *	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamides			
PFOSA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
NEtFOSA-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSA-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamidoacetic acids			
NEtFOSAA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSAA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamidoethanols			
NEtFOSE-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSE-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Telomere Sulfonic acids			
4:2 FTS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
6:2 FTS	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
8:2 FTS	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
10:2 FTS *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Telomere Carboxylic acids			
FPrPA (3:3FTA) *	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
FPePA (5:3FTA) *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
FHpPA (7:3FTA) *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Miscellaneous			
F-53B (major) *	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
F-53B (minor) *	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
Sum F-53B *	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
ADONA *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
HFPO-DA (GenX) *	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
Internal Standards			
M3PFBS	103	%	AsureQuality Method (LC-MS/MS)
M3PFHxS	103	%	AsureQuality Method (LC-MS/MS)
M8PFOS	107	%	AsureQuality Method (LC-MS/MS)
M4PFBA	109	%	AsureQuality Method (LC-MS/MS)
M5PFPeA	108	%	AsureQuality Method (LC-MS/MS)
M5PFHxA	108	%	AsureQuality Method (LC-MS/MS)
MPFHpA	106	%	AsureQuality Method (LC-MS/MS)
M8PFOA	109	%	AsureQuality Method (LC-MS/MS)
M9PFNA	104	%	AsureQuality Method (LC-MS/MS)
M6PFDA	109	%	AsureQuality Method (LC-MS/MS)
M7PFUnDA	105	%	AsureQuality Method (LC-MS/MS)
MPFDoDA	110	%	AsureQuality Method (LC-MS/MS)
MPFTeDA	105	%	AsureQuality Method (LC-MS/MS)
MPFOSA	106	%	AsureQuality Method (LC-MS/MS)

AsureQuality Reference: 21-110291 **Report Issued:** 20-Apr-2021

Test	Result	Unit	Method Reference
DNEtFOSA	110	%	AsureQuality Method (LC-MS/MS)
DNMeFOSA	110	%	AsureQuality Method (LC-MS/MS)
DNEtFOSAA	111	%	AsureQuality Method (LC-MS/MS)
DNMeFOSAA	107	%	AsureQuality Method (LC-MS/MS)
DNEtFOSE	106	%	AsureQuality Method (LC-MS/MS)
DNMeFOSE	109	%	AsureQuality Method (LC-MS/MS)
M4:2FTS	101	%	AsureQuality Method (LC-MS/MS)
M6:2FTS	107	%	AsureQuality Method (LC-MS/MS)
M8:2FTS	97	%	AsureQuality Method (LC-MS/MS)
M3HFPO-DA *	126	%	AsureQuality Method (LC-MS/MS)

Customer Sample Name: 2582797.5 **Lab ID:** 21-110291-5

Sample Condition: Acceptable **Sampled Date**: 13-Apr-2021

Test	Result	Unit	Method Reference
Poly- and Perfluorinated Alkyl Substances (PFAS) in Water - High Level			
Perfluoroalkylsulfonic acids			
PFPrS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFBS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFPeS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
di-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
mono-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
L-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Total PFHxS (3)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFHpS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
di-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
mono-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
L-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Total PFOS (7)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Sum PFHxS+PFOS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFNS	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
PFDS	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFECHS *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Perfluoroalkylcarboxylic acids			
PFBA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFPeA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFHxA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFHpA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFOA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFNA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFDA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFUnDA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFDoDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFTrDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFTeDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
P37DMOA *	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamides			
PFOSA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
NEtFOSA-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSA-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)

AsureQuality Reference: 21-110291 **Report Issued:** 20-Apr-2021

Test	Result	Unit	Method Reference
Perfluorooctanesulfonamidoacetic acids			
NEtFOSAA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSAA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamidoethanols			
NEtFOSE-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSE-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Telomere Sulfonic acids			
4:2 FTS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
6:2 FTS	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
8:2 FTS	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
10:2 FTS *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Telomere Carboxylic acids			
FPrPA (3:3FTA) *	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
FPePA (5:3FTA) *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
FHpPA (7:3FTA) *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Miscellaneous			
F-53B (major) *	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
F-53B (minor) *	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
Sum F-53B *	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
ADONA *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
HFPO-DA (GenX) *	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
Internal Standards			
M3PFBS	108	%	AsureQuality Method (LC-MS/MS)
M3PFHxS	104	%	AsureQuality Method (LC-MS/MS)
M8PFOS	112	%	AsureQuality Method (LC-MS/MS)
M4PFBA	113	%	AsureQuality Method (LC-MS/MS)
M5PFPeA	108	%	AsureQuality Method (LC-MS/MS)
M5PFHxA	113	%	AsureQuality Method (LC-MS/MS)
MPFHpA	111	%	AsureQuality Method (LC-MS/MS)
M8PFOA	112	%	AsureQuality Method (LC-MS/MS)
M9PFNA	103	%	AsureQuality Method (LC-MS/MS)
M6PFDA	105	%	AsureQuality Method (LC-MS/MS)
M7PFUnDA	105	%	AsureQuality Method (LC-MS/MS)
MPFDoDA	101	%	AsureQuality Method (LC-MS/MS)
MPFTeDA	77	%	AsureQuality Method (LC-MS/MS)
MPFOSA	107	%	AsureQuality Method (LC-MS/MS)
DNEtFOSA	110	%	AsureQuality Method (LC-MS/MS)
DNMeFOSA	102	%	AsureQuality Method (LC-MS/MS)
DNEtFOSAA	110	%	AsureQuality Method (LC-MS/MS)
DNMeFOSAA	103	%	AsureQuality Method (LC-MS/MS)
DNEtFOSE	112	%	AsureQuality Method (LC-MS/MS)
DNMeFOSE	108	%	AsureQuality Method (LC-MS/MS)
M4:2FTS	106	%	AsureQuality Method (LC-MS/MS)
M6:2FTS	108	%	AsureQuality Method (LC-MS/MS)
M8:2FTS	102	%	AsureQuality Method (LC-MS/MS)
M3HFPO-DA *	117	%	AsureQuality Method (LC-MS/MS)

Customer Sample Name: 2582797.8 **Lab ID:** 21-110291-6

Sample Condition: Acceptable **Sampled Date**: 13-Apr-2021

Test	Result	Unit	Method Reference

AsureQuality Reference: 21-110291 **Report Issued:** 20-Apr-2021

Poly- and Perfluorinated Alkyl Substances (PFAS) in Water - High Level

Perfluoroalkylsulfonic acids			
PFPrS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFBS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFPeS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
di-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
mono-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
L-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Total PFHxS (3)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFHpS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
di-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
mono-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
L-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Total PFOS (7)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Sum PFHxS+PFOS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFNS	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
PFDS	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFECHS *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Perfluoroalkylcarboxylic acids			
PFBA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFPeA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFHxA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFHpA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFOA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFNA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFDA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFUnDA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFDoDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFTrDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFTeDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
P37DMOA *	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamides			
PFOSA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
NEtFOSA-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSA-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamidoacetic acids			
NEtFOSAA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSAA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamidoethanols			
NEtFOSE-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSE-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Telomere Sulfonic acids			
4:2 FTS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
6:2 FTS	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
8:2 FTS	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
10:2 FTS *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Telomere Carboxylic acids			
FPrPA (3:3FTA) *	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
FPePA (5:3FTA) *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
FHpPA (7:3FTA) *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)

AsureQuality Reference: 21-110291 **Report Issued:** 20-Apr-2021

Test	Result	Unit	Method Reference
Miscellaneous			
F-53B (major) *	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
F-53B (minor) *	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
Sum F-53B *	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
ADONA *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
HFPO-DA (GenX) *	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
Internal Standards			
M3PFBS	104	%	AsureQuality Method (LC-MS/MS)
M3PFHxS	104	%	AsureQuality Method (LC-MS/MS)
M8PFOS	103	%	AsureQuality Method (LC-MS/MS)
M4PFBA	109	%	AsureQuality Method (LC-MS/MS)
M5PFPeA	106	%	AsureQuality Method (LC-MS/MS)
M5PFHxA	109	%	AsureQuality Method (LC-MS/MS)
MPFHpA	108	%	AsureQuality Method (LC-MS/MS)
M8PFOA	111	%	AsureQuality Method (LC-MS/MS)
M9PFNA	97	%	AsureQuality Method (LC-MS/MS)
M6PFDA	106	%	AsureQuality Method (LC-MS/MS)
M7PFUnDA	122	%	AsureQuality Method (LC-MS/MS)
MPFDoDA	109	%	AsureQuality Method (LC-MS/MS)
MPFTeDA	106	%	AsureQuality Method (LC-MS/MS)
MPFOSA	104	%	AsureQuality Method (LC-MS/MS)
DNEtFOSA	111	%	AsureQuality Method (LC-MS/MS)
DNMeFOSA	110	%	AsureQuality Method (LC-MS/MS)
DNEtFOSAA	112	%	AsureQuality Method (LC-MS/MS)
DNMeFOSAA	104	%	AsureQuality Method (LC-MS/MS)
DNEtFOSE	107	%	AsureQuality Method (LC-MS/MS)
DNMeFOSE	106	%	AsureQuality Method (LC-MS/MS)
M4:2FTS	105	%	AsureQuality Method (LC-MS/MS)
M6:2FTS	102	%	AsureQuality Method (LC-MS/MS)
M8:2FTS	100	%	AsureQuality Method (LC-MS/MS)
M3HFPO-DA *	107	%	AsureQuality Method (LC-MS/MS)

Customer Sample Name: 2582797.9 **Lab ID:** 21-110291-7

Sample Condition: Acceptable **Sampled Date**: 13-Apr-2021

Test	Result	Unit	Method Reference
Poly- and Perfluorinated Alkyl Substances (PFAS) in Water - High Level			
Perfluoroalkylsulfonic acids			
PFPrS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFBS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFPeS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
di-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
mono-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
L-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Total PFHxS (3)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFHpS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
di-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
mono-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
L-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Total PFOS (7)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Sum PFHxS+PFOS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)

AsureQuality Reference: 21-110291 **Report Issued:** 20-Apr-2021

Test	Result	Unit	Method Reference
PFNS	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
PFDS	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFECHS *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Perfluoroalkylcarboxylic acids			
PFBA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFPeA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFHxA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFHpA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFOA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFNA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFDA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFUnDA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFDoDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFTrDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFTeDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
P37DMOA *	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamides			
PFOSA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
NEtFOSA-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSA-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamidoacetic acids			
NEtFOSAA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSAA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamidoethanols			
NEtFOSE-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSE-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Telomere Sulfonic acids			
4:2 FTS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
6:2 FTS	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
8:2 FTS	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
10:2 FTS *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Telomere Carboxylic acids			
FPrPA (3:3FTA) *	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
FPePA (5:3FTA) *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
FHpPA (7:3FTA) *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Miscellaneous			
F-53B (major) *	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
F-53B (minor) *	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
Sum F-53B *	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
ADONA *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
HFPO-DA (GenX) *	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
Internal Standards			
M3PFBS	104	%	AsureQuality Method (LC-MS/MS)
M3PFHxS	101	%	AsureQuality Method (LC-MS/MS)
M8PFOS	103	%	AsureQuality Method (LC-MS/MS)
M4PFBA	108	%	AsureQuality Method (LC-MS/MS)
M5PFPeA	106	%	AsureQuality Method (LC-MS/MS)
M5PFHxA	105	%	AsureQuality Method (LC-MS/MS)
MPFHpA	103	%	AsureQuality Method (LC-MS/MS)
M8PFOA	107	%	AsureQuality Method (LC-MS/MS)

