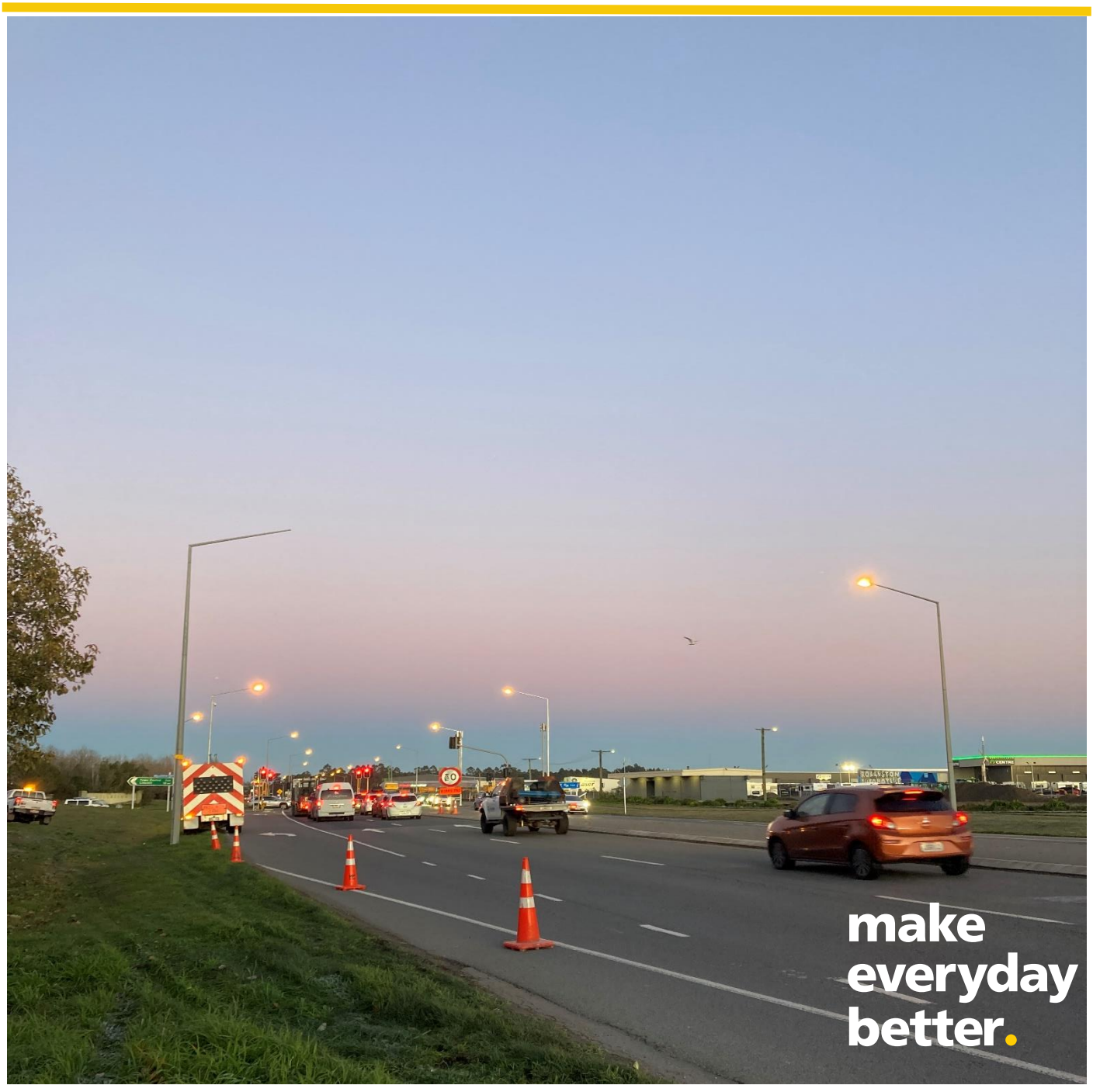
Detailed Site Investigation (Contamination) (Package 1)

Rolleston Access Improvements (Package 1)

Prepared for New Zealand Transport Agency Waka Kotahi
Prepared by Beca Limited

6 September 2024



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Revision History

Revision N°	Prepared By	Description	Date
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Document Acceptance

Action	Name	Signed	Date
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on behalf of	Beca Limited		

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Executive Summary

New Zealand Transport Agency Waka Kotahi (NZTA) have commissioned Beca Ltd (Beca) to undertake a Detailed Site Investigation (DSI) in relation to the proposed works associated with upgrades to the SH1 Rolleston Access Improvements. For reporting purposes, the proposed development has been divided into two sections – 'Package 1' and 'Package 2'. This DSI report is concerned with the investigations undertaken for Package 1 only.

The purpose of this investigation was to identify areas of soil contamination which may require management during redevelopment, potential for soils reuse in stormwater basins, and to inform the likely contaminated land consent requirements under the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (NESCS) and rules of the Environment Canterbury Land and Water Regional Plan (LWRP).

A Preliminary Site Investigation (PSI) of the wider development area was undertaken by Stantec in May 2023, which identified a portion of the site (adjacent to the northwest of the Runners and Walkers Road intersection) as Hazardous Activity and Industries List (HAIL) C1 and G5:

- Potential waste disposal to land (HAIL G5),
- Mortar launching site (HAIL C1)

Additional potential sources of contamination were identified for the site:

- Historical use of coal tar during roading construction of portions of the site (i.e., SH1 and Walkers, Runners and Dunns Crossing Roads).
- Accumulation of contaminants (i.e., exhaust residues, fuels, oils and tyre compounds) within road verges from prolonged use of the site as a road.
- Accumulation of contaminants (i.e., fuels, oils and asbestos) within the existing railway corridor from prolonged use of the site as a railway line.

Based on the findings of the PSI and information review, further investigation (in the form of a DSI) was required to inform material handling, reuse, and disposal options during the works.

Summary of DSI Findings

Soil sampling from 16 test pits was undertaken between 19 June and 29 July, targeting the HAIL activities and potential sources of contamination identified in the Stantec PSI and information review. Soil samples were analysed for at least one of the following: heavy metals (antimony, arsenic, cadmium, copper, chromium, nickel, mercury, tin and zinc), polycyclic aromatic hydrocarbons (PAH), total petroleum hydrocarbons (TPH), semi-volatile organic compounds (SVOC), and asbestos. Field observations and results indicate:

- No samples exceeded the adopted human health or terrestrial ecology guidelines.
- A blue/black stained layer (with no notable odour) was observed during excavation of TP04 at a depth of approximately 1.2 – 1.3 m bgl. Two samples were subsequently analysed for cyanide, which was not detected above the LOD.
- Analysis of asphalt samples returned concentrations of PAH and benzo(a)pyrene Toxic Equivalence (B(a)P TEQ) that do not indicate the presence of coal tar on site. Note that coal tar distribution can be variable spatially and by depth, and could still be encountered during works.

Potentially complete pathways of exposure of human and environmental receptors to sources of contamination on site were reviewed based on the soil sampling results. Given all contaminant concentrations were below human health and environmental criteria, the risk from a human health and

environmental perspective is considered low, therefore all source-receptor pathways relevant to the works were considered incomplete.

Consenting Requirements

NESCS

The following HAIL activities have been identified for a portion of the site, located immediately north-west of Runners Road and Walkers Road intersection (i.e., Department of Corrections Land/Rolleston Prison):

- HAIL C1 - Explosive or ordnance production, maintenance, dismantling, disposal, bulk storage or repackaging.
- HAIL G5 – Waste disposal to land.

Whilst the site is considered a low risk to human health based on soil sampling results, as contaminant concentrations were above published background concentrations, the NESCS applies to the proposed works within this portion of the site. Once soil disturbance and disposal volumes associated with the proposed works are confirmed, these should be assessed against the Permitted Activity criteria for soil disturbance. If not compliant, resource consent under the NESCS will likely be required as a controlled activity.

ECan LWRP

Based on the findings of this investigation:

- The portion of the site located immediately north-west of Runners Road and Walkers Road intersection (i.e., Department of Corrections Land/Rolleston Prison) is considered to meet the definition of 'potentially contaminated land', given contaminants concentrations in soils within this area were found above published background concentrations. Therefore, the LWRP rules referring or relating to potentially contaminated land apply to this portion of the site.
- The remainder of the site is not considered to meet the definition of 'potentially contaminated' or 'contaminated' land, as no '*activity or industry described in the list in Schedule 3 of the plan*' is being or has been undertaken, and therefore the rules referring or relating to these definitions do not apply to these areas.

Recommendations

- Soil results indicate that the risk to human health and the environment from the proposed works is low. However, it is recommended that the works be undertaken with robust unexpected discovery protocols and good practice erosion and sediment control measures. A Contaminated Soils Management Plan (CSMP) and Erosion and Sediment Control Plan (ESCP) may be required to support consent.
- With the exception of the stained material observed in the rail corridor, soils are suitable for reuse on site, and can be reused within the proposed stormwater soakage basins (subject to some limitations discussed in the report).
- If off-site disposal is required, excess spoil within the soakage basins is likely suitable for disposal as clean fill on the basis of average concentrations of contaminants in these areas. Elsewhere, managed fill disposal may be required for surficial soils, with deeper soils anticipated to be accepted at a cleanfill facility. Any soil acceptance is ultimately the decision of the receiving facility and obtaining acceptance prior to works is recommended.
- Asphalt and soils within the roading and railway corridors are likely not suitable for disposal as clean fill, due to widespread detections of contaminants above published background concentrations and will required disposal to licensed disposal to a fill facility licensed and consented to accept the contaminant levels observed on site.
- Although not currently anticipated, if dewatering is required for the proposed works, groundwater sampling and analysis is recommended to assess for potential contamination and inform options for dewatering methodology and disposal of dewatered groundwater.

1 Introduction

Waka Kotahi New Zealand Transport Agency (NZTA has engaged Beca Limited (Beca) to prepare a Detailed Site Investigation – Contamination (DSI) for the proposed works associated with upgrades to the Rolleston transport network.

For reporting purposes, the proposed development has been divided into two sections – 'Package 1' and 'Package 2'. This DSI report is concerned with the investigations undertaken for Package 1 only (see Section 2.1 for location details of each package).

As part of this investigation, Beca relied on the Stantec Ltd (Stantec) Preliminary Site Investigation (PSI) [1]undertaken for the project. Beca has not peer reviewed or independently verified the Stantec PSI, and all findings have been taken as reported by Stantec.

1.1 Purpose

The purpose of this DSI is to:

- Identify contaminants in soils and groundwater within the proposed areas for upgrades as a result of current or historical activities.
- Refine the Conceptual Site Model for the site to confirm the presence or absence of complete contaminant source-pathway-receptor connections.
- Identify areas of soil contamination which may require management with respect to risks to human health and the environment.
- Comment on contaminated land consent requirements for the proposed works under the following legislation:
  - Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (NESCS)
  - Environment Canterbury (ECan) Land and Water Regional Plan (LWRP)
- Provide initial comments on soil disposal and/or re-use options in relation to soil contamination. Particularly around stormwater basins.
- Note all conclusions relating to soil testing and the location of contamination are limited to the locations and number of samples taken - see Section 10.4 for Limitations of Site Characterisation.

1.2 Scope

The scope of the works for this Package 1 DSI comprised:

- Machine excavation of 16 test pits to a maximum depth of 2.3 m below ground level (bgl).
- Drilling of one borehole, in conjunction with the Beca Geotechnical team, to a maximum depth of 15 m bgl.
- Collection of representative soil samples by an Environmental Scientist
- Laboratory analysis of 41 soil samples for at least one of the following - heavy metals (arsenic, cadmium, chromium, copper, lead, nickel, mercury and zinc), polycyclic aromatic hydrocarbons (PAH), total petroleum hydrocarbons (TPH), semi-volatile and volatile organic compounds (SVOC and VOC), and asbestos.
- Assessment of laboratory results against published background soil concentrations, human health and environmental criteria.

The investigation has been undertaken and reported in general accordance with:

[1] Rolleston Access Improvements Preliminary Site Investigation. Stantec, May 2023.

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

2 Site Description

2.1 Site Location

The proposed works are located in Rolleston (within the Selwyn District, approximately 25 m south-west of Christchurch City Centre). Majority of the wider development is located within the SH1 (Main South Road) road carriageway and reserve and extends from approximately 1km east of the central commercial and industrial area of Rolleston to approximately 400 m west of Dunns Crossing Road and Walkers Road intersection.

Works within the Package 1 section (herein referred to as 'the site') are located within the road carriageway and reserve of SH1, Walkers Road, Dunns Crossing Road, and Runners Road, and occupies a portion of the existing railway corridor. The site is also partially inclusive of properties adjacent to the north-west (Department of Corrections Land) and south-west of the SH1 and Walkers Road/Dunns Crossing Road intersection, as indicated on **Figure 1** and **Figure 2**.

Further details on the proposed works are detailed in Section **2.2.**

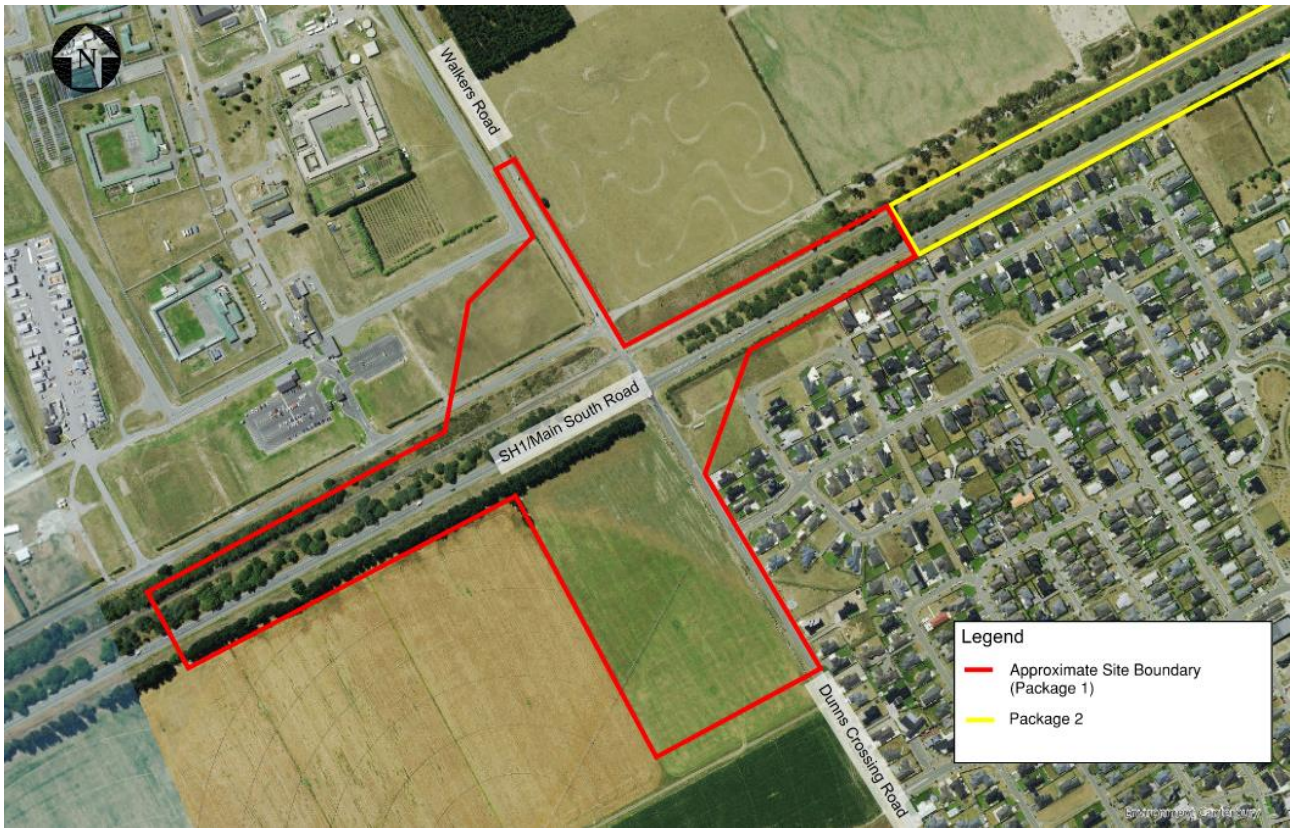

Figure 1. Extent of Package 1 works (i.e., the site), with an approximate site boundary outlined in red (Image Source: Canterbury Maps Viewer).

Figure 2. The location of the site with respect to the wider suburb of Rolleston (Image source: Canterbury Maps Viewer).

2.2 Proposed works

The proposed works are part of the wider SH1 Rolleston Access Improvements project. The main features of the design for Package 1 works include:

- A new roundabout with a walking and cycling subway at the intersection of SH1/Main South Road with Dunns Crossing and Walkers Roads, with new entry and exit lanes.
- Two stormwater soakage basins that service Dunns Crossing and Walkers Road, to the north and south of the new roundabout, in which operational phase stormwater will be discharged to ground.

The proposed works is estimated to cover an approximate area of 2,500 m^2. Earthworks volumes and depths of excavations are not yet finalised, but the design team have informed that earthworks are expected to range in depth up to:

- 3-4 m below ground level (bgl) (in relation to construction of the cycling subway)
- 1.5 m bgl (within the stormwater soakage basins)
- 0.5 – 1.0 bgl (relating to modifications of the existing roads to merge with the roundabout entry/exit lanes).

Development plans of the proposed stormwater soakage basins are shown in **Figure 3** and concept design drawings for the site are included as **Appendix A**.

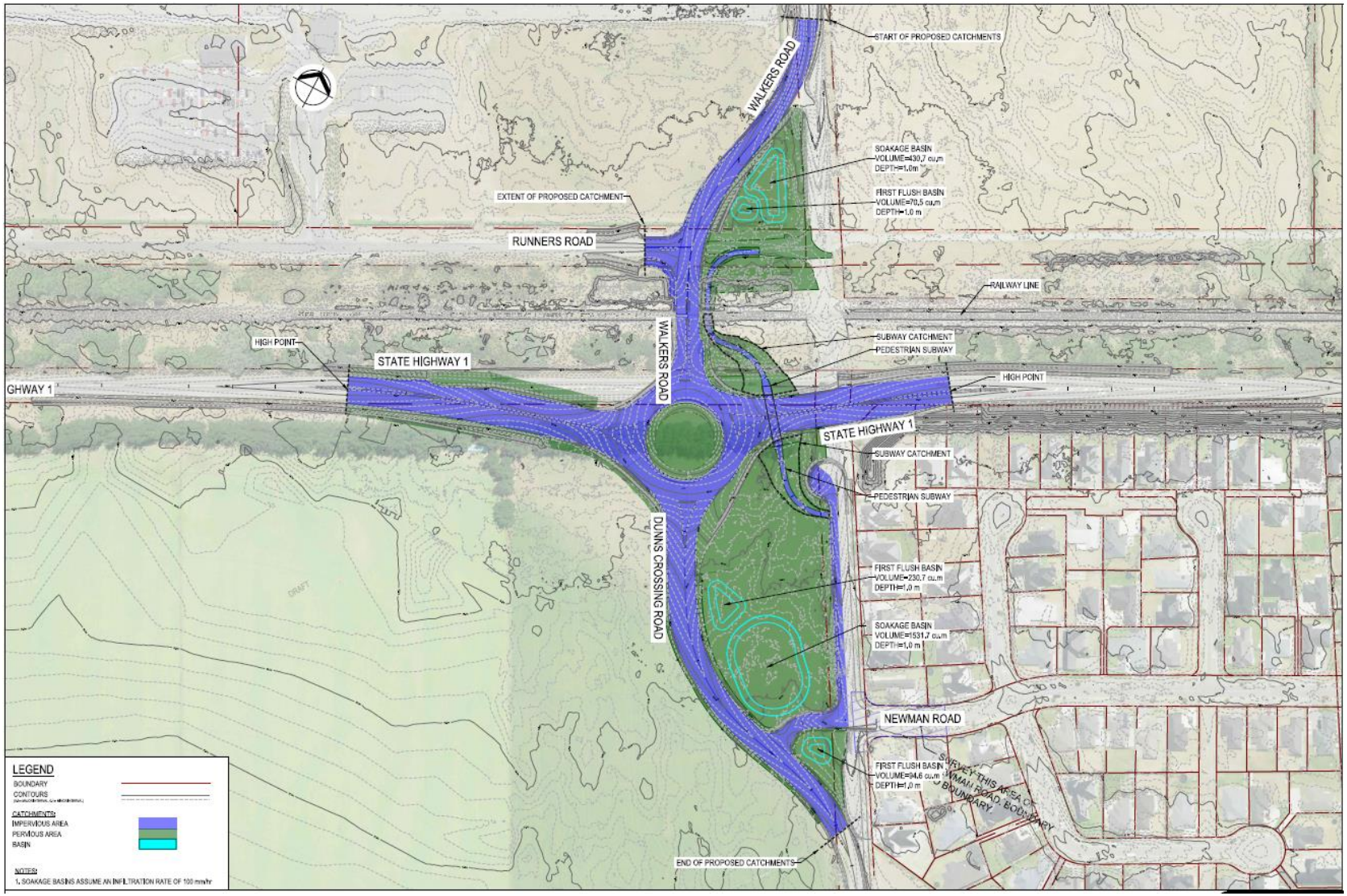

Figure 3. Design Plans for the proposed stormwater soakage basin, north and south of the proposed roundabout (Figure adapted from Stormwater Catchment Plan (Drawing No 3338703-10-CD-2191), Beca July 2024).

3 Environmental Setting

3.1 Current Land Use

The majority of the proposed works is to be undertaken within the corridors of the following roads:

- SH1/Main South Road
- Walkers Road
- Dunns Crossing Road

Additionally, a portion of the site is occupied by an existing railway line that is located between Runners Road and SH1, as well as an agricultural property (currently grazed) immediately south-east of the SH1 and Walkers/Dunns Crossing Roads intersection, and Department of Corrections land to the north of SH1 on the northwest corner of Walkers and Runners Road.

3.2 Surrounding Land Use

The immediate surrounding area of the site consists of residential housing (south-east of SH1) and undeveloped, agricultural land (mostly north of and south of SH1). Rolleston Prison (Department of Corrections) is located adjacent to the west of Walkers Road.

3.3 Geology and Hydrogeology

The site is underlain with Late Pleistocene river deposits, described as 'Unweathered, brownish-grey, variable mix of gravels/sand/silt/clay in low river terraces; locally up to 2m'[2].

The Canterbury Maps Viewer indicates that the site is located over an unconfined/semi-confined aquifer system. The 'Wells and Bores' layer of Canterbury Maps Viewer exhibits a number of bores that are located within 100 m of the site, one of which is used for domestic water supply (see Section 3.5). Recordings of groundwater levels in these bores range between 9 and 16 m bgl. Based on the 'Piezometric Contours' layer of Canterbury Maps viewer, groundwater appears to flow in a general east to west direction, towards the Pacific Ocean.

3.4 Topography

The site is relatively flat, with an approximate elevation range of 55 to 57 m above mean sea level[3]

3.5 Sensitive Receptors and Hydrology

The nearest surface water body in relation to the site is an artificial water race, located approximately 300 m south of the site. The Selwyn River is located approximately 7 km south-west of the site, which flows in a west to east direction, discharging to the Pacific Ocean.

The 'Canterbury Three Waters Data' and 'Drains and Water Courses' layers of Canterbury Maps Viewer indicates that no open drainage channels are present within 100 m of the site that have been recorded in the database.

Canterbury Maps Viewer indicates that the site is not located within a community drinking water protection zone, and that the closest drinking water protection zone is located approximately 50 m north-west of the

[2] GNS Science 2016, 1:250,000 scale, (https://data.gns.cri.nz/geology/), viewed 8 August 2024.

[3] LINZ NZ Contours (Topo, 1:50k), (https://data.linz.govt.nz/layer/50768-nz-contours-topo-150k/), Viewed 8 August 2024.

site, in relation to a domestic supply for Rolleston Prison (the associated bore is located approximately 200 m north-west of the site).

Based on this information, no sensitive receptors have been identified on or within 100 m of the site.

4 Summary of Existing Information

4.1 Rolleston Access Improvements – Preliminary Site Investigation (Stantec, May 2023).

Stantec were engaged by NZTA to undertake a Preliminary Site Investigation (PSI; May 2023) of the wider development area (i.e., combined Package 1 and 2 sections) in relation to the proposed upgrades. A summary of the PSI findings and conclusions relevant to the site (Package 1) is provided below, and a copy of the report is included in **Appendix B**:

- Review of historical aerial imagery indicates that majority of the site has been used as roading since at least 1940 (earliest available imagery). Land/adjacent properties to the north and south-east of the SH1 and Walkers/Dunns Crossing Roads intersection were undeveloped, agricultural land, with some forestry activity visible south of the intersection.
- An area of former residential housing was present on the adjacent property to the north of the Runners Road portion of the works (i.e., approximately 130 m west of the proposed works), visible from the 1970's to early 2000's, later identified by Stantec as 'HAIL I - Any other land that has been subject to intentional or accidental release of a hazardous substance in sufficient quantity that it could be a risk to human health and or the environment'.
- Market gardens were observed approximately 40 m west of the northernmost extent of the Walkers Road section of the site (within the Rolleston Prison Grounds), from 1990's to present/latest imagery. Overall, 12 off-site HAIL activities (i.e., on adjacent properties located within 50 m of the site) were identified during review of the Environment Canterbury Listed Land Use Register (LLUR) and associated previous site investigation reports:
  - A8: Livestock dip or spray race A8: Livestock dip or spray race.
  - A10: Persistent pesticide bulk storage or use.
  - A17: Storage of tanks or drums for fuel, chemicals, or liquid waste.
  - C1: Explosive or ordinance production, bulk storage, or disposal
  - E1: Asbestos products, manufacture, or disposal
  - F6: Railway yards including goods handling yards, workshops, refuelling facilities or maintenance areas
  - G3: Landfill Sites
  - G5: Waste Disposal to Land
  - I: Any other land that has been subject to intentional or accidental release of a hazardous substance in
- Of these 12 HAIL activities, two were considered to be onsite or adjacent at a distance that Stantec categorised them as 'Low-Medium' risk of impacting the site. Both at the northwest corner of the Walkers/Runners Road intersection (although specific location was not determined)::
  - Potential waste disposal to land, **HAIL G5**
  - Potential use of the land as a mortar launching site, **HAIL C1** within a former military training area
- Additionally, the PSI identified that there is potential for coal tar to be encountered during the proposed works. The information reviewed in the Stantec PSI did not identify any existing data or information specifically confirming coal tar was used in the construction of the site, however, due to the era of construction of the roads within the site, it is considered a potential source of contamination. Further investigation was required to inform whether residual contamination originating from these activities is present or had migrated to the site.

Therefore, the portion of the site that intersects and is adjacent to this land, was identified by Stantec as HAIL C1 and G5,, as shown in Figure 4. However, further investigation (i.e., soil sampling and analysis) was recommended to inform if contamination originating from these activities had migrated to the site, and confirm the applicability of each HAIL code.

Based on the information reviewed in the PSI, Stantec made the following conclusions and recommendations (*see* Figure 4 *for references to 'Figure 8-2'. Note 'Figure 8-1' relates to Package 2 of the wider development area and is not relevant to the purposes of this report*):

- *"Further investigation including soil testing be conducted on the northwest corner of Runners Road and Walkers Road, as shown in Figure 8-2* [refer to Figure 4]*, to assess if this part of the alignment has contaminant concentrations above background levels and thus confirmed as a HAIL site.*
- *The NESCS activity status of soil disturbance works as shown in Figure 8-1 and Figure 8-2, should be assessed based results of soil testing and soil disturbance and disposal volumes to determine if this is a permitted activity under Section 8(3) of the NESCS.*
- *The unexpected discovery protocol outlined in Section 10 should be followed during the construction phase for the remainder of the project site*."

4.2 Additional Potential Sources of Contamination

Road verges can be subject to accumulation of contaminants from various vehicle and transport-related contaminants such as (not limited to) exhaust residues, fuels, oils and tyre compounds over extended periods of time. Similarly, accumulation of contaminants (i.e., fuels, oils and asbestos) within the existing railway corridor from prolonged use of the site as a railway line is also considered a potential source of contamination to this specific portion of the site.

The possible use of coal tar during road construction, and accumulation of contaminants within the road verge do not meet the 'more likely than not' threshold to be a 'piece of land' under the NESCS, however this determination could be revised following soil sampling and testing. The MfE HAIL user guide[4] specifically excludes rail corridor (as opposed to rail yards) as part of the wider rail network as a HAIL activity.

Soil sampling is recommended to inform project costs and management in the form of material management, re-use and disposal options as part of the proposed works.

[4] Users' Guide – National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health. (Ministry for the Environment, April 2012).

5 Preliminary Risk Assessment

5.1 Potential Contaminants of Concern

Table 1 presents a summary of the identified sources of contamination and potential contaminants of concern, based on the information summarised in **Section 4**. **Figure 4** presents a HAIL Plan for the site (note that activities that do not meet the 'more likely than not' threshold to be a 'piece of land' are not shown on **Figure 4**)

Table 1. Identified Sources of Potential Contamination and Associated Contaminants of Concern

Activity	HAIL Code	Potential Contaminants of Concern
• Potential waste disposal to land use of land as a mortar launching site, located immediately north-west of Runners Road and Walkers Road intersection (Stantec PSI 2023)	C1 - Explosive or ordinance production, bulk storage, or disposal G5 - Waste disposal to land	• Heavy metals (arsenic, antimony, cadmium, chromium, copper, lead, mercury, nickel, tin, zinc) • TPH • PAH • SVOC • Asbestos
• Potential use of coal tar within road pavement construction • Potential accumulation of contaminants in road verges and the railway corridor from prolonged use of the site as a road and railway line	Does not meet the 'more likely than not' threshold to be considered a 'piece of land' however contamination may be present. Soil sampling is recommended to inform the HAIL determination	• Heavy Metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, zinc) • TPH • PAH • Asbestos

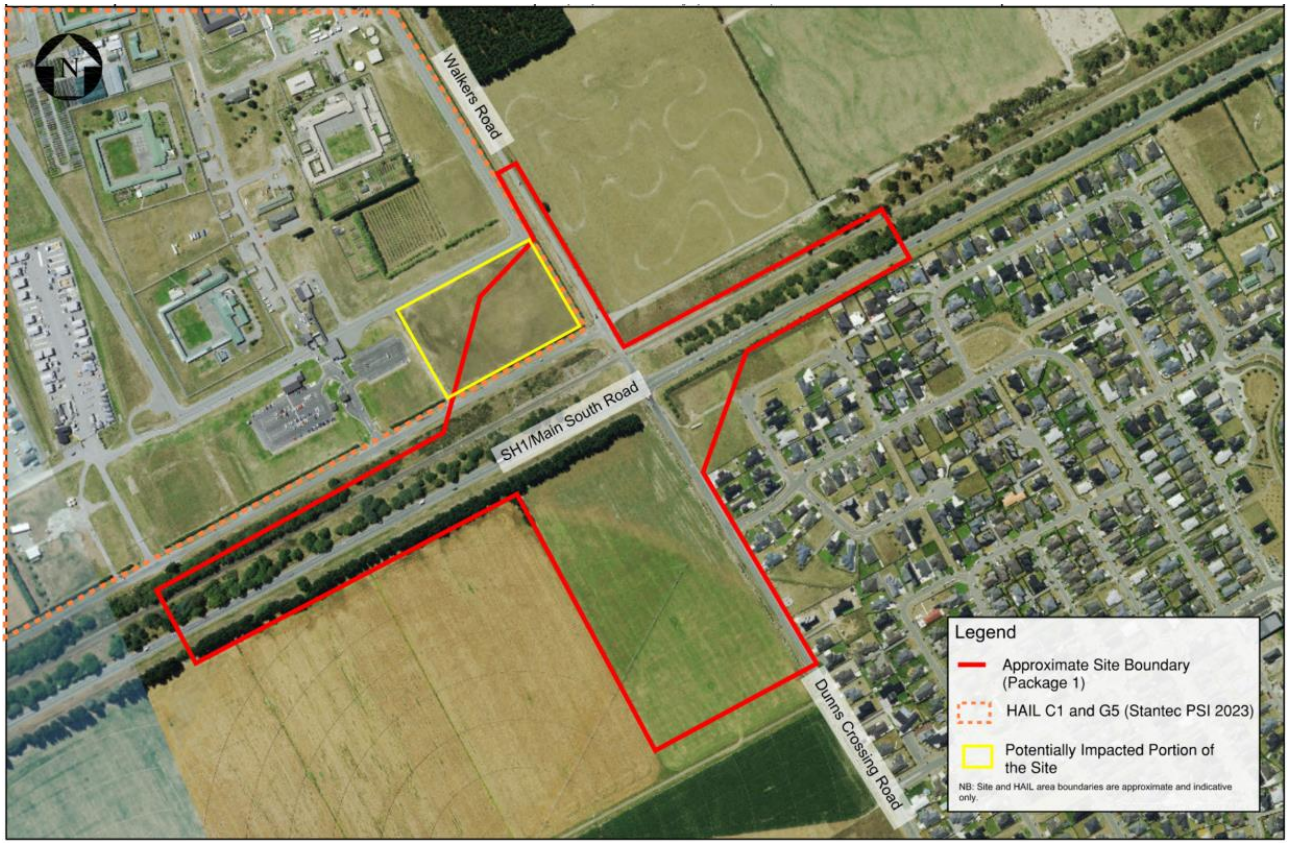

Figure 4. HAIL Plan for the site as informed by the Stantec PSI and ECan LLUR Statement. Note that site and HAIL area boundaries are approximate, and HAIL area boundaries are not shown to their full extent in this Figure.

5.2 Preliminary Conceptual Site Model

The Conceptual Site Model (CSM) (**Table 2**) was developed to describe the relationship between potential sources of contamination on site, the human and environmental receptors that may be exposed to those contaminants in the context of soil disturbance as part of the site re-development, and the pathways by which those receptors may be exposed. The CSM will be updated following the soil sampling and analysis.

Pathways identified as incomplete in the preliminary CSM will not be assessed further in this DSI.

Table 2. Preliminary Conceptual Site Model

Source	Receptor	Pathway	Completeness of Pathway
• HAIL activities (C1 and G5) immediately north-west of Runners and Walkers Roads intersection. • Potential use of coal tar in road construction	Construction workers	Exposure of workers to contaminants in soils and groundwater during construction i.e., via dermal contact, ingestion, or inhalation of dust/vapours.	**Potentially Complete Pathway** Potential sources of contamination have been identified for the site. Further investigation is recommended to assess the presence of contamination and to inform potential risk to human health and inform site management practices and disposal. Noting that the excavation/maintenance worker is not an exposure scenario covered by the NESCS. Worker exposure is managed

Source	Receptor	Pathway	Completeness of Pathway
• Potential accumulation of contaminants within road verges and railway corridor			by controls required under health and safety legislation[5].
	Future site users (excluding future construction workers, covered above)	Exposure of future site users to contaminants in soils – dermal contact, ingestion, or inhalation of dust/vapours.	**Potentially Complete Pathway** While majority of the site will be sealed upon completion of the works, some areas of the development will remain unsealed (i.e., grassed stormwater soakage basins and road berm). The unsealed areas are not proposed for recreational use, and the likelihood of future site users encountering soils in these areas is considered low (i.e. passive contact such as walking past/through berms). Therefore, this pathway is considered potentially complete, but low risk. If development plans or proposed land use changes, reassessment of this pathway will be required.
	General public during construction	Exposure of general public to contaminants in soils– dermal contact, ingestion or inhalation of dust/vapours.	**Incomplete Pathway** Public access to the site during construction will be prohibited.
	Groundwater resources for public consumption	Leaching and migration of soil contaminants into groundwater during development.	**Incomplete Pathway** One groundwater bore for domestic water supply was identified approximately 200 m north-west of the site. Although potential sources of contamination have been identified for the site, the activities and potential contaminants identified are not typically mobile in soil. Given the anticipated depth to groundwater in the area is between approximately 9 and 16 m bgl, it is considered that even if contaminants were present in shallow soils the migration to impact groundwater is unlikely.
	Terrestrial ecology	Exposure of terrestrial ecology to contaminants in soils– dermal contact or ingestion.	**Potentially Complete Pathway** The proposed re-development area is predominately hard standing but includes soft landscaping and stormwater basins with associated landscaping, which may provide some habitat for terrestrial ecology and food chain interactions. Further investigation is recommended.

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

Source	Receptor	Pathway	Completeness of Pathway
	Surface water	Contaminated sediment and runoff directly into surface water or runoff into stormwater system which may discharge to surface water and subsequent marine environment, during construction.	**Incomplete Pathway** The distance to the nearest receiving surface waters (an artificial watercourse) is approximately 300 m south from the site. Based on the distance to the receptor, attenuation and dilution factors would likely reduce contamination concentrations in surface water runoff prior to encountering the receiving environment.
		Discharge of contaminated groundwater into the stormwater network and subsequent surface water receiving environment.	**Incomplete Pathway** Due to depth of groundwater in area and anticipated depth of earthworks, groundwater is not expected to be encountered during the proposed works – therefore dewatering is not required, and this pathway is considered incomplete.

6 Sampling and Analysis Plan

6.1 Data Quality Objectives

The data quality objectives of soil and groundwater sampling relate to the proposed development area and are to:

- Assess contaminant concentrations in soil to determine whether contaminants most associated with the identified historical and current HAIL activities have resulted in contamination of soils within the proposed development area.
- Assess the identified soil contaminant concentrations against human health and environmental criteria to determine the level of management required to protect human health and the environment during proposed soil disturbance works.
- Assess the identified contaminant concentrations in soil to determine potential offsite disposal and onsite reuse options related to the proposed development area.
- Undertake initial risk screening of soil suitability for use in stormwater basins and swales from a soil contamination perspective.

6.2 Investigation Rationale

The HAIL activities and other potential sources of contamination identified (**Table 1**) were targeted during the investigation. The investigation scope and rationale were based on the following considerations:

- Soil sampling targeting areas of proposed soil disturbance that intersect HAIL areas/ potential sources of contamination identified or provisionally identified in the Stantec PSI.
- Soil sampling undertaken to inform soil management required to protect human health and the environment; and to provide re-use and disposal options for works within HAIL areas and the wider site (i.e., outside of the identified HAIL areas).
- Soil sample locations targeting propose stormwater basin locations regardless of HAIL and potential contamination status.

6.3 Investigation Scope

The investigation scope comprised soil sampling from 16 machine excavated test pits, including four pavement pits, and three infiltrations pits. Test pit spacing was systematic within targeted areas. Test pit locations targeted the proposed earthworks footprints only, and included earthworks areas that intersect HAIL activities and potential sources of contamination.

Table 3 presents a summary of the sampling scope for the soil and groundwater investigations. A Sample Location Plan is provided in **Appendix C.**

Table 3. Sampling and Analysis Locations and Rationale

Targeting/Rationale	Sampling Locations	Sampling Depths	Potential Contaminants of Concern
HAIL C1 and G5, and proposed stormwater soakage basin (property adjacent to the north-west of Runners Road and Walkers Road intersection)	TP10, TP11, IP03	Up to 2 m bgl.	• Heavy Metals (arsenic, antimony, cadmium, chromium, copper, lead, mercury, nickel, tin, zinc) • TPH • PAH • SVOC • Asbestos

Targeting/Rationale	Sampling Locations	Sampling Depths	Potential Contaminants of Concern
Potential use of coal tar in roading construction	PP01 – PP04, PP18	Up to 1 m bgl.	• TPH • PAH
Potential accumulation of contaminants within road verges	IP01, TP06, TP07	Up to 4 m bgl.	• Heavy Metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, zinc) • TPH • PAH
Potential accumulation of contaminants within the railway corridor	TP02, TP04	Up to 2 m bgl.	• Heavy Metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, zinc) • TPH • PAH • Asbestos
Other development areas (proposed south-western stormwater soakage basins, roundabout, and subway) -general site sampling to inform soil disposal and management options	IP02, TP03, TP08	Up to 2 m bgl.	• Heavy Metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, zinc) • TPH • PAH

6.4 Permitted Activity Provisions

6.4.1 NESCS

Given that activities listed on the HAIL have been undertaken at the site, the NESCS applies with respect to activities including soil sampling. Where undertaken in accordance with Regulation 8(2), the soil sampling for investigation of contaminated land is a permitted activity (PA). In accordance with Regulation 8(2), measures were in place to minimise human exposure to contaminants before, during and after the sampling program and 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 in laboratory-supplied jars.

6.4.2 LWRP

Under Rule 5.185 of the LWRP, a site investigation is a permitted activity assuming, the investigation is completed in accordance with CLMG No.1 and No.5, and the site investigation report is provided to ECan within two months of the completion of the investigation. To comply with this rule NZTA should supply this report to ECan.

7 Assessment Criteria

7.1 Human Health

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). In the absence of a 'maintenance and excavation worker' criteria in New Zealand (which is intended to be managed under the relevant health and safety legislation), a commercial/industrial land use scenario has been selected for assessment of risk to human health associated with construction site workers being potentially exposed to contaminants during site works and the proposed end use of the site remaining as a commercial/industrial premises.

While roading surface material is not soil, soil assessment criteria have been adopted for the asphalt samples analysed in this investigation to provide an indication of risk to human health of exposure to road surface material during the proposed works.

Human health assessment criteria are summarised in **Table 4**.

Table 4. Human Health Screening Criteria

Contaminant of Concern	Assessment Criteria
• Heavy metals (arsenic, boron, cadmium, chromium, copper, lead, mercury) • Benzo(a)pyrene (BaP) Toxic equivalency (TEQ) • SVOC (Dieldrin and DDT)	• NESCS Soil Contaminant Standards for a Commercial/industrial outdoor worker (unpaved).
• Heavy metals (nickel and zinc)	• Australian National Environment Protection (Assessment of Site Contamination) Measure (2011). Values for 'Commercial/industrial' land use, Table 1A(1).
• TPH • BTEX • Naphthalene • Pyrene	• Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand (MfE, 1999). Module 4. • Tier 1 soil acceptance criteria for a commercial/industrial use - All Pathways; sand soil type, surface (<1 m) depth of contamination (Table 4.11 and Table 4.14). • Regional Screening Levels, US Environment Protection Agency (USEPA, Spring 2024). Values applicable to 'Industrial Soil
• SVOC (various compounds) • Cyanide	• Regional Screening Levels, US Environment Protection Agency (USEPA, Spring 2024). Values applicable to 'Industrial Soil.
• Asbestos	• BRANZ New Zealand Guidelines for Assessing and Managing Asbestos in Soil (GAMAS).

7.2 Environmental

To inform environmental and ecological risk, the results were assessed against the following guidelines:

- Terrestrial Ecology - For arsenic, cadmium, copper, chromium, lead, and zinc, Manaaki Whenua Landcare Research (2022) Exploring the implementation of ecological soil guideline values for soil contaminants selected. Trigger value for 80% species protection selected – Tables 13, 14 and 22. TPH values applicable to 'coarse' grained soils adopted. For copper and zinc sensitive aged soil values selected
- Terrestrial Ecology - For nickel and mercury, Canadian Council of Ministers of the Environment (CCME) (1999) Soil Contact Guidelines.

Both guidelines were selected to assess potential ecological risk within the development areas of soft landscaping which may provide habitat for terrestrial soil organisms. Ecological criteria were not applied to road surfacing material.

7.3 Background Concentrations

The following background concentrations have been adopted for this investigation:

- ECan online GIS Map Viewer: Canterbury Maps (Trace Elements Level 2, Soil Group 'Recent' applied).
- Environment Canterbury Contaminated Land Management User Guide - Background/Typical concentration of polycyclic aromatic hydrocarbons (PAHs) in Christchurch urban soils.

7.4 Landfill Acceptance Criteria

- MfE Hazardous Waste Guidelines, Landfill Waste Acceptance Criteria and Landfill Classification, (2004). Table 1. Class A values were used as these are the acceptance criteria for Kate Valley Landfill.There are a range of other Canterbury-based fill facilities with bespoke consented acceptance limits that were not assessed as part of this DSI.

8 Sampling Methodology

The soil investigation was undertaken between the 18 June and 29 of July 2024, in collaboration with the Beca geotechnical investigation, where practical test pits were advanced for the purpose of geotechnical and environmental investigation, and some test pits were environmental only. Test pits were machine excavated by Corde. Locations were marked and cleared for services using a ground penetrating radar (GPR) and cable avoidance tool (CAT) operated by Radar Investigations, and if present, services were positively identified via hydro-excavation prior to sampling commencing.

Representative soil samples were collected from each test pit and hand pit location, based on visual observations and/or significant geological changes. Samples were collected directly from the centre of the excavator bucket or dug using hand tools from the sides/base to minimise any potential cross contamination and placed in laboratory supplied sampling jars as appropriate.

Field sampling and relevant sampling management procedures were undertaken in general accordance with the MfE CLMG No. 5 – Site Investigation and Analysis (2021). Soils encountered during the investigation were logged in general accordance with New Zealand Geotechnical Society Field Description of Soil (NZGS 2005) sufficient to inform environmental assessment; refer to the geotechnical report for logs for geotechnical purposes. Soil logs and photos are provided as **Appendix D.**

Visual/olfactory screening of the sample location surface and recovered material for potential buried waste/refuse, asbestos containing materials (ACM) fragments or staining was also undertaken. Observations are recorded in **Section 8.2**and in the relevant soil logs **Appendix D.**

8.1.1 Quality Assurance and Quality Control

The digging and soil sampling hand tools were decontaminated between sampling locations using Decon90 and clean water.

Each sample was collected using a clean pair of nitrile gloves. Samples were then placed into laboratory-supplied sample containers. Each sample was given a unique sample identification number, and the sample location was recorded. Following collection, all samples were placed directly into a chilled chilly bin and were transported under standard chain of custody procedures, to the laboratory for analysis to ensure that samples were analysed within the appropriate holding times for each analyte. Three duplicate soil samples were analysed to allow the relative percentage difference (RPD) to be calculated.

Hills Laboratories performed all analyses and are International Accreditation New Zealand (IANZ) accredited. All test methods were also IANZ accredited. Copies of the Hills laboratory reports are included in **Appendix E.**

8.2 Field Observations

The following observations were made during the investigation:

- Ground cover across the site comprised mainly of grass (for non-road locations), except for areas (pavement pit sites) that were located on sections of sealed road. TP04 was located atop a mound of former railway ballast material and also did not have any surface grass coverage.
- The site soils in grassed areas were predominantly a layer of topsoil, consisting of fine to medium sandy silt with trace gravels to approximately 0.3 to 0.5 m bgl, transitioning to a layer of medium to coarse silty sand with gravels down to the test pit termination depth between 1 and 4 m bgl.
- Due to setback requirements at the time of investigation, two test pits targeting rail line activities (TP02 and TP04) were moved (away from the rail line) and were instead located approximately 10 m off the rail

line, therefore may not have observed contamination directly associated with the rail corridor in closer proximity to the rail lines.

- In three pavement pits (PP01, PP04 and PP18), a second (deeper) layer of asphalt was encountered at depths of approximately 0.4 m bgl. 0.25 m bgl and 0.3 m bgl, respectively.
- A blue/black stained layer (with no notable odour) was observed during excavation of TP04 at a depth of approximately 1.2 – 1.3 m bgl. Additional laboratory testing for cyanide was added.
- No fill or other indications of contamination were observed in other test pits across the site.
- Groundwater was not encountered in any of the test pits.

Soil logs and photos are provided **as Appendix D.**

9 Summary of Soil Analytical Results

Hill Laboratories analysis certificates and Chain of Custody documents are included as **Appendix E** and full summary tables, screening results against the adopted human health and environmental criteria are included as **Appendix F**.

The results are summarised below:

9.1 Heavy Metals

A total of 36 samples were analysed for a suite of heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc). In addition, six samples (targeting the identified HAIL activities north-west of Runners and Walkers Rd) were analysed for antimony and tin. In summary,

- No samples returned concentrations of heavy metals above the adopted human health guidelines or terrestrial ecology guidelines.
- 20 samples recorded concentrations of above published background concentrations
  - 13 for lead (of which 1 with cadmium, one with copper, and one with zinc marginally exceeding background levels)
  - 1 for arsenic
  - 1 marginally for nickel
  - 4 road surface samples: 3 for lead, one for copper
- No samples exceeded the MfE Class A Landfill screening criteria.
- For pits targeting stormwater basin areas, one surface sample marginally exceed background levels for lead (25 mg/kg vs 19.75 mg/kg) and zinc (80 mg/kg vs 69.58 mg/kg)

9.2 PAH

31 samples were tested for PAH. In summary:

- All samples recorded PAH concentrations below the human health and terrestrial ecology guidelines, published background concentrations and MfE Class A Landfill screening criteria.

9.3 TPH

31 samples were tested for TPH. In summary:

- All samples reported concentrations below the adopted human health guidelines.
- Three surface soil samples (collected at 0.1 m bgl) returned detections of TPH marginally above the laboratory limit of detection (LOD). All other soil samples returned TPH concentrations below the LOD.

9.4 SVOC

15 samples were analysed for SVOC. In summary:

- All samples returned concentrations below the LOD for all SVOC compounds.

9.5 Cyanide

Two samples (TP04 1.3 and TP04 1.5) in the rail corridor were analysed for cyanide (based on field observations at the time of soil sampling of blue/black colour, see **Section8.2**). Both samples returned concentrations of cyanide below the LOD and did not exceed human health criteria.

9.6 Asbestos

13 samples were analysed for asbestos. No asbestos was detected above the LOD in any tested sample.

9.7 Quality Assurance/Quality Control (QA/QC)

For soil sampling, three duplicate samples were analysed to allow the relative percentage difference (RPD) to be calculated. The RPD values ranged from 0 to 53%. Generally RPD was in the 0-23% range with the exception of 40%-53% in IP03. Some of this variation can be explained by lower concentrations of analytes (e.g. arsenic at 3 mg/kg and 5 mg/kg respectively), however is it acknowledged that the zinc RPD in IP03 of 53% is slightly higher than would be expected. This is a marginally elevated RPD and in only one analyte of the 83 compared in the three duplicate samples; the remaining results across the duplicates collected are all within an acceptable level. Therefore, the RPD assessment suggests an acceptable level of consistency in the soil sampling methods employed on site and the results are considered appropriate for the purposes of the assessment given the data objectives.

10 Discussion and Risk Assessment

The DSI targeted site soils identified within, or in close proximity to, HAIL areas and/or potential sources of contamination identified during review of existing information for the site. The risk assessment is based on comparison of results against the adopted human health and environmental criteria (Section 7) and the proposed development involving earthworks and potential exposure to construction workers.

Road surface material is not soil, and therefore the NESCS is not applicable to road surface material. The results of analysis of surface roading material (i.e., asphalt, seal, and bituminous materials) and soils are therefore discussed separately below.

10.1 Soils

10.1.1 Human Health

All soil analytical results from the proposed development area recorded contaminant concentrations below human health criteria.

The LOD for mercury, and several compounds within the PAH testing suite, is greater than the published background concentrations. All detections of PAH compounds were below background concentrations, and the detections of mercury in this investigation are of similar concentrations to background concentrations within the wider Canterbury region. Therefore, these contaminants are considered to be equivalent to be below background concentrations.

Based on the investigation results, the risk to human health from soils associated with the proposed works is considered low. Residual risk during the works can be managed with robust unexpected discovery protocols.

10.1.2 Environmental

No exceedances of ecological soil guideline values were recorded for all contaminants analysed for; therefore, the proposed works present a low risk to soil organisms in a terrestrial ecology context following works.

The design team have informed that stormwater is to be discharged to ground within proposed stormwater soakage basins. Background concentrations were marginally exceeded in one surface sample for lead and zinc, and the deeper sample in the test pit had concentrations within published background levels. All other samples targeting stormwater basins were below published background levels. For swales, the soil analytical results were similar, where background levels were exceeded by low levels for lead, with the deeper (0.3m bgl) sample generally around or lower than background levels.

In the swale and soakage basin areas, hydrocarbons were below background concentrations except for one sample at 50 mg/kg vs LOD of 40 mg/kg. Naturally occurring matter (NOM) can be detected in TPH analysis typically in the 50-500 mg/kg range. This has been particularly noted where there is a significant amount of extractable organic matter and results in a TPH detection. It has been noted by laboratories that many topsoil with moderate to elevated levels of organic matter can result also result in positive detections and are occurring at increasing frequency as new land is developed.

Overall, soil results in test pits targeting basins are considered within typical background ranges and based on the investigation results the environmental risk from infiltration of stormwater through soils at proposed basin locations into ground is considered low, therefore soils in these areas are considered suitable for reuse within the proposed stormwater soakage basins and roadside swales from a contamination perspective.

The distance to the nearest receiving surface waters is approximately 300 m south from the site. Based on the above assessment of soil results, environmental risk relating to contaminant-laden sediment during

construction is considered low other than general effects of sedimentation. It is therefore recommended that the proposed works should be managed with good practice erosion and sediment control measures.

10.2 Road Surface Material

10.2.1 Human Health

Asphalt was sampled in five test pits located within the existing road carriageway to target to potential use of coal tar in historic roading construction. All samples returned concentrations of contaminants below the human health guidelines.

The WasteMINZ Coal Tar Guidelines[6] outline that a total PAH concentration of 20 mg/kg or greater, and/or a Benzo(a) Pyrene Toxic Equivalent (BaP TEQ) concentration <1 mg/kg, in roading material can be adopted as an indication that coal tar is present. All asphalt samples analysed returned a total PAH concentration of either 3 mg/kg or less. There was no other olfactory or visual indication of coal tar on site. Therefore, based on sampling and analysis results, the surface roading material is not considered to contain coal tar, and the risk to human health from exposure to road surface material during construction is considered low.

Note that coal tar distribution can be variable spatially and by depth, and could still be encountered during works.

10.3 Revised Conceptual Site Model (CSM)

The CSM was reviewed based on the soil testing results to describe the relationship between sources of contamination on site, the human and environmental receptors that may be exposed to those contaminants in the context of the recreational and commercial/industrial use of the site, and the pathways by which those receptors may be exposed.

All contaminant concentrations were below human health and environmental criteria. The risk from a human health and environmental perspective is considered low, therefore all source-receptor pathways were identified as incomplete. Works should be undertaken with robust unexpected discovery protocols and good practice erosion and sediment control measures as a precaution, in the event that contamination is encountered on site during development.

10.4 Limitations of Site Characterisation

Characterisation of subsurface conditions is dependent on the number of sample locations, methods of sampling and uniformity of subsurface conditions. 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 of and 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.

[6] Guidelines for Assessing and Managing Coal Tar Contamination in Roading. WasteMINZ (December 2023).

11 Development Implications

11.1 Consents

11.1.1 National Environmental Standard

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

(7) "Land covered:

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

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

For the portion of the site located immediately north-west of Runners Road and Walkers Road intersection (i.e., Department of Corrections Land/Rolleston Prison) (see **Figure 4**), the following HAIL activities have been identified:

- HAIL C1 - Explosive or ordnance production, maintenance, dismantling, disposal, bulk storage or repackaging.
- HAIL G5 – Waste disposal to land.

No evidence of waste disposal to land was observed in the test pits undertaken within the identified HAIL area, and results are not considered reflective of waste disposal activities. G5 is therefore not considered applicable to the site on the basis of soil sampling. C1, however was identified from historical aerial photographs and information reviewed by Stantec, and meets the 'more likely than not' threshold for having occurred.

As the proposed works is to be undertaken within the HAIL activities identified for the site, and soil sampling observed contaminant concentrations above published background levels, the NESCS applies to the proposed works within this area. Under Regulation 8(3) of the NESCS, soil disturbance of up to 25 m^3 per 500 m^2 and disposal of up to 5 m^3 per 500 m^2 is allowed as a Permitted Activity. Based on indicative earthworks volumes for the proposed works in this area, the Permitted Activity criteria are unlikely to be met, and resource consent under the NESCS will likely be required. Once soil disturbance and disposal volumes are determined, these should be assessed against the Permitted Activity criteria to confirm whether consent under the NESCS is required.

11.1.2 Canterbury Land and Water Regional Plan

Section 2.9 of the LWRP defines contaminated land as:

- *Contaminated land – means land that has a hazardous substance in or on it that –*

  a) has significant adverse effects on the environment; or

  b) is reasonably likely to have significant adverse effects on the environment.
- *Potentially contaminated - means that part of a site where an activity or industry described in the list in Schedule 3 of this Plan has been or is being undertaken on it or where it is more likely than not that an activity or industry described in the list in Schedule 3 of this Plan is being or has been undertaken on it,*

but excludes any site where a detailed site investigation has been completed and reported and which demonstrates that any contaminants in or on the site are at, or below, background concentrations.

Based on the results of soil sampling and analysis within the identified HAIL areas are above published background concentrations, the portion of the site located immediately north-west of Runners Road and Walkers Road intersection (i.e., Department of Corrections Land/Rolleston Prison) is considered to meet the definition of 'potentially contaminated land'. Therefore, the LWRP rules referring or relating to potentially contaminated land apply to this portion of the site. On the basis of the soil analytical results, the environmental risk within the 'potentially contaminated land' is considered low in relation to the proposed project earthworks and stormwater basins.

The remainder of the site is not considered to meet the definition of 'potentially contaminated' or 'contaminated' land, as no '*activity or industry described in the list in Schedule 3 of the plan*' is being or has been undertaken, and therefore the rules referring or relating to these definitions do not apply to these areas.

11.2 Soil Re-Use and Disposal Options

11.2.1 Re-Use

From a contamination perspective with the exception of the stained material observed in the rail corridor, based on the observed results soils can be reused onsite, which includes within swales and basins as discussed in Section 10.1.2, subject to soakage and geotechnical limitations. Reuse on site is recommended as a generally more sustainable option compared to disposing of soil to landfill.

Upon completion of the works the re-used soil must be fully stabilised (e.g., sealed, grassed/hydro-seeded or similar stabilising landscaping) to prevent erosion and discharge of sediment.

11.2.2 Offsite Soil Disposal

If off-site disposal is required, the soil will likely require disposal to a fill facility licensed and consented to accept the contaminant levels observed on site. All fill facility acceptance is ultimately the discretion of the facility operator, and it is recommended that acceptance is obtained prior to works. If soils are to be disposed off-site, it is recommended (and likely required) that a copy of the soil analytical results be provided to the nominated disposal facilities by the contractor for review,

Soils within proposed stormwater soakage basins are likely suitable for disposal as clean fill as samples were largely within published background concentrations within these areas. One sample (collected from within the northern soakage basin location) returned two minor exceedances for lead and zinc, therefore it is possible that these soils may be accepted as clean fill based on average concentrations. However, this is ultimately at the discretion of the receiving facility.

Asphalt/road surface material and soils within areas of the roading and railway corridors are likely not suitable for disposal as clean fill due to widespread detections of contaminants above published background concentrations. This material will require managed fill disposal, however it is not considered to meet the definition of coal tar as per the coal tar guidelines.

Depending on the depth of required excavations for the proposed development, soil from depths greater than 0.3-0.5m bgl may be accepted at clean fill facilities, or managed facilities with lower acceptance criteria. Generally at this depth exceedances of background levels was less frequent, and to a lesser extent where it occurred.

All contaminant concentrations were within the MfE screening criteria for Class A Landfills, for example Kate Valley Landfill may be a suitable option for off-site disposal. . There are several other authorised managed and contaminated fill facilities in Canterbury, which have site specific acceptance criteria based on the requirements of their resource consents, which could accept material at the concentrations observed.

11.3 Dewatering

Due to depth of groundwater in the area, dewatering is not currently anticipated for the proposed works. If dewatering is required to support development of the site, groundwater sampling and analysis is recommended to inform options of dewatering management and disposal during works.

11.4 Management Plans

To manage risk from erosion and sedimentation, and to support consent under the NESCS and LWRP an Erosion and Sediment Control Plan, and potentially a Contaminated Soils Management Plan (CSMP) may be required.

12 Conclusions and Recommendations

Beca was engaged by NZTA to undertake a DSI in relation to the proposed SH1 Rolleston Access Improvements. The DSI targeted the areas of proposed earthworks, proposed stormwater basins, and potential HAIL activities and potential sources of contamination that were identified in the Stantec PSI (2023).

Stantec identified a portion of the site that intersects and is adjacent to this land was identified as HAIL C1 and G5 onsite in the north-west of the Runners and Walkers Roads intersection, and that further investigation was required to determine if these activities had impacted/apply to the site.

Soil sampling from 16 test pits, was undertaken between 19 June and 29 July. Soil samples were analysed for at least one of the following: heavy metals (antimony, arsenic, cadmium, copper, chromium, nickel, mercury, tin and zinc), PAH, TPH, SVOC, and asbestos. Field observations and results indicate:

- No samples exceeded the adopted human health or terrestrial ecology guidelines.
- Soil is suitable for reuse on site, including within stormwater basins and swales (subject to some limitations discussed in the report)
- Analysis of asphalt samples returned concentrations of PAH and B(a)P TEQ that do not indicate the presence of coal tar on site. Note that coal tar distribution can be variable spatially and by depth, and could still be encountered during works.

The risk from a human health and environmental perspective is considered low, therefore all source-receptor pathways were identified as incomplete.

Consenting

NESCS

The following HAIL activities have been identified for a portion of the site, located immediately north-west of Runners Road and Walkers Road intersection (i.e., Department of Corrections Land/Rolleston Prison):

- HAIL C1 - Explosive or ordnance production, maintenance, dismantling, disposal, bulk storage or repackaging.
- HAIL G5 – Waste disposal to land.

Therefore, the NESCS applies to the proposed works within this portion of the site. Once soil disturbance and disposal volumes are confirmed, these should be assessed against the Permitted Activity criteria. As soil analytical results exceeded published background concentrations, should PA criteria not be met, resource consent under the NESCS will likely be required as a controlled activity.

ECan LWRP

Based on the findings of soil sampling and analysis:

- The portion of the site located immediately north-west of Runners Road and Walkers Road intersection is considered to meet the definition of ‘potentially contaminated land’. Therefore, the LWRP rules referring or relating to potentially contaminated land apply to this portion of the site.
- The remainder of the site is not considered to meet the definition of ‘potentially contaminated’ or ‘contaminated’ land.
- On the basis of the soil analytical results, the environmental risk within the ‘potentially contaminated land’ is considered low in relation to the proposed project earthworks and stormwater basins

Recommendations

- Soil results indicate that the risk to human health and the environment from the proposed works is low. However, it is recommended that the works be undertaken with robust unexpected discovery protocols and good practice erosion and sediment control measures.
- Soils are suitable for reuse on site, and can be reused within the proposed stormwater soakage basins (subject to some limitations discussed in the report).
- If off-site disposal is required, excess spoil within the soakage basins is likely suitable for disposal as clean fill on the basis of average concentrations of contaminants in these areas.
- Asphalt and soils within the roading and railway corridors are likely not suitable for disposal as clean fill, due to widespread detections of contaminants above published background concentrations and will required disposal to licensed disposal to a fill facility licensed and consented to accept the contaminant levels observed on site (e.g., such as Kate Valley Landfill).
- Although not currently anticipated, if dewatering is required for the proposed works, groundwater sampling and analysis is recommended to assess for potential contamination and inform options for dewatering methodology and disposal of dewatered groundwater.
- An ESCP and CSMP may be required to support works and consenting.

Reviewing Statement

This report has been reviewed by Dr Ben Waterhouse, CEnvP Site Contamination Specialist. Ben is a suitably qualified and experienced practitioner (SQEP) with over 13 years' experience managing and delivering a wide variety of environmental investigation works in New Zealand and the United Kingdom. He is experienced in regulatory compliance, oversight of environmental investigations, monitoring and risk assessment, contractor management, preparation and review of technical reports, as well as working with regulatory bodies. Ben has been a Certified Environmental Practitioner Site Contamination Specialist since 2022.

A

Appendix A – Concept Design Drawings

LEGEND

BOUNDARY

EXISTING SERVICES
POWER
FIBRE OPTIC
CHORUS
WATER MAIN
STORMWATER
SEWER
STOCK WATER RACE
LIGHTING COLUMN

PROPOSED DESIGN
LIGHTING COLUMN
KERB BREAK
STORMWATER MANHOLE
SCRUFFY DOME
STORMWATER CATCHPIT
STORMWATER PIPE
SWALE
KERB
SEAL EDGE
BACK OF VERGE
GROUND INTERFACE
WIRE ROPE BARRIER
W SECTION BARRIER

NOTES:

CONCEPT DESIGN
NOT FOR CONSTRUCTION

No.	Revision	By	Chk	Appd	Date
A	FOR INFORMATION	JC	MH	BC	28.05.24
B	50% GEOMETRIC DESIGN	RA	QD	BC	04.07.24

Original Scale (A1) 1:500
Reduced Scale (A3) 1:1000

Design	Q.DETTLING	28.03.24	Approved For Construction*
Drawn	R.ANDERSON	28.03.24	
Dsg Verifier			
Drc Check			Date

* Refer to Revision 1 for Original Signature

Beca

Client: NZ TRANSPORT AGENCY WAKA KOTAHI

Project: SH1 ROLLESTON ACCESS IMPROVEMENTS

Title: GENERAL ARRANGEMENT SHEET 1 OF 5

Discipline: CIVIL ENGINEERING

Drawing No.: 3338703-10-CA-1201

Rev.: B

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LEGEND

BOUNDARY

EXISTING SERVICES
POWER
FIBRE OPTIC
CHORUS
WATER MAIN
STORMWATER
SEWER
STOCK WATER RACE
LIGHTING COLUMN

PROPOSED DESIGN
LIGHTING COLUMN
KERB BREAK
STORMWATER MANHOLE
SCRUFFY DOME
STORMWATER CATCHPIT
STORMWATER PIPE
SWALE
KERB
SEAL EDGE
BACK OF VERGE
GROUND INTERFACE
WIRE ROPE BARRIER
W SECTION BARRIER

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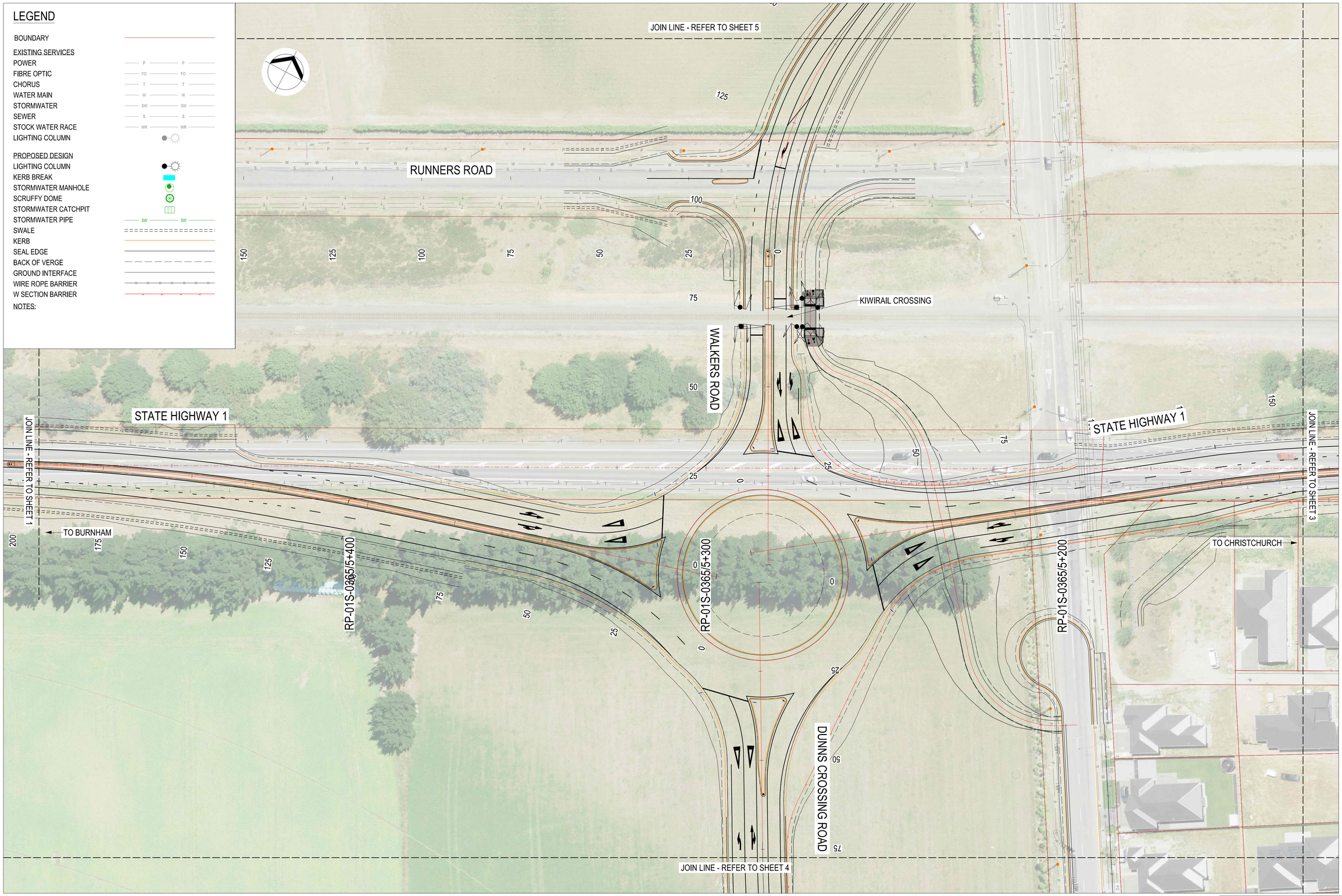

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	Drawn	R.ANDERSON	28.03.24	
Reduced Scale (A3) 1:1000	Dsg Verifier			
	Drc Check			Date
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Client: NZ TRANSPORT AGENCY WAKA KOTAHI

Project: SH1 ROLLESTON ACCESS IMPROVEMENTS

Title: GENERAL ARRANGEMENT SHEET 2 OF 5

Discipline: CIVIL ENGINEERING

Drawing No.: 3338703-10-CA-1202

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LEGEND

BOUNDARY

EXISTING SERVICES
POWER
FIBRE OPTIC
CHORUS
WATER MAIN
STORMWATER
SEWER
STOCK WATER RACE
LIGHTING COLUMN

PROPOSED DESIGN
LIGHTING COLUMN
KERB BREAK
STORMWATER MANHOLE
SCRUFFY DOME
STORMWATER CATCHPIT
STORMWATER PIPE
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KERB
SEAL EDGE
BACK OF VERGE
GROUND INTERFACE
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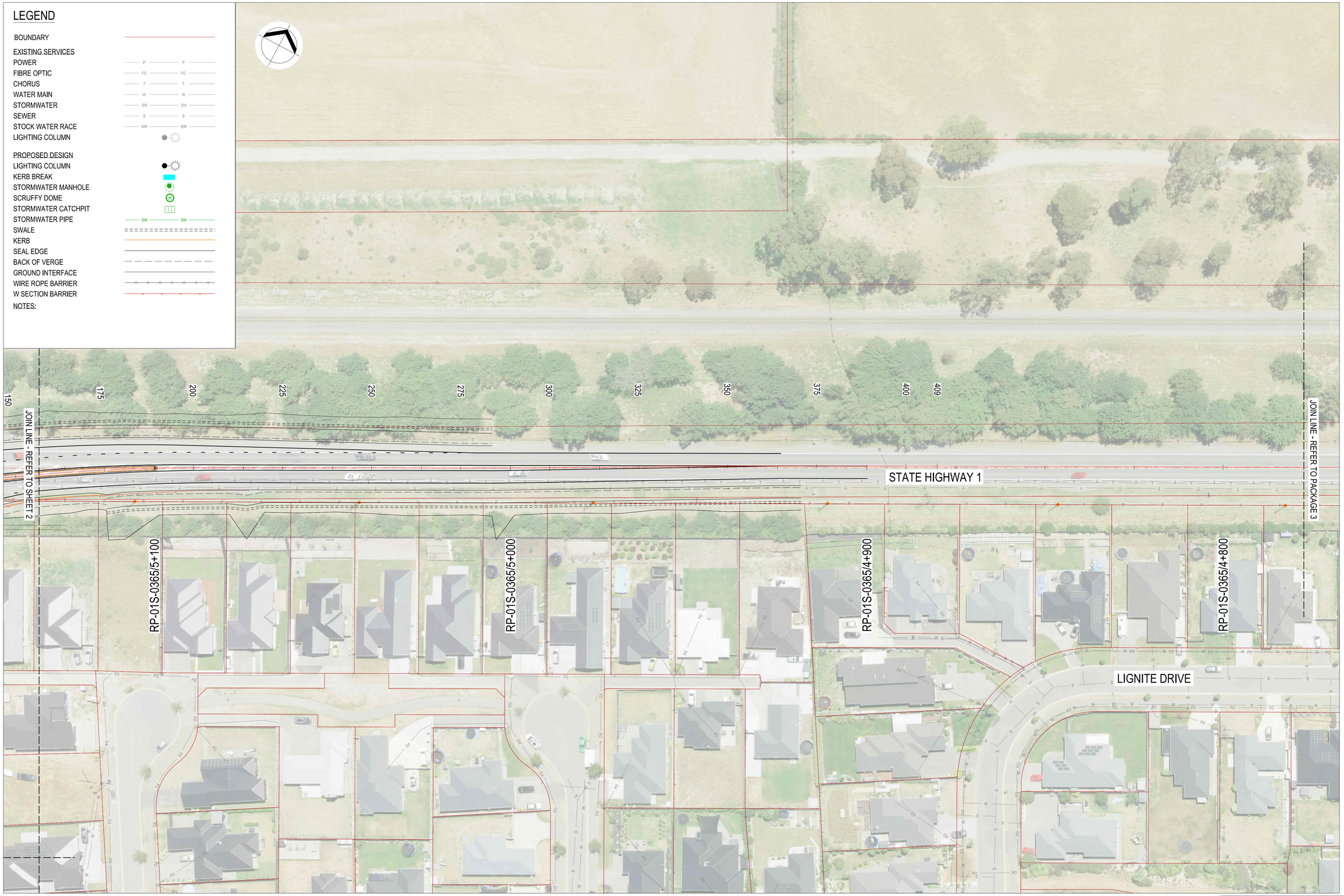