AsureQuality Reference: 21-110291 **Report Issued:** 20-Apr-2021

Test	Result	Unit	Method Reference
M9PFNA	100	%	AsureQuality Method (LC-MS/MS)
M6PFDA	107	%	AsureQuality Method (LC-MS/MS)
M7PFUnDA	113	%	AsureQuality Method (LC-MS/MS)
MPFDoDA	103	%	AsureQuality Method (LC-MS/MS)
MPFTeDA	100	%	AsureQuality Method (LC-MS/MS)
MPFOSA	103	%	AsureQuality Method (LC-MS/MS)
DNEtFOSA	106	%	AsureQuality Method (LC-MS/MS)
DNMeFOSA	104	%	AsureQuality Method (LC-MS/MS)
DNEtFOSAA	104	%	AsureQuality Method (LC-MS/MS)
DNMeFOSAA	101	%	AsureQuality Method (LC-MS/MS)
DNEtFOSE	103	%	AsureQuality Method (LC-MS/MS)
DNMeFOSE	100	%	AsureQuality Method (LC-MS/MS)
M4:2FTS	98	%	AsureQuality Method (LC-MS/MS)
M6:2FTS	103	%	AsureQuality Method (LC-MS/MS)
M8:2FTS	94	%	AsureQuality Method (LC-MS/MS)
M3HFPO-DA *	108	%	AsureQuality Method (LC-MS/MS)

Customer Sample Name: 2582797.10 **Lab ID:** 21-110291-8

Sample Condition: Acceptable **Sampled Date**: 13-Apr-2021

Test	Result	Unit	Method Reference
Poly- and Perfluorinated Alkyl Substances (PFAS) in Water - High Level			
Perfluoroalkylsulfonic acids			
PFPrS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFBS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFPeS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
di-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
mono-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
L-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Total PFHxS (3)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFHpS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
di-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
mono-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
L-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Total PFOS (7)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Sum PFHxS+PFOS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFNS	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
PFDS	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFECHS *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Perfluoroalkylcarboxylic acids			
PFBA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFPeA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFHxA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFHpA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFOA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFNA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFDA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFUnDA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFDoDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFTrDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFTeDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)

AsureQuality Reference: 21-110291 **Report Issued:** 20-Apr-2021

Test	Result	Unit	Method Reference
P37DMOA *	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamides			
PFOSA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
NEtFOSA-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSA-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamidoacetic acids			
NEtFOSAA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSAA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamidoethanols			
NEtFOSE-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSE-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Telomere Sulfonic acids			
4:2 FTS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
6:2 FTS	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
8:2 FTS	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
10:2 FTS *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Telomere Carboxylic acids			
FPrPA (3:3FTA) *	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
FPePA (5:3FTA) *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
FHpPA (7:3FTA) *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Miscellaneous			
F-53B (major) *	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
F-53B (minor) *	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
Sum F-53B *	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
ADONA *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
HFPO-DA (GenX) *	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
Internal Standards			
M3PFBS	103	%	AsureQuality Method (LC-MS/MS)
M3PFHxS	101	%	AsureQuality Method (LC-MS/MS)
M8PFOS	106	%	AsureQuality Method (LC-MS/MS)
M4PFBA	108	%	AsureQuality Method (LC-MS/MS)
M5PFPeA	105	%	AsureQuality Method (LC-MS/MS)
M5PFHxA	107	%	AsureQuality Method (LC-MS/MS)
MPFHpA	108	%	AsureQuality Method (LC-MS/MS)
M8PFOA	107	%	AsureQuality Method (LC-MS/MS)
M9PFNA	94	%	AsureQuality Method (LC-MS/MS)
M6PFDA	110	%	AsureQuality Method (LC-MS/MS)
M7PFUnDA	101	%	AsureQuality Method (LC-MS/MS)
MPFDoDA	104	%	AsureQuality Method (LC-MS/MS)
MPFTeDA	106	%	AsureQuality Method (LC-MS/MS)
MPFOSA	105	%	AsureQuality Method (LC-MS/MS)
DNEtFOSA	104	%	AsureQuality Method (LC-MS/MS)
DNMeFOSA	105	%	AsureQuality Method (LC-MS/MS)
DNEtFOSAA	109	%	AsureQuality Method (LC-MS/MS)
DNMeFOSAA	102	%	AsureQuality Method (LC-MS/MS)
DNEtFOSE	108	%	AsureQuality Method (LC-MS/MS)
DNMeFOSE	105	%	AsureQuality Method (LC-MS/MS)
M4:2FTS	96	%	AsureQuality Method (LC-MS/MS)
M6:2FTS	99	%	AsureQuality Method (LC-MS/MS)
M8:2FTS	96	%	AsureQuality Method (LC-MS/MS)

AsureQuality Reference: 21-110291 **Report Issued:** 20-Apr-2021

Test	Result	Unit	Method Reference
M3HFPO-DA *	116	%	AsureQuality Method (LC-MS/MS)

Customer Sample Name: 2582797.11 **Lab ID:** 21-110291-9

Sample Condition: Acceptable **Sampled Date**: 13-Apr-2021

Test	Result	Unit	Method Reference
Poly- and Perfluorinated Alkyl Substances (PFAS) in Water - High Level			
Perfluoroalkylsulfonic acids			
PFPrS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFBS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFPeS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
di-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
mono-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
L-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Total PFHxS (3)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFHpS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
di-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
mono-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
L-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Total PFOS (7)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Sum PFHxS+PFOS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFNS	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
PFDS	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFECHS *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Perfluoroalkylcarboxylic acids			
PFBA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFPeA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFHxA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFHpA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFOA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFNA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFDA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFUnDA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFDoDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFTrDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFTeDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
P37DMOA *	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamides			
PFOSA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
NEtFOSA-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSA-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamidoacetic acids			
NEtFOSAA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSAA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamidoethanols			
NEtFOSE-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSE-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Telomere Sulfonic acids			
4:2 FTS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
6:2 FTS	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
8:2 FTS	<0.10	µg/L	AsureQuality Method (LC-MS/MS)

AsureQuality Reference: 21-110291 **Report Issued:** 20-Apr-2021

Test	Result	Unit	Method Reference
10:2 FTS *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Telomere Carboxylic acids			
FPrPA (3:3FTA) *	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
FPePA (5:3FTA) *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
FHpPA (7:3FTA) *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Miscellaneous			
F-53B (major) *	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
F-53B (minor) *	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
Sum F-53B *	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
ADONA *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
HFPO-DA (GenX) *	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
Internal Standards			
M3PFBS	102	%	AsureQuality Method (LC-MS/MS)
M3PFHxS	104	%	AsureQuality Method (LC-MS/MS)
M8PFOS	103	%	AsureQuality Method (LC-MS/MS)
M4PFBA	104	%	AsureQuality Method (LC-MS/MS)
M5PFPeA	102	%	AsureQuality Method (LC-MS/MS)
M5PFHxA	101	%	AsureQuality Method (LC-MS/MS)
MPFHpA	105	%	AsureQuality Method (LC-MS/MS)
M8PFOA	108	%	AsureQuality Method (LC-MS/MS)
M9PFNA	100	%	AsureQuality Method (LC-MS/MS)
M6PFDA	107	%	AsureQuality Method (LC-MS/MS)
M7PFUnDA	97	%	AsureQuality Method (LC-MS/MS)
MPFDoDA	100	%	AsureQuality Method (LC-MS/MS)
MPFTeDA	91	%	AsureQuality Method (LC-MS/MS)
MPFOSA	106	%	AsureQuality Method (LC-MS/MS)
DNEtFOSA	106	%	AsureQuality Method (LC-MS/MS)
DNMeFOSA	104	%	AsureQuality Method (LC-MS/MS)
DNEtFOSAA	103	%	AsureQuality Method (LC-MS/MS)
DNMeFOSAA	101	%	AsureQuality Method (LC-MS/MS)
DNEtFOSE	104	%	AsureQuality Method (LC-MS/MS)
DNMeFOSE	102	%	AsureQuality Method (LC-MS/MS)
M4:2FTS	104	%	AsureQuality Method (LC-MS/MS)
M6:2FTS	106	%	AsureQuality Method (LC-MS/MS)
M8:2FTS	92	%	AsureQuality Method (LC-MS/MS)
M3HFPO-DA *	104	%	AsureQuality Method (LC-MS/MS)

Customer Sample Name: 2582797.12 **Lab ID:** 21-110291-10

Sample Condition: Acceptable **Sampled Date**: 13-Apr-2021

Test	Result	Unit	Method Reference
Poly- and Perfluorinated Alkyl Substances (PFAS) in Water - High Level			
Perfluoroalkylsulfonic acids			
PFPrS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFBS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFPeS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
di-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
mono-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
L-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Total PFHxS (3)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFHpS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)

AsureQuality Reference: 21-110291 **Report Issued:** 20-Apr-2021

Test	Result	Unit	Method Reference
di-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
mono-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
L-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Total PFOS (7)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Sum PFHxS+PFOS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFNS	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
PFDS	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFECHS *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Perfluoroalkylcarboxylic acids			
PFBA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFPeA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFHxA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFHpA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFOA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFNA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFDA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFUnDA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFDoDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFTrDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFTeDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
P37DMOA *	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamides			
PFOSA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
NEtFOSA-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSA-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamidoacetic acids			
NEtFOSAA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSAA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamidoethanols			
NEtFOSE-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSE-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Telomere Sulfonic acids			
4:2 FTS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
6:2 FTS	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
8:2 FTS	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
10:2 FTS *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Telomere Carboxylic acids			
FPrPA (3:3FTA) *	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
FPePA (5:3FTA) *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
FHpPA (7:3FTA) *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Miscellaneous			
F-53B (major) *	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
F-53B (minor) *	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
Sum F-53B *	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
ADONA *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
HFPO-DA (GenX) *	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
Internal Standards			
M3PFBS	104	%	AsureQuality Method (LC-MS/MS)
M3PFHxS	106	%	AsureQuality Method (LC-MS/MS)
M8PFOS	101	%	AsureQuality Method (LC-MS/MS)

AsureQuality Reference: 21-110291 **Report Issued:** 20-Apr-2021

Test	Result	Unit	Method Reference
M4PFBA	107	%	AsureQuality Method (LC-MS/MS)
M5PFPeA	103	%	AsureQuality Method (LC-MS/MS)
M5PFHxA	107	%	AsureQuality Method (LC-MS/MS)
MPFHpA	101	%	AsureQuality Method (LC-MS/MS)
M8PFOA	105	%	AsureQuality Method (LC-MS/MS)
M9PFNA	101	%	AsureQuality Method (LC-MS/MS)
M6PFDA	99	%	AsureQuality Method (LC-MS/MS)
M7PFUnDA	104	%	AsureQuality Method (LC-MS/MS)
MPFDoDA	103	%	AsureQuality Method (LC-MS/MS)
MPFTeDA	98	%	AsureQuality Method (LC-MS/MS)
MPFOSA	102	%	AsureQuality Method (LC-MS/MS)
DNEtFOSA	105	%	AsureQuality Method (LC-MS/MS)
DNMeFOSA	105	%	AsureQuality Method (LC-MS/MS)
DNEtFOSAA	107	%	AsureQuality Method (LC-MS/MS)
DNMeFOSAA	100	%	AsureQuality Method (LC-MS/MS)
DNEtFOSE	106	%	AsureQuality Method (LC-MS/MS)
DNMeFOSE	105	%	AsureQuality Method (LC-MS/MS)
M4:2FTS	98	%	AsureQuality Method (LC-MS/MS)
M6:2FTS	98	%	AsureQuality Method (LC-MS/MS)
M8:2FTS	91	%	AsureQuality Method (LC-MS/MS)
M3HFPO-DA *	117	%	AsureQuality Method (LC-MS/MS)