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Client: NZ TRANSPORT AGENCY WAKA KOTAHI

Project: SH1 ROLLESTON ACCESS IMPROVEMENTS

Title: GENERAL ARRANGEMENT SHEET 3 OF 5

Discipline: CIVIL ENGINEERING

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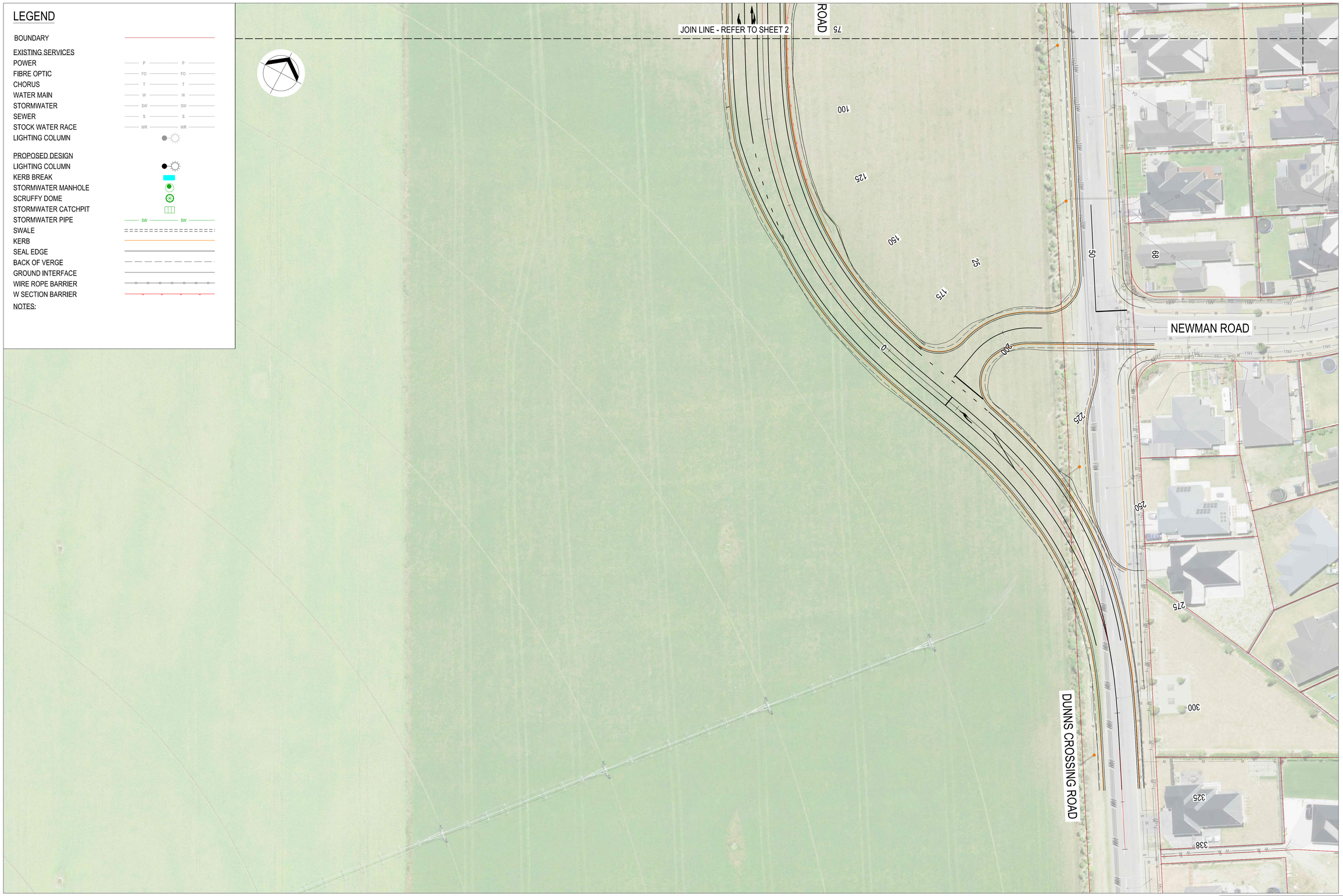
LEGEND

BOUNDARY

EXISTING SERVICES
- POWER
- FIBRE OPTIC
- CHORUS
- WATER MAIN
- STORMWATER
- SEWER
- STOCK WATER RACE
- LIGHTING COLUMN

PROPOSED DESIGN
- LIGHTING COLUMN
- KERB BREAK
- STORMWATER MANHOLE
- SCRUFFY DOME
- STORMWATER CATCHPIT
- STORMWATER PIPE
- SWALE
- KERB
- SEAL EDGE
- BACK OF VERGE
- GROUND INTERFACE
- WIRE ROPE BARRIER
- W SECTION BARRIER

NOTES:



CONCEPT DESIGN
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No.	Revision	By	Chk	Appd	Date
A	FOR INFORMATION	JC	MH	BC	28.05.24
B	50% GEOMETRIC DESIGN	RA	QD	BC	04.07.24

Original Scale (A1): 1:500
Reduced Scale (A3): 1:1000

Design	Q.DETTLING	28.03.24	Approved For Construction*
Drawn	R.ANDERSON	28.03.24	
Dsg Verifier			
Drc Check			Date

* Refer to Revision 1 for Original Signature

Beca

Client: NZ TRANSPORT AGENCY WAKA KOTAHI

Project: SH1 ROLLESTON ACCESS IMPROVEMENTS

Title: GENERAL ARRANGEMENT SHEET 4 OF 5

Discipline: CIVIL ENGINEERING

Drawing No.: 3338703-10-CA-1204

Rev.: B

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LEGEND

BOUNDARY

EXISTING SERVICES
POWER
FIBRE OPTIC
CHORUS
WATER MAIN
STORMWATER
SEWER
STOCK WATER RACE
LIGHTING COLUMN

PROPOSED DESIGN
LIGHTING COLUMN
KERB BREAK
STORMWATER MANHOLE
SCRUFFY DOME
STORMWATER CATCHPIT
STORMWATER PIPE
SWALE
KERB
SEAL EDGE
BACK OF VERGE
GROUND INTERFACE
WIRE ROPE BARRIER
W SECTION BARRIER

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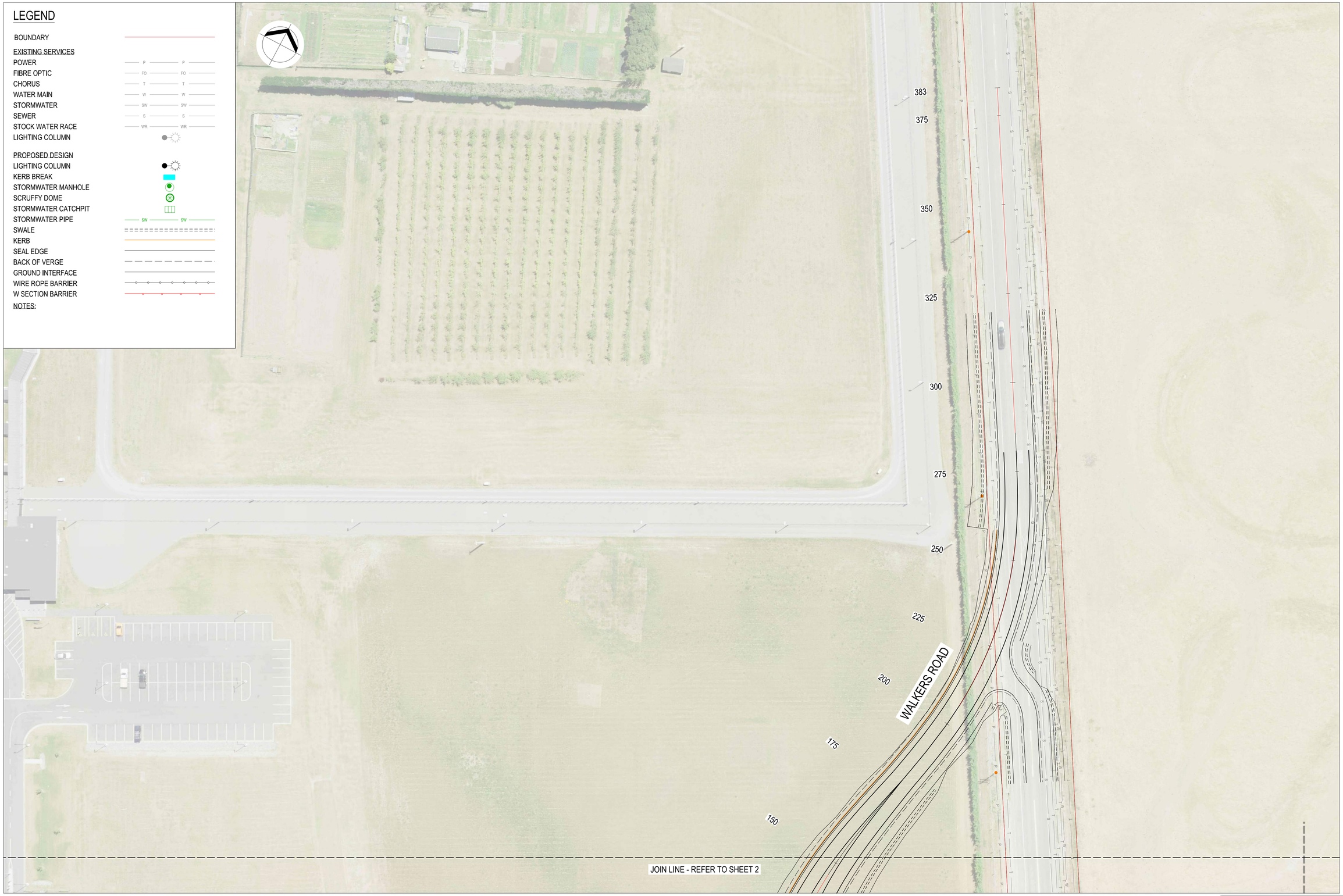

CONCEPT DESIGN
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No.	Revision	By	Chk	Appd	Date
A	FOR INFORMATION	JC	MH	BC	28.05.24
B	50% GEOMETRIC DESIGN	RA	QD	BC	04.07.24

Original Scale (A1)	1:500	Reduced Scale (A3)	1:1000

Design	Q.DETTLING	28.03.24	Approved For Construction*
Drawn	R.ANDERSON	28.03.24	
Dsg Verifier			
Drc Check			Date

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Client: NZ TRANSPORT AGENCY WAKA KOTAHI

Project: SH1 ROLLESTON ACCESS IMPROVEMENTS

Title: GENERAL ARRANGEMENT SHEET 5 OF 5

Discipline: CIVIL ENGINEERING

Drawing No.: 3338703-10-CA-1205

Rev.: B

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B

Appendix B – Stantec Preliminary Site Investigation Report (2023)

Rolleston Access Improvements Preliminary Site Investigation

PREPARED FOR Waka Kotahi NZ | May 2023

We design with community in mind

Stantec

Revision schedule

Rev No	Date	Description	Signature of Typed Name (documentation on file)			
			Prepared by	**Checked by**	**Reviewed by**	**Approved by**
1	5/11/2023	Rolleston Access Improvements PSI	E Wilson-Hill	S Fellers	K Halder	A Newman

This document was prepared by Stantec New Zealand ("Stantec") for the account of Waka Kotahi NZ Transport Agency (the "Client"). The conclusions in the Report titled Rolleston Access Improvements Preliminary Site Investigation are Stantec's professional opinion, as of the time of the Report, and concerning the scope described in the Report. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. The Report relates solely to the specific project for which Stantec was retained and the stated purpose for which the Report was prepared. The Report is not to be used or relied on for any variation or extension of the project, or for any other project or purpose, and any unauthorized use or reliance is at the recipient's own risk.

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Quality statement

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STATUS FINAL | Project No 310204503

Executive summary

Waka Kotahi NZ Transport Agency (the client) has engaged Stantec New Zealand (Stantec) to complete a Preliminary Site Investigation (PSI) in accordance with the Statement of Work for the improvement of safety and access along State Highway One (SH1) through Rolleston, Christchurch. The overall project alignment has been split into five sub-project alignments, that follow Main South Road (SH1) and its surrounding areas. The project works will comprise of the upgrade of approximately 6.7 km of road alignment.

The PSI comprised of a desktop study review and virtual site inspection of publicly available information pertaining to the project site to determine:

- If an activity or industry described in the October 2011 edition of the Ministry for the Environment (MfE) Hazardous Activities and Industries List (HAIL) is being undertaken, has been undertaken, or is more likely than not to have been undertaken within or adjacent to the proposed project site; and
- The risk to human health from potentially contaminated soil.

Land use activities described in the October (2011) edition of the HAIL list were identified through the publicly available information from Environment Canterbury's databases, the Listed Land Use Register[1] and Canterbury Maps[2].

The PSI has identified several confirmed and potential HAIL sites in the area within and surrounding the overall project alignment. It is considered possible that the associated contaminants from three HAIL sites could have migrated in concentrations to impact soils within this project alignment. Thus, it is considered that portions of the Rolleston Drive alignment are likely to be a HAIL sites and therefore subject to the Resource Management (National Environmental Standards for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (NESCS).

It is recommended that:

- Further investigation including soil testing be conducted on Kidman Street along the property boundaries of Lot 2 & 3 DP 501225, to assess if this part of the alignment has contaminant concentrations above background levels and thus confirmed as a HAIL site.
- Further investigation including soil testing be conducted on the northwest corner of Runners Road and Walkers Road, as shown in Figure 8-2, to assess if this part of the alignment has contaminant concentrations above background levels and thus confirmed as a HAIL site.
- The NESCS activity status of soil disturbance works as shown in Figure 8-1 and Figure 8-2, should be assessed based results of soil testing and soil disturbance and disposal volumes to determine if this is a permitted activity under Section 8*(3)* of the NESCS.
- The unexpected discovery protocol outlined in Section 10 should be followed during the construction phase for the remainder of the project site.

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Abbreviations

Abbreviation	Full Name
PSI	Preliminary Site Investigation
MfE	Ministry for the Environment
CLMG No.1	Ministry for the Environment's C*ontaminated Land Management Guidelines No. 1*
NESCS	Ministry for the Environment's *National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health*
HAIL	Hazardous Activities and Industries List
ECan	Environment Canterbury
LLUR	Listed Land Use Register
CSM	Conceptual Site Model
SQEP	Suitably Qualified and Experienced Practitioner
CLS	Contaminated Land Specialist
SH1	State Highway 1

1 Introduction

Waka Kotahi NZ Transport Agency has engaged Stantec New Zealand (Stantec) to complete a Preliminary Site Investigation (PSI) associated with the improvement of safety and access along State Highway One (SH1) through Rolleston, Christchurch. The overall project works comprise of the upgrade of approximately 6.7 km of access ways across five different sub-project alignments.

The proposed upgrade works will involve soil disturbance within the current road reserves and surrounding properties. The construction methodology used will be a conventional design build and therefore this PSI has been based on the concept design.

Based on the expected soil disturbance and the change of use of some land to accommodate the road improvements, a PSI is required to identify if there are any potentially contaminating historical and/or current land uses included on the Ministry for the Environment's (MfE) Hazardous Activities and Industries List (HAIL) associated with any of the land at or near the project alignment and the likelihood that there will be a risk to human health or the environment as a result of the propose works.

1.1 Investigation Objectives

The objectives of this PSI are as follows:

- Determine if an activity or industry described in the October 2011 edition of the MfE HAIL is being undertaken, has been undertaken, or is more likely than not to have been undertaken within or adjacent to the proposed project site,
- Identify potential historical and/or current sources of contamination within the proposed project site works areas and immediate surrounding areas,
- Consider the likelihood that any potentially contaminating activities identified within the project site works areas pose a risk to human health,
- Assess the need for any further investigations within any of the project site works areas and outline any further recommendations.

1.2 Scope of Report

This PSI focuses on the individual project works area and their immediate surrounds. It has been undertaken in accordance with the MfE Contaminated Land Management Guidelines (CLMG) No.1 Reporting on Contaminated Sites in New Zealand (2021) and the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (NESCS).

The scope of this PSI includes the following:

- Review of Environment Canterbury's (ECan) Listed Land Use Register (LLUR)[1],
- Review of historical aerial photography held on ECan's Canterbury Maps website[2]
- Review of relevant publicly available information from ECan's databases available on Canterbury Maps[2],
- Conduct a virtual site inspection of the project alignment via Google Maps Street View[3],
- Assessment of activities or industries listed in the October 2011 edition of the MfE HAIL which are being undertaken, have been undertaken or are more likely than not to have been undertaken on or adjacent to the project alignment,
- Determine the likelihood that potentially contaminating activities identified within the project site or adjacent to it pose a risk to human health,

[1] https://llur.ecan.govt.nz/home
[2] https://mapviewer.canterburymaps.govt.nz/
[3] https://www.google.co.nz/maps

2 Site Identification

2.1 Site Overview

The project alignment is located in the Rolleston suburb of Christchurch (Figure 2-1), approximately 25 km to the southwest of the Christchurch City Centre. For this report, the project alignment has been divided into five sub-project alignments, the Walkers Road, Main South Road, Rolleston Drive, Hoskyns Road, and Railway Upgrade alignments. Descriptions of these sub-projects are provided in Sections 2.2.1, 2.2.2, 2.2.3, 2.2.4, and 2.2.5.

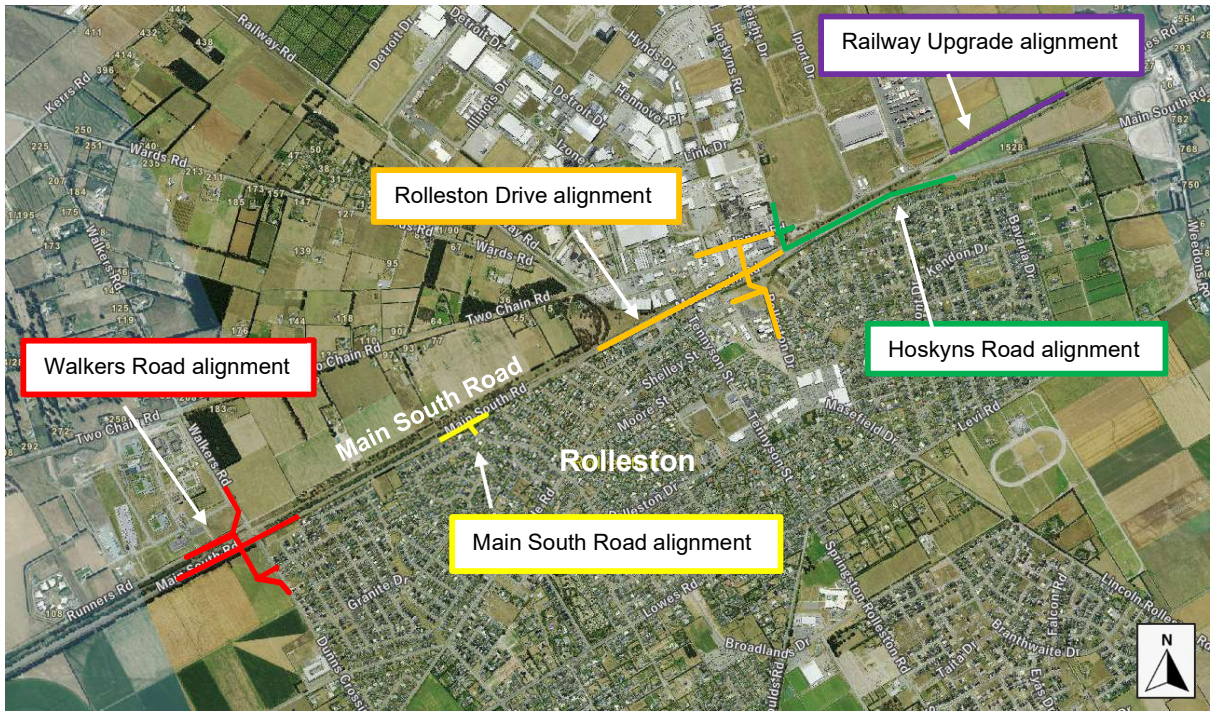


Figure 2-1 Project alignment.

2.2 Proposed Activities and Summary of Works

2.2.1 Walkers Road alignment

The proposed alignment will extend along portions of Walkers Road, Main South Road, and Dunns Crossing Road. The proposed works are located within the current road reserve and portions of surrounding properties with approximately 1.6 km of road improvements and improved access from SH1 to Walkers Road and Rolleston.

2.2.2 Main South Road alignment

The proposed alignment will extend along a portion of Main South Road and Rolleston Drive. The proposed works are likely located within the current road reserve with approximately 0.3 km of road improvements.

2.2.3 Rolleston Drive alignment

The proposed alignment will extend along a portion of Main South Road, Jones Road, Rolleston Drive, and Kidman Street. The proposed works are likely located within the current road reserve and portions of surrounding properties with approximately 2.2 km of road improvements and improved access across SH1.

2.2.4 Hoskyns Road alignment

The proposed alignment will extend along a portion of Hoskyns Roads, Jones Road, and Main South Road. The proposed works are likely located within the current road reserve with approximately 1.9 km of road improvements.

2.2.5 Railway Upgrade alignment

The proposed alignment will extend along the Railway that runs between Jones Road and Main South Road. The proposed works involve the construction of two sets of tracks in parallel to the existing railway track, with approximately 0.7 km of railway improvements.

3 Site Description

3.1 Environmental Setting

3.1.1 Geology

The regional geology of the area is described in the Institute of Geological and Nuclear Science (GNS) 1:250,000 scale geological map[4]. The Walkers Road and Main South Road project alignments' geology is defined as grey river alluvium beneath plains or low-level terraces (Q1a). While the Rolleston Drive, Hoskyns Road, and Railway Upgrade alignments' geology is defined as brownish-grey river alluvium (Q2a). Generally, alluvial deposits allow for water drainage and migration of certain contaminants through the groundwater.

3.1.2 Hydrology and Hydrogeology

The closest surface water body to the project alignment is Baileys Creek, located approximately 5.1 km south of the project alignment. There are three community drinking water protection zones[2] located within 100 m the overall project alignment, with one located within the Main South Road alignment. Piezometric data available on Canterbury Maps shows groundwater is moving in a general west to east direction towards the Pacific Ocean. Depth to groundwater is estimated to be between 4.8 and 17.5 m bgl, based on nearby bore hole data obtained from the New Zealand Geotechnical Database[5].

4 Historical Site Uses

4.1 Environmental Canterbury's Listed Land Use Register

A summary of the HAIL sites identified from ECan's Listed Land Use Register[1] (LLUR) within the 50 m of the project alignments is provided in Table 4-1 below and maps of nearby HAIL sites are provided in Figure 4-2, Figure 4-3, and Figure 4-4. Property statements and available relevant reports of the sites that have been received from the LLUR have also been summarised below.

Table 4-1 Summary of identified HAIL sites.

Address	Alignment	LLUR ID	HAIL category	Description of HAIL activity	Contaminated Land Status
Main South Road Railway Reserve	Adjacent to all five sub-project alignments	SIT120659 SIT121411	F6 - Railway yards including goods-handling yards, workshops, refuelling facilities or maintenance areas.	This property is located within and adjacent to all five project alignments. The railway line was constructed in 1941 and is currently still in use. The railway way in its entirety is not considered a HAIL but discrete locations where a credible source of contamination has been determined to be present, should be assessed as a HAIL activity. Part of this alignment includes the Rolleston train station located at the intersection of Main South Road and Rolleston Drive, adjacent to the Rolleston Drive alignment. The railway line and station have not been investigated.	Not investigated.
Runners Road – Rolleston Prison.	Walkers Road	SIT2541	A10 – Persistent pesticide bulk storage or use. A17 – storage tanks or drums for fuel, chemicals, or liquid waste.	This property is located adjacent to the Walkers Road alignment. Since 1958 this property has been used as Rolleston Prison, prior to this it was used as agricultural land and an army detention centre. Several investigations have taken place across various areas of this property indicating several HAIL activities. Not all investigations have been summarised or available for review but those that have, have indicated that site remediation actions have occurred, or any contaminants detected were	Partially investigated

[4] GNS Web Maps
[5] https://www.nzgd.org.nz/

Address	Alignment	LLUR ID	HAIL category	Description of HAIL activity	Contaminated Land Status
			C1 – Explosive or ordinance production, bulk storage, or disposal. E1 – Asbestos products, manufacture, or disposal. G3 – Landfill sites. G5 – Waste disposal to land. I – Any other land that has been subject to intentional or accidental release of a hazardous substance.	below background concentrations and residential land-use guidelines. Only one investigation has occurred within 50m of the project alignment. WSP conducted a soil validation report in 2019 for the sites redevelopment. They identified sources of asbestos across the property site, including ACM pipes in the Prison's visitors carpark, 60 m north of to the project alignment. After remediation works the site was considered successfully remediated and suitable for on-going use as Rolleston Prison. The HAIL category for this site notes the potential for a mortar (riffle shooting) site to have been present on this site, however there is no information on the type of activities that may have occurred. Anecdotal evidence suggests the mortar site was located on the corner of Runners Road and Walkers Road was not identified in historical aerials. However, one has been located at Burnham Military Camp as Aylesbury Shooting range since prior to 1940 and is not located within the project alignment. In accordance with the MfE guidance gun clubs or rifle ranges, including clay target clubs are excluded from the HAIL activity list. Therefore, it is likely there are none of the HAIL activities identified on the council records for this site that have occurred within 50 m of the project alignment.	
139 Two Chain Road	Walkers Road, Main South Road, and Rolleston Drive alignment	SIT120543	A8 – Livestock dip or spray race. A10 – Persistent pesticide bulk storage or use. A17 – Storage of tanks or drums for fuel, chemicals, or liquid waste. G3 – Landfill site.	This property is located adjacent to the Walkers Road, Main South Road, and Rolleston Drive alignment. This sites primary use is as agricultural land, with some associated residential properties. Several investigations have taken place across various areas of this property indicating several HAIL activities. However, none of these HAIL activities have occurred within 50 m of the project alignment.	Partially investigated.
799 Jones Road	Rolleston Drive	SIT123882	A17 – Storage tanks or drums for fuel, chemicals, or liquid waste.	This site is located adjacent to the Rolleston Drive alignment, on the southwest corner of Hoskyns Road and Jones Road. It is currently used as Drummond and Etheridge Ltd, an agricultural service. Since 2013, this site has had storage tanks or drums for fuel, chemicals, or liquid waste. There have been no investigations into activities at this site.	Not investigated.
790	Rolleston Drive	SIT16354	A17 – Storage tanks or drums for fuel, chemicals, or liquid waste.	This site is located adjacent to the Rolleston Drive alignment, on the northwest corner of Hoskyns Road and Jones Road. 73 Hire, a building equipment hire service is located at this site. Based on signage at this property, it is also used as an automotive and battery centre. Prior to 2010 it	Not investigated.

Address	Alignment	LLUR ID	HAIL category	Description of HAIL activity	Contaminated Land Status
			F4 – Motor vehicle workshops.	appears to have been used as agricultural land until 1970, then as NRM Feeds from 1970 – 2010. The LLUR file states from 1995-1997, this property has had storage tanks or drums of fuel, chemicals, or liquid waste. Information from the landowner states that a 15,000l above ground diesel tank has been installed in 2013. The location of the fuel tank shown on the LLUR is approximately 75m north of the project alignment.	
804 Jones Road	Rolleston Drive	SIT18823	E5 – Coal or Coke yards.	This site is located adjacent to the Rolleston Drive alignment, on the northwest corner of Hoskyns Road and Jones Road. Tailored Energy Solutions Limited, a coal supplier, is located at this site and has been used as a coal or coke yard since around 2010 to present. Coal appears to have been stockpiled on site since around the 1970s. Kirk Roberts conducted a DSI in 2022 at this site due to development occurring in the south-eastern property section. The report identified potential contamination from hydrocarbons, boron, and arsenic as well as coal tar. Soil samples were analysed and were found to be below background concentrations and below commercial / industrial NESCS standards. Thus, concluded the risk to site users/construction works is low.	Investigated
801 Jones Road	Rolleston Drive	SIT263238	F6 – Railway yards. I – Any other land that has been subject to intentional or accidental release of a hazardous substance.	This site is located adjacent to the Rolleston Drive alignment. Historically this site was used as a railway yard in which coal was unloaded which caused a layer of coal dust on this property. A DSI conducted by Engineering Design Consultants in 2018 indicated that there was a large layer of black dense coal dust contaminated gravel at this property. They also indicated the potential for asbestos contamination from train brake pad use. Soil samples were collected, and results were found to be below industrial/commercial SCS. Although coal contaminated soils within the southern lot were considered combustible and have potential to create toxic, asphyxiant or noxious gasses. The risk to human health from gas/vapour inhalation was assessed as moderate. A site remediation plan was completed in 2021. The site validation report concluded that the risk to human health at this site is now negligible.	Investigated and site remediated.
812 Jones Road	Rolleston Drive	SIT24351	G4 – Scrap yards.	This property is located adjacent to the Rolleston Drive. It is used as a Global Tractors sales yard. The LLUR file for this property states it was previously used as a scrap yard including automotive dismantling, wrecking, or scrap metal yards. Based on historical aerials it was used as a scrap yard until around 2015, and the entirety of the property was covered in cars and scrap metal.	Not investigated.
814 Jones Road	Rolleston Drive	SIT176679	G4 – Scrap yards.	This property is located adjacent to the Rolleston Drive. It appears to have an abandoned house in the front yard, which historical aerials indicate was built around 2000, and multiple storage containers at the back, and an office building at the front. This property has been used as a scrap yard since prior to 2000 until 2015 with the majority of the property covered in cars and scrap metal.	Investigated.

Address	Alignment	LLUR ID	HAIL category	Description of HAIL activity	Contaminated Land Status
				Separate Phase Ltd conducted a PSI at this site in 2017 due to the sites intended redevelopment. It was assessed that due to the historical storage of vehicles, minor hotspots of contamination may be present in topsoil. However, the property's topsoil had since been removed and the redevelopment intended to import aggregates and asphalt the site. Thus, it was concluded that this site was highly unlikely to pose a risk to human health and should be reclassified on ECan's LLUR as 'investigated – verified non-HAIL.'	
816 Jones Road	Rolleston Drive	SIT176681	G4 – Scrap yards.	This property is located adjacent to the Rolleston Drive. It is used as Canterbury Cranes, a construction company. It has been identified as a HAIL site since post-2000s and historical aerials state it was used as a scrap yard until around 2015, and the majority of the property was covered in cars and scrap metal.	Not investigated.
826 Jones Road	40 m west of Rolleston Drive	SIT3394	F4 – Motor vehicle workshops. A17 – Storage tanks or drums for fuel, chemicals, or liquid waste.	This property is located 40 m west of the Rolleston Drive alignment. It has been used as Holland Collision Centre since around 2007 and conducts spray paintings and panel beating activities. This site was visited by Pollution Protection and noted it stores 1,000 L of waste oil and approximately 820 L of various engine / transmission oils.	Not investigated.
Kidman Street: Lot 2 & 3 DP 501225	Rolleston Drive		A1 – Agrichemicals including commercial premises used by spray contractors for filling, storing, or washing out tanks for agrichemical application. A8 – Livestock dip or spray race operations. A10 – bulk pesticide storage or use. A17 – Storage tanks or drums for fuel, chemicals, or liquid waste. A18 – Wood treatment or preservation including bulk storage.	This property is located within the Rolleston Drive alignment. Currently it appears to be an empty field with a small car park on the western side. Numerous HAIL activities have occurred on parts of this site. This includes Canterbury Tractor Company, livestock dip and spray races associated with saleyards present, a furnace, and storage of treated timber. From 1960 – 1968 this site has had storage tanks or drums for fuel, chemicals, or liquid waste on site. Malloch Environmental Ltd conducted a PSI in 2014 across Lot 2, 3 and 5 of 501225 for the Selwyn District Council. The PSI concluded that there was a low to moderate risk to human health if this site was used for residential or commercial use. It was recommended that a DSI be carried out to further investigate, as sections of this property are likely to have had activities that would have resulted in some level of soil contamination. However, there is no record of a DSI taking place. At risk areas are outlined in Figure 4-1. The investigation indicated that the most likely contaminants present are heavy metals, particularly arsenic, PAH, and TPH.	Partially investigated.

Address	Alignment	LLUR ID	HAIL category	Description of HAIL activity	Contaminated Land Status
			F3 – Engine reconditioning workshops. F4 – Motor vehicle workshops. G4 – Scrap yards including automotive dismantling, wrecking, or scrap metal yards. H - Any land that has been subject to the migration of hazardous substances from adjacent land in sufficient quantity that it could be a risk to human health or the environment.	 **Figure 4-1 At risk areas (shaded in blue) within Lot 2 & 3 DP 501225[6].**	
37 & 51 Overbury Crescent	Rolleston Drive	SIT248358	A10 – Persistent pesticide bulk storage or use.	This property is located adjacent to the Rolleston Drive alignment and is a large residential subdivision. It was previously used for market gardens from 1990 to 2010. Geoscience Consulting Ltd conducted a PSI in 2012. Soil samples were collected but none were found above guideline criteria and deemed the site suitable for residential development.	Investigated
15 Kidman Street	Rolleston Drive	SIT16076	A17 – Storage tanks or drums for fuel, chemicals, or liquid waste. A18 - Bulk storage of treated timber outside. I – Any other land that has been subject to intentional or accidental release of a hazardous substance.	This property is located adjacent to the Rolleston Drive alignment. This site is currently used a McDonalds; however, the previous property alignment extends further than the McDonalds site boundary and is now covered by residential property, and the St John Ambulance building. Previously this site was used as Canterbury Tractor Company from 1962 to 1968, then as Dominion Building Supplies until around 2010. LLUR property file revealed HAIL A17 occurred at this site from 1960 to 1968. The timber storage was present on site from around 1960 – 1980. Multiple investigations have taken place at this property. A PSI was conducted by Sephira Environmental in 2016 that identified the need for a DSI. The DSI was undertaken and collected test pit soil samples at four locations along the eastern McDonalds property boundary and found no	Managed – Industrial / Commercial.

[6] https://llur.ecan.govt.nz/home

Address	Alignment	LLUR ID	HAIL category	Description of HAIL activity	Contaminated Land Status
				exceedances of commercial/industrial SCSs. It was recommendation that no further investigations were required, however, the presence of trace heavy metals and PAHs were encountered. All other reports at this site also indicated that soil sample results were below commercial / industrial SCSs.	
1705 Main South Road	Rolleston Drive	SIT9022	A17 – Storage tanks or drums for fuel, chemicals, or liquid waste. F7 – Service Stations	This property is located adjacent to the Rolleston Drive alignment and since 2003 it has been used as a BP service station. AECOM conducted a soil validation report at this site in 2013 during excavation works to install new underground petroleum storage tanks. The site has had a history of storage tanks dating back to 1960. Soil samples were collected from stormwater infiltration basins and in the new tank pit. Samples were tested for PAHs, BTEX, TPH, copper, lead, and zinc, the results showed the site is acceptable for commercial land use.	Investigated.
4 Tennyson Street	Rolleston Drive	SIT558	F4 – Motor vehicle workshops F7 – Service Stations	This property is located adjacent to the Rolleston Drive alignment. It appears to be an undeveloped site but previous was used as an automotive garage that sold fuel and serviced cars from 1930 until 2008. It was noted that fuel tanks were removed from site in 2001, some soil contaminated with fuel was removed during this. Malloch Environmental Ltd conducted a PSI, DSI, and Remediation Action Plan in 2015. Initial soil sampling indicated lead contamination in the surrounds of the former building. Zinc and lead levels across the site were above background levels but below residential levels. A site remediation plan proposed to excavate and remove contaminated soil and remaining building foundations, however whether this plan has been undertaken is unclear.	Investigated.
2 Brookside Road	Rolleston Drive	SIT214811	I – Any other land that has been subject to intentional or accidental release of a hazardous substance.	This property is located adjacent to the Rolleston Drive alignment. The property has a large building that operates as Rolly Inn. Historically this site had another tavern and adjoining garage, however these were demolished and the Rolly Inn bar/restaurant and two retail shops were constructed. Engineering Design Consultants Ltd conducted a DSI in 2018 at this site prior to the new Rolly Inn bar being constructed. It was stated that there was potential lead, asbestos, and PAH contamination from previous building materials and the builders yard. 17 soil samples were collected from the 20 test pit locations made across the site. Samples were tested for asbestos, petroleum hydrocarbons, BTEX, and pesticides. All samples did not exceed commercial/industrial SCSs, except for one that slightly exceeded limits for lead. It was recommended that the isolated area with elevated lead concentrations be excavated and disposed of offsite at the beginning of site development. There is no indicated this remediation occurred, but the site has since been redeveloped and capped over.	Investigated – not considered a HAIL site.
4 Brookside Road	Rolleston Drive	SIT214811	I – Any other land that has been subject to intentional or accidental release of a hazardous substance.	This property is located adjacent to the Rolleston Drive alignment and has been used as a Z petrol station since 2021. AECOM completed a DSI in 2018 prior to its development to a service station. The investigation indicated that the site is considered suitable for ongoing commercial / industrial use and is highly	Investigated – not considered a HAIL site.