Customer Sample Name: 2582797.13 **Lab ID:** 21-110291-11

Sample Condition: Acceptable **Sampled Date**: 13-Apr-2021

Test	Result	Unit	Method Reference
Poly- and Perfluorinated Alkyl Substances (PFAS) in Water - High Level			
Perfluoroalkylsulfonic acids			
PFPrS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFBS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFPeS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
di-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
mono-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
L-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Total PFHxS (3)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFHpS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
di-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
mono-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
L-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Total PFOS (7)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Sum PFHxS+PFOS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFNS	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
PFDS	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFECHS *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Perfluoroalkylcarboxylic acids			
PFBA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFPeA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFHxA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFHpA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFOA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFNA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)

AsureQuality Reference: 21-110291 **Report Issued:** 20-Apr-2021

Test	Result	Unit	Method Reference
PFDA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFUnDA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFDoDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFTrDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFTeDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
P37DMOA *	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamides			
PFOSA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
NEtFOSA-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSA-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamidoacetic acids			
NEtFOSAA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSAA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamidoethanols			
NEtFOSE-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSE-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Telomere Sulfonic acids			
4:2 FTS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
6:2 FTS	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
8:2 FTS	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
10:2 FTS *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Telomere Carboxylic acids			
FPrPA (3:3FTA) *	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
FPePA (5:3FTA) *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
FHpPA (7:3FTA) *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Miscellaneous			
F-53B (major) *	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
F-53B (minor) *	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
Sum F-53B *	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
ADONA *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
HFPO-DA (GenX) *	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
Internal Standards			
M3PFBS	102	%	AsureQuality Method (LC-MS/MS)
M3PFHxS	102	%	AsureQuality Method (LC-MS/MS)
M8PFOS	103	%	AsureQuality Method (LC-MS/MS)
M4PFBA	110	%	AsureQuality Method (LC-MS/MS)
M5PFPeA	104	%	AsureQuality Method (LC-MS/MS)
M5PFHxA	112	%	AsureQuality Method (LC-MS/MS)
MPFHpA	106	%	AsureQuality Method (LC-MS/MS)
M8PFOA	110	%	AsureQuality Method (LC-MS/MS)
M9PFNA	104	%	AsureQuality Method (LC-MS/MS)
M6PFDA	106	%	AsureQuality Method (LC-MS/MS)
M7PFUnDA	113	%	AsureQuality Method (LC-MS/MS)
MPFDoDA	110	%	AsureQuality Method (LC-MS/MS)
MPFTeDA	107	%	AsureQuality Method (LC-MS/MS)
MPFOSA	107	%	AsureQuality Method (LC-MS/MS)
DNEtFOSA	113	%	AsureQuality Method (LC-MS/MS)
DNMeFOSA	106	%	AsureQuality Method (LC-MS/MS)
DNEtFOSAA	108	%	AsureQuality Method (LC-MS/MS)
DNMeFOSAA	105	%	AsureQuality Method (LC-MS/MS)

AsureQuality Reference: 21-110291 **Report Issued:** 20-Apr-2021

Test	Result	Unit	Method Reference
DNEtFOSE	111	%	AsureQuality Method (LC-MS/MS)
DNMeFOSE	106	%	AsureQuality Method (LC-MS/MS)
M4:2FTS	100	%	AsureQuality Method (LC-MS/MS)
M6:2FTS	98	%	AsureQuality Method (LC-MS/MS)
M8:2FTS	100	%	AsureQuality Method (LC-MS/MS)
M3HFPO-DA *	106	%	AsureQuality Method (LC-MS/MS)

Customer Sample Name: 2582797.14 **Lab ID:** 21-110291-12

Sample Condition: Acceptable **Sampled Date**: 13-Apr-2021

Test	Result	Unit	Method Reference
Poly- and Perfluorinated Alkyl Substances (PFAS) in Water - High Level			
Perfluoroalkylsulfonic acids			
PFPrS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFBS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFPeS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
di-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
mono-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
L-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Total PFHxS (3)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFHpS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
di-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
mono-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
L-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Total PFOS (7)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Sum PFHxS+PFOS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFNS	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
PFDS	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFECHS *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Perfluoroalkylcarboxylic acids			
PFBA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFPeA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFHxA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFHpA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFOA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFNA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFDA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFUnDA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFDoDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFTrDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFTeDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
P37DMOA *	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamides			
PFOSA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
NEtFOSA-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSA-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamidoacetic acids			
NEtFOSAA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSAA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamidoethanols			
NEtFOSE-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)

AsureQuality Reference: 21-110291 **Report Issued:** 20-Apr-2021

Test	Result	Unit	Method Reference
NMeFOSE-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Telomere Sulfonic acids			
4:2 FTS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
6:2 FTS	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
8:2 FTS	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
10:2 FTS *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Telomere Carboxylic acids			
FPrPA (3:3FTA) *	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
FPePA (5:3FTA) *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
FHpPA (7:3FTA) *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Miscellaneous			
F-53B (major) *	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
F-53B (minor) *	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
Sum F-53B *	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
ADONA *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
HFPO-DA (GenX) *	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
Internal Standards			
M3PFBS	105	%	AsureQuality Method (LC-MS/MS)
M3PFHxS	102	%	AsureQuality Method (LC-MS/MS)
M8PFOS	104	%	AsureQuality Method (LC-MS/MS)
M4PFBA	111	%	AsureQuality Method (LC-MS/MS)
M5PFPeA	106	%	AsureQuality Method (LC-MS/MS)
M5PFHxA	110	%	AsureQuality Method (LC-MS/MS)
MPFHpA	104	%	AsureQuality Method (LC-MS/MS)
M8PFOA	104	%	AsureQuality Method (LC-MS/MS)
M9PFNA	101	%	AsureQuality Method (LC-MS/MS)
M6PFDA	106	%	AsureQuality Method (LC-MS/MS)
M7PFUnDA	108	%	AsureQuality Method (LC-MS/MS)
MPFDoDA	108	%	AsureQuality Method (LC-MS/MS)
MPFTeDA	91	%	AsureQuality Method (LC-MS/MS)
MPFOSA	105	%	AsureQuality Method (LC-MS/MS)
DNEtFOSA	108	%	AsureQuality Method (LC-MS/MS)
DNMeFOSA	105	%	AsureQuality Method (LC-MS/MS)
DNEtFOSAA	111	%	AsureQuality Method (LC-MS/MS)
DNMeFOSAA	106	%	AsureQuality Method (LC-MS/MS)
DNEtFOSE	108	%	AsureQuality Method (LC-MS/MS)
DNMeFOSE	103	%	AsureQuality Method (LC-MS/MS)
M4:2FTS	104	%	AsureQuality Method (LC-MS/MS)
M6:2FTS	101	%	AsureQuality Method (LC-MS/MS)
M8:2FTS	100	%	AsureQuality Method (LC-MS/MS)
M3HFPO-DA *	112	%	AsureQuality Method (LC-MS/MS)

Customer Sample Name: 2582797.15 **Lab ID:** 21-110291-13

Sample Condition: Acceptable **Sampled Date**: 13-Apr-2021

Test	Result	Unit	Method Reference
Poly- and Perfluorinated Alkyl Substances (PFAS) in Water - High Level			
Perfluoroalkylsulfonic acids			
PFPrS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFBS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFPeS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)

AsureQuality Reference: 21-110291 **Report Issued:** 20-Apr-2021

Test	Result	Unit	Method Reference
di-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
mono-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
L-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Total PFHxS (3)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFHpS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
di-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
mono-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
L-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Total PFOS (7)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Sum PFHxS+PFOS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFNS	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
PFDS	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFECHS *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Perfluoroalkylcarboxylic acids			
PFBA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFPeA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFHxA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFHpA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFOA	0.039	µg/L	AsureQuality Method (LC-MS/MS)
PFNA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFDA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFUnDA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFDoDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFTrDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFTeDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
P37DMOA *	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamides			
PFOSA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
NEtFOSA-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSA-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamidoacetic acids			
NEtFOSAA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSAA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamidoethanols			
NEtFOSE-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSE-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Telomere Sulfonic acids			
4:2 FTS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
6:2 FTS	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
8:2 FTS	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
10:2 FTS *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Telomere Carboxylic acids			
FPrPA (3:3FTA) *	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
FPePA (5:3FTA) *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
FHpPA (7:3FTA) *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Miscellaneous			
F-53B (major) *	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
F-53B (minor) *	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
Sum F-53B *	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
ADONA *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)

AsureQuality Reference: 21-110291 **Report Issued:** 20-Apr-2021

Test	Result	Unit	Method Reference
HFPO-DA (GenX) *	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
Internal Standards			
M3PFBS	103	%	AsureQuality Method (LC-MS/MS)
M3PFHxS	106	%	AsureQuality Method (LC-MS/MS)
M8PFOS	106	%	AsureQuality Method (LC-MS/MS)
M4PFBA	108	%	AsureQuality Method (LC-MS/MS)
M5PFPeA	105	%	AsureQuality Method (LC-MS/MS)
M5PFHxA	110	%	AsureQuality Method (LC-MS/MS)
MPFHpA	105	%	AsureQuality Method (LC-MS/MS)
M8PFOA	111	%	AsureQuality Method (LC-MS/MS)
M9PFNA	102	%	AsureQuality Method (LC-MS/MS)
M6PFDA	113	%	AsureQuality Method (LC-MS/MS)
M7PFUnDA	102	%	AsureQuality Method (LC-MS/MS)
MPFDoDA	108	%	AsureQuality Method (LC-MS/MS)
MPFTeDA	106	%	AsureQuality Method (LC-MS/MS)
MPFOSA	105	%	AsureQuality Method (LC-MS/MS)
DNEtFOSA	110	%	AsureQuality Method (LC-MS/MS)
DNMeFOSA	109	%	AsureQuality Method (LC-MS/MS)
DNEtFOSAA	114	%	AsureQuality Method (LC-MS/MS)
DNMeFOSAA	112	%	AsureQuality Method (LC-MS/MS)
DNEtFOSE	109	%	AsureQuality Method (LC-MS/MS)
DNMeFOSE	106	%	AsureQuality Method (LC-MS/MS)
M4:2FTS	102	%	AsureQuality Method (LC-MS/MS)
M6:2FTS	99	%	AsureQuality Method (LC-MS/MS)
M8:2FTS	103	%	AsureQuality Method (LC-MS/MS)
M3HFPO-DA *	110	%	AsureQuality Method (LC-MS/MS)