Address	Alignment	LLUR ID	HAIL category	Description of HAIL activity	Contaminated Land Status
				unlikely to pose a risk to human health if the land is redevelopment into a service station.	
Parklane Subdivision	Hoskyns Road		A8 – Livestock dip or spray race operations. A10 – Persistent pesticide bulk storage or use.	This site is located adjacent to the Hoskyns Road alignment. The site is currently a residential subdivision since approximately 2010, prior to this from 1942 – 2010 this site was used as agricultural land. Geoscience Consulting Ltd conducted a PSI in 2012. The report stated that a hazelnut orchard was planted in 1995, however it was noted that no sprays or chemicals were used on the plants. LLUR files on this property state the potential for an apple orchard on this site, indicating persistent pesticide bulk storage or use could have occurred. However, it was determined that the site was suitable for residential land use.	Investigated.
57 Weedons Ross Road	50 m north of Railway Upgrades alignment.		A8 – Livestock dip or spray race operations. G3 – Landfill sites.	This property is located 50 m north of the Railway Upgrades alignment. It is used primarily for agricultural. Several investigations have taken place across various areas of this property indicating several HAIL activities. However, none of these HAIL activities have occurred within 50 m of the project alignment.	Partially investigated.

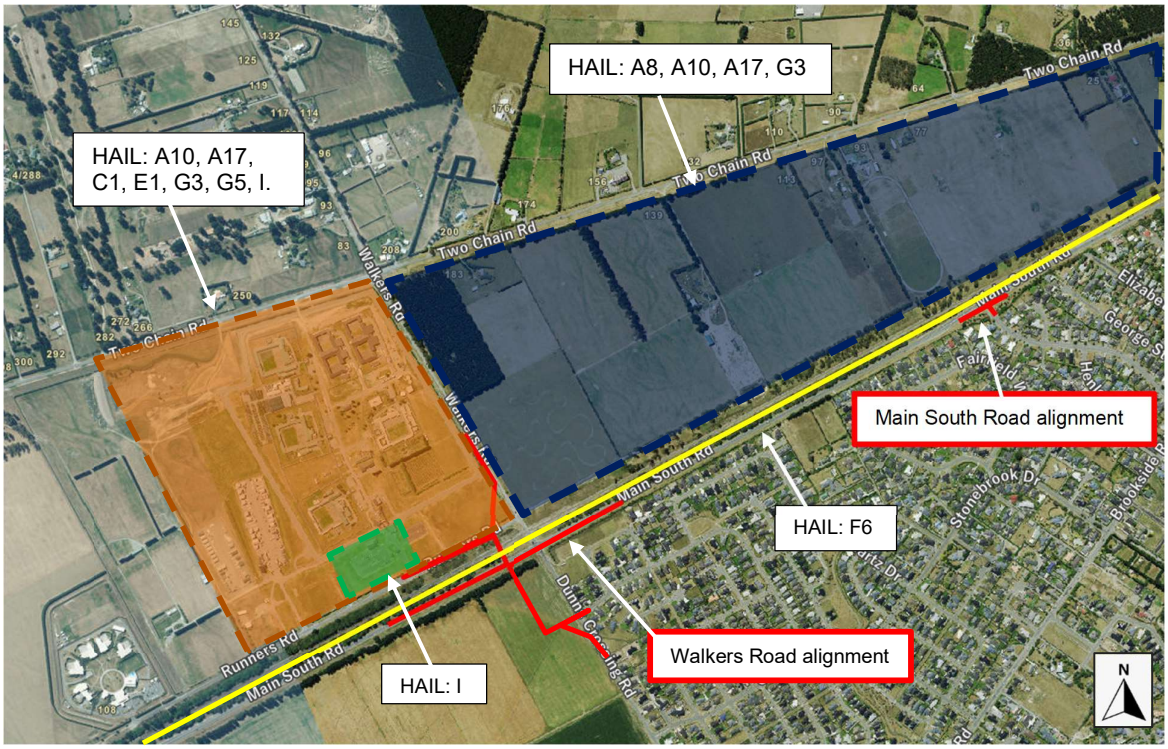


Figure 4-2 Identified HAIL sites with the Walkers Road and Main South Road alignments (red line).

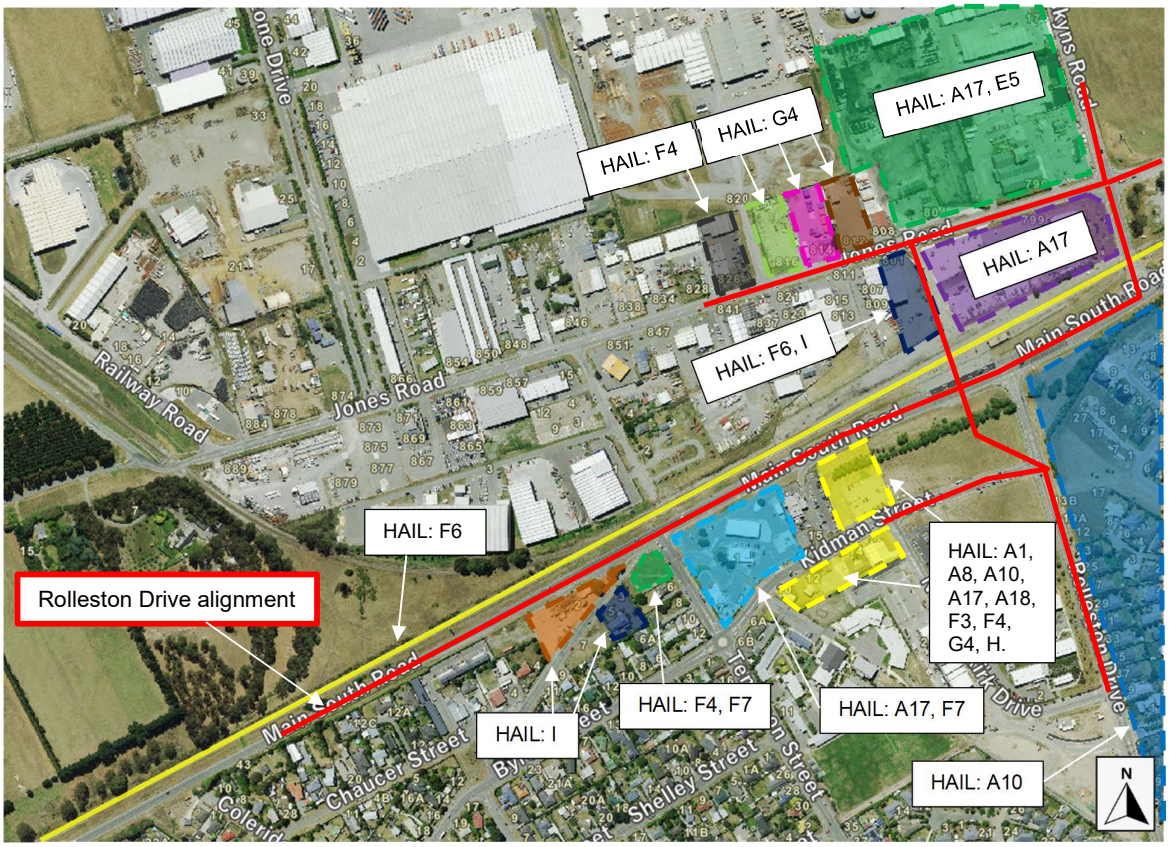


Figure 4-3 Identified HAIL sites with the Rolleston Drive alignment (red line).

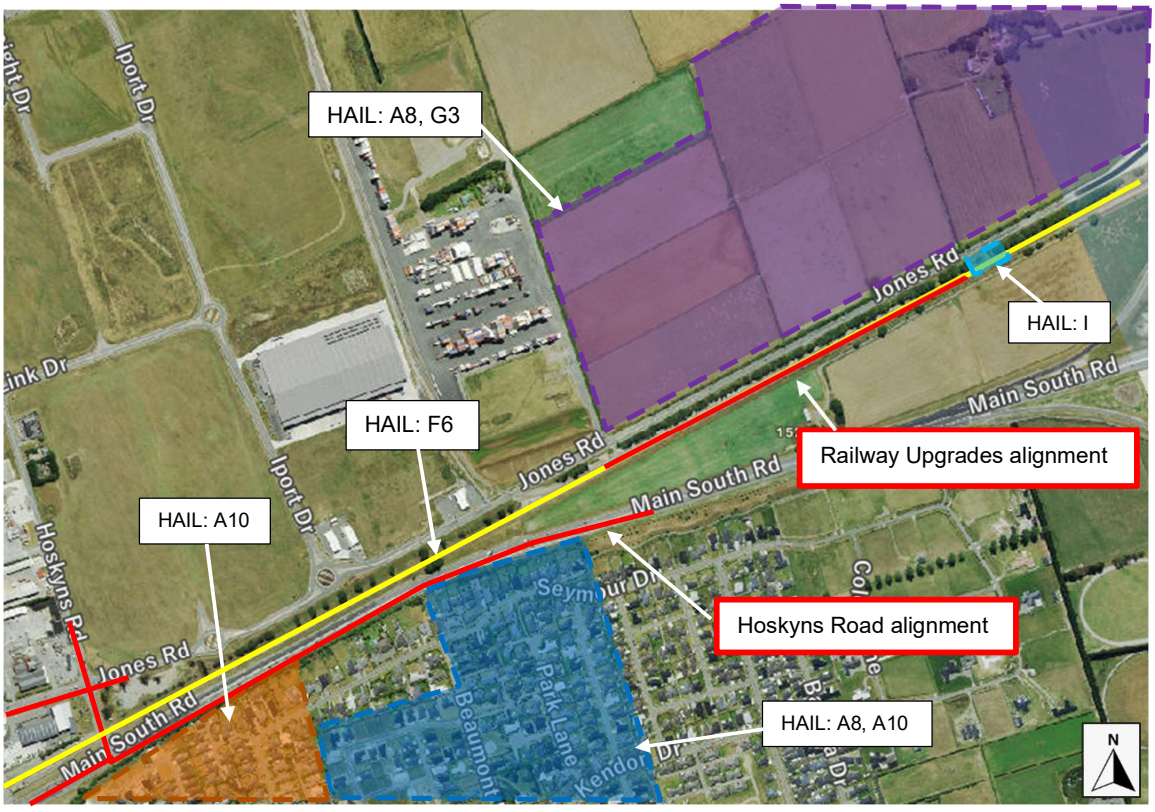


Figure 4-4 Identified HAIL sites within the Hoskyns Road and Railway Upgrades alignments (red line).

4.2 Historical Aerial Photographs

A desktop assessment of historical and current land uses in and within 50 m of the project site of the proposed project alignments has been undertaken to identify any land uses and land use changes that may indicate the presence of HAIL sites affecting the overall project alignment and to further add to the information already provided as part of Council records. This information is summarised in Table 4-2 below. The historical aerial photographs are provided in Appendix B of this report.

Table 4-2 Summary of historical aerial photographs.

Year	Walkers Road	Main South Road	Rolleston Drive & Hoskyns Road	Railway Upgrades
1940	The project alignment and the surrounding land is predominately used as agricultural and forestry land. Walkers Road, Runners Road, Main South Road, Dunns Crossing Road, and the railway track have all been constructed. A large structure, potentially a water tank, has been built adjacent to the Walkers Road project alignment, on the corner of Walkers Road and Runners Road. There is also a square platform near the tank and a small shed. The land southwest of the Main South Road and Dunns Crossing Road intersection, both within and surrounding the alignment, is being used for forestry. There is a farmland property located within the forestry land, and within the Walkers Road alignment along Main South Road.	The project alignment and the surrounding land is predominately used as agricultural land. Main South Road, Brookside Road, and the railway line (HAIL F6) have been constructed.	Jones Road, Main South Road, Tennyson Street, Hoskyns Road, Brookside Road, and the Rolleston railway line and railway station (HAIL F6) have all been constructed. The land between Jones Road and Main South Road has been used for forestry, while the rest of the land within and surrounding the alignment is predominantly agricultural land. Several industrial and residential buildings have been constructed at the intersection of Main South Road, Jones Road, and Tennyson Street. In particular, at the present 5 Brookside Road is an industrial site with three buildings. There are two rural residential/farmland properties located on the southern side of Main South Road, adjacent to the Hoskyns alignment.	Jones Road, Main South Road, and the railway line has been constructed. There are two buildings that are located east of the railway line, along Jones Road, one is adjacent to the alignment that appears to be a residential property and shed, and the other approximately 100 m east. There a residential/farmland property located 70 m south of the alignment at 1528 Main South Road.
1960	No significant change from previous aerial.	No significant change from previous aerial.	Further industrial and commercial development has occurred at the Main South Road and Jones Road intersection and along the southern Main South Road roadside, adjacent to the Rolleston Drive alignment. There appears to be a small outdoor timber storage site at 5 Brookside Road, 70 m south of the Rolleston Drive alignment.	No significant change from previous aerial, aside from the railway building east of the alignment being removed.

Year	Walkers Road	Main South Road	Rolleston Drive & Hoskyns Road	Railway Upgrades
			A large property located adjacent to the Rolleston Drive alignment along Main South Road (now 15 Kidman Street) has several industrial buildings and multiple parked cars. It also has an outdoor timber storage yard (HAIL A18) located approximately 80 m south of the alignment.	
1970	A road built off Runners Road has been extended and is now located 100 m northwest of the alignment section that runs along Runners Road. There are several residential properties along both sides of the road. Appears to be a cluster of sheep around hay bales within the project alignment on the west side of Walker Road, next to the water tank. The shed next to the water tank has been removed.	No significant change from previous aerial.	The southern side of Main South Road and both sides of Tennyson road have seen residential development. Multiple industrial buildings previously along these roads have been removed (HAIL I), including the industrial and timber storage site at 7 Brookside Road. The industrial site at 15 Kidman Street now appears to have timber stored 40 m south of the alignment. A large industrial site has been constructed adjacent to the Rolleston Drive alignment at 790 Jones Road. The property has a large industrial building and two large tanks (HAIL A17) connected at the rear, as well as several smaller buildings across the site. Another industrial building at 804 Jones Road has also been constructed.	No significant change from previous aerial, aside from the Jones Road railway house adjacent the project alignment being removed (HAIL I).
1980	The residential block on Runners road has been further developed and is now located adjacent to the project alignment along Runners Road. The property on the forestry site has been removed. The forestry trees have grown significantly.	No significant change from previous aerial.	No significant change from previous aerial, aside from the residential area that has been further developed and timber storage removed at 15 Kidman Street.	No significant change from previous aerial.
1990	Market gardens (HAIL A10) have been planted to the 70 m west of the northern most section of the project alignment along Walkers Road. These have been planted within Rolleston Prison that has been noted to	No significant change from previous aerial.	There has been significant farmland development with multiple market gardens (HAIL A10) grown adjacent to the Rolleston Drive alignment, specifically south of Main South Road adjacent to the future Rolleston Drive. A farmland property also sits on this land.	No significant change from previous aerial.

Year	Walkers Road	Main South Road	Rolleston Drive & Hoskyns Road	Railway Upgrades
	have been constructed greater than 50 m north of the alignment. The water tank and square platform located on the corner of Runners Road and Walkers Road has been removed and the water tank location dug out.		The northern roadside of Jones Road has seen a few more residential or industrial buildings constructed adjacent to the Rolleston Drive alignment.	
2000	The market gardens have been expanded to the east and are now located 40 m from the project alignment. The residential area off Runners Road has been removed and cleared (HAIL I). The dug-out area where the water tank was located has been infilled. It is unknown what materials have been used and therefore there is a potential for (HAIL G5) waste disposal to exist. The grass over the top of this area has not grown back. The forestry land has been significantly cleared.	No significant change from previous aerial.	No significant change from previous aerial aside from Rolleston Drive being constructed.	No significant change from previous aerial, aside from a large tank, likely a water tank, being constructed 50 m south of the alignment at property 1528 Main South Road.
2010	No significant change from previous aerial aside from the forestry land has been completely cleared. Evidence of the historic water tank can no longer be seen, and the land has been flattened and is used as a grassed paddock	There has been extensive residential development adjacent to the project alignment on the southern side of Main South Road. Rolleston Drive has been constructed.	The majority of the market gardens on the corner of Main South Road and east side of Rolleston Drive have been removed and replaced by residential properties, adjacent to both the Rolleston Drive and Hoskyns Road alignment. The Selwyn District Council and Youth Council has been constructed on the western Rolleston Drive roadside, adjacent to the south-western section of the Rolleston Drive alignment. Significant industrial development has occurred along both sides of Jones Road, adjacent to the Rolleston Drive alignment. This includes the multiple	No significant change from previous aerial.

Year	Walkers Road	Main South Road	Rolleston Drive & Hoskyns Road	Railway Upgrades
			collision repair shops (HAIL F4), and Tailored Energy Solutions – a coal supplier (HAIL E5), and Landscape supplier store. Also adjacent to the Rolleston Drive alignment is a BP truck stop (HAIL F7) at 1705 Main South Road and a Z service station (HAIL F7) at 4 Brookside Road. There are two cell phone towers and at the base are green electrical boxes (HAIL E2) on the corner of Hoskyns Road and Jones Road (Lot 1 DP 475847), adjacent to the Hoskyns Road alignment.	
Latest	No significant change from previous aerial aside from a large carpark that has been built approximately 50 m west of the alignment along Runners Road.	No significant change from previous aerial.	No significant change from previous aerial, aside from further residential development on the southern side of Main South Road, adjacent to the Hoskyns Road alignment. The Selwyn District Council has constructed a carpark.	No significant change from previous aerial.

5 Virtual Site Inspection

A virtual site inspection of the project alignment was completed using 2019 and 2022 Google Street Viewer[7] data and 2023 Google Maps[8] data. One site was identified in the inspection that was not outlined on the LLUR. Virtual site inspection notes can be found in Table 5-1 and the relevant screenshot found in Appendix C .

Table 5-1 Potential sites of concern from virtual site inspection.

Location	Virtual site visit notes	Potential HAIL Category
821 Jones Road	This site is located adjacent to the Rolleston Drive alignment. It has been identified as Diesel Fix, a diesel engine repair service (HAIL F4), since 2017. The site has a large building and carpark with several cars parked outside.	F4 – Motor vehicle workshops.

[7] https://www.google.com/streetview/
[8] https://www.google.com/maps/

6 Summary of Identified HAIL Sites

All identified HAIL activities for each HAIL site have been summarised in Table 6-1 below based on the information gathered from the LLUR, historical imagery, and the virtual site inspection.

Table 6-1 Summary of HAIL sites identified in PSI.

Address	HAIL Activity
Runners Road residential area	I – Any other land that has been subject to the intentional or accidental release of a hazardous substance.
Corner of Runners Road and Walkers Road.	Unverified G5 – Waste disposal to land (excluding where biosolids have been used as soil conditioners). Unverified C1 – Explosive or ordinance production, bulk storage, or disposal.
4 Brookside Road	F7 – Service Stations.
5 Brookside Road	A18 - Bulk storage of treated timber outside. I – Any other land that has been subject to the intentional or accidental release of a hazardous substance.
821 Jones Road	F4 – Motor vehicle workshops.
Main South Road Railway Reserve	F6 - Railway yards including goods-handling yards, workshops, refuelling facilities or maintenance areas.
15 Kidman Street	
799 Jones Road	A17 – Storage tanks or drums for fuel, chemicals, or liquid waste.
790 Jones Road	A17 – Storage tanks or drums for fuel, chemicals, or liquid waste.
804 Jones Road	E5 – Coal or Coke yards.
801 Jones Road	F6 – Railway yards.
812 Jones Road	G4 – Scrap yards.
814 Jones Road	G4 – Scrap yards.
816 Jones Road	G4 – Scrap yards.
826 Jones Road	F4 – Motor vehicle workshops.
Lot 2 & 3 DP 501225	A17 – Storage tanks or drums for fuel, chemicals, or liquid waste.
37 & 51 Overbury Crescent	A10 – Persistent pesticide bulk storage or use.
1705 Main South Road	A17 – Storage tanks or drums for fuel, chemicals, or liquid waste. F7 – Service Stations.
4 Tennyson Street	F4 – Motor vehicle workshops. F7 – Service Stations.
2 Brookside Road	I – Any other land that has been subject to the intentional or accidental release of a hazardous substance.
Parklane Subdivision	A8 – Livestock dip or spray race operations. A10 – Persistent pesticide bulk storage or use.
Jones Road railway house	I – Any other land that has been subject to the intentional or accidental release of a hazardous substance.

7 Risk Assessment

Several properties have been identified as HAIL sites in proximity to the overall project alignment. However, not all these sites are likely to pose a risk to human health or the environment during the project works.

A preliminary Conceptual Site Model (CSM) is a tool used in the determination of the potential risk to human health and/or the environment as a result of soil and/or groundwater conditions. An assessment is undertaken to identify the likely presence or absence of the following elements:

- ***Source*** - a substance that is capable of causing an unacceptable risk to human and/or environmental health.
- ***Pathway*** - a mode or route by which the substance/source can migrate to a receptor.
- ***Receptor*** - someone and/or something that could be adversely affected by the substance/source.

Where one or more of the CSM elements are absent then a complete pathway for contamination cannot exist and therefore the potential risk to human and/or environmental health is considered low. Where a complete source, pathway,

receptor linkage can be identified then the likelihood of risk to the project works is considered medium or high (depending on the characteristics of the potential contaminants present) and will require further investigation and possible remediation and/or management.

A summary of the likelihood of risk to the project works associated with each site is identified in Table 7-1. The rankings, low, medium, and high, indicate the assessed level of risk to the project works or likelihood of disturbance from the contaminants potentially associated with the identified HAIL sites.

Table 7-1 Summary of risk from HAIL sites identified during desktop assessment.

Address	Proximity to project alignment	Risk	Comment	Further Investigations
Runners Road residential area	Adjacent	Low	This sites HAIL activities relate to its identification as a HAIL I site in relation to potential contaminants from the demolition of former buildings on the site. Due to this sites redevelopment into a carpark for the Rolleston Prison in 2018, and the location adjacent to the project alignment rather than within it. It is considered unlikely that any potential contaminants would have migrated from this property to the project alignment in concentrations to cause harm to human health.	No further investigations recommended.
Corner of Runners Road and Walkers Road.	Adjacent	Low - Medium	This sites HAIL activities relate to the potential of unauthorised waste disposal to have occurred to backfill a small area on site and the unverified information that the land was once a mortar launching site. The project works cross part of this property, but the current project alignment is outside the footprint where unauthorised materials may have been disposed of. The disturbed land is located north of the alignment and the flow of groundwater west to east, it is unlikely any potential contamination at this location would migrate to the project works. The uncertainty around the historical use of this site as a mortar launching site would require further testing to assess if any residual contamination could be present.	Further investigations recommended.
4 Brookside Road	Adjacent	Low	This sites HAIL activities relate to its use as a Z service station since the end of 2021. Previous investigation at this site indicates that there is no evidence of any HAIL activities occurring at this site and is considered suitable for ongoing commercial / industrial use and is highly unlikely to pose a risk to human health if the land is redevelopment into a service station. This along with the site being modern and expected to have modern environmental protections to prevent leaks from fuel storage	No further investigations recommended.

Address	Proximity to project alignment	Risk	Comment	Further Investigations
			tanks, and the sites location south of the alignment with the flow of groundwater west to east means it is highly unlikely that any potential contaminants would have migrated to the project alignment.	
5 Brookside Road	40 m south	Low	This sites HAIL activities related to its presence of a timber storage site and to its identification as a HAIL I site in relation to potential contaminants from the demolition of former buildings on the site. There has been no investigation into contamination at this site however due to the historical timber storage sites distance of 70 m south of the alignment, the flow of groundwater west to east, and the redevelopment of this site in around 2004 into a veterinary clinic. This site is unlikely to pose a risk to human health during site works.	No further investigations recommended.
15 Kidman Street	Adjacent	Low	This sites HAIL activities are related to the storage tanks or drums for fuel, chemicals, or liquid waste. There have been several investigations at this property. All reports have determined that any contamination at this site is below commercial/industrial guidelines, thus, this site is unlikely to pose a risk to human health during site works.	No further investigations recommended.
Main South Road Railway Reserve	Adjacent	Low	This sites HAIL activities relate to its use as a Railway reserve. There have been no investigations into potential contamination at this site. Due to this site's usage as a railway line rather than yard, it is considered unlikely that any potential contaminants would be present in concentrations that will pose a risk to human health or the environment during site works.	No further investigations recommended.
799 Jones Road	Adjacent	Low	This sites HAIL activities relate to its storage of tanks or drums for fuels, chemicals, or liquid waste. There have been no investigations at this site, however, the tanks are recently installed (2013) and are not expected to be for commercial sales, i.e., relatively small. It is considered unlikely that any potential contaminants would have migrated from this property to the project alignment in concentrations to cause harm to human health.	No further investigations recommended.

Address	Proximity to project alignment	Risk	Comment	Further Investigations
790 Jones Road	Adjacent	Low	This sites HAIL activities relate to its storage of tanks or drums for fuels from 1995-1997, and as a current automotive service shop. The auto shop appears to be contained in modern buildings along the south part of the site. Storage of fuel and or oils appears to be located at the rear of the shop approximate 50m north of the project alignment. Some staining can be seen around the stored fuel/oil, but the site appears to be fully paved which would allow minimal contact with the underlying soils. Therefore, it is unlikely that any potential contaminants would have migrated from this property to the project alignment in concentrations harmful to human health.	No further investigations recommended.
804 Jones Road	Adjacent	Low	This sites HAIL activities relate to its use as a coal supplier. A previous investigation by Kirk Roberts at this site indicates the risk to site users and construction workers from potential contamination associated with the HAIL E5 activity is low. This, along with majority of this site's activities occurring 100 m north of the alignment, makes it unlikely that any potential contamination at this site would have migrated to the project alignment in concentrations to pose a risk to human health.	No further investigations recommended.
801 Jones Road	Adjacent	Low	This sites HAIL activities relate to its use as a railway yard. Previous investigations found soil contaminated with coal dust contaminated gravel that had combustible potential and was a risk to human health. The site has since been remediated and testing indicated that the risk of this site to human health is negligible. Therefore, this site is a low risk to the project works.	No further investigations recommended.

Address	Proximity to project alignment	Risk	Comment	Further Investigations
812 Jones Road	Adjacent	Low	This sites HAIL activities relate to its historical use as a scrap yard from 2009 to 2014. This site is currently used as a tractor sale yard, with majority of the activities appearing to occur at the rear of the property, 60 m north of the alignment. An investigation at 814 Jones Road stated that the properties previous land use as a scrap yard likely would have resulted in minor hotspots of contamination present in topsoil. It appears in Google Street View that upon subsequent development of the site that the topsoil has been removed and the site is now covered with gravel hardstand. This has likely removed much of the source of contamination. Based on this it is unlikely that contamination has migrated to the project site is concentrations to harm human health.	Soil sampling is recommended along the property boundaries.
814 Jones Road	Adjacent	Low	This sites HAIL activities relate to its historical use as a scrap yard. Previous investigations for this site have stated that topsoil would have likely had minor hotspots of contamination. The investigation also states that topsoil has been removed and hardstand placed over the site. This has likely removed much of the source of contamination. Based on the removal of the main source of contamination and the current land use as storage for shipping containers, it is unlikely any contamination from this site would have migrated to the project alignment in concentrations that will pose a risk to human health.	No further investigations recommended.

Address	Proximity to project alignment	Risk	Comment	Further Investigations
816 Jones Road	Adjacent	Low	This sites HAIL activities relate to its historical use as a scrap yard. This site is currently used by Canterbury Cranes with the rear appearing to be used as storage of equipment. No investigations have occurred at this site but an investigation at 814 Jones Road stated that these properties previous land use as a scrap yard likely would have resulted in minor hotspots of contamination present in topsoil. Since the site's use as a scrap yard buildings on the site have been removed and the site appears to be covered with hardstand gravel thus removing the main source of contamination. Based on the removal of the main source of contamination and the current land as storage of equipment, it is unlikely any contamination from this site would have migrated to the project alignment in concentrations that will pose a risk to human health.	Soil sampling is recommended along the property boundaries.
826 Jones Road	Adjacent	Low	This sites HAIL activities refer to its use as a collision centre panel beaters shop. The site appears tidy, modern, asphalted over, and activities appear to occur within the large buildings. It is considered unlikely that any contaminants associated with activities on the site would have migrated to the project alignment in concentrations that would impact human health.	No further investigations recommended.
Kidman Street: Lot 2 & 3 DP 501225	Adjacent	Medium	The LLUR lists the site's HAIL activities in reference to historical storage of tanks or drums for fuel, chemicals, or liquid waste. No further information is given on the LLUR about the location and scale of this tank. Previous investigation by Malloch Environmental state that numerous HAIL activities have occurred on the site. It was identified that soils within the western and south-western sections of this site present a low to medium risk to human health. These sections are located adjacent to the Rolleston Drive alignment on Kidman Street. Thus, there may be potential for contaminants associated with this site to migrate to within the project alignment and pose a risk to human health during the project works.	Soil sampling is recommended along west part of Kidman Street.

Address	Proximity to project alignment	Risk	Comment	Further Investigations
37 & 51 Overbury Crescent	Adjacent	Low	This sites HAIL activities relate to the presence of historical market gardens. Contaminants associated with pesticides tend to bond strongly with soil. This makes it unlikely for contamination to migrate to the project alignment. Given Rolleston Drive was not established at the time the market gardens existed, there is a small chance of spray drift leading to minor contamination. If this occurred, it would have been limited to topsoil which would have been removed during the construction of Rolleston Drive. Additionally, due to the extensive residential redevelopment at this location, it is likely that any contamination at this site would have been removed during redevelopment.	No further investigations recommended.
1705 Main South Road	Adjacent	Low	This sites HAIL activities relate to its use as a BP service station. Previous investigations at this site have stated that soil at this site is considered acceptable for commercial land use and ongoing petroleum handling works. Thus, it is unlikely that this site will pose a risk to the project works and soil within commercial guidelines.	No further investigations recommended.
4 Tennyson Street	Adjacent	Low	This sites HAIL activities relate to its use as an automotive garage and service station. Previous investigations have stated that soil samples collected and analysed were below residential guidelines. However, a site remediation plan was proposed to remove contaminated soil and the remaining building foundations. It is unclear whether the site has been remediated based on suggestions. However, due to the soil being below residential guidelines, and the flow of groundwater west to east away from the alignment, it is unlikely any contamination at this site would have migrated from this property to the project alignment and will not pose a risk to human health.	No further investigations recommended.

Address	Proximity to project alignment	Risk	Comment	Further Investigations
2 Brookside Road	Adjacent	Low	This sites HAIL activities relate to its identification as a HAIL I site in relation to potential contaminants from the demolition of former buildings on the site. Previous investigations stated that any soil samples collected and analysed in the surrounding land in test pits, did not exceed commercial/industrial guidelines. Because of this, the sites redevelopment, its location south of the project alignment, and flow of groundwater west to east, it is unlikely any contamination at this site would have migrated from this property to the project alignment.	No further investigations recommended.
Parklane Subdivision	Adjacent	Low	This sites HAIL activities relate to the presence of historical market gardens. Contaminants associated with pesticides tend to bond strongly with soil. This makes it unlikely for contamination to migrate to the project alignment. Given Rolleston Drive was not established at the time the market gardens existed, there is a small chance of spray drift leading to minor contamination. If this occurred, it would have been limited to topsoil which would have been removed during the construction of Rolleston Drive. Additionally, due to the extensive residential redevelopment at this location, it is likely that any contamination at this site would have been removed during redevelopment.	No further investigations recommended.
Jones Road railway house	Adjacent	Low	This sites HAIL activities relate to its identification as a HAIL I site in relation to potential contaminants from the demolition of former buildings on the site. This site appears to not have been used since the buildings demolition, however the project works will not be occurring within this property alignment and given this properties location east of the alignment and the flow of groundwater west to east, it is unlikely any contamination at this site would have migrated from this property to the project alignment in concentrations to cause harm to human health.	

8 Conclusions

This PSI was completed in accordance with the NESCS comprising of a desktop study and of publicly available information relating to the project site and a virtual site inspection to assess potential for contaminated soil to be encountered during project works.

The PSI has identified several HAIL activities within and in the surrounds of the proposed safety and access upgrade works within the Rolleston Drive sub-project alignment. However, at all but one site it is assessed as unlikely that contaminants associated with these sites would be disturbed as part of the project or have migrated to impact soils within these sub-project alignments to the extent to be harmful to human health or the environment.

It is assessed that the site along Kidman Street at Lot 2 & 3 DP 501225 has the possibility for contaminants of concern associated with the activities to cause harm to human health during the project works. The section of Kidman Street is therefore classified under HAIL activity H which applies to, *Any land that has been subject to the migration of hazardous substances from adjacent land in sufficient quantity that it could be a risk to human health or the environment'.* Therefore, the portion of the Rolleston Drive alignment as shown in Figure 8-1 below is subject to the requirements of the NESCS.

There is also uncertainty over the historical land use on the north-western corner of Runners Road and Walkers Road. Further investigations are required to verify if any contaminants are present at this site. Therefore, the portion of the Walkers Road alignment as shown in Figure 8-2 below is subject to the requirements of the NESCS. Further information on this site has been requested from the client but has not been received at the time of this reporting.

The remainder of the project alignment is not assessed as being a HAIL site and therefore not subject to the NESC.

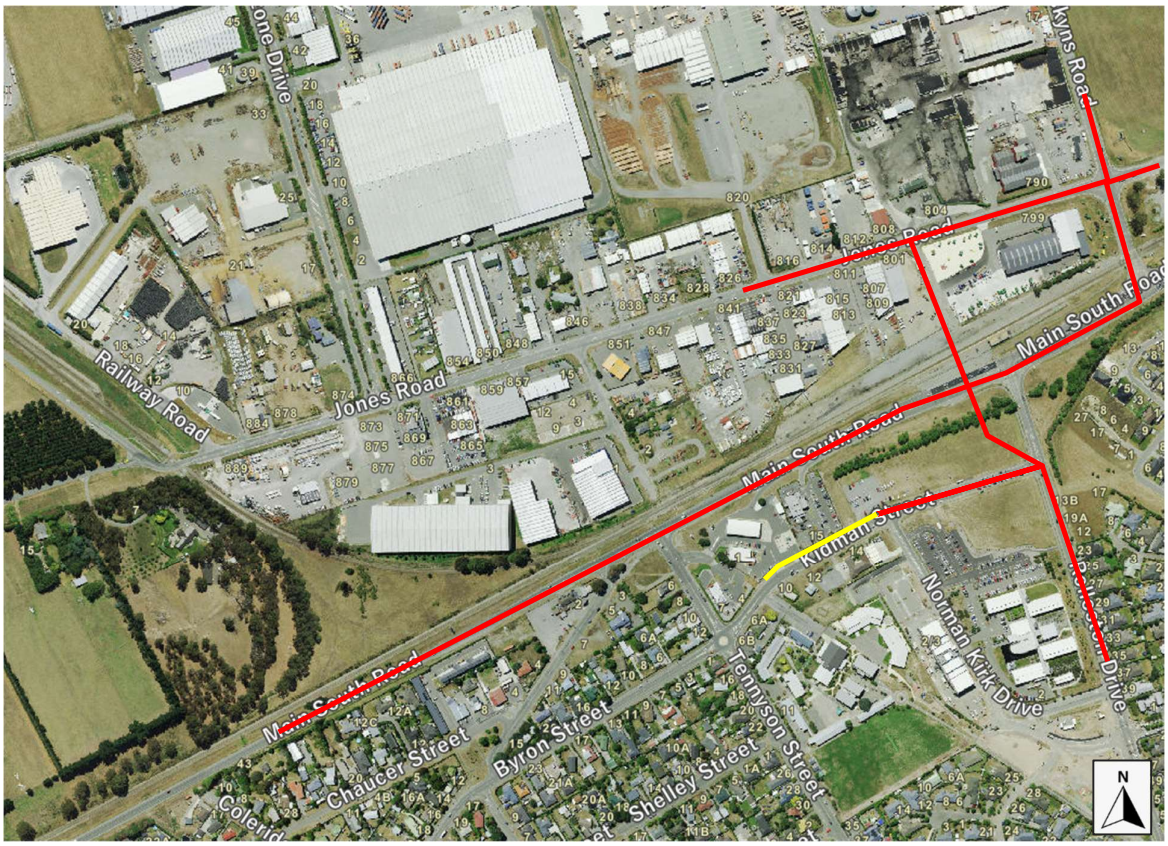


Figure 8-1 Sections of the Rolleston Drive alignment (red line) identified as possibly a HAIL H site (yellow line) and subject to the requirements of NESCS.

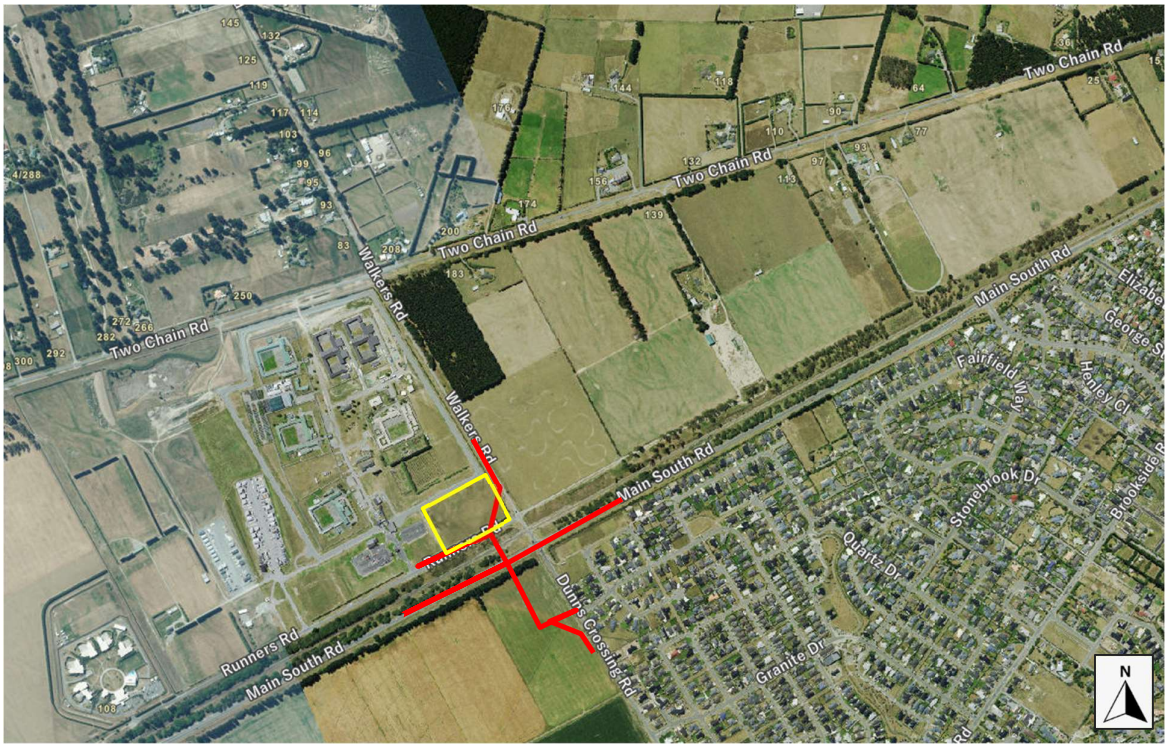


Figure 8-2 Sections of the Walkers Road alignment (red line) identified as possibly a HAIL H site (yellow line) and subject to the requirements of NESCS.

9 Recommendations

It is recommended that the following further investigations are required for this project:

- Further investigation including soil testing be conducted on Kidman Street along the property boundaries of Lot 2 & 3 DP 501225, to assess if this part of the alignment has contaminant concentrations above background levels and thus confirmed as a HAIL site.
- Further investigation including soil testing be conducted on the northwest corner of Runners Road and Walkers Road, as shown in Figure 8-2, to assess if this part of the alignment has contaminant concentrations above background levels and thus confirmed as a HAIL site.
- The NESCS activity status of soil disturbance works as shown in Figure 8-1 and Figure 8-2, should be assessed based results of soil testing and soil disturbance and disposal volumes to determine if this is a permitted activity under Section 8*(3)* of the NESCS.
- The unexpected discovery protocol outlined in Section 10 should be followed during the construction phase for the remainder of the project site.

10 Discovery of Unexpected Contaminants

10.1 Overview

During the construction phase of the project, it is possible that unexpected / accidental discovery of contamination / hazardous material could be encountered, including but not limited to:

- Intact or broken drums and containers.
- Soil with unusual odours.
- Indicators of coal tar (for example, strong naphthalene (moth ball) odour and texture ranging from viscous tar to low density clinker rock).
- Discoloured or stained water and soil.
- Hydrocarbon contaminated soil and/or free product.
- Liquid waste and any material that normally would be sent to a licensed landfill facility.
- Waste containers.
- Asbestos containing materials (ACM).

10.2 Unexpected Discovery Protocol

During earthworks, site personnel will actively monitor areas for the conditions/materials specified above. If newly discovered contaminated material is encountered, it must remain in situ until a Contaminated Land Specialist (CSL), or a Suitably Qualified Experienced Practitioner (SQEP) has been notified and had the opportunity to assess the material.

If potentially contaminated material is discovered, the following actions shall be taken:

- Work within the immediate vicinity of the impacted material shall cease.
- The Construction Manager (or similar) will contact the CLS / SQEP.
- Health and Safety restrictions will be implemented including limiting access to the area, shutting down equipment to reduce potential ignition sources as well as unintentionally spreading contamination around the site. Establishing an exclusion zone around the area of potential contamination, clearly delineating, isolating and securing these areas as required. The location of the zone should be established by the Site Supervisor with input from the CLS / SQEP.
- Any stormwater generated as part of the site works is to be directed away from the material, if this cannot be achieved then the material should be covered (e.g., tarpaulin) to reduce the risk of runoff.
- The CSL / SQEP will advise on the appropriate course of action which may include the completion of additional soil testing. All sampling and testing shall be completed in general accordance with the CLMG No.5 – Site Investigation and Analysis of Soils, MfE (2011).
- Construction works will not resume within the affected area until the CLS/SQEP advises it is safe to do so.

10.2.1 Asbestos

If asbestos material is observed or suspected during the earthwork, all works shall cease in the immediate vicinity and the CLS / SQEP will be contacted. The CLS / SQEP will review site conditions and provide guidance on how to proceed. Depending on the volume of asbestos discovered or whether it is friable, additional support may be required by a qualified and experienced asbestos assessor.

The following regulations and guidelines should be referenced with respect to asbestos management:

- Health and Safety at Work (Asbestos) Regulations 2016.
- New Zealand Guidelines for Assessing and Managing Asbestos in Soil (BRANZ, 2017). Works can recommence once asbestos has been appropriately managed/safely removed as advised by the asbestos professional.

10.2.2 Coal Tar

It is possible that coal tar may be encountered within the road asphalt during the site works. It is recommended that if historical paving is encountered within the site works, the material should be tested prior to disposal. If coal tar is encountered, then the material should be disposed of at a facility authorised to accept such material.

11 Report Limitations

The conclusions contained in this report are based on a desk study and virtual site inspection. It is possible these may not provide a complete or accurate assessment of the entire site. The contents of this report are for the sole use of the client and no responsibility or liability will be accepted to any third party. Data or opinions in this report may not be used in other contexts or for any other purposes without Stantec's prior review and agreement.

Only a finite amount of information has been collected to meet the specific technical requirements of the client's brief, this report does not provide a complete assessment of the environmental statues of the project site soils and is limited to the scope defined herein. Should any further information become available regarding conditions at the project sites, including previously unknown likely sources of contamination, Stantec reserves the right to review the report in the context of the additional information.

This report has been prepared for Waka Kotahi for its own use and is based on information provided. Stantec takes no responsibility and disclaims all liability whatsoever for any loss or damage the client may suffer as a result of using or relying on any such information or recommendations contained in this report, except to the extent Stantec expressly indicates in this report that it has verified the information to its satisfaction. This report is not to be reproduced either wholly or in part without prior written permission.

A copy of this report should be provided to any contractor who is required to undertake earthworks at the site. The Contractor will need to make their own interpretation of the factual data provided. The Contractor shall comply with the recommendations of the report and the Health and Safety at Work Act 2015.

12 Suitable Qualified Environmental Practitioner Certification of the Report

National Environmental Standard for assessing and managing contaminants in soil to protect human health
PRELIMINARY SITE INVESTIGATION CERTIFYING STATEMENT

I *Kathryn Halder* certify that:

This preliminary site investigation meets the requirements of the Resource Management (National Environmental Standard for assessing and managing contaminants in soil to protect human health) Regulations 2011 because it has been:

a. done under the supervision of a suitably qualified and experienced practitioner, and
b. reported on in accordance with the current edition of Contaminated land management guidelines No 1 – Reporting on contaminated sites in New Zealand, and
c. the report is certified by a suitably qualified and experienced practitioner.

For activities under R8(4) of the NESCS this preliminary site investigation concludes it is possible that there will be a risk to human health if the activity is done to the piece of land as shown in Figure 8-1.

The activity to be undertaken as defined in R 5(5) and R5(6) is described on page 2 of this preliminary site investigation.

Evidence of the qualifications and experience of the suitably qualified and experienced practitioner(s) who have done this investigation and have certified this report is in Appendix D of this Preliminary Site Investigation report.

Signed and dated:

Signed: ……Kathryn Halder……..…….

Dated: ……08 May 2023…… ……

Appendices

We design with community in mind

Appendix A PSI Table

The Ministry for the Environment specifies certain sections that are required for a PSI. Below is the checklist provided in the MfE 2021, *Contaminated Land Management Guidelines No. 1*, Reporting on Contaminated Sites in New Zealand. Stars indicate sections included in this report.

Table A-1 Preliminary Site Investigation table of contents.

Content	Required	Required if relied on[9]
1. Introduction		
• investigation objectives	★	
• site identification (site name, address, legal description, site boundaries, a map reference and geographic coordinates)	★	
• proposed site use.		★
2. Site description		
• environmental setting		★
• site layout	★	
• current site uses	★	
• surrounding uses	★	
• geophysical surveys		☐
• site inspection.		★
3. Historical site use (sufficient to plan investigation)		
• summary of site history gained from:		
– review of existing investigation reports		★
– review of council information		★
– review of aerial photographs		★
– interviews	N/A	☐
– review of other historical Information		★
• preliminary sampling (if carried out)	N/A	☐
– description (including diagram)		
– results		
– comparison of results to guidelines.		
4. Risk Assessment		
• Evaluate the probability that pursuant to regulation 6 (3):	★	
- *An activity or industry described in the HAIL is, or is not, being undertaken on the piece of land, or*		
- *An activity or industry described under the HAIL has, or has not, been undertaken on the piece of land, or*		
- *The likelihood of an activity or industry described in the HAIL being undertaken, or having been undertaken, on the piece of land*		

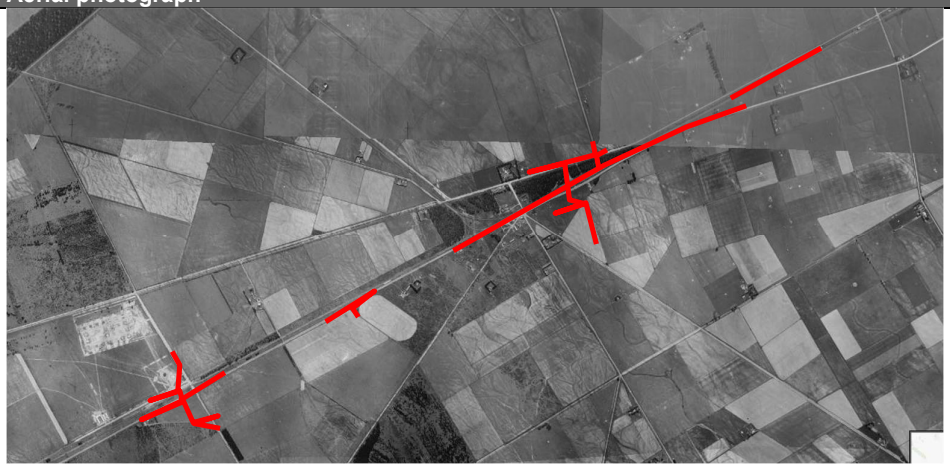
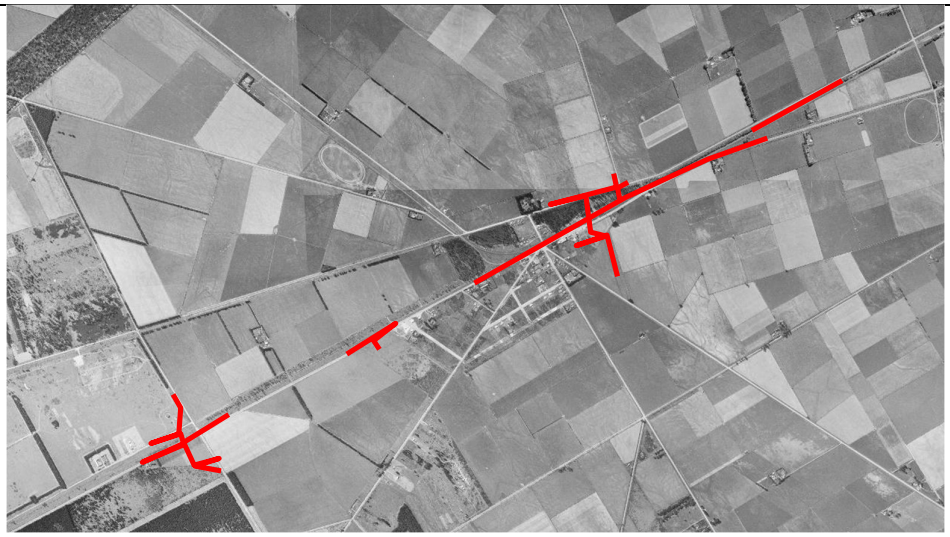
9 Any evidence relied upon to form an opinion/conclusion must be included in report.

Content	Required	Required if relied on[9]
• Evaluate the probability that pursuant to regulation 6 (3): - *The likelihood that the soil is contaminated as a result of activity or industry occurring*	★	
• Description of the limitations of the data collected and the assumptions and uncertainties inherent in the data and models used	★	
5. Conclusions	★	
6. Recommendations (if relevant to report purpose)		★
7. Report limitations	★	
8. SQEP certification of report	★	
9. References	★	
Appendices: relevant supporting information	★	

Appendix B Historical Aerial Photographs

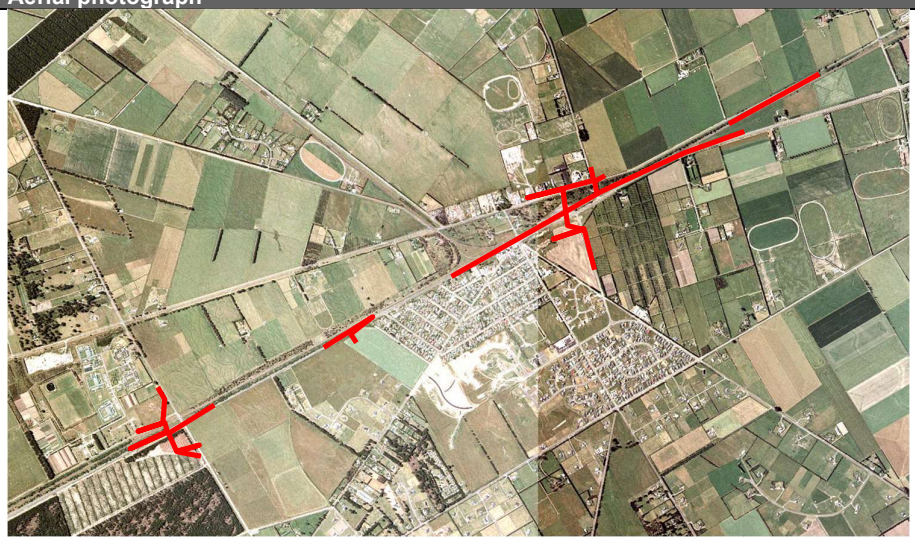
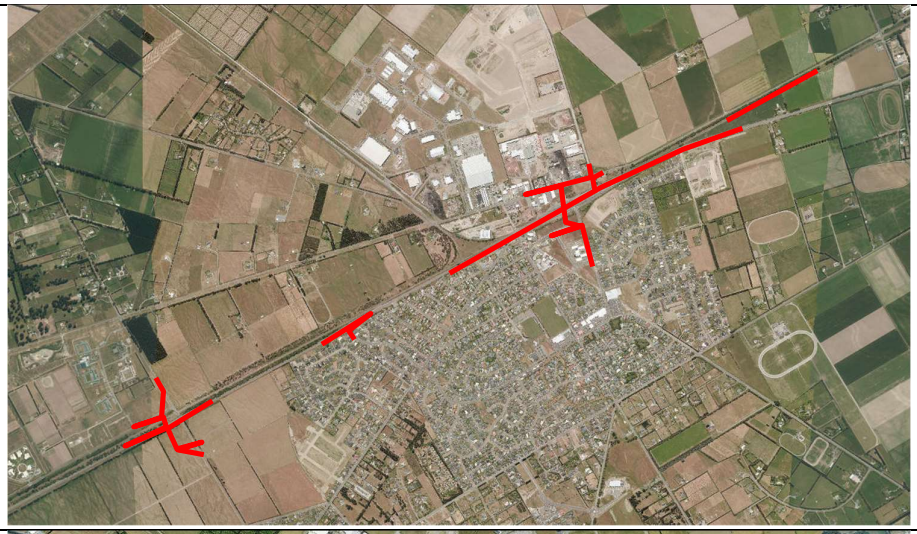
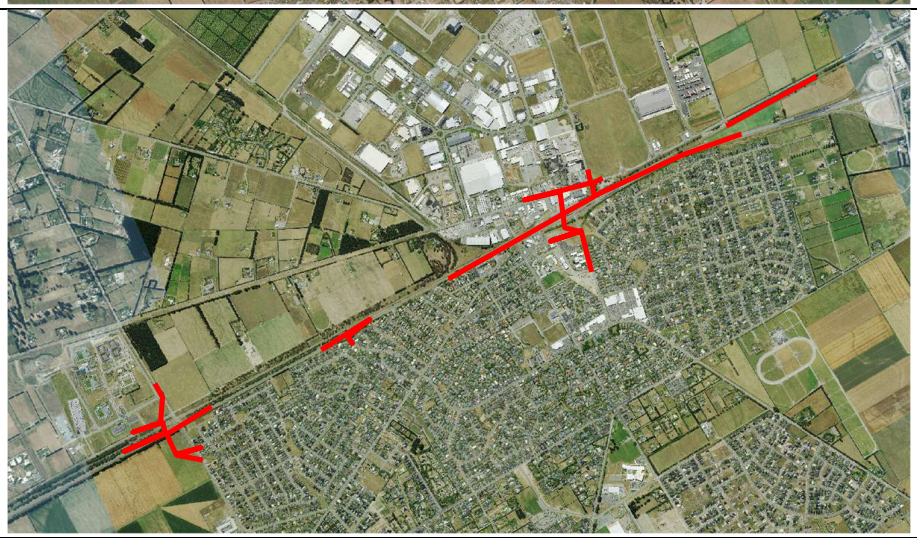
Historical aerials were sourced from Environment Canterbury's Historical Aerial Imagery[10], the project alignments are outlined by a red line.

B-1 Historical aerial photographs of the project alignment

Year	Aerial photograph
1940-1944	
1960-1964	

[10] https://apps.canterburymaps.govt.nz/CanterburyHistoricAerialImagery/

Year	Aerial photograph
1970-1974	
1980-1984	
1990-1994	

Year	Aerial photograph
2000-2004	
2010-2015	
Latest	

Appendix C Current Site Usage Photos

C-1 Screenshots of current site usage from virtual site inspection.

Address	Current site usage
821 Jones Road	

Appendix D Evidence of Qualifications and Experience of the SQEP

KATHRYN HALDER

Kathryn is a Principal Environmental Scientist and has worked both in New Zealand and throughout the UK in contaminated land and waste management. Kathryn has over 20 years' experience working closely with Local Councils, Regulatory Authorities, Governmental bodies and businesses. She has also worked with the Ministry for the Environment in developing waste assessment guidance document and developing a NZ waste minimisation infrastructure database.

Kathryn's undergraduate and master studies were in contaminated land and site risk assessments based on historic land. She has also experience in applying the National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health having carried out contaminated land investigations. She has also overseen the successful bioremediation of a number of these sites. Kathryn also has experience in working with developing 'source, pathway, receptor' models to assess risk to human health and reporting to the standard of the Ministry for the Environments Contaminated Land Management Guidelines. Kathryn has been involved as Contaminated Land technical advisor on several Waka Kotahi projects including Woodend Corridor Alignment, Ō2NL and SH58.

While in NZ, Kathryn has undertaken over 100 projects with respect to risk assessment of contaminated soil, contaminated land investigations, and contaminated soil management. Kathryn has also been responsible for:

- Preparation of preliminary site investigations (PSI)
- On site test pitting, core sample investigations, hydrovac pothole investigations and sample collection
- Preparation of detailed site investigation reports (DSI)
- Development of Waste Assessments and Waste Management and Minimisation Plans (WMMPs)
- Site Management and sediment control plans
- Hazardous Waste Management
- Landfill waste acceptance
- Environmental Monitoring
- Coal tar assessment
- Consenting applications under the National Environmental Standard for Assessing and Managing Contaminants in Soil (NESCS)

She has also spent seven years assessing special and contaminated soil waste acceptance applications for the Tasman District landfill in terms of the environmental effect, safe handling, and disposal protocols, where appropriate.

EDUCATION

- MSc (Environmental Engineering), Queens University Belfast, 1999
- BSc (Environmental Science), Aberdeen University, 1998

MEMBERSHIPS

- Member, WasteMINZ
- Full member of EIANZ
- Chartered member of CIWM while in the UK
- Environmental Practitioner (CEnvP), UK

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C

Appendix C – Sampling Location Plan

PP03
PP19/IP11
PP18
TP11
IP03
TP10
PP04
TP04
TP07
TP02
TP06
TP03
IP01
IP02
TP08
PP01
PP02

Legend

- Approximate Site Boundary (Package 1)
- Package 2 Boundary
- HAIL C1 and G5 (Stantec PSI 2023)
- Test Pit Location

NB: Site and HAIL area boundaries are approximate and indicative only.

N

Revision	Drawer	Verified	Approved	Date
0	MH	BW		21.08.24

Title: **Sampling Location Plan - Package 1**

Client: Waka Kotahi New Zealand Transport Agency

Project: Rolleston Access Upgrades

Beca

Discipline: ENVIRONMENTAL

Drawing No.

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D

Appendix D – Soil Logs and Photographs

Environmental Test Pit Log

Test Pit ID: IP01

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	On grass verge adjacent to SH1 approx. 170m southwest of intersection of SH1 and Dunns Crossing Road (southbound)	**Coordinate System:**	NZTM2000
		Northing:	5172119.0
		Easting:	1547537.0
		Vertical Datum:	
		Ground Level (mRL):	58.80
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				Dense, silty fine to medium SAND, trace fine to medium gravel, trace organics; brown; dry. Gravel: well graded, sub-rounded to rounded, slightly weathered, greywacke. Organics: roots/rootlets. [TOPSOIL]	
		ES		58.5		Dense, fine to coarse sandy fine to coarse GRAVEL, minor cobbles, trace organics; light brown; dry. Gravel/cobbles: well graded, sub-angular to rounded, slightly weathered, greywacke. Organics: rootlets.	
		ES	0.5				
				58.0		*some cobbles*	
		ES	1.0				
				57.5			
		ES	1.5			'Very dense', cobbly fine to coarse GRAVEL, some fine to coarse sand; greyish brown; dry. Gravel/ cobbles: well graded, sub-angular to rounded, slightly weathered, greywacke.	
				57.0			
		ES					

Date Started:	18/06/2024	**Logged By:**	RO	**Comments:**
Method:	TP	**Contractor:**	CORDE	Groundwater not encountered. No visual or olfactory evidence of contamination.
Face Orientation:		**Equipment:**	JCB Hydradig 110W	

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

Environmental Test Pit Log

Test Pit ID: IP01
Sheet 2 of 2

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	On grass verge adjacent to SH1 approx. 170m southwest of intersection of SH1 and Dunns Crossing Road (southbound)	**Coordinate System:**	NZTM2000
		Northing:	5172119.0
		Easting:	1547537.0
		Vertical Datum:	
		Ground Level (mRL):	58.80
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
						'Very dense', cobbly fine to coarse GRAVEL, some fine to coarse sand; greyish brown; dry. Gravel/ cobbles: well graded, sub-angular to rounded, slightly weathered, greywacke.	
						2.20m - End of test pit, target depth.	
				56.5			
			2.5				
				56.0			
			3.0				
				55.5			
			3.5				
				55.0			

Date Started:	18/06/2024	**Logged By:**	RO	**Comments:**
Method:	TP	**Contractor:**	CORDE	Groundwater not encountered. No visual or olfactory evidence of contamination.
Face Orientation:		**Equipment:**	JCB Hydradig 110W	

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

Photo Log

Location ID: IP01

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	On grass verge adjacent to SH1 approx. 170m southwest of intersection of SH1 and Dunns Crossing Road (southbound)	**Coordinate system:**	NZTM2000
		Northing:	5172119.0
		Easting:	1547537.0
		Vertical datum:	
		Ground level (mRL):	58.80
		Location method:	GPS +/- 5m

Environmental Test Pit Log

Test Pit ID: IP02

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	Paddock on the corner of SH1 and Dunns Crossing Road	**Coordinate System:**	NZTM2000
		Northing:	5172102.2
		Easting:	1547697.8
		Vertical Datum:	
		Ground Level (mRL):	58.20
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				Medium dense, fine sandy SILT, some organics, minor fine to coarse gravel, trace clay; dark brown; moist. Gravel: well graded, sub-angular to sub-rounded, slightly weathered, greywacke. Organics: rootlets. [TOPSOIL]	
				58.0		Medium dense, fine sandy SILT, minor organics, trace fine to medium gravel; dark brown; moist. Gravel: well graded, sub-rounded, slightly weathered, greywacke. Organics: rootlets.	
		ES					
						Very dense, silty fine to coarse GRAVEL, some fine to coarse sand, minor cobbles, trace organics; dark brown; moist. Gravel/cobbles: well graded, sub-angular to sub-rounded, slightly weathered, greywacke. Organics: rootlets.	
		ES	0.5				
		ES		57.5		Very dense, fine to coarse sandy fine to coarse GRAVEL, some cobbles, trace silt; light greyish brown; moist. Gravel/cobbles: well graded, sub-angular to rounded, slightly weathered, greywacke.	
		ES	1.0				
				57.0			
		ES	1.5				
				56.5			
		ES					

Date Started:	01/07/2024	**Logged By:**	NY	**Comments:**
Method:	TP	**Contractor:**	CORDE	Groundwater not encountered. No visual or olfactory evidence of contamination.
Face Orientation:		**Equipment:**	JCB Hydradig 110W	

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

Environmental Test Pit Log

Test Pit ID: IP02

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	Paddock on the corner of SH1 and Dunns Crossing Road	**Coordinate System:**	NZTM2000
		Northing:	5172102.2
		Easting:	1547697.8
		Vertical Datum:	
		Ground Level (mRL):	58.20
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
				56.0		Very dense, fine to coarse sandy fine to coarse GRAVEL, some cobbles, trace silt; light greyish brown; moist. Gravel/cobbles: well graded, sub-angular to rounded, slightly weathered, greywacke.	
						2.20m - End of test pit, target depth.	
			2.5	55.5			
			3.0	55.0			
			3.5	54.5			

Date Started:	01/07/2024	**Logged By:**	NY	**Comments:**
Method:	TP	**Contractor:**	CORDE	Groundwater not encountered. No visual or olfactory evidence of contamination.
Face Orientation:		**Equipment:**	JCB Hydradig 110W	

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

Photo Log

Location ID: IP02

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	Paddock on the corner of SH1 and Dunns Crossing Road	**Coordinate system:**	NZTM2000
		Northing:	5172102.2
		Easting:	1547697.8
		Vertical datum:	
		Ground level (mRL):	58.20
		Location method:	GPS +/- 5m

Environmental Test Pit Log

Test Pit ID: IP03

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	Department of Corrections land on the corner of Runners Road and Walkers Road	**Coordinate System:**	NZTM2000
		Northing:	5172302.0
		Easting:	1547589.0
		Vertical Datum:	
		Ground Level (mRL):	59.40
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				Very loose, silty fine to medium SAND, trace fine to medium gravel, trace organics; dark brown; dry. Gravel: well graded, sub-rounded to rounded, slightly weathered, greywacke. Organics: roots. [TOPSOIL]	
						Medium dense, fine to medium sandy fine to medium GRAVEL, some organics, minor silt; light orange brown; dry. Gravel: well graded, sub-angular to sub-rounded, slightly weathered, greywacke. Organics: rootlets.	
		ES					
				59.0			
		ES	0.5			'Dense', fine to medium sandy fine to coarse GRAVEL, some organics, trace silt; light brown; dry. Gravel: well graded, sub-angular to sub-rounded, slightly weathered, greywacke. Organics: rootlets.	
						trace cobbles	
		ES					
						Dense, fine to coarse sandy fine to coarse GRAVEL, minor cobbles, trace silt; light brown; dry. Gravel/cobbles: well graded, sub-angular to sub-rounded, slightly weathered, greywacke.	
				58.5			
		ES	1.0				
				58.0			
		ES	1.5				
				57.5			
		ES					

Date Started:	01/08/2024	**Logged By:**	NY	**Comments:**
Method:	TP	**Contractor:**	CORDE	Groundwater not encountered. No visual or olfactory evidence of contamination.
Face Orientation:		**Equipment:**	DOOSAN DX140w	

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

Environmental Test Pit Log

Test Pit ID: IP03

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	Department of Corrections land on the corner of Runners Road and Walkers Road	**Coordinate System:**	NZTM2000
		Northing:	5172302.0
		Easting:	1547589.0
		Vertical Datum:	
		Ground Level (mRL):	59.40
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
						Dense, fine to coarse sandy fine to coarse GRAVEL, minor cobbles, trace silt; light brown; dry. Gravel/cobbles: well graded, sub-angular to sub-rounded, slightly weathered, greywacke.	
						'Dense', fine to coarse GRAVEL, some cobbles, trace fine to coarse sand; light brown; dry. Gravel/ cobbles: well graded, sub-angular to rounded, slightly weathered, greywacke.	
						2.30m - End of test pit, target de	
				57.0			
			2.5				
				56.5			
			3.0				
				56.0			
			3.5				
				55.5			

Date Started:	01/08/2024	**Logged By:**	NY	**Comments:**
Method:	TP	**Contractor:**	CORDE	Groundwater not encountered. No visual or olfactory evidence of contamination.
Face Orientation:		**Equipment:**	DOOSAN DX140w	

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

Photo Log

Location ID: IP03

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	Department of Corrections land on the corner of Runners Road and Walkers Road	**Coordinate system:**	NZTM2000
		Northing:	5172302.0
		Easting:	1547589.0
		Vertical datum:	
		Ground level (mRL):	59.40
		Location method:	GPS +/- 5m

Environmental Test Pit Log

Test Pit ID: IP04

Sheet 1 of 1

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	Grassed area on the south corner of SH1 and Rolleston Drive (South)	**Coordinate System:**	NZTM2000
		Northing:	5172765.3
		Easting:	1548747.2
		Vertical Datum:	
		Ground Level (mRL):	57.20
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				Loose, fine sandy SILT, some organics, minor fine to medium gravel; dark brown; dry. Gravel: well graded, sub-angular to sub-rounded, slightly weathered, greywacke. Organics: rootlets. [TOPSOIL]	
				57.0			
		ES				Medium dense, silty fine to coarse GRAVEL, some fine to medium sand, minor cobbles, trace clay; light orange brown; dry. Gravel/cobbles: well graded, sub-angular to rounded, slightly weathered greywacke.	
						becomes very dense	
		ES	0.5				
						Very dense, fine to medium sandy fine to coarse GRAVEL, some cobbles, minor silt; grey; dry. Gravel/cobbles: well graded, sub-angular to rounded, slightly weathered greywacke.	
		ES		56.5			
		ES	1.0				
				56.0			
		ES	1.5			1.50m - End of test pit, target depth.	
				55.5			

Date Started:	24/06/2024	**Logged By:**	NY	**Comments:**	
Method:	TP	**Contractor:**	CORDE	Groundwater not encountered. No visual or olfactory evidence of contamination.	
Face Orientation:		**Equipment:**	JCB Hydradig 110W		

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

Photo Log

Location ID: IP04

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	Grassed area on the south corner of SH1 and Rolleston Drive (South)	**Coordinate system:**	NZTM2000
		Northing:	5172765.3
		Easting:	1548747.2
		Vertical datum:	
		Ground level (mRL):	57.20
		Location method:	GPS +/- 5m

Environmental Test Pit Log

Test Pit ID: PP01
Sheet 1 of 1

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	On SH1 approximately 360m southwest of Walkers Road/Dunns Crossing Road intersection (southbound)	**Coordinate System:**	NZTM2000
		Northing:	5172029.0
		Easting:	1547354.0
		Vertical Datum:	
		Ground Level (mRL):	59.00
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				ASPHALT	
		ES				'Very dense', fine to coarse sandy fine to coarse GRAVEL, minor silt; light greyish brown; moist. Gravel: well graded, angular to sub-rounded, slightly weathered, greywacke. Broken faces. AP40. [BASECOURSE]	
		ES				'Very dense', fine to coarse sandy fine to coarse GRAVEL, trace silt; light grey. Gravel: well graded, sub-angular to sub-rounded, slightly weathered, greywacke. AP65. [SUB-BASE]	
		ES				BURIED CHIPSEAL	
			0.5	58.5		'Medium dense', silty fine to coarse GRAVEL, minor fine sand; light greyish brown; dry. Gravel: well graded, sub-rounded, slightly weathered, greywacke. [BURIED BASECOURSE]	
						Dense, SILT, some fine sand; light brown; dry, non-plastic.	
		ES				*minor fine to coarse gravel, trace cobbles. Gravel/cobbles: sub-rounded, slightly weathered, greywacke.*	
						Dense, silty fine to coarse GRAVEL, trace cobbles, trace fine sand; light brown; dry. Gravel/ cobbles: well graded, sub-angular to sub-rounded, slightly weathered, greywacke.	
						0.80m - End of test pit, target depth.	
			1.0	58.0			
			1.5	57.5			

Date Started:	16/07/2024	**Logged By:**	NY
Method:	TP	**Contractor:**	CORDE
Face Orientation:		**Equipment:**	Komatsu PC35MR

Comments:
Groundwater not encountered. No visual or olfactory evidence of contamination.