Customer Sample Name: 2582797.16 **Lab ID:** 21-110291-14

Sample Condition: Acceptable **Sampled Date**: 13-Apr-2021

Test	Result	Unit	Method Reference
Poly- and Perfluorinated Alkyl Substances (PFAS) in Water - High Level			
Perfluoroalkylsulfonic acids			
PFPrS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFBS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFPeS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
di-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
mono-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
L-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Total PFHxS (3)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFHpS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
di-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
mono-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
L-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Total PFOS (7)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Sum PFHxS+PFOS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFNS	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
PFDS	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFECHS *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Perfluoroalkylcarboxylic acids			
PFBA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)

AsureQuality Reference: 21-110291 **Report Issued:** 20-Apr-2021

Test	Result	Unit	Method Reference
PFPeA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFHxA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFHpA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFOA	0.053	µg/L	AsureQuality Method (LC-MS/MS)
PFNA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFDA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFUnDA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFDoDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFTrDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFTeDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
P37DMOA *	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamides			
PFOSA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
NEtFOSA-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSA-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamidoacetic acids			
NEtFOSAA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSAA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamidoethanols			
NEtFOSE-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSE-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Telomere Sulfonic acids			
4:2 FTS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
6:2 FTS	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
8:2 FTS	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
10:2 FTS *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Telomere Carboxylic acids			
FPrPA (3:3FTA) *	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
FPePA (5:3FTA) *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
FHpPA (7:3FTA) *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Miscellaneous			
F-53B (major) *	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
F-53B (minor) *	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
Sum F-53B *	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
ADONA *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
HFPO-DA (GenX) *	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
Internal Standards			
M3PFBS	109	%	AsureQuality Method (LC-MS/MS)
M3PFHxS	108	%	AsureQuality Method (LC-MS/MS)
M8PFOS	107	%	AsureQuality Method (LC-MS/MS)
M4PFBA	107	%	AsureQuality Method (LC-MS/MS)
M5PFPeA	107	%	AsureQuality Method (LC-MS/MS)
M5PFHxA	108	%	AsureQuality Method (LC-MS/MS)
MPFHpA	108	%	AsureQuality Method (LC-MS/MS)
M8PFOA	112	%	AsureQuality Method (LC-MS/MS)
M9PFNA	96	%	AsureQuality Method (LC-MS/MS)
M6PFDA	111	%	AsureQuality Method (LC-MS/MS)
M7PFUnDA	106	%	AsureQuality Method (LC-MS/MS)
MPFDoDA	106	%	AsureQuality Method (LC-MS/MS)
MPFTeDA	90	%	AsureQuality Method (LC-MS/MS)

AsureQuality Reference: 21-110291 **Report Issued:** 20-Apr-2021

Test	Result	Unit	Method Reference
MPFOSA	106	%	AsureQuality Method (LC-MS/MS)
DNEtFOSA	113	%	AsureQuality Method (LC-MS/MS)
DNMeFOSA	107	%	AsureQuality Method (LC-MS/MS)
DNEtFOSAA	116	%	AsureQuality Method (LC-MS/MS)
DNMeFOSAA	106	%	AsureQuality Method (LC-MS/MS)
DNEtFOSE	106	%	AsureQuality Method (LC-MS/MS)
DNMeFOSE	99	%	AsureQuality Method (LC-MS/MS)
M4:2FTS	104	%	AsureQuality Method (LC-MS/MS)
M6:2FTS	94	%	AsureQuality Method (LC-MS/MS)
M8:2FTS	101	%	AsureQuality Method (LC-MS/MS)
M3HFPO-DA *	102	%	AsureQuality Method (LC-MS/MS)

Customer Sample Name: Duplicate of 21-110291-14A **Lab ID:** 21-110291-15

Sample Description: 2582797.16 Duplicate

Sample Condition: Acceptable **Sampled Date**: 13-Apr-2021

Test	Result	Unit	Method Reference
Poly- and Perfluorinated Alkyl Substances (PFAS) in Water - High Level			
Perfluoroalkylsulfonic acids			
PFPrS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFBS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFPeS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
di-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
mono-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
L-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Total PFHxS (3)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFHpS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
di-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
mono-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
L-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Total PFOS (7)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Sum PFHxS+PFOS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFNS	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
PFDS	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFECHS *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Perfluoroalkylcarboxylic acids			
PFBA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFPeA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFHxA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFHpA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFOA	0.050	µg/L	AsureQuality Method (LC-MS/MS)
PFNA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFDA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFUnDA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFDoDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFTrDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFTeDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
P37DMOA *	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamides			
PFOSA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
NEtFOSA-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)

AsureQuality Reference: 21-110291 **Report Issued:** 20-Apr-2021

Test	Result	Unit	Method Reference
NMeFOSA-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamidoacetic acids			
NEtFOSAA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSAA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamidoethanols			
NEtFOSE-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSE-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Telomere Sulfonic acids			
4:2 FTS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
6:2 FTS	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
8:2 FTS	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
10:2 FTS *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Telomere Carboxylic acids			
FPrPA (3:3FTA) *	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
FPePA (5:3FTA) *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
FHpPA (7:3FTA) *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Miscellaneous			
F-53B (major) *	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
F-53B (minor) *	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
Sum F-53B *	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
ADONA *	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
HFPO-DA (GenX) *	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
Internal Standards			
M3PFBS	107	%	AsureQuality Method (LC-MS/MS)
M3PFHxS	104	%	AsureQuality Method (LC-MS/MS)
M8PFOS	104	%	AsureQuality Method (LC-MS/MS)
M4PFBA	109	%	AsureQuality Method (LC-MS/MS)
M5PFPeA	107	%	AsureQuality Method (LC-MS/MS)
M5PFHxA	108	%	AsureQuality Method (LC-MS/MS)
MPFHpA	101	%	AsureQuality Method (LC-MS/MS)
M8PFOA	107	%	AsureQuality Method (LC-MS/MS)
M9PFNA	91	%	AsureQuality Method (LC-MS/MS)
M6PFDA	111	%	AsureQuality Method (LC-MS/MS)
M7PFUnDA	104	%	AsureQuality Method (LC-MS/MS)
MPFDoDA	107	%	AsureQuality Method (LC-MS/MS)
MPFTeDA	83	%	AsureQuality Method (LC-MS/MS)
MPFOSA	106	%	AsureQuality Method (LC-MS/MS)
DNEtFOSA	115	%	AsureQuality Method (LC-MS/MS)
DNMeFOSA	110	%	AsureQuality Method (LC-MS/MS)
DNEtFOSAA	118	%	AsureQuality Method (LC-MS/MS)
DNMeFOSAA	109	%	AsureQuality Method (LC-MS/MS)
DNEtFOSE	101	%	AsureQuality Method (LC-MS/MS)
DNMeFOSE	100	%	AsureQuality Method (LC-MS/MS)
M4:2FTS	100	%	AsureQuality Method (LC-MS/MS)
M6:2FTS	95	%	AsureQuality Method (LC-MS/MS)
M8:2FTS	90	%	AsureQuality Method (LC-MS/MS)
M3HFPO-DA *	97	%	AsureQuality Method (LC-MS/MS)

QC Results

Blank

Relates to sample(s) 21-110291-1, 21-110291-2, 21-110291-3, 21-110291-4, 21-110291-5, 21-110291-6, 21-110291-7, 21-110291-8, 21-110291-9, 21-110291-10, 21-110291-11, 21-110291-12, 21-110291-13, 21-110291-14, 21-110291-15

Test	Result	Unit	Method Reference
Poly- and Perfluorinated Alkyl Substances (PFAS) in Water - High Level			
Perfluoroalkylsulfonic acids			
PFPrS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFBS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFPeS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
di-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
mono-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
L-PFHxS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Total PFHxS (3)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFHpS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
di-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
mono-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
L-PFOS (5)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Total PFOS (7)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Sum PFHxS+PFOS (1)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFNS	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
PFDS	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFECHS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Perfluoroalkylcarboxylic acids			
PFBA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFPeA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFHxA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFHpA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFOA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFNA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFDA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFUnDA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
PFDoDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFTrDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
PFTeDA	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
P37DMOA	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamides			
PFOSA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
NEtFOSA-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSA-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamidoacetic acids			
NEtFOSAA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSAA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamidoethanols			
NEtFOSE-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSE-M	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
Telomere Sulfonic acids			
4:2 FTS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)

AsureQuality Reference: 21-110291 **Report Issued:** 20-Apr-2021

Test	Result	Unit	Method Reference
6:2 FTS	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
8:2 FTS	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
10:2 FTS	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Telomere Carboxylic acids			
FPrPA (3:3FTA)	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
FPePA (5:3FTA)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
FHpPA (7:3FTA)	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
Miscellaneous			
F-53B (major)	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
F-53B (minor)	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
Sum F-53B	<0.10	µg/L	AsureQuality Method (LC-MS/MS)
ADONA	<0.025	µg/L	AsureQuality Method (LC-MS/MS)
HFPO-DA (GenX)	<0.050	µg/L	AsureQuality Method (LC-MS/MS)
Internal Standards			
M3PFBS	111	%	AsureQuality Method (LC-MS/MS)
M3PFHxS	106	%	AsureQuality Method (LC-MS/MS)
M8PFOS	112	%	AsureQuality Method (LC-MS/MS)
M4PFBA	116	%	AsureQuality Method (LC-MS/MS)
M5PFPeA	111	%	AsureQuality Method (LC-MS/MS)
M5PFHxA	118	%	AsureQuality Method (LC-MS/MS)
MPFHpA	105	%	AsureQuality Method (LC-MS/MS)
M8PFOA	114	%	AsureQuality Method (LC-MS/MS)
M9PFNA	107	%	AsureQuality Method (LC-MS/MS)
M6PFDA	110	%	AsureQuality Method (LC-MS/MS)
M7PFUnDA	106	%	AsureQuality Method (LC-MS/MS)
MPFDoDA	107	%	AsureQuality Method (LC-MS/MS)
MPFTeDA	85	%	AsureQuality Method (LC-MS/MS)
MPFOSA	108	%	AsureQuality Method (LC-MS/MS)
DNEtFOSA	104	%	AsureQuality Method (LC-MS/MS)
DNMeFOSA	106	%	AsureQuality Method (LC-MS/MS)
DNEtFOSAA	115	%	AsureQuality Method (LC-MS/MS)
DNMeFOSAA	112	%	AsureQuality Method (LC-MS/MS)
DNEtFOSE	113	%	AsureQuality Method (LC-MS/MS)
DNMeFOSE	110	%	AsureQuality Method (LC-MS/MS)
M4:2FTS	110	%	AsureQuality Method (LC-MS/MS)
M6:2FTS	107	%	AsureQuality Method (LC-MS/MS)
M8:2FTS	99	%	AsureQuality Method (LC-MS/MS)
M3HFPO-DA	121	%	AsureQuality Method (LC-MS/MS)

Analysis Summary

Wellington Laboratory

Analysis	Method	Accreditation	Authorised by
Poly- and Perfluorinated Alkyl Substances (PFAS) in Water - High Level			
DX-PFCS01, 05-HIGHLEVEL	AsureQuality Method (LC-MS/MS)	IANZ	Amelie Sellier

AsureQuality Reference: 21-110291 **Report Issued:** 20-Apr-2021

Analysis	Method	Accreditation	Authorised by

di-PFHxS (1) = Concentration determined using a branched di-PFHxS isomer standard (399>80 transition)

mono-PFHxS (1) = Concentration determined using a branched mono-PFHxS isomer standard (399>80 transition)

L-PFHxS (1) = Concentration determined using the linear PFHxS isomer standard (399>80 transition)

Total PFHxS (3) = The numerical sum of di-PFHxS (1), mono-PFHxS (1), and L-PFHxS (1)

di-PFOS (5) = Concentration determined using a branched di-PFOS isomer standard (499>80 transition)

mono-PFOS (5) = Concentration determined using a branched mono-PFOS isomer standard (499>80 transition)

L-PFOS (5) = Concentration determined using the linear PFOS isomer standard (499>230 transition)

Total PFOS (7) = The numerical sum of di-PFOS (5), mono-PFOS (5), and L-PFOS (5)

Sum PFHxS+PFOS (1) = The numerical sum of Total PFHxS (3) and Total PFOS (7)

Sum F-53B = The numerical sum of 9Cl-PF3ONS (F-53B major) and 11Cl-PF3OUdS (F-53B minor)

For all Totals, where a component is detected below the LOR, the value of zero is used in the calculation of the sum. The result represents the lower-bound concentration present in the sample.