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

Photo Log

Location ID: PP01

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	On SH1 approximately 360m southwest of Walkers Road/Dunns Crossing Road intersection (southbound)	**Coordinate system:**	NZTM2000
		Northing:	5172029.0
		Easting:	1547354.0
		Vertical datum:	
		Ground level (mRL):	59.00
		Location method:	GPS +/- 5m

Environmental Test Pit Log

Test Pit ID: PP02

Sheet 1 of 1

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	382 Dunns Crossing Road (southbound)	**Coordinate System:**	NZTM2000
		Northing:	5171941.9
		Easting:	1547854.5
		Vertical Datum:	
		Ground Level (mRL):	56.90
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				ASPHALT	
		ES				'Very dense', fine to coarse GRAVEL, some fine to coarse sand, minor silt; light greyish brown; dry. Gravel: well graded, angular to sub-rounded, slightly weathered, greywacke. Broken faces. AP40. [BASECOURSE]	
		ES				'Very dense', fine to coarse sandy fine to coarse GRAVEL, trace silt; light greyish brown; dry. Gravel: well graded, sub-angular to sub-rounded, slightly weathered, greywacke. AP65. [SUB-BASE]	
				56.5			
		ES	0.5			Very dense, fine sandy fine to coarse GRAVEL, some cobbles, minor silt; light brown; dry. Gravel/ cobbles: well graded, sub-rounded to sub-rounded, slightly weathered, greywacke.	
		ES				0.80m - End of test pit, target depth.	
				56.0			
			1.0				
				55.5			
			1.5				
				55.0			

Date Started:	26/06/2024	**Logged By:**	NY	**Comments:**
Method:	TP	**Contractor:**	CORDE	Groundwater not encountered. No visual or olfactory evidence of contamination.
Face Orientation:		**Equipment:**	JCB Hydradig 110W	

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

Photo Log

Location ID: PP02

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	382 Dunns Crossing Road (southbound)	**Coordinate system:**	NZTM2000
		Northing:	5171941.9
		Easting:	1547854.5
		Vertical datum:	
		Ground level (mRL):	56.90
		Location method:	GPS +/- 5m

Environmental Test Pit Log

Test Pit ID: PP03

Sheet 1 of 1

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	Walkers Road opposite Rolleston Prison (southbound)	**Coordinate System:**	NZTM2000
		Northing:	5172466.9
		Easting:	1547534.0
		Vertical Datum:	
		Ground Level (mRL):	60.60
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				ASPHALT	
				60.5		'Very dense', fine to coarse sandy fine to coarse GRAVEL, minor silt; light greyish brown; dry. Gravel: well graded, angular to sub-rounded, slightly weathered, greywacke. Broken faces. AP40. [BASECOURSE]	
		ES					
						'Very dense', fine to coarse sandy fine to coarse GRAVEL, minor cobbles, trace silt; light greyish brown; dry. Gravel: well graded, angular to sub-rounded, slightly weathered, greywacke. AP65. [SUB-BASE]	
		ES					
			0.5				
				60.0		Very dense, cobbly fine to medium sandy fine to coarse GRAVEL, minor silt, trace organics; light brown; dry. Gravel/cobbles: well graded, sub-angular to rounded, slightly weathered, greywacke. Organics: rootlets.	
		ES					
		ES	1.0			1.00m - End of test pit, target depth.	
				59.5			
			1.5				
				59.0			

Date Started:	26/06/2024	**Logged By:**	NY	**Comments:**
Method:	TP	**Contractor:**	CORDE	Groundwater not encountered. No visual or olfactory evidence of contamination.
Face Orientation:		**Equipment:**	JCB Hydradig 110W	

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

Photo Log

Location ID: PP03

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	Walkers Road opposite Rolleston Prison (southbound)	**Coordinate system:**	NZTM2000
		Northing:	5172466.9
		Easting:	1547534.0
		Vertical datum:	
		Ground level (mRL):	60.60
		Location method:	GPS +/- 5m

Environmental Test Pit Log

Test Pit ID: PP04
Sheet 1 of 1

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	On SH1 approximately 190m northeast of Walkers Road/Dunns Crossing Road intersection (southbound)	**Coordinate System:**	NZTM2000
		Northing:	5172300.1
		Easting:	1547856.4
		Vertical Datum:	
		Ground Level (mRL):	59.00
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				ASPHALT	
		ES					
		ES				'Very dense', fine to coarse GRAVEL, some fine to coarse sand, minor silt; light grey; moist. Gravel: well graded, angular to sub-rounded, slightly weathered, greywacke. Broken faces. AP40. [BASECOURSE]	
						BURIED CHIPSEAL	
		ES				'Very dense', fine to coarse sandy fine to coarse GRAVEL, trace silt; light grey; dry. Gravel: well graded, angular to sub-rounded, slightly weathered, greywacke. Broken faces. AP40. [BURIED BASECOURSE]	
						'Very dense', silty fine to medium sandy fine to coarse GRAVEL, minor cobbles; light orange brown; dry. Gravel/cobbles: well graded, sub-angular to rounded, slightly weathered, greywacke.	
		ES	0.5	58.5			
		ES				Dense, fine to coarse cobbly GRAVEL, some fine to coarse sand, trace silt; light brown; dry. Gravel/ cobbles: well graded, sub-angular to rounded, slightly weathered, greywacke.	
						0.80m - End of test pit, target depth.	
			1.0	58.0			
			1.5	57.5			

Date Started:	12/07/2024	**Logged By:**	NY	**Comments:**
Method:	TP	**Contractor:**	CORDE	Groundwater not encountered. No visual or olfactory evidence of contamination.
Face Orientation:		**Equipment:**	JCB Hydradig 110W	

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

Photo Log

Location ID: PP04

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	On SH1 approximately 190m northeast of Walkers Road/Dunns Crossing Road intersection (southbound)	**Coordinate system:**	NZTM2000
		Northing:	5172300.1
		Easting:	1547856.4
		Vertical datum:	
		Ground level (mRL):	59.00
		Location method:	GPS +/- 5m

Environmental Test Pit Log

Test Pit ID: PP05

Sheet 1 of 1

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	On SH1 approximately 65m southbound from intersection of SH1 and Rolleston Drive (South) (southbound)	**Coordinate System:**	NZTM2000
		Northing:	5172755.2
		Easting:	1548698.7
		Vertical Datum:	
		Ground Level (mRL):	57.50
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				ASPHALT	
		ES				'Very dense', fine to coarse sandy fine to coarse GRAVEL, minor silt; light grey; moist. Gravel: well graded, sub-angular to sub-rounded, slightly weathered, greywacke. Broken faces. AP40. [BASECOURSE]	
		ES				'Very dense', fine to coarse sandy fine to coarse GRAVEL, trace silt; light grey. Gravel: well graded, sub-angular to sub-rounded, slightly weathered, greywacke. AP65. [SUB-BASE]	
		ES	0.5	57.0		Very dense, silty fine sandy fine to coarse GRAVEL, trace cobbles; light brown; dry. Gravel/cobbles: well graded, sub-angular to sub-rounded, slightly weathered, greywacke.	
		ES				Very dense, fine to coarse sandy fine to coarse GRAVEL, trace silt, trace cobbles; light brown; dry. Gravel/cobbles: well graded, sub-angular to rounded, slightly weathered, greywacke. [Late Pleistocene Alluvium]	
			1.0	56.5		0.75m - End of test pit, target depth.	
			1.5	56.0			

Date Started:	08/07/2024	**Logged By:**	NY	**Comments:**
Method:	TP	**Contractor:**	CORDE	Groundwater not encountered. No visual or olfactory evidence of contamination.
Face Orientation:		**Equipment:**	JCB Hydradig 110W	

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

Photo Log

Location ID: PP05

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	On SH1 approximately 65m southbound from intersection of SH1 and Rolleston Drive (South) (southbound)	**Coordinate system:**	NZTM2000
		Northing:	5172755.2
		Easting:	1548698.7
		Vertical datum:	
		Ground level (mRL):	57.50
		Location method:	GPS +/- 5m

Environmental Test Pit Log

Test Pit ID: PP06

Sheet 1 of 1

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	Approximately 15m north of 263 Rolleston Drive (northbound)	**Coordinate System:**	NZTM2000
		Northing:	5172768.3
		Easting:	1548784.1
		Vertical Datum:	
		Ground Level (mRL):	56.60
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				ASPHALT	
				56.5		'Dense', fine to coarse GRAVEL, some fine to coarse sand, minor silt; grey; moist, Gravel: well graded, sub-rounded, slightly weathered, greywacke. Broken faces. AP40. [BASECOURSE]	
		ES					
		ES					
		ES	0.5			Dense, medium to coarse sandy fine to coarse GRAVEL, minor cobbles, trace silt; brown; dry. Gravel/cobbles: well graded, sub-angular to rounded, slightly weathered, greywacke.	
				56.0			
			1.0			1.00m - End of test pit, target depth.	
				55.5			
			1.5				
				55.0			

Date Started:	20/06/2024	**Logged By:**	RO	**Comments:**
Method:	TP	**Contractor:**	CORDE	Groundwater not encountered. No visual or olfactory evidence of contamination.
Face Orientation:		**Equipment:**	JCB Hydradig 110W	

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

Photo Log

Location ID: PP06

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	Approximately 15m north of 263 Rolleston Drive (northbound)	**Coordinate system:**	NZTM2000
		Northing:	5172768.3
		Easting:	1548784.1
		Vertical datum:	
		Ground level (mRL):	56.60
		Location method:	GPS +/- 5m

Environmental Test Pit Log

Test Pit ID: PP07
Sheet 1 of 1

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	On SH1 approximately 70m northwest from intersection of SH1 and Rolleston Drive (South) (southbound)	**Coordinate System:**	NZTM2000
		Northing:	5172821.1
		Easting:	1548817.6
		Vertical Datum:	
		Ground Level (mRL):	55.80
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				ASPHALT	
		ES				'Very dense', fine to coarse sandy fine to coarse GRAVEL, minor silt; light greyish brown; dry. Gravel: well graded, angular to sub-rounded, slightly weathered, greywacke. AP40. [BASECOURSE]	
		ES		55.5		'Very dense', fine to coarse sandy fine to coarse GRAVEL, trace silt, trace cobbles; light greyish brown; dry. Gravel/cobbles: well graded, sub-angular to sub-rounded, slightly weathered, greywacke. AP65. [SUB-BASE]	
		ES	0.5			Dense, fine sandy fine to coarse GRAVEL, some cobbles, minor silt; light brown; dry. Gravel/ cobbles: well graded, sub-angular to rounded, slightly weathered, greywacke.	
		ES		55.0		'Dense', fine sandy SILT; mottled orange; dry, non-plastic. [Late Pleistocene Alluvium]	
			1.0			0.90m - End of test pit, target depth.	
				54.5			
			1.5				
				54.0			

Date Started:	22/07/2024	**Logged By:**	RO	**Comments:**
Method:	TP	**Contractor:**	CORDE	Groundwater not encountered. No visual or olfactory evidence of contamination.
Face Orientation:		**Equipment:**	JCB Hydradig 110W	

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

Photo Log

Location ID: PP07

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	On SH1 approximately 70m northwest from intersection of SH1 and Rolleston Drive (South) (southbound)	**Coordinate system:**	NZTM2000
		Northing:	5172821.1
		Easting:	1548817.6
		Vertical datum:	
		Ground level (mRL):	55.80
		Location method:	GPS +/- 5m

Environmental Test Pit Log

Test Pit ID: PP18

Sheet 1 of 1

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	On SH1 behind 66 Lignite Drive (southbound)	**Coordinate System:**	NZTM2000
		Northing:	5172366.0
		Easting:	1547987.0
		Vertical Datum:	
		Ground Level (mRL):	61.40
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				ASPHALT	
		ES				'Very dense', fine to coarse GRAVEL, some fine to coarse sand, minor silt; light greyish brown; dry. Gravel: well graded, angular to sub-rounded, slightly weathered, greywacke. AP40. Broken faces. Highly cemented. [BASECOURSE]	
		ES				BUREID CHIPSEAL	
		ES				'Very dense', silty fine SAND, trace fine to coarse gravel; light brown; dry. Gravel: well graded, sub-rounded, slightly weathered, greywacke. [BURIED BASECOURSE]	
		ES		61.0		'Dense', fine to coarse sandy fine to coarse GRAVEL, trace silt; light brown; dry. Gravel: well graded, sub-angular to rounded, slightly weathered, greywacke. [Late Pleistocene Alluvium]	
		ES	0.5			0.60m - End of test pit, target depth.	
				60.5			
			1.0				
				60.0			
			1.5				
				59.5			

Date Started:	12/07/2024	**Logged By:**	NY	**Comments:**
Method:	TP	**Contractor:**	CORDE	Groundwater not encountered. No visual or olfactory evidence of contamination.
Face Orientation:		**Equipment:**	JCB Hydradig 110W	

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

Photo Log

Location ID: PP18

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	On SH1 behind 66 Lignite Drive (southbound)	**Coordinate system:**	NZTM2000
		Northing:	5172366.0
		Easting:	1547987.0
		Vertical datum:	
		Ground level (mRL):	61.40
		Location method:	GPS +/- 5m

Environmental Test Pit Log

Test Pit ID: TP02

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	KiwiRail land on the corner of Walkers Road and SH1, approximately 10m south of edge of rail ballast	**Coordinate System:**	NZTM2000
		Northing:	5172193.2
		Easting:	1547596.9
		Vertical Datum:	
		Ground Level (mRL):	58.90
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				Loose, fine sandy SILT, some organics, minor fine to coarse gravel; dark brown; moist. Gravel: well graded, sub-angular to sub-rounded, slightly weathered, greywacke. Organics: rootlets. [TOPSOIL]	
		ES		58.5		Medium dense, fine sandy silty fine to coarse GRAVEL, some cobbles, minor organics; light brown; dry. Gravel/cobbles: well graded, sub-rounded, slightly weathered, greywacke. Organics: roots.	
		ES	0.5				
		ES				Dense, fine to coarse sandy fine to coarse GRAVEL, some cobbles, trace silt, trace organics; light brown; dry. Gravel/cobbles: well graded, sub-angular to rounded, slightly weathered, greywacke. Organics: rootlets.	
		ES		58.0			
			1.0				
		ES		57.5			
			1.5			'Dense', cobbly fine to coarse GRAVEL, trace fine to medium sand; light brown; dry. Gravel/ cobbles: well graded, sub-angular to rounded, slightly weathered, greywacke.	
				57.0			

Date Started:	18/07/2024	**Logged By:**	NY	**Comments:**
Method:	TP	**Contractor:**	CORDE	Groundwater not encountered. No visual or olfactory evidence of contamination.
Face Orientation:		**Equipment:**	DOOSAN DX140w	

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

Environmental Test Pit Log

Test Pit ID: TP02

Sheet 2 of 2

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	KiwiRail land on the corner of Walkers Road and SH1, approximately 10m south of edge of rail ballast	**Coordinate System:**	NZTM2000
		Northing:	5172193.2
		Easting:	1547596.9
		Vertical Datum:	
		Ground Level (mRL):	58.90
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
				56.5		2.00m - End of test pit	
			2.5				
				56.0			
			3.0				
				55.5			
			3.5				
				55.0			

Date Started:	18/07/2024	**Logged By:**	NY	**Comments:**
Method:	TP	**Contractor:**	CORDE	Groundwater not encountered. No visual or olfactory evidence of contamination.
Face Orientation:		**Equipment:**	DOOSAN DX140w	

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

Photo Log

Location ID: TP02

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	KiwiRail land on the corner of Walkers Road and SH1, approximately 10m south of edge of rail ballast	**Coordinate system:**	NZTM2000
		Northing:	5172193.2
		Easting:	1547596.9
		Vertical datum:	
		Ground level (mRL):	58.90
		Location method:	GPS +/- 5m

Environmental Test Pit Log

Test Pit ID: TP03

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	Paddock on the southeast corner of SH1 and Dunns Crossing Road, approximately 20m south of northern fence line	**Coordinate System:**	NZTM2000
		Northing:	5172149.3
		Easting:	1547636.5
		Vertical Datum:	
		Ground Level (mRL):	58.30
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				Loose, fine sandy SILT, some organics, minor fine to coarse gravel, trace clay; dark brown; moist. Gravel: well graded, sub-angular to sub-rounded, slightly weathered, greywacke. Organics: rootlets. [TOPSOIL]	
						Dense, fine to coarse gravelly SILT, some fine sand, minor organics, trace cobbles; dark greyish brown; moist. Gravel/cobbles: well graded, sub-rounded, slightly weathered, greywacke. Organics: rootlets.	
		ES		58.0			
						Very dense, silty fine to coarse GRAVEL, some fine sand, minor organics; dark brown; moist. Gravel: well graded, sub-angular to sub-rounded, slightly weathered, greywacke. Organics: rootlets.	
		ES	0.5				
		ES					
				57.5		Very dense, fine to coarse sandy fine to coarse GRAVEL, some cobbles, trace silt; dark greyish brown; moist. Gravel/cobbles: well graded, sub-angular to rounded, slightly weathered, greywacke.	
		ES	1.0				
				57.0			
		ES	1.5				
				56.5		'Very dense', cobbly fine to coarse GRAVEL, some fine to coarse sand, trace silt; dark greyish brown; moist. Gravel/cobbles: well graded, sub-angular to rounded, slightly weathered, greywacke.	
		ES					

Date Started:	01/07/2024	**Logged By:**	NY	**Comments:**
Method:	TP	**Contractor:**	CORDE	Groundwater not encountered. No visual or olfactory evidence of contamination.
Face Orientation:		**Equipment:**	JCB Hydradig 110W	

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

Environmental Test Pit Log

Test Pit ID: TP03
Sheet 2 of 2

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	Paddock on the southeast corner of SH1 and Dunns Crossing Road, approximately 20m south of northern fence line	**Coordinate System:**	NZTM2000
		Northing:	5172149.3
		Easting:	1547636.5
		Vertical Datum:	
		Ground Level (mRL):	58.30
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
				56.0		2.00m - End of test pit, target depth.	
			2.5				
				55.5			
			3.0				
				55.0			
			3.5				
				54.5			

Date Started:	01/07/2024	**Logged By:**	NY	**Comments:**
Method:	TP	**Contractor:**	CORDE	Groundwater not encountered. No visual or olfactory evidence of contamination.
Face Orientation:		**Equipment:**	JCB Hydradig 110W	

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

Photo Log

Location ID: TP03

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	Paddock on the southeast corner of SH1 and Dunns Crossing Road, approximately 20m south of northern fence line	**Coordinate system:**	NZTM2000
		Northing:	5172149.3
		Easting:	1547636.5
		Vertical datum:	
		Ground level (mRL):	58.30
		Location method:	GPS +/- 5m

Environmental Test Pit Log

Test Pit ID: TP04

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	KiwiRail land on the corner of Walkers Road and SH1, approximately 15m north of edge of rail ballast. On top of earth mound.	**Coordinate System:**	NZTM2000
		Northing:	5172233.2
		Easting:	1547603.7
		Vertical Datum:	
		Ground Level (mRL):	59.50
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				Loose, medium to coarse GRAVEL, minor fine sand, trace silt, trace organics; light greyish brown; dry. Gravel: well graded, angular to sub-angular, slightly weathered, greywacke. Organics: rootlets.	
						becomes medium dense	
		ES	0.5	59.0			
		ES				Medium dense, fine to medium sandy fine to coarse GRAVEL, some silt, trace cobbles, trace organics; light brown; dry. Gravel/cobbles: well graded, sub-angular to sub-rounded, slightly weathered, greywacke. Organics: rootlets.	
		ES				*0.05m thick lens of fine sand*	
			1.0	58.5		*becomes dense*	
		ES				Dense to very dense, silty fine SAND, minor fine to coarse gravel; light yellowish brown; dry. Gravel: sub-rounded, slightly weathered, greywacke.	
		ES					
			1.5	58.0		'Very dense', fine to coarse sandy fine to coarse GRAVEL, some cobbles, trace silt; light brown; dry. Gravel/cobbles: well graded, sub-angular to sub-rounded, slightly weathered, greywacke.	
		ES					

Date Started:	18/07/2024	**Logged By:**	NY	**Comments:**
Method:	TP	**Contractor:**	CORDE	Groundwater not encountered.
Face Orientation:		**Equipment:**	DOOSAN DX140w	

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

Environmental Test Pit Log

Test Pit ID: TP04
Sheet 2 of 2

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	KiwiRail land on the corner of Walkers Road and SH1, approximately 15m north of edge of rail ballast. On top of earth mound.	**Coordinate System:**	NZTM2000
		Northing:	5172233.2
		Easting:	1547603.7
		Vertical Datum:	
		Ground Level (mRL):	59.50
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
						'Very dense', fine to coarse sandy fine to coarse GRAVEL, some cobbles, trace silt; light brown; dry. Gravel/cobbles: well graded, sub-angular to sub-rounded, slightly weathered, greywacke.	
		ES	2.5	57.0			
		ES	3.0	56.5		3.00m - End of test pit	
			3.5	56.0			

Date Started:	18/07/2024	**Logged By:**	NY	**Comments:**
Method:	TP	**Contractor:**	CORDE	Groundwater not encountered.
Face Orientation:		**Equipment:**	DOOSAN DX140w	

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

Photo Log

Location ID: TP04

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	KiwiRail land on the corner of Walkers Road and SH1, approximately 15m north of edge of rail ballast. On top of earth mound.	**Coordinate system:**	NZTM2000
		Northing:	5172233.2
		Easting:	1547603.7
		Vertical datum:	
		Ground level (mRL):	59.50
		Location method:	GPS +/- 5m

Environmental Test Pit Log

Test Pit ID: TP06

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	On grass verge adjacent to SH1 approx. 40m southwest of SH1 and Dunns Crossing Road intersection (southbound)	**Coordinate System:**	NZTM2000
		Northing:	5172184.4
		Easting:	1547658.9
		Vertical Datum:	
		Ground Level (mRL):	58.90
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				Very loose, fine sandy SILT, some organics, fine to coarse gravel, trace clay; dark brown; moist. Gravel: well graded, sub-angular to sub-rounded, slightly weathered, greywacke. [TOPSOIL]	
						Very dense, silty fine to coarse GRAVEL, some fine to coarse sand, minor cobbles, trace organics; dark brown; moist. Gravel/cobbles: well graded, sub-angular to sub-rounded, slightly weathered, greywacke. Organics: rootlets.	
		ES		58.5			
		ES	0.5				
		ES					
						Very dense, fine to coarse sandy cobbly fine to coarse GRAVEL, minor silt; dark brown; moist. Gravel/cobbles: well graded, sub-angular to rounded, slightly weathered, greywacke.	
		ES		58.0			
			1.0				
				57.5		'Very dense', cobbly fine to coarse GRAVEL, some fine to coarse sand, trace silt; light orange brown; moist. Gravel/cobbles: well graded, sub-angular to rounded, slightly weathered, greywacke.	
		ES					
			1.5				
				57.0		'Very dense', fine to coarse sandy cobbly fine to coarse GRAVEL, trace silt; dark brown; moist. Gravel/cobbles: well graded, sub-angular to rounded, slightly weathered, greywacke.	
		ES					

Date Started:	01/07/2024	**Logged By:**	NY
Method:	TP	**Contractor:**	CORDE
Face Orientation:		**Equipment:**	Komatsu PC138US-8OS

Comments:
Groundwater not encountered. No visual or olfactory evidence of contamination.

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

Environmental Test Pit Log

Test Pit ID: TP06
Sheet 2 of 3

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	On grass verge adjacent to SH1 approx. 40m southwest of SH1 and Dunns Crossing Road intersection (southbound)	**Coordinate System:**	NZTM2000
		Northing:	5172184.4
		Easting:	1547658.9
		Vertical Datum:	
		Ground Level (mRL):	58.90
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
				56.5		'Very dense', fine to coarse sandy cobbly fine to coarse GRAVEL, trace silt; dark brown; moist. Gravel/cobbles: well graded, sub-angular to rounded, slightly weathered, greywacke. *trace boulders*	
			2.5				
		ES		56.0			
			3.0				
				55.5			
			3.5				
		ES		55.0			

Date Started:	01/07/2024	**Logged By:**	NY
Method:	TP	**Contractor:**	CORDE
Face Orientation:		**Equipment:**	Komatsu PC138US-8OS

Comments:
Groundwater not encountered. No visual or olfactory evidence of contamination.

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

Environmental Test Pit Log

Test Pit ID: TP06

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	On grass verge adjacent to SH1 approx. 40m southwest of SH1 and Dunns Crossing Road intersection (southbound)	**Coordinate System:**	NZTM2000
		Northing:	5172184.4
		Easting:	1547658.9
		Vertical Datum:	
		Ground Level (mRL):	58.90
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
						4.00m - End of test pit, target depth.	
				54.5			
			4.5				
				54.0			
			5.0				
				53.5			
			5.5				
				53.0			

Date Started:	01/07/2024	**Logged By:**	NY	**Comments:**
Method:	TP	**Contractor:**	CORDE	Groundwater not encountered. No visual or olfactory evidence of contamination.
Face Orientation:		**Equipment:**	Komatsu PC138US-8OS	

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

Photo Log

Location ID: TP06

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	On grass verge adjacent to SH1 approx. 40m southwest of SH1 and Dunns Crossing Road intersection (southbound)	**Coordinate system:**	NZTM2000
		Northing:	5172184.4
		Easting:	1547658.9
		Vertical datum:	
		Ground level (mRL):	58.90
		Location method:	GPS +/- 5m

Environmental Test Pit Log

Test Pit ID: TP07

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	On grass verge adjacent to SH1 approx. 35m northeast of intersection of SH1 and Dunns Crossing Road (southbound)	**Coordinate System:**	NZTM2000
		Northing:	5172221.1
		Easting:	1547734.0
		Vertical Datum:	
		Ground Level (mRL):	58.70
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				Loose, silty fine to medium SAND minor gravel, trace organics; greyish brown; dry, non-plastic, insensitive. Gravel: sub-rounded to rounded, slightly weathered, greywacke. Organics: roots and rootlets. [TOPSOIL]	
				58.5			
		ES				Medium dense, fine to coarse gravelly SAND minor organics; light brown; dry. Gravel: well graded, sub-angular to rounded, slightly weathered, greywacke. Organics: rootlets.	
		ES	0.5			'Very dense', fine to coarse sandy fine to coarse GRAVEL, trace silt; dark greyish brown; dry. Gravel: well graded, sub-angular to rounded, slightly weathered, greywacke. *trace organics: rootlets*	
				58.0			
		ES	1.0				
				57.5			
		ES	1.5			*minor cobbles* *trace organics: roots/rootlets*	
				57.0			
		ES					

Date Started:	17/06/2024	**Logged By:**	RO
Method:	TP	**Contractor:**	CORDE
Face Orientation:		**Equipment:**	JCB Hydradig 110W

Comments:
Groundwater not encountered. No visual or olfactory evidence of contamination.

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

Environmental Test Pit Log

Test Pit ID: TP07

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	On grass verge adjacent to SH1 approx. 35m northeast of intersection of SH1 and Dunns Crossing Road (southbound)	**Coordinate System:**	NZTM2000
		Northing:	5172221.1
		Easting:	1547734.0
		Vertical Datum:	
		Ground Level (mRL):	58.70
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
						2.00m - End of test pit, target depth.	
				56.5			
			2.5				
				56.0			
			3.0				
				55.5			
			3.5				
				55.0			

Date Started:	17/06/2024	**Logged By:**	RO	**Comments:**
Method:	TP	**Contractor:**	CORDE	Groundwater not encountered. No visual or olfactory evidence of contamination.
Face Orientation:		**Equipment:**	JCB Hydradig 110W	

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

Photo Log

Location ID: TP07

Sheet 1 of 1

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	On grass verge adjacent to SH1 approx. 35m northeast of intersection of SH1 and Dunns Crossing Road (southbound)	**Coordinate system:**	NZTM2000
		Northing:	5172221.1
		Easting:	1547734.0
		Vertical datum:	
		Ground level (mRL):	58.70
		Location method:	GPS +/- 5m

Environmental Test Pit Log

Test Pit ID: TP08

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	Paddock on the southeast corner of SH1 and Dunns Crossing Road, approximately 70m west of eastern fence line	**Coordinate System:**	NZTM2000
		Northing:	5172042.0
		Easting:	1547706.0
		Vertical Datum:	
		Ground Level (mRL):	57.90
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				Loose, fine sandy SILT, some organics, minor fine to coarse gravel; dark brown; moist, non-plastic. Gravel: well graded, sub-rounded, slightly weathered, greywacke. Organics: rootlets.	
		ES					
		ES		57.5		Dense, silty fine to coarse GRAVEL, some fine sand, minor organics; light orange; brown; moist. Gravel: well graded, sub-angular to sub-rounded, slightly weathered, greywacke.	
		ES	0.5			Dense, fine to coarse SAND, minor fine gravel, trace silt, trace organics; dark brown; moist. Gravel: well graded, sub-rounded, slightly weathered, greywacke. Organics: rootlets.	
		ES		57.0		Dense, fine to coarse sandy fine to coarse GRAVEL, some cobbles, trace silt; dark greyish brown; moist. Gravel/cobbles: well graded, sub-angular to rounded, slightly weathered, greywacke.	
		ES	1.0				
		ES		56.5			
		ES	1.5			'Dense', cobbly fine to coarse GRAVEL, some fine to coarse sand, trace silt; dark greyish brown; moist. Gravel/cobbles: well graded, sub-angular to rounded, slightly weathered, greywacke.	
		ES		56.0			

Date Started:	01/07/2024	**Logged By:**	NY	**Comments:**
Method:	TP	**Contractor:**	CORDE	Groundwater not encountered. No visual or olfactory evidence of contamination.
Face Orientation:		**Equipment:**	JCB Hydradig 110W	

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

Environmental Test Pit Log

Test Pit ID: TP08

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	Paddock on the southeast corner of SH1 and Dunns Crossing Road, approximately 70m west of eastern fence line	**Coordinate System:**	NZTM2000
		Northing:	5172042.0
		Easting:	1547706.0
		Vertical Datum:	
		Ground Level (mRL):	57.90
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
						2.00m - End of test pit, target depth.	
				55.5			
			2.5				
				55.0			
			3.0				
				54.5			
			3.5				
				54.0			

Date Started:	01/07/2024	**Logged By:**	NY	**Comments:**
Method:	TP	**Contractor:**	CORDE	Groundwater not encountered. No visual or olfactory evidence of contamination.
Face Orientation:		**Equipment:**	JCB Hydradig 110W	

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

Photo Log

Location ID: TP08

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	Paddock on the southeast corner of SH1 and Dunns Crossing Road, approximately 70m west of eastern fence line	**Coordinate system:**	NZTM2000
		Northing:	5172042.0
		Easting:	1547706.0
		Vertical datum:	
		Ground level (mRL):	57.90
		Location method:	GPS +/- 5m

Environmental Test Pit Log

Test Pit ID: TP10

Sheet 1 of 1

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	Department of Corrections land on the southeast corner of Runners Rd and Walkers Rd, approx. 10m northwest of boundary	**Coordinate System:**	NZTM2000
		Northing:	5172316.0
		Easting:	1547582.0
		Vertical Datum:	
		Ground Level (mRL):	59.30
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				Medium dense, fine sandy SILT, some organics, minor fine to coarse gravel; dark brown; moist, non-plastic. Gravel: well graded, sub-rounded, slightly weathered, greywacke. Organics: rootlets.	
		ES		59.0		Medium dense, fine to medium sandy fine to medium GRAVEL, some organics, minor silt; light orange brown; dry. Gravel: well graded, sub-angular to sub-rounded, slightly weathered, greywacke. Organics: rootlets.	
		ES	0.5			Dense, fine to coarse sandy fine to coarse GRAVEL, some cobbles, trace organics, trace silt; light brown; dry. Gravel/cobbles: well graded, sub-angular to sub-rounded, slightly weathered, greywacke. Organics: rootlets. Patches of dark brown spots.	
		ES		58.5		*organics absent.*	
		ES	1.0			*trace boulder.*	
				58.0		1.00m - End of test pit	
			1.5				
				57.5			

Date Started:	01/08/2024	**Logged By:**	NY
Method:	TP	**Contractor:**	CORDE
Face Orientation:		**Equipment:**	DOOSAN DX140w

Comments:
Groundwater not encountered. No visual or olfactory evidence of contamination.

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

Photo Log

Location ID: TP10

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	Department of Corrections land on the southeast corner of Runners Rd and Walkers Rd, approx. 10m northwest of boundary	**Coordinate system:**	NZTM2000
		Northing:	5172316.0
		Easting:	1547582.0
		Vertical datum:	
		Ground level (mRL):	59.30
		Location method:	GPS +/- 5m

Environmental Test Pit Log

Test Pit ID: TP11
Sheet 1 of 1

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	Department of Corrections land on the southeast corner of Runners Rd and Walkers Rd, approx. 10m west of boundary	**Coordinate System:**	NZTM2000
		Northing:	5172316.0
		Easting:	1547582.0
		Vertical Datum:	
		Ground Level (mRL):	59.40
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				Loose, fine sandy SILT, some organics, fine to coarse gravel, trace clay; dark brown; moist, non-plastic. Gravel: well graded, sub-angular to sub-rounded, slightly weathered, greywacke. [TOPSOIL]	
		ES		59.0		Dense, fine to medium sandy fine to coarse GRAVEL, some organics, minor cobbles, trace silt; light orange brown; dry. Gravel/cobbles: well graded, sub-angular to sub-rounded, slightly weathered, greywacke. Organics: rootlets.	
		ES	0.5			*colour changes to light brown. Patches of dark brown spots.*	
		ES				*organics absent.*	
		ES		58.5			
			1.0			1.00m - End of test pit, target depth.	
				58.0			
			1.5				
				57.5			

Date Started:	01/08/2024	**Logged By:**	NY	**Comments:**
Method:	TP	**Contractor:**	CORDE	Groundwater not encountered. No visual or olfactory evidence of contamination.
Face Orientation:		**Equipment:**	DOOSAN DX140w	

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

Photo Log

Location ID: TP11

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	Department of Corrections land on the southeast corner of Runners Rd and Walkers Rd, approx. 10m west of boundary	**Coordinate system:**	NZTM2000
		Northing:	5172316.0
		Easting:	1547582.0
		Vertical datum:	
		Ground level (mRL):	59.40
		Location method:	GPS +/- 5m

E

Appendix E – Hills Laboratory Reports and Chain of Custody Forms

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

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+64 7 858 2000
mail@hill-labs.co.nz
www.hill-labs.co.nz

Certificate of Analysis

Client:	Beca Limited	**Lab No:**	3608971 SPv1
Contact:	Stuart Caird	**Date Received:**	18-Jun-2024
	C/- Beca Limited	**Date Reported:**	24-Jun-2024
	PO Box 13960	**Quote No:**	129425
	Christchurch 8141	**Order No:**	
		Client Reference:	3338703/800
		Submitted By:	Melissa Fletcher

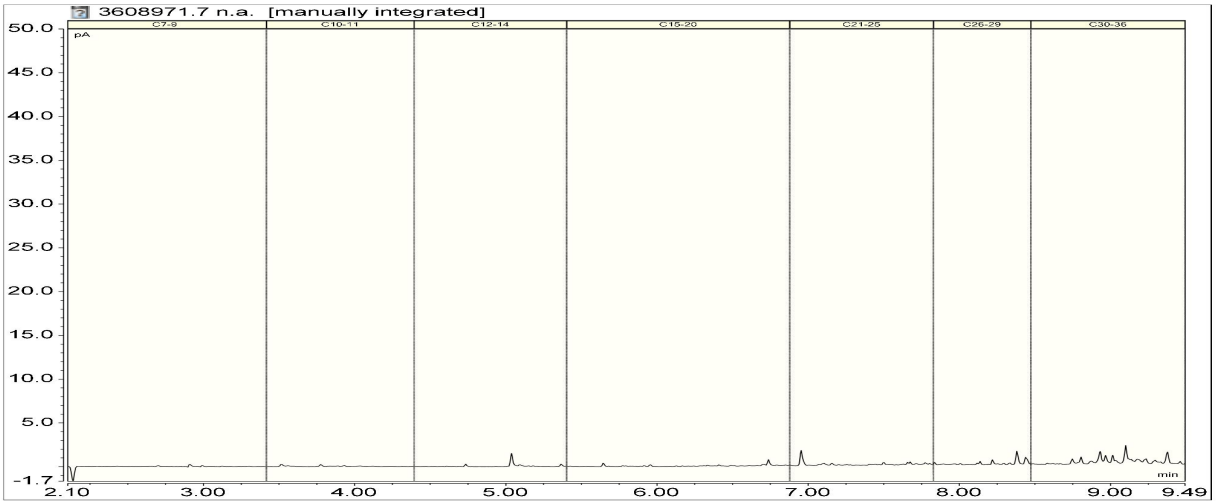
Sample Type: Soil

Sample Name:		TP07_0.1 18-Jun-2024	TP07_0.5 18-Jun-2024	IP01_0.1 18-Jun-2024	IP01_0.5 18-Jun-2024
Lab Number:		3608971.1	3608971.3	3608971.7	3608971.9
Individual Tests					
Dry Matter	g/100g as rcvd	86	91	90	92
Heavy Metals with Mercury, Screen Level					
Total Recoverable Arsenic	mg/kg dry wt	3	4	4	5
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	11	15	12	17
Total Recoverable Copper	mg/kg dry wt	6	5	7	5
Total Recoverable Lead	mg/kg dry wt	38	16.0	47	20
Total Recoverable Mercury	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Nickel	mg/kg dry wt	7	11	8	11
Total Recoverable Zinc	mg/kg dry wt	54	47	70	56
Polycyclic Aromatic Hydrocarbons Screening in Soil*					
Total of Reported PAHs in Soil	mg/kg dry wt	0.6	< 0.3	0.8	< 0.3
1-Methylnaphthalene	mg/kg dry wt	< 0.012	< 0.011	< 0.011	< 0.011
2-Methylnaphthalene	mg/kg dry wt	< 0.012	< 0.011	< 0.011	< 0.011
Acenaphthylene	mg/kg dry wt	< 0.012	< 0.011	< 0.011	< 0.011
Acenaphthene	mg/kg dry wt	< 0.012	< 0.011	< 0.011	< 0.011
Anthracene	mg/kg dry wt	0.014	< 0.011	0.021	< 0.011
Benzo[a]anthracene	mg/kg dry wt	0.042	< 0.011	0.046	< 0.011
Benzo[a]pyrene (BAP)	mg/kg dry wt	0.051	< 0.011	0.060	< 0.011
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	0.073	< 0.026	0.087	< 0.026
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	0.072	< 0.026	0.086	< 0.026
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	0.054	< 0.011	0.067	< 0.011
Benzo[e]pyrene	mg/kg dry wt	0.023	< 0.011	0.030	< 0.011
Benzo[g,h,i]perylene	mg/kg dry wt	0.028	< 0.011	0.032	< 0.011
Benzo[k]fluoranthene	mg/kg dry wt	0.020	< 0.011	0.025	< 0.011
Chrysene	mg/kg dry wt	0.047	< 0.011	0.060	< 0.011
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.012	< 0.011	< 0.011	< 0.011
Fluoranthene	mg/kg dry wt	0.105	< 0.011	0.132	< 0.011
Fluorene	mg/kg dry wt	< 0.012	< 0.011	0.012	< 0.011
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	0.025	< 0.011	0.033	< 0.011
Naphthalene	mg/kg dry wt	< 0.06	< 0.06	< 0.06	< 0.06
Perylene	mg/kg dry wt	< 0.012	< 0.011	< 0.011	< 0.011
Phenanthrene	mg/kg dry wt	0.082	< 0.011	0.115	< 0.011
Pyrene	mg/kg dry wt	0.105	< 0.011	0.132	< 0.011

This Laboratory is accredited by International Accreditation New Zealand (IANZ), which represents New Zealand in the International Laboratory Accreditation Cooperation (ILAC). Through the ILAC Mutual Recognition Arrangement (ILAC-MRA) this accreditation is internationally recognised.
The tests reported herein have been performed in accordance with the terms of accreditation, with the exception of tests marked * or any comments and interpretations, which are not accredited.