Reported results are corrected for internal standard recovery

Any tests marked with * are not accredited for specific matrices or analytes.

Results that are prefixed with '<' indicate the lowest level at which the analyte can be reported, and that in this case the analyte was not observed above this limit.

Amelie Sellier

Scientist

Accreditation

Appendix

Analyte LOR Summary

Poly- and Perfluorinated Alkyl Substances (PFAS) in Water - High Level - AsureQuality Method (LC-MS/MS)

Analyte	LOR
Perfluoroalkylsulfonic acids	
PFPrS	0.025 µg/L
PFBS	0.025 µg/L
PFPeS	0.025 µg/L
di-PFHxS (1)	0.025 µg/L
mono-PFHxS (1)	0.025 µg/L
L-PFHxS (1)	0.025 µg/L
Total PFHxS (3)	0.025 µg/L
PFHpS	0.025 µg/L
di-PFOS (5)	0.025 µg/L
mono-PFOS (5)	0.025 µg/L
L-PFOS (5)	0.025 µg/L
Total PFOS (7)	0.025 µg/L
Sum PFHxS+PFOS (1)	0.025 µg/L
PFNS	0.050 µg/L
PFDS	0.10 µg/L
PFECHS*	0.025 µg/L
Perfluoroalkylcarboxylic acids	
PFBA	0.10 µg/L
PFPeA	0.10 µg/L
PFHxA	0.025 µg/L
PFHpA	0.025 µg/L
PFOA	0.025 µg/L
PFNA	0.025 µg/L
PFDA	0.025 µg/L
PFUnDA	0.025 µg/L
PFDoDA	0.10 µg/L
PFTrDA	0.10 µg/L
PFTeDA	0.10 µg/L
P37DMOA*	0.050 µg/L
Perfluorooctanesulfonamides	
PFOSA	0.025 µg/L
NEtFOSA-M	0.10 µg/L
NMeFOSA-M	0.10 µg/L
Perfluorooctanesulfonamidoacetic acids	
NEtFOSAA	0.025 µg/L
NMeFOSAA	0.025 µg/L
Perfluorooctanesulfonamidoethanols	
NEtFOSE-M	0.10 µg/L
NMeFOSE-M	0.10 µg/L
Telomere Sulfonic acids	
4:2 FTS	0.025 µg/L
6:2 FTS	0.050 µg/L
8:2 FTS	0.10 µg/L
10:2 FTS*	0.025 µg/L
Telomere Carboxylic acids	
FPrPA (3:3FTA)*	0.10 µg/L
FPePA (5:3FTA)*	0.025 µg/L

FHpPA (7:3FTA)*	0.025 µg/L
Miscellaneous	
F-53B (major)*	0.10 µg/L
F-53B (minor)*	0.050 µg/L
Sum F-53B*	0.1 µg/L
ADONA*	0.025 µg/L
HFPO-DA (GenX)*	0.050 µg/L

Analyte Definitions

Poly- and Perfluorinated Alkyl Substances (PFAS) in Water - High Level - AsureQuality Method (LC-MS/MS)

Analyte	Full Name
Perfluoroalkylsulfonic acids	
PFPrS	Perfluoro-1-propanesulfonic acid
PFBS	Perfluoro-1-butanesulfonic acid
PFPeS	Perfluoro-1-pentanesulfonic acid
di-PFHxS (1)	Total Perfluorodimethylbutane sulfonic acids
mono-PFHxS (1)	Total Perfluoromethylpentane sulfonic acids
L-PFHxS (1)	Linear Perfluorohexanesulfonic acid
PFHpS	Perfluoro-1-heptanesulfonic acid
di-PFOS (5)	Total Perfluorodimethylhexane sulfonic acids
mono-PFOS (5)	Total Perfluoromethylheptane sulfonic acids
L-PFOS (5)	Linear Perfluorooctanesulfonic acid
PFNS	Perfluoro-1-nonanesulfonic acid
PFDS	Perfluoro-1-decanesulfonic acid
PFECHS*	Perfluoro-4-ethylcyclohexanesulfonic acid
Perfluoroalkylcarboxylic acids	
PFBA	Perfluoro-n-butanoic acid
PFPeA	Perfluoro-n-pentanoic acid
PFHxA	Perfluoro-n-hexanoic acid
PFHpA	Perfluoro-n-heptanoic acid
PFOA	Perfluoro-n-octanoic acid
PFNA	Perfluoro-n-nonanoic acid
PFDA	Perfluoro-n-decanoic acid
PFUnDA	Perfluoro-n-undecanoic acid
PFDoDA	Perfluoro-n-dodecanoic acid
PFTrDA	Perfluoro-n-tridecanoic acid
PFTeDA	Perfluoro-n-tetradecanoic acid
P37DMOA*	Perfluoro-3,7-dimethyloctanoic acid
Perfluorooctanesulfonamides	
PFOSA	Perfluoro-1-octanesulfonamide
NEtFOSA-M	N-ethylperfluoro-1-octanesulfonamide
NMeFOSA-M	N-methylperfluoro-1-octanesulfonamide
Perfluorooctanesulfonamidoacetic acids	
NEtFOSAA	N-ethylperfluoro-1-octanesulfonamidoacetic acid
NMeFOSAA	N-methylperfluoro-1-octanesulfonamidoacetic acid
Perfluorooctanesulfonamidoethanols	
NEtFOSE-M	2-(N-ethylperfluoro-1-octanesulfonamido)-ethanol
NMeFOSE-M	2-(N-methylperfluoro-1-octanesulfonamido)-ethanol
Telomere Sulfonic acids	
4:2 FTS	1H,1H,2H,2H-perfluoro-1-hexanesulfonic acid
6:2 FTS	1H,1H,2H,2H-perfluoro-1-octanesulfonic acid
8:2 FTS	1H,1H,2H,2H-perfluoro-1-decanesulfonic acid
10:2 FTS*	1H,1H,2H,2H-perfluorododecanesulfonic acid
Telomere Carboxylic acids	
FPrPA (3:3FTA)*	3-Perfluoropropyl propanoic acid

Analyte	Full Name
FPePA (5:3FTA)*	3-Perfluoropentyl propanoic acid
FHpPA (7:3FTA)*	3-Perfluoroheptyl propanoic acid
Miscellaneous	
F-53B (major)*	9-chlorohexadecafluoro-3-oxanonane-1-sulfonic acid
F-53B (minor)*	11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid
Sum F-53B*	Sum of F-53B components (major + minor)
ADONA*	Dodecafluoro-3H-4,8-dioxanonanoic acid
HFPO-DA (GenX)*	Tetrafluoro-2-(heptafluoropropoxy)propanoic acid
Internal Standards	
M3PFBS	Perfluoro-1-[2,3,4-13C3]butanesulfonic acid
M3PFHxS	Perfluoro-1-[1,2,3-13C3]hexanesulfonic acid
M8PFOS	Perfluoro-1-[13C8]octanesulfonic acid
M4PFBA	Perfluoro-n-[1,2,3,4-13C4]butanoic acid
M5PFPeA	Perfluoro-n-[1,2,3,4,5-13C5]pentanoic acid
M5PFHxA	Perfluoro-n-[1,2,3,4,6-13C5]hexanoic acid
MPFHpA	Perfluoro-n-[-1,2,3,4-13C4]heptanoic acid
M8PFOA	Perfluoro-n-[13C8]octanoic acid
M9PFNA	Perfluoro-n-[13C9]nonanoic acid
M6PFDA	Perfluoro-n-[1,2,3,4,5,6-13C6]decanoic acid
M7PFUnDA	Perfluoro-n-[1,2,3,4,5,6,7-13C7]undecanoic acid
MPFDoDA	Perfluoro-n-[1,2-13C2]dodecanoic acid
MPFTeDA	Perfluoro-n-[1,2-13C2]tetradecanoic acid
MPFOSA	Perfluoro-1-[13C8]octanesulfonamide
DNEtFOSA	N-ethyl-D5-perfluoro-1-octanesulfonamide
DNMeFOSA	N-methyl-D3-perfluoro-1-octanesulfonamide
DNEtFOSAA	N-ethyl-D5-perfluoro-1-octanesulfonamidoacetic acid
DNMeFOSAA	N-methyl-D3-perfluoro-1-octanesulfonamidoacetic acid
DNEtFOSE	2-(N-ethyl-D5-perfluoro-1-octanesulfonamido)ethan-D4-ol
DNMeFOSE	2-(N-methyl-D3-perfluoro-1-octanesulfonamido)ethan-D4-ol
M4:2FTS	1H,1H,2H,2H-perfluoro-1-[1,2-13C2]-hexane sulfonic acid
M6:2FTS	1H,1H,2H,2H-perfluoro-1-[1,2-13C2]-octane sulfonic acid
M8:2FTS	1H,1H,2H,2H-perfluoro-1-[1,2-13C2]-decane sulfonic acid
M3HFPO-DA*	Tetrafluoro-2-(heptafluoropropoxy)-13C3-propanoic acid

Any tests marked with * are not accredited for specific matrices or analytes.

LOR = Limit of Reporting LOD = Limit of Detection NR = Not Reportable

Hill Laboratories
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Certificate of Analysis

Client:	Beca Limited	**Lab No:**	2573008 SPv1
Contact:	Vicky Kennaugh C/- Beca Limited PO Box 6345 Wellesley Street Auckland 1141	**Date Received:**	31-Mar-2021
		Date Reported:	15-Apr-2021
		Quote No:	107787
		Order No:	3126366/100/DC
		Client Reference:	21:046
		Add. Client Ref:	Sampled: 29/03/21
		Submitted By:	Vicky Kennaugh

Sample Type: Aqueous

Sample Name:	A 29-Mar-2021	C 29-Mar-2021	D 29-Mar-2021		
Lab Number:	2573008.1	2573008.3	2573008.4		
Poly- and Perfluorinated Alkyl Substances in Water‡	See attached report	See attached report	See attached report	-	-

Analyst's Comments

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

Appendix No.1 - AsureQuality 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 Laboratories, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Poly- and Perfluorinated Alkyl Substances in Water	Analysis by LC-MS/MS. Subcontracted to AsureQuality, Lower Hutt.	-	1, 3-4

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

Testing was completed on 15-Apr-2021. For completion dates of individual analyses please contact the laboratory.