Sample Type: Soil					
Sample Name:		TP07_0.1 18-Jun-2024	TP07_0.5 18-Jun-2024	IP01_0.1 18-Jun-2024	IP01_0.5 18-Jun-2024
Lab Number:		3608971.1	3608971.3	3608971.7	3608971.9
Total Petroleum Hydrocarbons in Soil					
C7 - C9	mg/kg dry wt	< 20	< 20	< 20	< 20
C10 - C14	mg/kg dry wt	< 20	< 20	< 20	< 20
C15 - C36	mg/kg dry wt	< 40	< 40	50	< 40
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 80	< 80	< 80	< 80

3608971.7
IP01_0.1 18-Jun-2024
Client Chromatogram for TPH by FID



Summary of Methods

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

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Individual Tests			
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	1, 3, 7, 9
Total of Reported PAHs in Soil	Sonication extraction, GC-MS/MS analysis. In-house based on US EPA 8270.	0.03 mg/kg dry wt	1, 3, 7, 9
Dry Matter	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	1, 3, 7, 9
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	BaP Potency Equivalence calculated from; Benzo(a)anthracene x 0.1 + Benzo(b)fluoranthene x 0.1 + Benzo(j)fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Benzo(a)pyrene x 1.0 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Fluoranthene x 0.01 + Indeno(1,2,3-c,d)pyrene x 0.1. Ministry for the Environment. 2011. Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health. Wellington: Ministry for the Environment.	0.024 mg/kg dry wt	1, 3, 7, 9
Benzo[a]pyrene Toxic Equivalence (TEF)*	Benzo[a]pyrene Toxic Equivalence (TEF) calculated from; Benzo[a]pyrene x 1.0 + Benzo(a)anthracene x 0.1 + Benzo(b) fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Indeno(1,2,3-c,d)pyrene x 0.1. Guidelines for assessing and managing contaminated gasworks sites in New Zealand (GMG) (MfE, 1997).	0.024 mg/kg dry wt	1, 3, 7, 9
TPH Oil Industry Profile + PAHscreen	Sonication extraction, GC-FID and GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8015 and US EPA 8270.	0.010 - 70 mg/kg dry wt	1, 3, 7, 9

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1, 3, 7, 9
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.	-	7
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	1, 3, 7, 9
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, 3, 7, 9
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, 3, 7, 9
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, 3, 7, 9

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

Testing was completed between 19-Jun-2024 and 24-Jun-2024. For completion dates of individual analyses please contact the laboratory.

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

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

Ara Heron BSc (Tech)
Client Services Manager - Environmental

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Certificate of Analysis

Client:	Beca Limited	**Lab No:**	3615000 SPv1
Contact:	Stuart Caird C/- Beca Limited PO Box 13960 Christchurch 8141	**Date Received:** **Date Reported:** **Quote No:** **Order No:** **Client Reference:** **Submitted By:**	26-Jun-2024 08-Jul-2024 129425 3338703/800 Stuart Caird

Sample Type: Soil

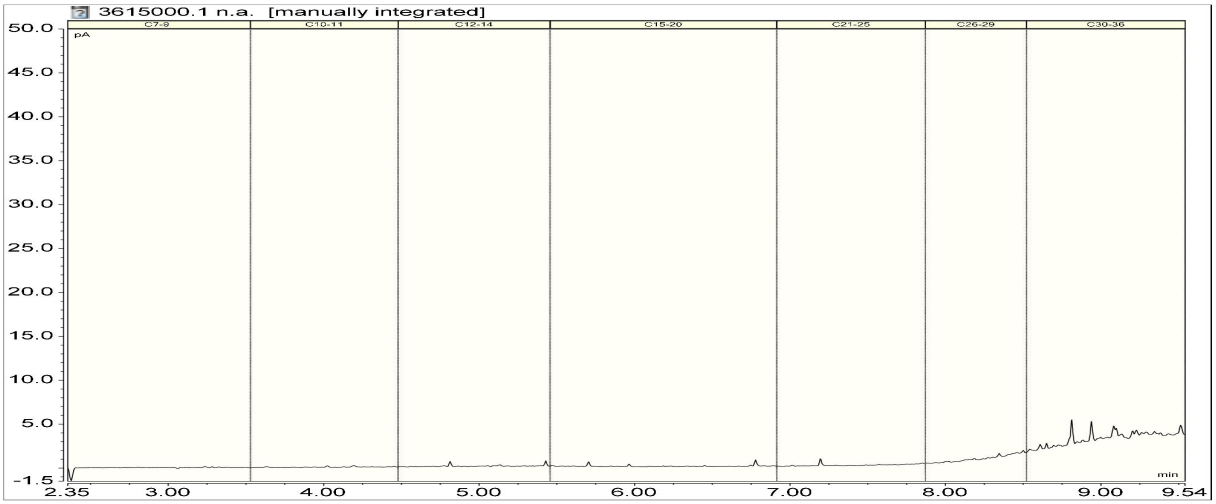
		Sample Name:	PP03_0.3 26-Jun-2024	PP02_0.3 26-Jun-2024
		Lab Number:	3615000.3	3615000.8
Individual Tests				
Dry Matter	g/100g as rcvd		95	85
Heavy Metals with Mercury, Screen Level				
Total Recoverable Arsenic	mg/kg dry wt		4	4
Total Recoverable Cadmium	mg/kg dry wt		< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt		13	12
Total Recoverable Copper	mg/kg dry wt		5	4
Total Recoverable Lead	mg/kg dry wt		38	25
Total Recoverable Mercury	mg/kg dry wt		< 0.10	< 0.10
Total Recoverable Nickel	mg/kg dry wt		11	8
Total Recoverable Zinc	mg/kg dry wt		39	46
Polycyclic Aromatic Hydrocarbons Screening in Soil*				
Total of Reported PAHs in Soil	mg/kg dry wt		< 0.3	< 0.3
1-Methylnaphthalene	mg/kg dry wt		< 0.011	< 0.012
2-Methylnaphthalene	mg/kg dry wt		< 0.016	< 0.018
Acenaphthylene	mg/kg dry wt		< 0.011	< 0.012
Acenaphthene	mg/kg dry wt		< 0.011	< 0.012
Anthracene	mg/kg dry wt		< 0.011	< 0.012
Benzo[a]anthracene	mg/kg dry wt		< 0.011	< 0.012
Benzo[a]pyrene (BAP)	mg/kg dry wt		< 0.011	< 0.012
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt		< 0.025	< 0.028
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt		< 0.025	< 0.028
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt		< 0.011	< 0.012
Benzo[e]pyrene	mg/kg dry wt		< 0.011	< 0.012
Benzo[g,h,i]perylene	mg/kg dry wt		< 0.011	< 0.012
Benzo[k]fluoranthene	mg/kg dry wt		< 0.011	< 0.012
Chrysene	mg/kg dry wt		< 0.011	< 0.012
Dibenzo[a,h]anthracene	mg/kg dry wt		< 0.011	< 0.012
Fluoranthene	mg/kg dry wt		< 0.011	< 0.012
Fluorene	mg/kg dry wt		< 0.011	< 0.012
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt		< 0.011	< 0.012
Naphthalene	mg/kg dry wt		< 0.06	< 0.06
Perylene	mg/kg dry wt		< 0.011	< 0.012
Phenanthrene	mg/kg dry wt		< 0.011	< 0.012
Pyrene	mg/kg dry wt		< 0.011	< 0.012

This Laboratory is accredited by International Accreditation New Zealand (IANZ), which represents New Zealand in the International Laboratory Accreditation Cooperation (ILAC). Through the ILAC Mutual Recognition Arrangement (ILAC-MRA) this accreditation is internationally recognised.
The tests reported herein have been performed in accordance with the terms of accreditation, with the exception of tests marked * or any comments and interpretations, which are not accredited.

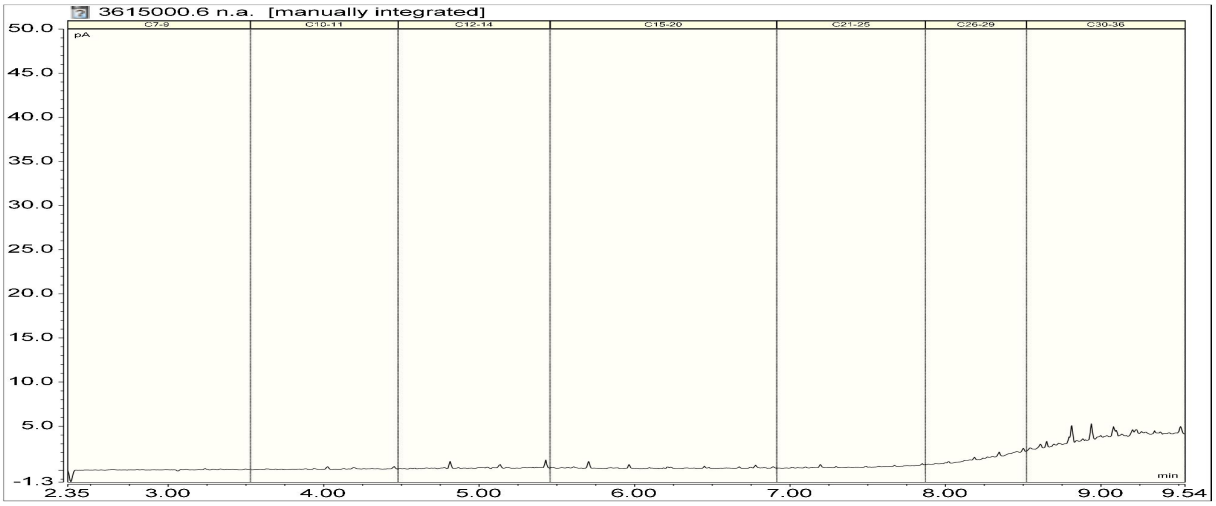
Sample Type: Soil			
Sample Name:		PP03_0.3 26-Jun-2024	PP02_0.3 26-Jun-2024
Lab Number:		3615000.3	3615000.8
Total Petroleum Hydrocarbons in Soil			
C7 - C9	mg/kg dry wt	< 20	< 20
C10 - C14	mg/kg dry wt	< 20	< 20
C15 - C36	mg/kg dry wt	< 40	< 40
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 80	< 80

Sample Type: Roading Material			
Sample Name:		PP03_0.05 26-Jun-2024	PP02_0.05 26-Jun-2024
Lab Number:		3615000.1	3615000.6
Individual Tests			
Total Recoverable Mercury*	mg/kg dry wt	< 0.10	< 0.10
Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn*			
Total Recoverable Arsenic	mg/kg as rcvd	< 2	< 2
Total Recoverable Cadmium*	mg/kg as rcvd	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg as rcvd	5	3
Total Recoverable Copper	mg/kg as rcvd	4	9
Total Recoverable Lead	mg/kg as rcvd	4.7	4.3
Total Recoverable Nickel	mg/kg as rcvd	5	6
Total Recoverable Zinc	mg/kg as rcvd	20	17
Polycyclic Aromatic Hydrocarbons Screening in Rock*			
1-Methylnaphthalene*	mg/kg as rcvd	0.56	0.35
2-Methylnaphthalene*	mg/kg as rcvd	0.56	0.34
Acenaphthylene*	mg/kg as rcvd	< 0.10	< 0.10
Acenaphthene*	mg/kg as rcvd	< 0.10	< 0.10
Anthracene*	mg/kg as rcvd	< 0.10	< 0.10
Benzo[a]anthracene*	mg/kg as rcvd	< 0.10	< 0.10
Benzo[a]pyrene (BAP)*	mg/kg as rcvd	< 0.10	< 0.10
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg as rcvd	< 0.24	< 0.24
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg as rcvd	< 0.3	< 0.3
Benzo[b]fluoranthene + Benzo[j] fluoranthene*	mg/kg as rcvd	< 0.10	< 0.10
Benzo[e]pyrene*	mg/kg as rcvd	0.13	0.10
Benzo[g,h,i]perylene*	mg/kg as rcvd	0.12	0.14
Benzo[k]fluoranthene*	mg/kg as rcvd	< 0.10	< 0.10
Chrysene*	mg/kg as rcvd	< 0.10	< 0.10
Dibenzo[a,h]anthracene*	mg/kg as rcvd	< 0.10	< 0.10
Fluoranthene*	mg/kg as rcvd	< 0.10	< 0.10
Fluorene*	mg/kg as rcvd	< 0.10	< 0.10
Indeno(1,2,3-c,d)pyrene*	mg/kg as rcvd	< 0.10	< 0.10
Naphthalene*	mg/kg as rcvd	< 0.5	< 0.5
Perylene*	mg/kg as rcvd	< 0.10	< 0.10
Phenanthrene*	mg/kg as rcvd	< 0.10	< 0.10
Pyrene*	mg/kg as rcvd	< 0.10	< 0.10
Total of Reported PAHs*	mg/kg as rcvd	< 3	< 3
Total Petroleum Hydrocarbons in Rock*			
C7 - C9*	mg/kg as rcvd	< 140	< 140
C10 - C14*	mg/kg as rcvd	< 120	161
C15 - C36*	mg/kg as rcvd	2,300	2,600
Total hydrocarbons (C7 - C36)*	mg/kg as rcvd	2,400	2,800

3615000.1
PP03_0.05 26-Jun-2024
Client Chromatogram for TPH by FID



3615000.6
PP02_0.05 26-Jun-2024
Client Chromatogram for TPH by FID



Summary of Methods

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

Sample Type: Soil

Test	Method Description	Default Detection Limit	Sample No
Individual Tests			
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	3, 8
Total of Reported PAHs in Soil	Sonication extraction, GC-MS/MS analysis. In-house based on US EPA 8270.	0.03 mg/kg dry wt	3, 8
Dry Matter	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	3, 8

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	BaP Potency Equivalence calculated from; Benzo(a)anthracene x 0.1 + Benzo(b)fluoranthene x 0.1 + Benzo(j)fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Benzo(a)pyrene x 1.0 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Fluoranthene x 0.01 + Indeno(1,2,3-c,d)pyrene x 0.1. Ministry for the Environment. 2011. Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health. Wellington: Ministry for the Environment.	0.024 mg/kg dry wt	3, 8
Benzo[a]pyrene Toxic Equivalence (TEF)*	Benzo[a]pyrene Toxic Equivalence (TEF) calculated from; Benzo[a]pyrene x 1.0 + Benzo(a)anthracene x 0.1 + Benzo(b) fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Indeno(1,2,3-c,d)pyrene x 0.1. Guidelines for assessing and managing contaminated gasworks sites in New Zealand (GMG) (MfE, 1997).	0.024 mg/kg dry wt	3, 8
TPH Oil Industry Profile + PAHscreen	Sonication extraction, GC-FID and GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8015 and US EPA 8270.	0.010 - 70 mg/kg dry wt	3, 8
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	3, 8
Total Petroleum Hydrocarbons in Soil			
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	3, 8
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	3, 8
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	3, 8
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	3, 8

Sample Type: Roading Material			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Individual Tests			
SHOC Macro Extraction 10x Dilution*		-	1, 6
Macro Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	1, 6
Total Recoverable Arsenic	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 6
Total Recoverable Cadmium*	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg as rcvd	1, 6
Total Recoverable Chromium	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 6
Total Recoverable Copper	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 6
Total Recoverable Lead	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.4 mg/kg as rcvd	1, 6
Total Recoverable Mercury*	Dried sample, Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg dry wt	1, 6
Total Recoverable Nickel	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 6
Total Recoverable Zinc	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	4 mg/kg as rcvd	1, 6
Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn*	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 - 4 mg/kg as rcvd	1, 6
Total Petroleum Hydrocarbons in Rock			
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	1, 6
C7 - C9*	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg as rcvd	1, 6
C10 - C14*	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg as rcvd	1, 6
C15 - C36*	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg as rcvd	1, 6
Total hydrocarbons (C7 - C36)*	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg as rcvd	1, 6

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Certificate of Analysis

Client:	Beca Limited	**Lab No:**	3617400 SPv1
Contact:	Stuart Caird C/- Beca Limited PO Box 13960 Christchurch 8141	**Date Received:**	01-Jul-2024
		Date Reported:	04-Jul-2024
		Quote No:	129425
		Order No:	
		Client Reference:	338703/800
		Submitted By:	Maisie Hopkins

Sample Type: Soil

Sample Name:		TP06_0.1 01-Jul-2024	TP06_0.5 01-Jul-2024	TP08_0.1 01-Jul-2024	TP08_0.5 01-Jul-2024	TP03_0.1 01-Jul-2024
Lab Number:		3617400.1	3617400.3	3617400.10	3617400.12	3617400.17
Individual Tests						
Dry Matter	g/100g as rcvd	84	92	73	88	78
Heavy Metals with Mercury, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	3	4	3	3	3
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	13	14	11	15	10
Total Recoverable Copper	mg/kg dry wt	6	4	4	4	4
Total Recoverable Lead	mg/kg dry wt	33	14.0	14.7	14.0	19.8
Total Recoverable Mercury	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Nickel	mg/kg dry wt	7	11	7	11	6
Total Recoverable Zinc	mg/kg dry wt	54	40	42	46	46
Polycyclic Aromatic Hydrocarbons Screening in Soil*						
Total of Reported PAHs in Soil	mg/kg dry wt	0.9	< 0.3	< 0.4	< 0.3	< 0.3
1-Methylnaphthalene	mg/kg dry wt	< 0.012	< 0.011	< 0.014	< 0.012	< 0.013
2-Methylnaphthalene	mg/kg dry wt	< 0.012	< 0.011	< 0.014	< 0.012	< 0.013
Acenaphthylene	mg/kg dry wt	0.016	< 0.011	< 0.014	< 0.012	< 0.013
Acenaphthene	mg/kg dry wt	< 0.012	< 0.011	< 0.014	< 0.012	< 0.013
Anthracene	mg/kg dry wt	0.019	< 0.011	< 0.014	< 0.012	< 0.013
Benzo[a]anthracene	mg/kg dry wt	0.058	< 0.011	< 0.014	< 0.012	< 0.013
Benzo[a]pyrene (BAP)	mg/kg dry wt	0.067	< 0.011	< 0.014	< 0.012	< 0.013
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	0.100	< 0.026	< 0.032	< 0.027	< 0.030
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	0.098	< 0.026	< 0.032	< 0.027	< 0.030
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	0.074	< 0.011	< 0.014	< 0.012	0.016
Benzo[e]pyrene	mg/kg dry wt	0.035	< 0.011	< 0.014	< 0.012	< 0.013
Benzo[g,h,i]perylene	mg/kg dry wt	0.039	< 0.011	< 0.014	< 0.012	< 0.013
Benzo[k]fluoranthene	mg/kg dry wt	0.032	< 0.011	< 0.014	< 0.012	< 0.013
Chrysene	mg/kg dry wt	0.063	< 0.011	< 0.014	< 0.012	< 0.013
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.012	< 0.011	< 0.014	< 0.012	< 0.013
Fluoranthene	mg/kg dry wt	0.160	< 0.011	< 0.014	< 0.012	0.026
Fluorene	mg/kg dry wt	0.014	< 0.011	< 0.014	< 0.012	< 0.013
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	0.039	< 0.011	< 0.014	< 0.012	< 0.013
Naphthalene	mg/kg dry wt	< 0.06	< 0.06	< 0.07	< 0.06	< 0.07
Perylene	mg/kg dry wt	0.013	< 0.011	< 0.014	< 0.012	< 0.013
Phenanthrene	mg/kg dry wt	0.132	< 0.011	< 0.014	< 0.012	0.019
Pyrene	mg/kg dry wt	0.150	< 0.011	< 0.014	< 0.012	0.030

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The tests reported herein have been performed in accordance with the terms of accreditation, with the exception of tests marked * or any comments and interpretations, which are not accredited.

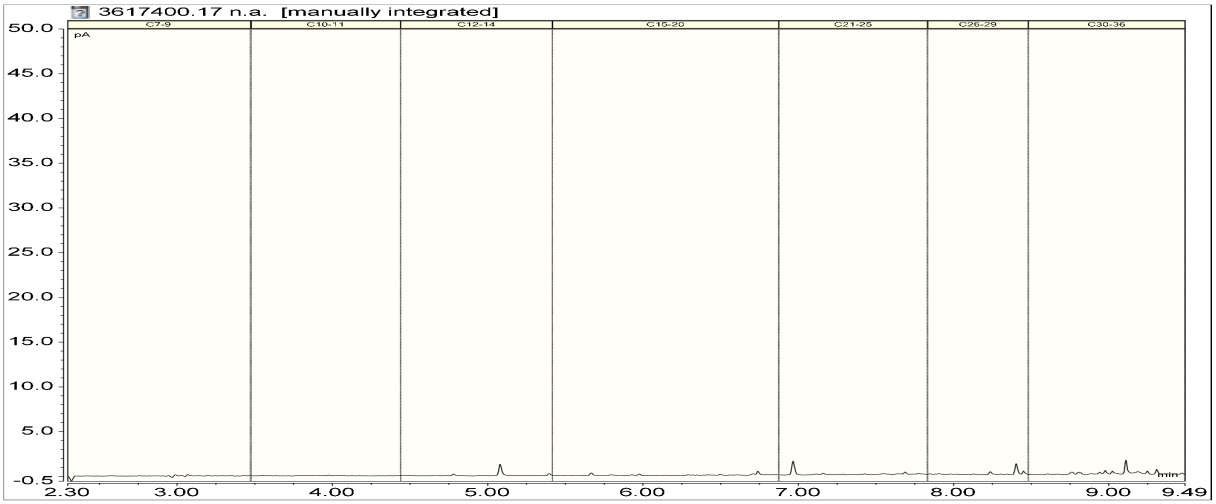
Sample Type: Soil						
Sample Name:		TP06_0.1 01-Jul-2024	TP06_0.5 01-Jul-2024	TP08_0.1 01-Jul-2024	TP08_0.5 01-Jul-2024	TP03_0.1 01-Jul-2024
Lab Number:		3617400.1	3617400.3	3617400.10	3617400.12	3617400.17
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	< 20	< 20	< 20	< 20	< 20
C10 - C14	mg/kg dry wt	< 20	< 20	< 20	< 20	< 20
C15 - C36	mg/kg dry wt	< 40	< 40	< 40	< 40	44
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 80	< 80	< 80	< 80	< 80

Sample Name:		TP03_0.5 01-Jul-2024	DUP_E 01-Jul-2024	BH02_0.1-0.2 01-Jul-2024	BH02_0.5-0.7 01-Jul-2024	IP02_0.1 01-Jul-2024
Lab Number:		3617400.19	3617400.24	3617400.25	3617400.27	3617400.30
Individual Tests						
Dry Matter	g/100g as rcvd	93	92	90	92	82
Heavy Metals with Mercury, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	4	5	3	3	3
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	15	16	14	13	10
Total Recoverable Copper	mg/kg dry wt	4	5	4	5	4
Total Recoverable Lead	mg/kg dry wt	15.3	16.2	15.6	14.1	14.9
Total Recoverable Mercury	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Nickel	mg/kg dry wt	9	11	8	10	7
Total Recoverable Zinc	mg/kg dry wt	40	47	41	44	39
Polycyclic Aromatic Hydrocarbons Screening in Soil*						
Total of Reported PAHs in Soil	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
1-Methylnaphthalene	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.013
2-Methylnaphthalene	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.013
Acenaphthylene	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.013
Acenaphthene	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.013
Anthracene	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.013
Benzo[a]anthracene	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.013
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.013
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	< 0.026	< 0.026	< 0.027	< 0.026	< 0.030
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	< 0.026	< 0.026	< 0.026	< 0.026	< 0.030
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.013
Benzo[e]pyrene	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.013
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.013
Benzo[k]fluoranthene	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.013
Chrysene	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.013
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.013
Fluoranthene	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	0.013
Fluorene	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.013
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.013
Naphthalene	mg/kg dry wt	< 0.06	< 0.06	< 0.06	< 0.06	< 0.07
Perylene	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.013
Phenanthrene	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.013
Pyrene	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	0.013
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	< 20	< 20	< 20	< 20	< 20
C10 - C14	mg/kg dry wt	< 20	< 20	< 20	< 20	< 20
C15 - C36	mg/kg dry wt	< 40	< 40	< 40	62	< 40
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 80	< 80	< 80	< 80	< 80

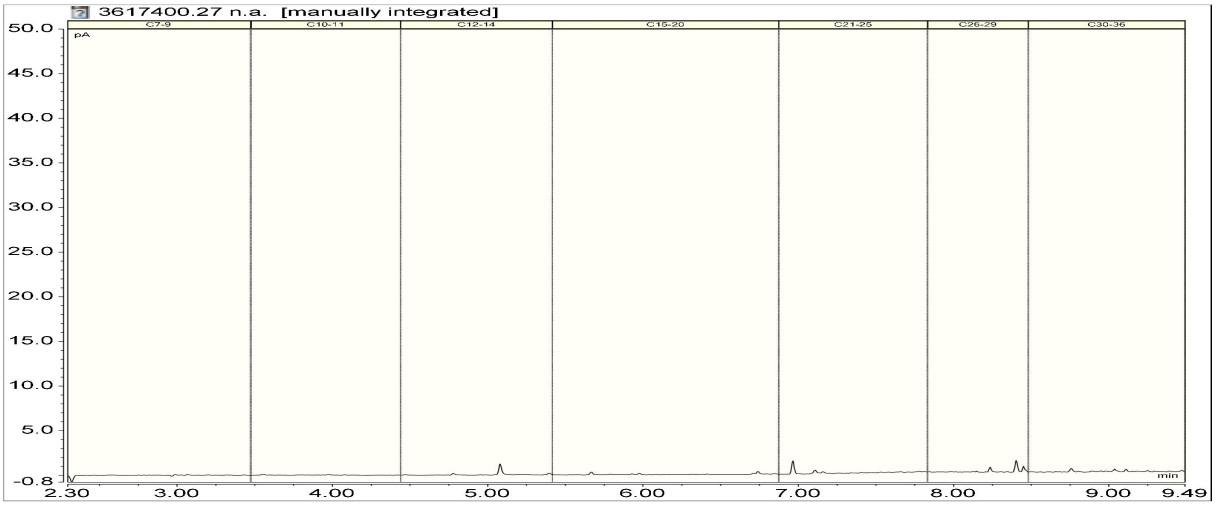
Sample Name:		IP02_0.5 01-Jul-2024
Lab Number:		3617400.32
Individual Tests		
Dry Matter	g/100g as rcvd	88

Sample Type: Soil		
Sample Name:		IP02_0.5 01-Jul-2024
Lab Number:		3617400.32
Heavy Metals with Mercury, Screen Level		
Total Recoverable Arsenic	mg/kg dry wt	5
Total Recoverable Cadmium	mg/kg dry wt	< 0.10
Total Recoverable Chromium	mg/kg dry wt	17
Total Recoverable Copper	mg/kg dry wt	5
Total Recoverable Lead	mg/kg dry wt	19.1
Total Recoverable Mercury	mg/kg dry wt	< 0.10
Total Recoverable Nickel	mg/kg dry wt	12
Total Recoverable Zinc	mg/kg dry wt	58
Polycyclic Aromatic Hydrocarbons Screening in Soil*		
Total of Reported PAHs in Soil	mg/kg dry wt	< 0.3
1-Methylnaphthalene	mg/kg dry wt	< 0.011
2-Methylnaphthalene	mg/kg dry wt	< 0.011
Acenaphthylene	mg/kg dry wt	< 0.011
Acenaphthene	mg/kg dry wt	< 0.011
Anthracene	mg/kg dry wt	< 0.011
Benzo[a]anthracene	mg/kg dry wt	< 0.011
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.011
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	< 0.027
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	< 0.027
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.011
Benzo[e]pyrene	mg/kg dry wt	< 0.011
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.011
Benzo[k]fluoranthene	mg/kg dry wt	< 0.011
Chrysene	mg/kg dry wt	< 0.011
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.011
Fluoranthene	mg/kg dry wt	< 0.011
Fluorene	mg/kg dry wt	< 0.011
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.011
Naphthalene	mg/kg dry wt	< 0.06
Perylene	mg/kg dry wt	< 0.011
Phenanthrene	mg/kg dry wt	< 0.011
Pyrene	mg/kg dry wt	< 0.011
Total Petroleum Hydrocarbons in Soil		
C7 - C9	mg/kg dry wt	< 20
C10 - C14	mg/kg dry wt	< 20
C15 - C36	mg/kg dry wt	< 40
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 80

3617400.17
TP03_0.1 01-Jul-2024
Client Chromatogram for TPH by FID



3617400.27
BH02_0.5-0.7 01-Jul-2024
Client Chromatogram for TPH by FID



Summary of Methods

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

Sample Type: Soil

Test	Method Description	Default Detection Limit	Sample No
Individual Tests			
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	1, 3, 10, 12, 17, 19, 24-25, 27, 30, 32
Total of Reported PAHs in Soil	Sonication extraction, GC-MS/MS analysis. In-house based on US EPA 8270.	0.03 mg/kg dry wt	1, 3, 10, 12, 17, 19, 24-25, 27, 30, 32
Dry Matter	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	1, 3, 10, 12, 17, 19, 24-25, 27, 30, 32

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	BaP Potency Equivalence calculated from; Benzo(a)anthracene x 0.1 + Benzo(b)fluoranthene x 0.1 + Benzo(j)fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Benzo(a)pyrene x 1.0 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Fluoranthene x 0.01 + Indeno(1,2,3-c,d)pyrene x 0.1. Ministry for the Environment. 2011. Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health. Wellington: Ministry for the Environment.	0.024 mg/kg dry wt	1, 3, 10, 12, 17, 19, 24-25, 27, 30, 32
Benzo[a]pyrene Toxic Equivalence (TEF)*	Benzo[a]pyrene Toxic Equivalence (TEF) calculated from; Benzo[a]pyrene x 1.0 + Benzo(a)anthracene x 0.1 + Benzo(b) fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Indeno(1,2,3-c,d)pyrene x 0.1. Guidelines for assessing and managing contaminated gasworks sites in New Zealand (GMG) (MfE, 1997).	0.024 mg/kg dry wt	1, 3, 10, 12, 17, 19, 24-25, 27, 30, 32
TPH Oil Industry Profile + PAHscreen	Sonication extraction, GC-FID and GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8015 and US EPA 8270.	0.010 - 70 mg/kg dry wt	1, 3, 10, 12, 17, 19, 24-25, 27, 30, 32
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, 3, 10, 12, 17, 19, 24-25, 27, 30, 32
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.	-	17, 27
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	1, 3, 10, 12, 17, 19, 24-25, 27, 30, 32
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, 3, 10, 12, 17, 19, 24-25, 27, 30, 32
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, 3, 10, 12, 17, 19, 24-25, 27, 30, 32
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, 3, 10, 12, 17, 19, 24-25, 27, 30, 32

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

Testing was completed between 02-Jul-2024 and 04-Jul-2024. For completion dates of individual analyses please contact the laboratory.

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

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

Ara Heron BSc (Tech)
Client Services Manager - Environmental

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www.hill-labs.co.nz

Certificate of Analysis

Client:	Beca Limited	**Lab No:**	3626395 SPv1
Contact:	Stuart Caird C/- Beca Limited PO Box 13960 Christchurch 8141	**Date Received:** **Date Reported:** **Quote No:** **Order No:** **Client Reference:** **Submitted By:**	12-Jul-2024 23-Jul-2024 129425 3338703/800 Rolleston 338703 Stuart Caird

Sample Type: Soil

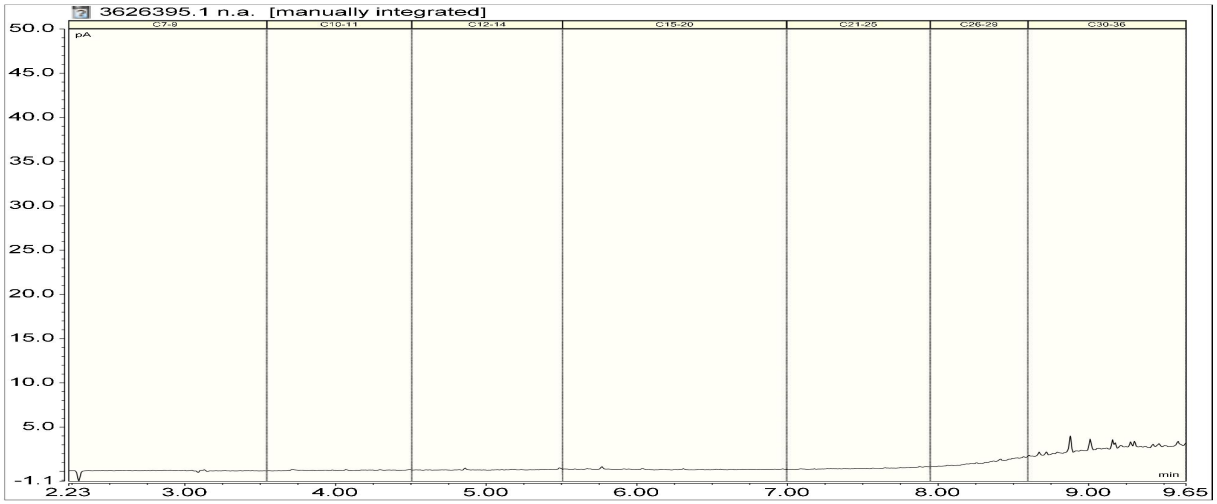
		Sample Name:	PP18_0.15 12-Jul-2024	PP04_0.1 12-Jul-2024
		Lab Number:	3626395.2	3626395.8
Individual Tests				
Dry Matter	g/100g as rcvd		97	97
Heavy Metals with Mercury, Screen Level				
Total Recoverable Arsenic	mg/kg dry wt		4	4
Total Recoverable Cadmium	mg/kg dry wt		< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt		12	12
Total Recoverable Copper	mg/kg dry wt		7	9
Total Recoverable Lead	mg/kg dry wt		12.8	26
Total Recoverable Mercury	mg/kg dry wt		< 0.10	< 0.10
Total Recoverable Nickel	mg/kg dry wt		10	11
Total Recoverable Zinc	mg/kg dry wt		41	45
Polycyclic Aromatic Hydrocarbons Screening in Soil*				
Total of Reported PAHs in Soil	mg/kg dry wt		< 0.3	< 0.3
1-Methylnaphthalene	mg/kg dry wt		< 0.010	< 0.010
2-Methylnaphthalene	mg/kg dry wt		< 0.010	< 0.018
Acenaphthylene	mg/kg dry wt		< 0.010	< 0.010
Acenaphthene	mg/kg dry wt		< 0.010	< 0.010
Anthracene	mg/kg dry wt		< 0.010	< 0.010
Benzo[a]anthracene	mg/kg dry wt		< 0.010	< 0.010
Benzo[a]pyrene (BAP)	mg/kg dry wt		< 0.010	< 0.010
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt		< 0.025	< 0.025
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt		< 0.025	< 0.025
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt		< 0.010	< 0.010
Benzo[e]pyrene	mg/kg dry wt		< 0.010	< 0.010
Benzo[g,h,i]perylene	mg/kg dry wt		< 0.010	< 0.010
Benzo[k]fluoranthene	mg/kg dry wt		< 0.010	< 0.010
Chrysene	mg/kg dry wt		< 0.010	< 0.010
Dibenzo[a,h]anthracene	mg/kg dry wt		< 0.010	< 0.010
Fluoranthene	mg/kg dry wt		< 0.010	< 0.010
Fluorene	mg/kg dry wt		< 0.010	< 0.010
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt		< 0.010	< 0.010
Naphthalene	mg/kg dry wt		< 0.05	< 0.05
Perylene	mg/kg dry wt		< 0.010	< 0.010
Phenanthrene	mg/kg dry wt		< 0.010	< 0.010
Pyrene	mg/kg dry wt		< 0.010	< 0.010

This Laboratory is accredited by International Accreditation New Zealand (IANZ), which represents New Zealand in the International Laboratory Accreditation Cooperation (ILAC). Through the ILAC Mutual Recognition Arrangement (ILAC-MRA) this accreditation is internationally recognised.
The tests reported herein have been performed in accordance with the terms of accreditation, with the exception of tests marked * or any comments and interpretations, which are not accredited.