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

Ara Heron BSc (Tech)
Client Services Manager - Environmental

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PO Box 31242 | Lower Hutt 5040 | Wellington | New Zealand
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Certificate of Analysis

Submission Reference: EnvSubAQ_LH 377
Final Report

Environment Client Service Managers
Hill Laboratories - Hamilton
Private Bag 3205
Hamilton 3240
New Zealand

PO Number: 155776

Report Issued: 15-Apr-2021 **AsureQuality Reference: 21-100069** **Sample(s) Received:** 07-Apr-2021 07:30

Testing Period: 07-Apr-2021 to 15-Apr-2021
Date of analysis is available on request.

Results

The tests were performed on the samples as received.

Customer Sample Name: 2573008.1 **Lab ID:** 21-100069-1

Sample Condition: Acceptable **Sampled Date**: 31-Mar-2021

Test	Result	Unit	Method Reference
Poly- and Perfluorinated Alkyl Substances (PFAS) in Water			
Perfluoroalkylsulfonic acids			
PFPrS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFBS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFPeS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
di-PFHxS (1)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
mono-PFHxS (1)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
L-PFHxS (1)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Total PFHxS (3)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFHpS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
di-PFOS (5)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
mono-PFOS (5)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
L-PFOS (5)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Total PFOS (7)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Sum PFHxS+PFOS (1)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFNS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFDS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFECHS *	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Perfluoroalkylcarboxylic acids			
PFBA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFPeA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFHxA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFHpA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFOA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFNA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFDA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFUnDA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)

AsureQuality Reference: 21-100069 **Report Issued:** 15-Apr-2021

Test	Result	Unit	Method Reference
PFDoDA	NR	µg/L	AsureQuality Method (LC-MS/MS)
PFTrDA	NR	µg/L	AsureQuality Method (LC-MS/MS)
PFTeDA	NR	µg/L	AsureQuality Method (LC-MS/MS)
P37DMOA *	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamides			
PFOSA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
NEtFOSA-M	NR	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSA-M	NR	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamidoacetic acids			
NEtFOSAA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSAA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamidoethanols			
NEtFOSE-M	NR	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSE-M	NR	µg/L	AsureQuality Method (LC-MS/MS)
Telomere Sulfonic acids			
4:2 FTS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
6:2 FTS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
8:2 FTS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
10:2 FTS *	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Telomere Carboxylic acids			
FPrPA (3:3FTA) *	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
FPePA (5:3FTA) *	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
FHpPA (7:3FTA) *	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Miscellaneous			
F-53B (major) *	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
F-53B (minor) *	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Sum F-53B *	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
ADONA *	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
HFPO-DA (GenX) *	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Internal Standards			
M3PFBS	101	%	AsureQuality Method (LC-MS/MS)
M3PFHxS	107	%	AsureQuality Method (LC-MS/MS)
M8PFOS	141	%	AsureQuality Method (LC-MS/MS)
M4PFBA	103	%	AsureQuality Method (LC-MS/MS)
M5PFPeA	98	%	AsureQuality Method (LC-MS/MS)
M5PFHxA	110	%	AsureQuality Method (LC-MS/MS)
MPFHpA	106	%	AsureQuality Method (LC-MS/MS)
M8PFOA	124	%	AsureQuality Method (LC-MS/MS)
M9PFNA	118	%	AsureQuality Method (LC-MS/MS)
M6PFDA	127	%	AsureQuality Method (LC-MS/MS)
M7PFUnDA	226 (R)	%	AsureQuality Method (LC-MS/MS)
MPFDoDA	218 (R)	%	AsureQuality Method (LC-MS/MS)
MPFTeDA	NR	%	AsureQuality Method (LC-MS/MS)
MPFOSA	140	%	AsureQuality Method (LC-MS/MS)
DNEtFOSA	225 (R)	%	AsureQuality Method (LC-MS/MS)
DNMeFOSA	181 (R)	%	AsureQuality Method (LC-MS/MS)
DNEtFOSAA	147	%	AsureQuality Method (LC-MS/MS)
DNMeFOSAA	141	%	AsureQuality Method (LC-MS/MS)
DNEtFOSE	158 (R)	%	AsureQuality Method (LC-MS/MS)
DNMeFOSE	141	%	AsureQuality Method (LC-MS/MS)

AsureQuality Reference: 21-100069 **Report Issued:** 15-Apr-2021

Test	Result	Unit	Method Reference
M4:2FTS	111	%	AsureQuality Method (LC-MS/MS)
M6:2FTS	116	%	AsureQuality Method (LC-MS/MS)
M8:2FTS	129	%	AsureQuality Method (LC-MS/MS)
M3HFPO-DA *	106	%	AsureQuality Method (LC-MS/MS)

R = Recovery outside method limits

Customer Sample Name: 2573008.3 **Lab ID:** 21-100069-2

Sample Condition: Acceptable **Sampled Date**: 31-Mar-2021

Test	Result	Unit	Method Reference
Poly- and Perfluorinated Alkyl Substances (PFAS) in Water			
Perfluoroalkylsulfonic acids			
PFPrS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFBS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFPeS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
di-PFHxS (1)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
mono-PFHxS (1)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
L-PFHxS (1)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Total PFHxS (3)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFHpS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
di-PFOS (5)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
mono-PFOS (5)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
L-PFOS (5)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Total PFOS (7)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Sum PFHxS+PFOS (1)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFNS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFDS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFECHS *	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Perfluoroalkylcarboxylic acids			
PFBA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFPeA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFHxA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFHpA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFOA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFNA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFDA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFUnDA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFDoDA	NR	µg/L	AsureQuality Method (LC-MS/MS)
PFTrDA	NR	µg/L	AsureQuality Method (LC-MS/MS)
PFTeDA	NR	µg/L	AsureQuality Method (LC-MS/MS)
P37DMOA *	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamides			
PFOSA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
NEtFOSA-M	NR	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSA-M	NR	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamidoacetic acids			
NEtFOSAA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSAA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamidoethanols			
NEtFOSE-M	NR	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSE-M	NR	µg/L	AsureQuality Method (LC-MS/MS)

AsureQuality Reference: 21-100069 **Report Issued:** 15-Apr-2021

Test	Result	Unit	Method Reference
Telomere Sulfonic acids			
4:2 FTS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
6:2 FTS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
8:2 FTS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
10:2 FTS *	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Telomere Carboxylic acids			
FPrPA (3:3FTA) *	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
FPePA (5:3FTA) *	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
FHpPA (7:3FTA) *	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Miscellaneous			
F-53B (major) *	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
F-53B (minor) *	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Sum F-53B *	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
ADONA *	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
HFPO-DA (GenX) *	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Internal Standards			
M3PFBS	105	%	AsureQuality Method (LC-MS/MS)
M3PFHxS	116	%	AsureQuality Method (LC-MS/MS)
M8PFOS	141	%	AsureQuality Method (LC-MS/MS)
M4PFBA	98	%	AsureQuality Method (LC-MS/MS)
M5PFPeA	100	%	AsureQuality Method (LC-MS/MS)
M5PFHxA	109	%	AsureQuality Method (LC-MS/MS)
MPFHpA	110	%	AsureQuality Method (LC-MS/MS)
M8PFOA	113	%	AsureQuality Method (LC-MS/MS)
M9PFNA	121	%	AsureQuality Method (LC-MS/MS)
M6PFDA	152 (R)	%	AsureQuality Method (LC-MS/MS)
M7PFUnDA	212 (R)	%	AsureQuality Method (LC-MS/MS)
MPFDoDA	346 (R)	%	AsureQuality Method (LC-MS/MS)
MPFTeDA	NR	%	AsureQuality Method (LC-MS/MS)
MPFOSA	175 (R)	%	AsureQuality Method (LC-MS/MS)
DNEtFOSA	377 (R)	%	AsureQuality Method (LC-MS/MS)
DNMeFOSA	297 (R)	%	AsureQuality Method (LC-MS/MS)
DNEtFOSAA	191 (R)	%	AsureQuality Method (LC-MS/MS)
DNMeFOSAA	169 (R)	%	AsureQuality Method (LC-MS/MS)
DNEtFOSE	311 (R)	%	AsureQuality Method (LC-MS/MS)
DNMeFOSE	199 (R)	%	AsureQuality Method (LC-MS/MS)
M4:2FTS	108	%	AsureQuality Method (LC-MS/MS)
M6:2FTS	119	%	AsureQuality Method (LC-MS/MS)
M8:2FTS	150	%	AsureQuality Method (LC-MS/MS)
M3HFPO-DA *	119	%	AsureQuality Method (LC-MS/MS)

R = Recovery outside method limits

Customer Sample Name: 2573008.4 **Lab ID:** 21-100069-3

Sample Condition: Acceptable **Sampled Date**: 31-Mar-2021

Test	Result	Unit	Method Reference
Poly- and Perfluorinated Alkyl Substances (PFAS) in Water			
Perfluoroalkylsulfonic acids			
PFPrS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFBS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFPeS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)

AsureQuality Reference: 21-100069 **Report Issued:** 15-Apr-2021

Test	Result	Unit	Method Reference
di-PFHxS (1)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
mono-PFHxS (1)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
L-PFHxS (1)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Total PFHxS (3)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFHpS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
di-PFOS (5)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
mono-PFOS (5)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
L-PFOS (5)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Total PFOS (7)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Sum PFHxS+PFOS (1)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFNS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFDS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFECHS *	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Perfluoroalkylcarboxylic acids			
PFBA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFPeA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFHxA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFHpA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFOA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFNA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFDA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFUnDA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFDoDA	NR	µg/L	AsureQuality Method (LC-MS/MS)
PFTrDA	NR	µg/L	AsureQuality Method (LC-MS/MS)
PFTeDA	NR	µg/L	AsureQuality Method (LC-MS/MS)
P37DMOA *	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamides			
PFOSA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
NEtFOSA-M	NR	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSA-M	NR	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamidoacetic acids			
NEtFOSAA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSAA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamidoethanols			
NEtFOSE-M	NR	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSE-M	NR	µg/L	AsureQuality Method (LC-MS/MS)
Telomere Sulfonic acids			
4:2 FTS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
6:2 FTS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
8:2 FTS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
10:2 FTS *	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Telomere Carboxylic acids			
FPrPA (3:3FTA) *	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
FPePA (5:3FTA) *	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
FHpPA (7:3FTA) *	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Miscellaneous			
F-53B (major) *	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
F-53B (minor) *	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Sum F-53B *	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
ADONA *	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)

AsureQuality Reference: 21-100069 **Report Issued:** 15-Apr-2021

Test	Result	Unit	Method Reference
HFPO-DA (GenX) *	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Internal Standards			
M3PFBS	104	%	AsureQuality Method (LC-MS/MS)
M3PFHxS	120	%	AsureQuality Method (LC-MS/MS)
M8PFOS	157 (R)	%	AsureQuality Method (LC-MS/MS)
M4PFBA	98	%	AsureQuality Method (LC-MS/MS)
M5PFPeA	98	%	AsureQuality Method (LC-MS/MS)
M5PFHxA	101	%	AsureQuality Method (LC-MS/MS)
MPFHpA	101	%	AsureQuality Method (LC-MS/MS)
M8PFOA	116	%	AsureQuality Method (LC-MS/MS)
M9PFNA	130	%	AsureQuality Method (LC-MS/MS)
M6PFDA	144	%	AsureQuality Method (LC-MS/MS)
M7PFUnDA	159 (R)	%	AsureQuality Method (LC-MS/MS)
MPFDoDA	230 (R)	%	AsureQuality Method (LC-MS/MS)
MPFTeDA	NR	%	AsureQuality Method (LC-MS/MS)
MPFOSA	128	%	AsureQuality Method (LC-MS/MS)
DNEtFOSA	252 (R)	%	AsureQuality Method (LC-MS/MS)
DNMeFOSA	203 (R)	%	AsureQuality Method (LC-MS/MS)
DNEtFOSAA	159 (R)	%	AsureQuality Method (LC-MS/MS)
DNMeFOSAA	133	%	AsureQuality Method (LC-MS/MS)
DNEtFOSE	198 (R)	%	AsureQuality Method (LC-MS/MS)
DNMeFOSE	141	%	AsureQuality Method (LC-MS/MS)
M4:2FTS	112	%	AsureQuality Method (LC-MS/MS)
M6:2FTS	118	%	AsureQuality Method (LC-MS/MS)
M8:2FTS	133	%	AsureQuality Method (LC-MS/MS)
M3HFPO-DA *	96	%	AsureQuality Method (LC-MS/MS)

R = Recovery outside method limits

QC Results

Blank

Relates to sample(s) 21-100069-1, 21-100069-2, 21-100069-3

Test	Result	Unit	Method Reference
Poly- and Perfluorinated Alkyl Substances (PFAS) in Water			
Perfluoroalkylsulfonic acids			
PFPrS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFBS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFPeS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
di-PFHxS (1)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
mono-PFHxS (1)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
L-PFHxS (1)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Total PFHxS (3)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFHpS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
di-PFOS (5)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
mono-PFOS (5)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
L-PFOS (5)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Total PFOS (7)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Sum PFHxS+PFOS (1)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFNS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)

AsureQuality Reference: 21-100069 **Report Issued:** 15-Apr-2021

Test	Result	Unit	Method Reference
PFDS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFECHS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Perfluoroalkylcarboxylic acids			
PFBA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFPeA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFHxA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFHpA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFOA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFNA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFDA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFUnDA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
PFDoDA	NR	µg/L	AsureQuality Method (LC-MS/MS)
PFTrDA	NR	µg/L	AsureQuality Method (LC-MS/MS)
PFTeDA	NR	µg/L	AsureQuality Method (LC-MS/MS)
P37DMOA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamides			
PFOSA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
NEtFOSA-M	NR	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSA-M	NR	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamidoacetic acids			
NEtFOSAA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSAA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Perfluorooctanesulfonamidoethanols			
NEtFOSE-M	NR	µg/L	AsureQuality Method (LC-MS/MS)
NMeFOSE-M	NR	µg/L	AsureQuality Method (LC-MS/MS)
Telomere Sulfonic acids			
4:2 FTS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
6:2 FTS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
8:2 FTS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
10:2 FTS	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Telomere Carboxylic acids			
FPrPA (3:3FTA)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
FPePA (5:3FTA)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
FHpPA (7:3FTA)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Miscellaneous			
F-53B (major)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
F-53B (minor)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Sum F-53B	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
ADONA	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
HFPO-DA (GenX)	<0.0010	µg/L	AsureQuality Method (LC-MS/MS)
Internal Standards			
M3PFBS	98	%	AsureQuality Method (LC-MS/MS)
M3PFHxS	107	%	AsureQuality Method (LC-MS/MS)
M8PFOS	105	%	AsureQuality Method (LC-MS/MS)
M4PFBA	99	%	AsureQuality Method (LC-MS/MS)
M5PFPeA	97	%	AsureQuality Method (LC-MS/MS)
M5PFHxA	101	%	AsureQuality Method (LC-MS/MS)

AsureQuality Reference: 21-100069 **Report Issued:** 15-Apr-2021

Test	Result	Unit	Method Reference
MPFHpA	100	%	AsureQuality Method (LC-MS/MS)
M8PFOA	106	%	AsureQuality Method (LC-MS/MS)
M9PFNA	105	%	AsureQuality Method (LC-MS/MS)
M6PFDA	94	%	AsureQuality Method (LC-MS/MS)
M7PFUnDA	107	%	AsureQuality Method (LC-MS/MS)
MPFDoDA	100	%	AsureQuality Method (LC-MS/MS)
MPFTeDA	NR	%	AsureQuality Method (LC-MS/MS)
MPFOSA	105	%	AsureQuality Method (LC-MS/MS)
DNEtFOSA	122	%	AsureQuality Method (LC-MS/MS)
DNMeFOSA	105	%	AsureQuality Method (LC-MS/MS)
DNEtFOSAA	105	%	AsureQuality Method (LC-MS/MS)
DNMeFOSAA	97	%	AsureQuality Method (LC-MS/MS)
DNEtFOSE	88	%	AsureQuality Method (LC-MS/MS)
DNMeFOSE	100	%	AsureQuality Method (LC-MS/MS)
M4:2FTS	105	%	AsureQuality Method (LC-MS/MS)
M6:2FTS	106	%	AsureQuality Method (LC-MS/MS)
M8:2FTS	98	%	AsureQuality Method (LC-MS/MS)
M3HFPO-DA	107	%	AsureQuality Method (LC-MS/MS)

Analysis Summary

Wellington Laboratory

Analysis	Method	Accreditation	Authorised by
Poly- and Perfluorinated Alkyl Substances (PFAS) in Water			
DX-PFCS01, 03-SUITE_B	AsureQuality Method (LC-MS/MS)	IANZ	Lisa Graham

di-PFHxS (1) = Concentration determined using a branched di-PFHxS isomer standard (399>80 transition)

mono-PFHxS (1) = Concentration determined using a branched mono-PFHxS isomer standard (399>80 transition)

L-PFHxS (1) = Concentration determined using the linear PFHxS isomer standard (399>80 transition)

Total PFHxS (3) = The numerical sum of di-PFHxS (1), mono-PFHxS (1), and L-PFHxS (1)

di-PFOS (5) = Concentration determined using a branched di-PFOS isomer standard (499>80 transition)

mono-PFOS (5) = Concentration determined using a branched mono-PFOS isomer standard (499>80 transition)

L-PFOS (5) = Concentration determined using the linear PFOS isomer standard (499>230 transition)

Total PFOS (7) = The numerical sum of di-PFOS (5), mono-PFOS (5), and L-PFOS (5)

Sum PFHxS+PFOS (1) = The numerical sum of Total PFHxS (3) and Total PFOS (7)

Sum F-53B = The numerical sum of 9Cl-PF3ONS (F-53B major) and 11Cl-PF3OUdS (F-53B minor)

For all Totals, where a component is detected below the LOR, the value of zero is used in the calculation of the sum. The result represents the lower-bound concentration present in the sample.

Reported results are corrected for internal standard recovery

Any tests marked with * are not accredited for specific matrices or analytes.

Results that are prefixed with '<' indicate the lowest level at which the analyte can be reported, and that in this case the analyte was not observed above this limit.

NR = Not Reportable

Lisa Graham

Scientist / Team Leader

Accreditation

Appendix

Analyte LOR Summary

Poly- and Perfluorinated Alkyl Substances (PFAS) in Water - AsureQuality Method (LC-MS/MS)

Analyte	LOR
Perfluoroalkylsulfonic acids	
PFPrS	0.0010 µg/L
PFBS	0.0010 µg/L
PFPeS	0.0010 µg/L
di-PFHxS (1)	0.0010 µg/L
mono-PFHxS (1)	0.0010 µg/L
L-PFHxS (1)	0.0010 µg/L
Total PFHxS (3)	0.0010 µg/L
PFHpS	0.0010 µg/L
di-PFOS (5)	0.0010 µg/L
mono-PFOS (5)	0.0010 µg/L
L-PFOS (5)	0.0010 µg/L
Total PFOS (7)	0.0010 µg/L
Sum PFHxS+PFOS (1)	0.0010 µg/L
PFNS	0.0010 µg/L
PFDS	0.0010 µg/L
PFECHS*	0.0010 µg/L
Perfluoroalkylcarboxylic acids	
PFBA	0.0010 µg/L
PFPeA	0.0010 µg/L
PFHxA	0.0010 µg/L
PFHpA	0.0010 µg/L
PFOA	0.0010 µg/L
PFNA	0.0010 µg/L
PFDA	0.0010 µg/L
PFUnDA	0.0010 µg/L
PFDoDA	NR µg/L
PFTrDA	NR µg/L
PFTeDA	NR µg/L
P37DMOA*	0.0010 µg/L
Perfluorooctanesulfonamides	
PFOSA	0.0010 µg/L
NEtFOSA-M	NR µg/L
NMeFOSA-M	NR µg/L
Perfluorooctanesulfonamidoacetic acids	
NEtFOSAA	0.0010 µg/L
NMeFOSAA	0.0010 µg/L
Perfluorooctanesulfonamidoethanols	
NEtFOSE-M	NR µg/L
NMeFOSE-M	NR µg/L
Telomere Sulfonic acids	
4:2 FTS	0.0010 µg/L
6:2 FTS	0.0010 µg/L
8:2 FTS	0.0010 µg/L
10:2 FTS*	0.0010 µg/L
Telomere Carboxylic acids	
FPrPA (3:3FTA)*	0.0010 µg/L
FPePA (5:3FTA)*	0.0010 µg/L

FHpPA (7:3FTA)*	0.0010 µg/L
Miscellaneous	
F-53B (major)*	0.0010 µg/L
F-53B (minor)*	0.0010 µg/L
Sum F-53B*	0.0010 µg/L
ADONA*	0.0010 µg/L
HFPO-DA (GenX)*	0.0010 µg/L

Analyte Definitions

Poly- and Perfluorinated Alkyl Substances (PFAS) in Water - AsureQuality Method (LC-MS/MS)

Analyte	Full Name
Perfluoroalkylsulfonic acids	
PFPrS	Perfluoro-1-propanesulfonic acid
PFBS	Perfluoro-1-butanesulfonic acid
PFPeS	Perfluoro-1-pentanesulfonic acid
di-PFHxS (1)	Total Perfluorodimethylbutane sulfonic acids
mono-PFHxS (1)	Total Perfluoromethylpentane sulfonic acids
L-PFHxS (1)	Linear Perfluorohexanesulfonic acid
PFHpS	Perfluoro-1-heptanesulfonic acid
di-PFOS (5)	Total Perfluorodimethylhexane sulfonic acids
mono-PFOS (5)	Total Perfluoromethylheptane sulfonic acids
L-PFOS (5)	Linear Perfluorooctanesulfonic acid
PFNS	Perfluoro-1-nonanesulfonic acid
PFDS	Perfluoro-1-decanesulfonic acid
PFECHS*	Perfluoro-4-ethylcyclohexanesulfonic acid
Perfluoroalkylcarboxylic acids	
PFBA	Perfluoro-n-butanoic acid
PFPeA	Perfluoro-n-pentanoic acid
PFHxA	Perfluoro-n-hexanoic acid
PFHpA	Perfluoro-n-heptanoic acid
PFOA	Perfluoro-n-octanoic acid
PFNA	Perfluoro-n-nonanoic acid
PFDA	Perfluoro-n-decanoic acid
PFUnDA	Perfluoro-n-undecanoic acid
PFDoDA	Perfluoro-n-dodecanoic acid
PFTrDA	Perfluoro-n-tridecanoic acid
PFTeDA	Perfluoro-n-tetradecanoic acid
P37DMOA*	Perfluoro-3,7-dimethyloctanoic acid
Perfluorooctanesulfonamides	
PFOSA	Perfluoro-1-octanesulfonamide
NEtFOSA-M	N-ethylperfluoro-1-octanesulfonamide
NMeFOSA-M	N-methylperfluoro-1-octanesulfonamide
Perfluorooctanesulfonamidoacetic acids	
NEtFOSAA	N-ethylperfluoro-1-octanesulfonamidoacetic acid
NMeFOSAA	N-methylperfluoro-1-octanesulfonamidoacetic acid
Perfluorooctanesulfonamidoethanols	
NEtFOSE-M	2-(N-ethylperfluoro-1-octanesulfonamido)-ethanol
NMeFOSE-M	2-(N-methylperfluoro-1-octanesulfonamido)-ethanol
Telomere Sulfonic acids	
4:2 FTS	1H,1H,2H,2H-perfluoro-1-hexanesulfonic acid
6:2 FTS	1H,1H,2H,2H-perfluoro-1-octanesulfonic acid
8:2 FTS	1H,1H,2H,2H-perfluoro-1-decanesulfonic acid
10:2 FTS*	1H,1H,2H,2H-perfluorododecanesulfonic acid
Telomere Carboxylic acids	
FPrPA (3:3FTA)*	3-Perfluoropropyl propanoic acid

AsureQuality Reference: 21-100069 **Report Issued:** 15-Apr-2021

Analyte	Full Name
FPePA (5:3FTA)*	3-Perfluoropentyl propanoic acid
FHpPA (7:3FTA)*	3-Perfluoroheptyl propanoic acid
Miscellaneous	
F-53B (major)*	9-chlorohexadecafluoro-3-oxanonane-1-sulfonic acid
F-53B (minor)*	11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid
Sum F-53B*	Sum of F-53B components (major + minor)
ADONA*	Dodecafluoro-3H-4,8-dioxanonanoic acid
HFPO-DA (GenX)*	Tetrafluoro-2-(heptafluoropropoxy)propanoic acid
Internal Standards	
M3PFBS	Perfluoro-1-[2,3,4-13C3]butanesulfonic acid
M3PFHxS	Perfluoro-1-[1,2,3-13C3]hexanesulfonic acid
M8PFOS	Perfluoro-1-[13C8]octanesulfonic acid
M4PFBA	Perfluoro-n-[1,2,3,4-13C4]butanoic acid
M5PFPeA	Perfluoro-n-[1,2,3,4,5-13C5]pentanoic acid
M5PFHxA	Perfluoro-n-[1,2,3,4,6-13C5]hexanoic acid
MPFHpA	Perfluoro-n-[-1,2,3,4-13C4]heptanoic acid
M8PFOA	Perfluoro-n-[13C8]octanoic acid
M9PFNA	Perfluoro-n-[13C9]nonanoic acid
M6PFDA	Perfluoro-n-[1,2,3,4,5,6-13C6]decanoic acid
M7PFUnDA	Perfluoro-n-[1,2,3,4,5,6,7-13C7]undecanoic acid
MPFDoDA	Perfluoro-n-[1,2-13C2]dodecanoic acid
MPFTeDA	Perfluoro-n-[1,2-13C2]tetradecanoic acid
MPFOSA	Perfluoro-1-[13C8]octanesulfonamide
DNEtFOSA	N-ethyl-D5-perfluoro-1-octanesulfonamide
DNMeFOSA	N-methyl-D3-perfluoro-1-octanesulfonamide
DNEtFOSAA	N-ethyl-D5-perfluoro-1-octanesulfonamidoacetic acid
DNMeFOSAA	N-methyl-D3-perfluoro-1-octanesulfonamidoacetic acid
DNEtFOSE	2-(N-ethyl-D5-perfluoro-1-octanesulfonamido)ethan-D4-ol
DNMeFOSE	2-(N-methyl-D3-perfluoro-1-octanesulfonamido)ethan-D4-ol
M4:2FTS	1H,1H,2H,2H-perfluoro-1-[1,2-13C2]-hexane sulfonic acid
M6:2FTS	1H,1H,2H,2H-perfluoro-1-[1,2-13C2]-octane sulfonic acid
M8:2FTS	1H,1H,2H,2H-perfluoro-1-[1,2-13C2]-decane sulfonic acid
M3HFPO-DA*	Tetrafluoro-2-(heptafluoropropoxy)-13C3-propanoic acid

Any tests marked with * are not accredited for specific matrices or analytes.

LOR = Limit of Reporting LOD = Limit of Detection NR = Not Reportable

G

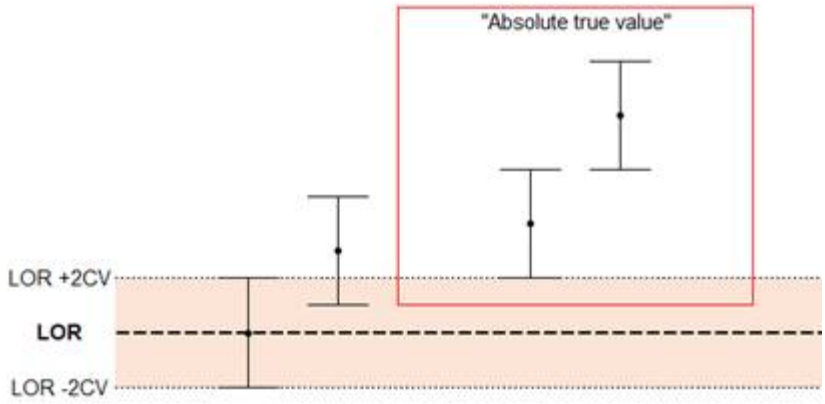
Appendix G – Laboratory Correspondence

Vicky Kennaugh

From: Amelie Sellier <Amelie.Sellier@AsureQuality.com>
Sent: Friday, 30 April 2021 4:24 PM
To: Vicky Kennaugh
Cc: Lisa Graham
Subject: RE: PFAS results - lab error margins
Attachments: UoM PFCS01_05-HIGHLEVEL.pdf

Hi Vicky,

Following your request regarding the uncertainty of measurement (UoM) for our high level method, please find attached a document which contain the average concentration of our QC sample and the uncertainty from our control chart.
I've then applied this uncertainty to our LOR for each method to show you the 'zone' in which the results are considered to be 'the same'. For example, for a L-PFOS result of 0.025 ug/L from our method PFCS01//05-HIGHLEVEL, any positive result between 0.022 and 0.028 ug/L would be considered "the same". So for you to have an "absolute true value" it means that the (result - 2CV) should be above the (LOR + 2CV) as shown below.



Those UoM are used in our control chart to assess our QC sample (de-ionised water spiked at 10*LOR for High level method). They were calculated as twice the coefficient of variation of the measured concentration of our QC sample on all our routine batches during a certain period of time (High level on 47 routines batches)

Our LOD were estimated statistically during the validation of our method from the standard deviation (S) of the measured concentrations of each analyte in seven replicates of reagent water fortified at a nominal concentration. LOD was calculated from the relationship LOD = 3 x S and LOQ from the relationship LOQ = 3 x LOD. The LOR was then assigned to a value of convenience. The LOR must be no lower than the statistically determined LOQ. We do not report numerical results for measured concentrations less than LOR.

When we are measuring concentration close to the LOR, that can lead to a number being reported (a positive result) or a result of "<LOR" for this analyte.

Hope these information can help.
Don't hesitate to go back to me if you need further information.

Thanks,

Amelie Sellier

PFCS01//05-HIGHLEVEL

	Average	2CV (U)	-2CV	LOR	+2CV
PFPrS	0.92	16%	0.021	0.025	0.029
PFBS	0.88	12%	0.022	0.025	0.028
PFPeS	0.93	10%	0.023	0.025	0.027
di-PFHxS	0.0023	43%	0.014	0.025	0.036
mono-PFHxS	0.15	16%	0.021	0.025	0.029
L-PFHxS	0.72	13%	0.022	0.025	0.028
PFHpS	0.94	13%	0.022	0.025	0.028
di-PFOS	0.01	25%	0.019	0.025	0.031
mono-PFOS	0.17	12%	0.022	0.025	0.028
L-PFOS	0.71	13%	0.022	0.025	0.028
PFNS	0.95	22%	0.039	0.050	0.061
PFDS	0.83	23%	0.077	0.10	0.12
PFBA	0.96	14%	0.086	0.10	0.11
PFPeA	0.98	9%	0.091	0.10	0.11
PFHxA	1.0	8%	0.023	0.025	0.027
PFHpA	1.0	12%	0.022	0.025	0.028
PFOA	1.0	15%	0.021	0.025	0.029
PFNA	0.98	35%	0.016	0.025	0.034
PFDA	0.94	25%	0.019	0.025	0.031
PFUnDA	0.91	21%	0.020	0.025	0.030
PFDoDA	1.1	15%	0.085	0.10	0.11
PFTrDA	1.1	22%	0.078	0.10	0.12
PFTeDA	1.0	32%	0.068	0.10	0.13
PFOSA	1.0	13%	0.022	0.025	0.028
NEtFOSA-M	0.96	26%	0.074	0.10	0.13
NMeFOSA-M	1.1	17%	0.083	0.10	0.12
NEtFOSAA	0.94	10%	0.022	0.025	0.028
NMeFOSAA	1.1	15%	0.021	0.025	0.029
NEtFOSE-M	1.0	11%	0.089	0.10	0.11
NMeFOSE-M	0.98	9%	0.091	0.10	0.11
4:2 FTS	0.97	14%	0.021	0.025	0.029
6:2 FTS	1.0	11%	0.045	0.050	0.055
8:2 FTS	1.1	18%	0.082	0.10	0.12
10:2 FTS	1.0	9%	0.023	0.025	0.027
9Cl-PF3ONS	0.94	4%	0.096	0.100	0.104
11Cl-PF3OUdS	0.93	11%	4.4	5.0	5.6
FPrPA	0.98	8%	0.092	0.10	0.11
FPePA	0.99	8%	0.023	0.025	0.027
FHpPA	0.95	7%	0.023	0.025	0.027
ADONA	0.97	7%	0.023	0.025	0.027
HFPO-DA	1.0	13%	0.044	0.050	0.056
P37DMOA	1.0	16%	0.042	0.050	0.058
PFECHS	0.82	3%	0.024	0.025	0.026

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From: Lisa Graham <Lisa.Graham@asurequality.com>
Sent: Friday, 30 April 2021 3:14 p.m.
To: Amelie Sellier <Amelie.Sellier@AsureQuality.com>
Subject: FW: PFAS results - lab error margins

Hi Amelie,

These water samples were subcontracted via Hills and were tested with 05-Highlevel.

Could you please send the measurement uncertainty summary that you recently compiled to Vicky?

Thanks
Lisa

Lisa Graham, PhD
Manager - Science & Innovation - Wellington Laboratory
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From: Vicky Kennaugh <Vicky.Kennaugh@beca.com>
Sent: Friday, 30 April 2021 2:54 pm
To: Lisa Graham <Lisa.Graham@asurequality.com>
Subject: PFAS results - lab error margins

Hi Lisa,

Thanks for your time on the phone yesterday.

Please could you provide the details on the lab error for the following reports:

- 21-110291
- 20-312648

Thanks

Vicky