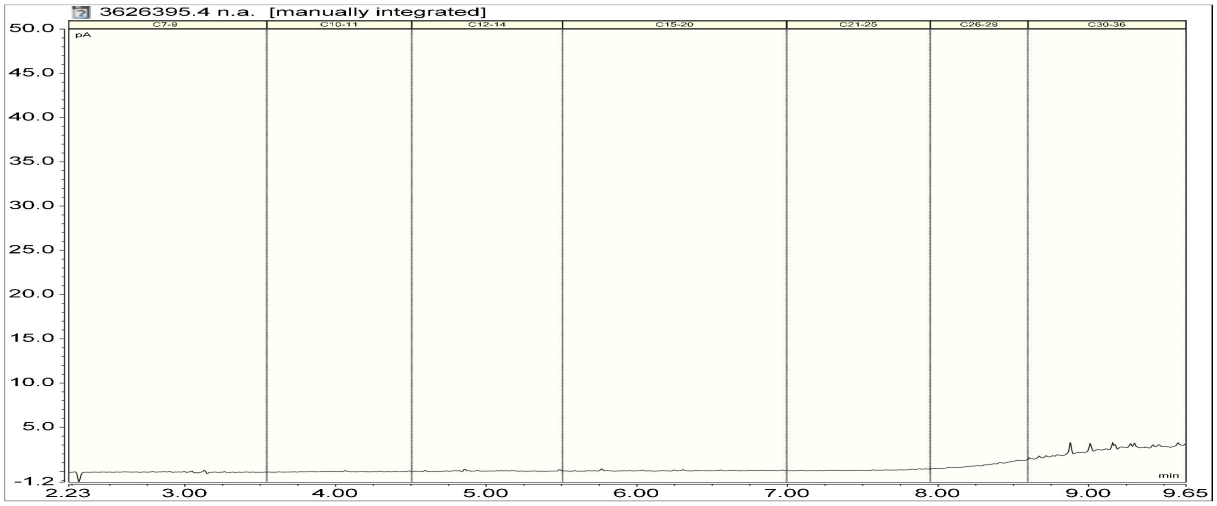
Sample Type: Soil			
Sample Name:		PP18_0.15 12-Jul-2024	PP04_0.1 12-Jul-2024
Lab Number:		3626395.2	3626395.8
Total Petroleum Hydrocarbons in Soil			
C7 - C9	mg/kg dry wt	< 20	< 20
C10 - C14	mg/kg dry wt	< 20	< 20
C15 - C36	mg/kg dry wt	< 40	< 40
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 80	< 80

Sample Type: Roading Material					
Sample Name:		PP18_0.05 12-Jul-2024	PP18_0.35 12-Jul-2024	PP04_0.05 12-Jul-2024	PP04_0.15 12-Jul-2024
Lab Number:		3626395.1	3626395.4	3626395.7	3626395.9
Individual Tests					
Total Recoverable Mercury*	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10
Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn*					
Total Recoverable Arsenic	mg/kg as rcvd	< 2	< 2	< 2	< 2
Total Recoverable Cadmium*	mg/kg as rcvd	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg as rcvd	4	6	3	4
Total Recoverable Copper	mg/kg as rcvd	19	4	7	4
Total Recoverable Lead	mg/kg as rcvd	15.2	46	8.0	70
Total Recoverable Nickel	mg/kg as rcvd	9	4	4	3
Total Recoverable Zinc	mg/kg as rcvd	35	18	29	17
Polycyclic Aromatic Hydrocarbons Screening in Rock*					
1-Methylnaphthalene*	mg/kg as rcvd	0.15	< 0.10	0.18	< 0.10
2-Methylnaphthalene*	mg/kg as rcvd	0.12	< 0.10	0.13	< 0.10
Acenaphthylene*	mg/kg as rcvd	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthene*	mg/kg as rcvd	< 0.10	< 0.10	< 0.10	< 0.10
Anthracene*	mg/kg as rcvd	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[a]anthracene*	mg/kg as rcvd	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene (BAP)*	mg/kg as rcvd	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg as rcvd	< 0.24	< 0.24	< 0.24	< 0.24
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg as rcvd	< 0.3	< 0.3	< 0.3	< 0.3
Benzo[b]fluoranthene + Benzo[j] fluoranthene*	mg/kg as rcvd	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[e]pyrene*	mg/kg as rcvd	0.12	< 0.10	0.15	< 0.10
Benzo[g,h,i]perylene*	mg/kg as rcvd	0.10	< 0.10	0.12	< 0.10
Benzo[k]fluoranthene*	mg/kg as rcvd	< 0.10	< 0.10	< 0.10	< 0.10
Chrysene*	mg/kg as rcvd	< 0.10	< 0.10	< 0.10	< 0.10
Dibenzo[a,h]anthracene*	mg/kg as rcvd	< 0.10	< 0.10	< 0.10	< 0.10
Fluoranthene*	mg/kg as rcvd	< 0.10	< 0.10	< 0.10	< 0.10
Fluorene*	mg/kg as rcvd	< 0.10	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)pyrene*	mg/kg as rcvd	< 0.10	< 0.10	< 0.10	< 0.10
Naphthalene*	mg/kg as rcvd	< 0.5	< 0.5	< 0.5	< 0.5
Perylene*	mg/kg as rcvd	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene*	mg/kg as rcvd	< 0.10	0.11	< 0.10	< 0.10
Pyrene*	mg/kg as rcvd	0.17	< 0.10	0.25	< 0.10
Total of Reported PAHs*	mg/kg as rcvd	< 3	< 3	< 3	< 3
Total Petroleum Hydrocarbons in Rock*					
C7 - C9*	mg/kg as rcvd	< 140	< 140	< 140	< 140
C10 - C14*	mg/kg as rcvd	< 120	< 120	< 120	< 120
C15 - C36*	mg/kg as rcvd	1,780	1,670	2,800	840
Total hydrocarbons (C7 - C36)*	mg/kg as rcvd	1,830	1,730	2,800	850

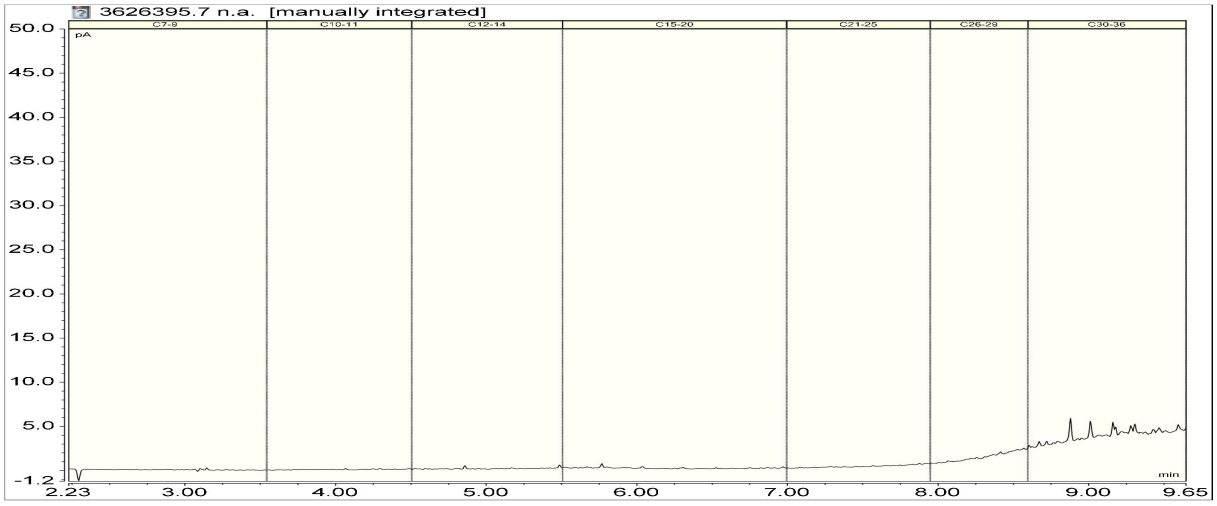
3626395.1
PP18_0.05 12-Jul-2024
Client Chromatogram for TPH by FID



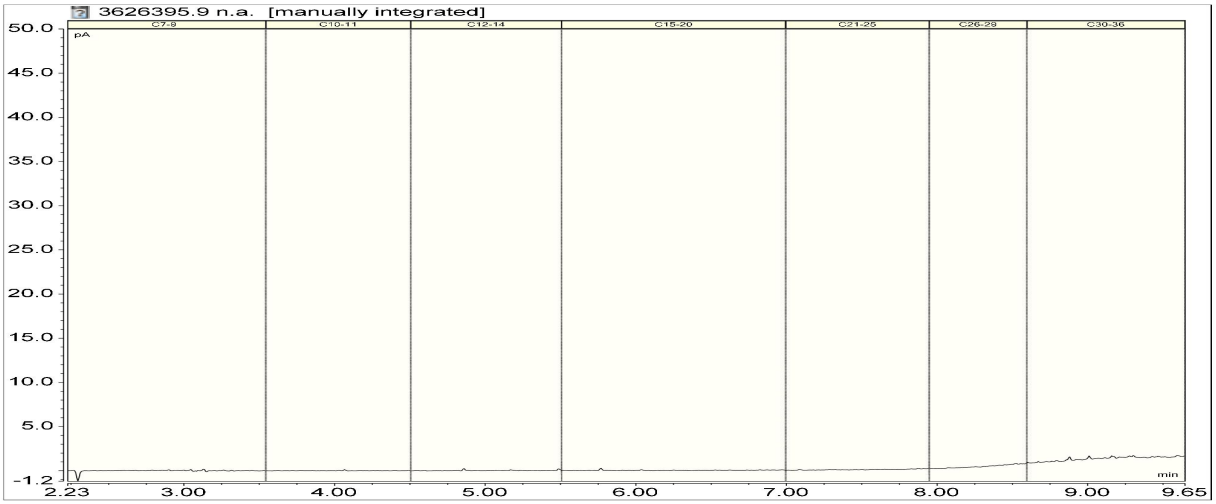
3626395.4
PP18_0.35 12-Jul-2024
Client Chromatogram for TPH by FID



3626395.7
PP04_0.05 12-Jul-2024
Client Chromatogram for TPH by FID



3626395.9
PP04_0.15 12-Jul-2024
Client Chromatogram for TPH by FID



Summary of Methods

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

Sample Type: Soil

Test	Method Description	Default Detection Limit	Sample No
Individual Tests			
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	2, 8
Total of Reported PAHs in Soil	Sonication extraction, GC-MS/MS analysis. In-house based on US EPA 8270.	0.03 mg/kg dry wt	2, 8
Dry Matter	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	2, 8
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	BaP Potency Equivalence calculated from; Benzo(a)anthracene x 0.1 + Benzo(b)fluoranthene x 0.1 + Benzo(j)fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Benzo(a)pyrene x 1.0 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Fluoranthene x 0.01 + Indeno(1,2,3-c,d)pyrene x 0.1. Ministry for the Environment. 2011. Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health. Wellington: Ministry for the Environment.	0.024 mg/kg dry wt	2, 8
Benzo[a]pyrene Toxic Equivalence (TEF)*	Benzo[a]pyrene Toxic Equivalence (TEF) calculated from; Benzo[a]pyrene x 1.0 + Benzo(a)anthracene x 0.1 + Benzo(b) fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Indeno(1,2,3-c,d)pyrene x 0.1. Guidelines for assessing and managing contaminated gasworks sites in New Zealand (GMG) (MfE, 1997).	0.024 mg/kg dry wt	2, 8
TPH Oil Industry Profile + PAHscreen	Sonication extraction, GC-FID and GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8015 and US EPA 8270.	0.010 - 70 mg/kg dry wt	2, 8
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, 8
Total Petroleum Hydrocarbons in Soil			
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	2, 8
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, 8
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, 8
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, 8

Sample Type: Roading Material			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Individual Tests			
SHOC Macro Extraction 10x Dilution*		-	1, 4, 7, 9
Macro Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	1, 4, 7, 9
Total Recoverable Arsenic	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 4, 7, 9
Total Recoverable Cadmium*	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg as rcvd	1, 4, 7, 9
Total Recoverable Chromium	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 4, 7, 9
Total Recoverable Copper	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 4, 7, 9
Total Recoverable Lead	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.4 mg/kg as rcvd	1, 4, 7, 9
Total Recoverable Mercury*	Dried sample, Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg dry wt	1, 4, 7, 9
Total Recoverable Nickel	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 4, 7, 9
Total Recoverable Zinc	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	4 mg/kg as rcvd	1, 4, 7, 9
Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn*	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 - 4 mg/kg as rcvd	1, 4, 7, 9
Total Petroleum Hydrocarbons in Rock			
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	1, 4, 7, 9
C7 - C9*	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg as rcvd	1, 4, 7, 9
C10 - C14*	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg as rcvd	1, 4, 7, 9
C15 - C36*	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg as rcvd	1, 4, 7, 9
Total hydrocarbons (C7 - C36)*	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg as rcvd	1, 4, 7, 9

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

Testing was completed between 13-Jul-2024 and 23-Jul-2024. For completion dates of individual analyses please contact the laboratory.

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

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

Graham Corban MSc Tech (Hons)
Client Services Manager - Environmental

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Certificate of Analysis

Client:	Beca Limited	**Lab No:**	3631687	SPv1
Contact:	Stuart Caird	**Date Received:**	19-Jul-2024	
	C/- Beca Limited	**Date Reported:**	26-Jul-2024	
	PO Box 13960	**Quote No:**	129425	
	Christchurch 8141	**Order No:**		
		Client Reference:	3338703/800	
		Submitted By:	Stuart Caird	

Sample Type: Soil

Sample Name:		TP02_0.1 19-Jul-2024	TP02_0.5 19-Jul-2024	TP04_0.1 19-Jul-2024	TP04_0.5 19-Jul-2024	TP04_1.0 19-Jul-2024
Lab Number:		3631687.1	3631687.3	3631687.7	3631687.8	3631687.10
Individual Tests						
Dry Matter	g/100g as rcvd	79	91	94	89	89
Heavy Metals with Mercury, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	3	4	4	4	4
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	11	15	14	14	13
Total Recoverable Copper	mg/kg dry wt	9	4	15	11	5
Total Recoverable Lead	mg/kg dry wt	25	14.9	35	67	12.7
Total Recoverable Mercury	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Nickel	mg/kg dry wt	7	9	11	11	10
Total Recoverable Zinc	mg/kg dry wt	49	56	51	64	32
BTEX in Soil by Headspace GC-MS						
Benzene	mg/kg dry wt	< 0.06	< 0.05	< 0.05	< 0.05	< 0.05
Toluene	mg/kg dry wt	< 0.06	< 0.05	< 0.05	< 0.05	< 0.05
Ethylbenzene	mg/kg dry wt	< 0.06	< 0.05	< 0.05	< 0.05	< 0.05
m&p-Xylene	mg/kg dry wt	< 0.11	< 0.10	< 0.10	< 0.10	< 0.10
o-Xylene	mg/kg dry wt	< 0.06	< 0.05	< 0.05	< 0.05	< 0.05
Haloethers Trace in SVOC Soil Samples by GC-MS						
Bis(2-chloroethoxy) methane	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Bis(2-chloroethyl)ether	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Bis(2-chloroisopropyl)ether	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
4-Bromophenyl phenyl ether	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
4-Chlorophenyl phenyl ether	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Nitrogen containing compounds Trace in SVOC Soil Samples, GC-MS						
N-Nitrosodiphenylamine + Diphenylamine	mg/kg dry wt	< 0.14	< 0.12	< 0.12	< 0.12	< 0.13
2,4-Dinitrotoluene	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
2,6-Dinitrotoluene	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Nitrobenzene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
N-Nitrosodi-n-propylamine	mg/kg dry wt	< 0.14	< 0.12	< 0.12	< 0.12	< 0.13
Organochlorine Pesticides Trace in SVOC Soil Samples by GC-MS						
Aldrin	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
alpha-BHC	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
beta-BHC	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
delta-BHC	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
gamma-BHC (Lindane)	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
4,4'-DDD	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
4,4'-DDE	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
4,4'-DDT	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2

This Laboratory is accredited by International Accreditation New Zealand (IANZ), which represents New Zealand in the International Laboratory Accreditation Cooperation (ILAC). Through the ILAC Mutual Recognition Arrangement (ILAC-MRA) this accreditation is internationally recognised.
The tests reported herein have been performed in accordance with the terms of accreditation, with the exception of tests marked * or any comments and interpretations, which are not accredited.

Sample Type: Soil						
Sample Name:		TP02_0.1 19-Jul-2024	TP02_0.5 19-Jul-2024	TP04_0.1 19-Jul-2024	TP04_0.5 19-Jul-2024	TP04_1.0 19-Jul-2024
Lab Number:		3631687.1	3631687.3	3631687.7	3631687.8	3631687.10
Organochlorine Pesticides Trace in SVOC Soil Samples by GC-MS						
Dieldrin	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Endosulfan I	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Endosulfan II	mg/kg dry wt	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Endosulfan sulphate	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Endrin	mg/kg dry wt	< 0.14	< 0.12	< 0.12	< 0.12	< 0.13
Endrin ketone	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Heptachlor	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Heptachlor epoxide	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Hexachlorobenzene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Polycyclic Aromatic Hydrocarbons Trace in SVOC Soil Samples*						
Acenaphthene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthylene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Anthracene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[a]anthracene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	0.33	< 0.10
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.10	< 0.10	< 0.10	0.33	< 0.10
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	0.35	< 0.10
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	0.14	< 0.10
Benzo[k]fluoranthene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	0.14	< 0.10
1&2-Chloronaphthalene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Chrysene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	0.39	< 0.10
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluoranthene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	0.60	< 0.10
Fluorene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	0.17	< 0.10
2-Methylnaphthalene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Naphthalene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	0.37	< 0.10
Pyrene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	0.67	< 0.10
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	< 0.25	< 0.25	< 0.25	0.48	< 0.25
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	< 0.25	< 0.25	< 0.25	0.48	< 0.25
Phenols Trace in SVOC Soil Samples by GC-MS						
4-Chloro-3-methylphenol	mg/kg dry wt	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
2-Chlorophenol	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
2,4-Dichlorophenol	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
2,4-Dimethylphenol	mg/kg dry wt	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
3 & 4-Methylphenol (m- + p-cresol)	mg/kg dry wt	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
2-Methylphenol (o-cresol)	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
2-Nitrophenol	mg/kg dry wt	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
Pentachlorophenol (PCP)	mg/kg dry wt	< 6	< 6	< 6	< 6	< 6
Phenol	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
2,4,5-Trichlorophenol	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
2,4,6-Trichlorophenol	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Plasticisers Trace in SVOC Soil Samples by GC-MS						
Bis(2-ethylhexyl)phthalate	mg/kg dry wt	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Butylbenzylphthalate	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Di(2-ethylhexyl)adipate	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Diethylphthalate	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Dimethylphthalate	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Di-n-butylphthalate	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Di-n-octylphthalate	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2

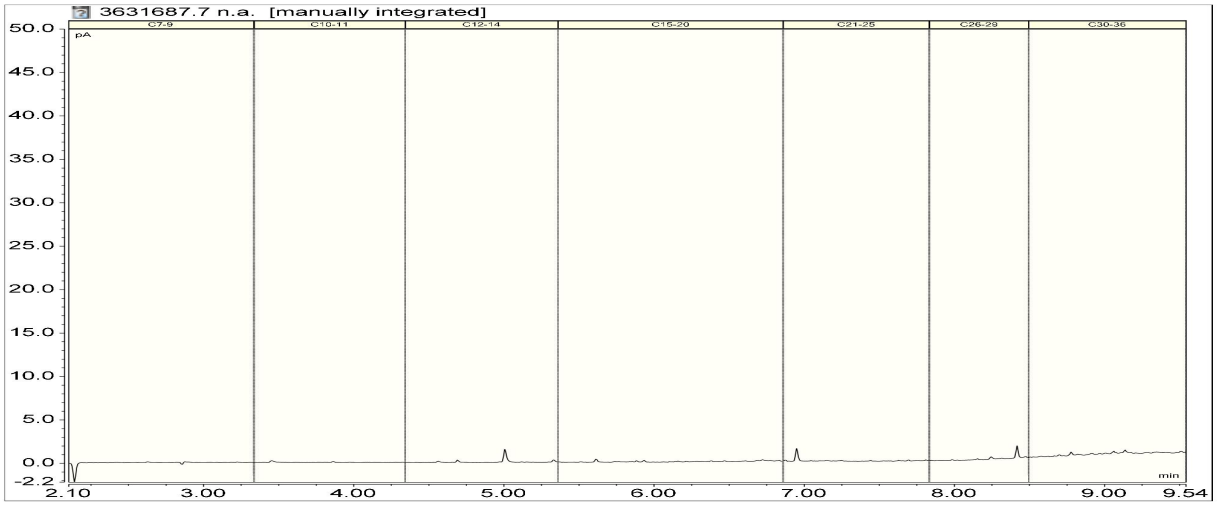
Sample Type: Soil						
Sample Name:		TP02_0.1 19-Jul-2024	TP02_0.5 19-Jul-2024	TP04_0.1 19-Jul-2024	TP04_0.5 19-Jul-2024	TP04_1.0 19-Jul-2024
Lab Number:		3631687.1	3631687.3	3631687.7	3631687.8	3631687.10
Other Halogenated compounds Trace in SVOC Soil Samples by GC-MS						
1,2-Dichlorobenzene	mg/kg dry wt	< 0.14	< 0.12	< 0.12	< 0.12	< 0.13
1,3-Dichlorobenzene	mg/kg dry wt	< 0.14	< 0.12	< 0.12	< 0.12	< 0.13
1,4-Dichlorobenzene	mg/kg dry wt	< 0.14	< 0.12	< 0.12	< 0.12	< 0.13
Hexachlorobutadiene	mg/kg dry wt	< 0.14	< 0.12	< 0.12	< 0.12	< 0.13
Hexachloroethane	mg/kg dry wt	< 0.14	< 0.12	< 0.12	< 0.12	< 0.13
1,2,4-Trichlorobenzene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Other SVOC Trace in SVOC Soil Samples by GC-MS						
Benzyl alcohol	mg/kg dry wt	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Carbazole	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Dibenzofuran	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Isophorone	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	< 20	< 20	< 20	< 20	< 20
C10 - C14	mg/kg dry wt	< 20	< 20	< 20	< 20	< 20
C15 - C36	mg/kg dry wt	< 40	< 40	85	< 40	< 40
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 80	< 80	85	< 80	< 80

Sample Name:		TP04_1.3 19-Jul-2024	TP04_1.5 19-Jul-2024
Lab Number:		3631687.11	3631687.12
Individual Tests			
Dry Matter	g/100g as rcvd	84	86
Total Cyanide*	mg/kg dry wt	< 0.10	< 0.10
Heavy Metals with Mercury, Screen Level			
Total Recoverable Arsenic	mg/kg dry wt	3	3
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	13	12
Total Recoverable Copper	mg/kg dry wt	3	3
Total Recoverable Lead	mg/kg dry wt	12.0	11.6
Total Recoverable Mercury	mg/kg dry wt	< 0.10	< 0.10
Total Recoverable Nickel	mg/kg dry wt	8	8
Total Recoverable Zinc	mg/kg dry wt	48	49
BTEX in Soil by Headspace GC-MS			
Benzene	mg/kg dry wt	< 0.05	< 0.05
Toluene	mg/kg dry wt	< 0.05	< 0.05
Ethylbenzene	mg/kg dry wt	< 0.05	< 0.05
m&p-Xylene	mg/kg dry wt	< 0.10	< 0.10
o-Xylene	mg/kg dry wt	< 0.05	< 0.05
Haloethers Trace in SVOC Soil Samples by GC-MS			
Bis(2-chloroethoxy) methane	mg/kg dry wt	< 0.10	< 0.10
Bis(2-chloroethyl)ether	mg/kg dry wt	< 0.10	< 0.10
Bis(2-chloroisopropyl)ether	mg/kg dry wt	< 0.10	< 0.10
4-Bromophenyl phenyl ether	mg/kg dry wt	< 0.10	< 0.10
4-Chlorophenyl phenyl ether	mg/kg dry wt	< 0.10	< 0.10
Nitrogen containing compounds Trace in SVOC Soil Samples, GC-MS			
N-Nitrosodiphenylamine + Diphenylamine	mg/kg dry wt	< 0.13	< 0.13
2,4-Dinitrotoluene	mg/kg dry wt	< 0.2	< 0.2
2,6-Dinitrotoluene	mg/kg dry wt	< 0.2	< 0.2
Nitrobenzene	mg/kg dry wt	< 0.10	< 0.10
N-Nitrosodi-n-propylamine	mg/kg dry wt	< 0.13	< 0.13
Organochlorine Pesticides Trace in SVOC Soil Samples by GC-MS			
Aldrin	mg/kg dry wt	< 0.10	< 0.10
alpha-BHC	mg/kg dry wt	< 0.10	< 0.10
beta-BHC	mg/kg dry wt	< 0.10	< 0.10
delta-BHC	mg/kg dry wt	< 0.10	< 0.10

Sample Type: Soil			
Sample Name:		TP04_1.3 19-Jul-2024	TP04_1.5 19-Jul-2024
Lab Number:		3631687.11	3631687.12
Organochlorine Pesticides Trace in SVOC Soil Samples by GC-MS			
gamma-BHC (Lindane)	mg/kg dry wt	< 0.10	< 0.10
4,4'-DDD	mg/kg dry wt	< 0.10	< 0.10
4,4'-DDE	mg/kg dry wt	< 0.10	< 0.10
4,4'-DDT	mg/kg dry wt	< 0.2	< 0.2
Dieldrin	mg/kg dry wt	< 0.10	< 0.10
Endosulfan I	mg/kg dry wt	< 0.2	< 0.2
Endosulfan II	mg/kg dry wt	< 0.5	< 0.5
Endosulfan sulphate	mg/kg dry wt	< 0.2	< 0.2
Endrin	mg/kg dry wt	< 0.13	< 0.13
Endrin ketone	mg/kg dry wt	< 0.2	< 0.2
Heptachlor	mg/kg dry wt	< 0.10	< 0.10
Heptachlor epoxide	mg/kg dry wt	< 0.10	< 0.10
Hexachlorobenzene	mg/kg dry wt	< 0.10	< 0.10
Polycyclic Aromatic Hydrocarbons Trace in SVOC Soil Samples*			
Acenaphthene	mg/kg dry wt	< 0.10	< 0.10
Acenaphthylene	mg/kg dry wt	< 0.10	< 0.10
Anthracene	mg/kg dry wt	< 0.10	< 0.10
Benzo[a]anthracene	mg/kg dry wt	< 0.10	< 0.10
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.10	< 0.10
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.10	< 0.10
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.10	< 0.10
Benzo[k]fluoranthene	mg/kg dry wt	< 0.10	< 0.10
1&2-Chloronaphthalene	mg/kg dry wt	< 0.10	< 0.10
Chrysene	mg/kg dry wt	< 0.10	< 0.10
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.10	< 0.10
Fluoranthene	mg/kg dry wt	< 0.10	< 0.10
Fluorene	mg/kg dry wt	< 0.10	< 0.10
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.10	< 0.10
2-Methylnaphthalene	mg/kg dry wt	< 0.10	< 0.10
Naphthalene	mg/kg dry wt	< 0.10	< 0.10
Phenanthrene	mg/kg dry wt	< 0.10	< 0.10
Pyrene	mg/kg dry wt	< 0.10	< 0.10
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	< 0.25	< 0.25
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	< 0.25	< 0.25
Phenols Trace in SVOC Soil Samples by GC-MS			
4-Chloro-3-methylphenol	mg/kg dry wt	< 0.5	< 0.5
2-Chlorophenol	mg/kg dry wt	< 0.2	< 0.2
2,4-Dichlorophenol	mg/kg dry wt	< 0.2	< 0.2
2,4-Dimethylphenol	mg/kg dry wt	< 0.4	< 0.4
3 & 4-Methylphenol (m- + p-cresol)	mg/kg dry wt	< 0.4	< 0.4
2-Methylphenol (o-cresol)	mg/kg dry wt	< 0.2	< 0.2
2-Nitrophenol	mg/kg dry wt	< 0.4	< 0.4
Pentachlorophenol (PCP)	mg/kg dry wt	< 6	< 6
Phenol	mg/kg dry wt	< 0.2	< 0.2
2,4,5-Trichlorophenol	mg/kg dry wt	< 0.2	< 0.2
2,4,6-Trichlorophenol	mg/kg dry wt	< 0.2	< 0.2
Plasticisers Trace in SVOC Soil Samples by GC-MS			
Bis(2-ethylhexyl)phthalate	mg/kg dry wt	< 0.5	< 0.5
Butylbenzylphthalate	mg/kg dry wt	< 0.2	< 0.2
Di(2-ethylhexyl)adipate	mg/kg dry wt	< 0.2	< 0.2
Diethylphthalate	mg/kg dry wt	< 0.2	< 0.2
Dimethylphthalate	mg/kg dry wt	< 0.2	< 0.2

Sample Type: Soil			
Sample Name:		TP04_1.3 19-Jul-2024	TP04_1.5 19-Jul-2024
Lab Number:		3631687.11	3631687.12
Plasticisers Trace in SVOC Soil Samples by GC-MS			
Di-n-butylphthalate	mg/kg dry wt	< 0.2	< 0.2
Di-n-octylphthalate	mg/kg dry wt	< 0.2	< 0.2
Other Halogenated compounds Trace in SVOC Soil Samples by GC-MS			
1,2-Dichlorobenzene	mg/kg dry wt	< 0.13	< 0.13
1,3-Dichlorobenzene	mg/kg dry wt	< 0.13	< 0.13
1,4-Dichlorobenzene	mg/kg dry wt	< 0.13	< 0.13
Hexachlorobutadiene	mg/kg dry wt	< 0.13	< 0.13
Hexachloroethane	mg/kg dry wt	< 0.13	< 0.13
1,2,4-Trichlorobenzene	mg/kg dry wt	< 0.10	< 0.10
Other SVOC Trace in SVOC Soil Samples by GC-MS			
Benzyl alcohol	mg/kg dry wt	< 1.0	< 1.0
Carbazole	mg/kg dry wt	< 0.10	< 0.10
Dibenzofuran	mg/kg dry wt	< 0.10	< 0.10
Isophorone	mg/kg dry wt	< 0.10	< 0.10
Total Petroleum Hydrocarbons in Soil			
C7 - C9	mg/kg dry wt	< 20	< 20
C10 - C14	mg/kg dry wt	< 20	< 20
C15 - C36	mg/kg dry wt	< 40	< 40
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 80	< 80

3631687.7
TP04_0.1 19-Jul-2024
Client Chromatogram for TPH by FID



Summary of Methods

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

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Individual Tests			
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	1, 3, 7-8, 10-12
Dry Matter	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	1, 3, 7-8, 10-12
Total Cyanide Distillation*	Distillation of sample as received. APHA 4500-CN^- C (modified) : Online Edition.	-	11-12

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Total Cyanide*	Distillation, colorimetry. APHA 4500-CN^- C (modified) : Online Edition & Skalar Method I295-004(+P14). ISO 14403:2012(E).	0.10 mg/kg dry wt	11-12
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, 3, 7-8, 10-12
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, 3, 7-8, 10-12
Semivolatile Organic Compounds Trace in Soil by GC-MS	Sonication extraction, GC-MS analysis. Tested on as received sample. In-house based on US EPA 8270.	0.10 - 6 mg/kg dry wt	1, 3, 7-8, 10-12
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.	-	7
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	1, 3, 7-8, 10-12
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, 3, 7-8, 10-12
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, 3, 7-8, 10-12
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, 3, 7-8, 10-12

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

Testing was completed between 22-Jul-2024 and 26-Jul-2024. For completion dates of individual analyses please contact the laboratory.

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

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Graham Corban MSc Tech (Hons)
Client Services Manager - Environmental

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Middleton
Christchurch 8024 New Zealand

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+64 7 858 2000
mail@hill-labs.co.nz
www.hill-labs.co.nz

Certificate of Analysis

Client:	Beca Limited	**Lab No:**	3631688	A2Pv1
Contact:	Stuart Caird	**Date Received:**	19-Jul-2024	
	C/- Beca Limited	**Date Reported:**	24-Jul-2024	
	PO Box 13960	**Quote No:**	129425	
	Christchurch 8141	**Order No:**		
		Client Reference:	3338703/800	
		Submitted By:	Stuart Caird	

Sample Type: Soil

Sample Name:		TP02_0.1 19-Jul-2024	TP02_0.5 19-Jul-2024	TP04_0.1 19-Jul-2024	TP04_0.5 19-Jul-2024	TP04_1.0 19-Jul-2024
Lab Number:		3631688.1	3631688.3	3631688.7	3631688.8	3631688.10
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	655.8	1,047.2	1,107.4	1,033.0	1,144.6
Dry Weight	g	551.3	985.8	1,055.5	952.5	1,090.8
Moisture*	%	16	6	5	8	5
Sample Fraction >10mm	g dry wt	1.3	448.3	509.8	402.3	533.6
Sample Fraction <10mm to >2mm	g dry wt	11.4	352.0	357.3	315.7	281.3
Sample Fraction <2mm	g dry wt	532.9	184.4	187.1	233.4	274.7
<2mm Subsample Weight	g dry wt	50.9	50.5	53.0	52.9	58.0
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:		TP04_1.3 19-Jul-2024	TP04_1.5 19-Jul-2024
Lab Number:		3631688.11	3631688.12
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	885.1	1,042.7
Dry Weight	g	744.2	964.2
Moisture*	%	16	8
Sample Fraction >10mm	g dry wt	6.4	344.2

This Laboratory is accredited by International Accreditation New Zealand (IANZ), which represents New Zealand in the International Laboratory Accreditation Cooperation (ILAC). Through the ILAC Mutual Recognition Arrangement (ILAC-MRA) this accreditation is internationally recognised.
The tests reported herein have been performed in accordance with the terms of accreditation, with the exception of tests marked * or any comments and interpretations, which are not accredited.

Sample Type: Soil			
Sample Name:		TP04_1.3 19-Jul-2024	TP04_1.5 19-Jul-2024
Lab Number:		3631688.11	3631688.12
Sample Fraction <10mm to >2mm	g dry wt	26.4	390.7
Sample Fraction <2mm	g dry wt	710.3	226.4
<2mm Subsample Weight	g dry wt	53.5	54.1
Weight of Asbestos in ACM (Non-Friable)	g dry wt	< 0.00001	< 0.00001
Weight of Asbestos as Fibrous Asbestos (Friable)	g dry wt	< 0.00001	< 0.00001
Weight of Asbestos as Asbestos Fines (Friable)*	g dry wt	< 0.00001	< 0.00001

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

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

The following assumptions have been made:

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

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

Summary of Methods

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

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
New Zealand Guidelines Semi Quantitative Asbestos in Soil			
As Received Weight	Measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g	1, 3, 7-8, 10-12
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g	1, 3, 7-8, 10-12
Moisture*	Sample dried at 100 to 105°C. Calculation = (As received weight - Dry weight) / as received weight x 100.	1 %	1, 3, 7-8, 10-12
Sample Fraction >10mm	Sample dried at 100 to 105°C, 10mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1, 3, 7-8, 10-12
Sample Fraction <10mm to >2mm	Sample dried at 100 to 105°C, 10mm and 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1, 3, 7-8, 10-12
Sample Fraction <2mm	Sample dried at 100 to 105°C, 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1, 3, 7-8, 10-12
Asbestos Presence / Absence	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0.01%	1, 3, 7-8, 10-12
Description of Asbestos Form	Description of asbestos form and/or shape if present.	-	1, 3, 7-8, 10-12
Weight of Asbestos in ACM (Non-Friable)	Measurement on analytical balance, from the >10mm Fraction. Weight of asbestos based on assessment of ACM form. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 3, 7-8, 10-12

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
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, 3, 7-8, 10-12
Weight of Asbestos as Fibrous Asbestos (Friable)	Measurement on analytical balance, from the >10mm Fraction. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 3, 7-8, 10-12
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, 3, 7-8, 10-12
Weight of Asbestos as Asbestos Fines (Friable)*	Measurement on analytical balance, from the <10mm Fractions. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 3, 7-8, 10-12
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, 3, 7-8, 10-12
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, 3, 7-8, 10-12

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

Testing was completed on 24-Jul-2024. For completion dates of individual analyses please contact the laboratory.

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

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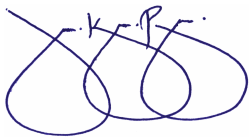

John Keneth Paglingayen BApSc
Laboratory Technician - Asbestos

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www.hill-labs.co.nz

Certificate of Analysis

Client:	Beca Limited	**Lab No:**	3640488	SPv1
Contact:	Stuart Caird	**Date Received:**	01-Aug-2024	
	C/- Beca Limited	**Date Reported:**	08-Aug-2024	
	PO Box 13960	**Quote No:**	129425	
	Christchurch 8141	**Order No:**		
		Client Reference:	3338703/800	
		Submitted By:	Stuart Caird	

Sample Type: Soil

		Sample Name:	IP03_0.1 01-Aug-2024	IP03_0.5 01-Aug-2024	Dup_L 01-Aug-2024	TP11_0.1 01-Aug-2024	TP11_0.5 01-Aug-2024
		Lab Number:	3640488.1	3640488.3	3640488.8	3640488.9	3640488.11
Individual Tests							
Dry Matter	g/100g as rcvd		76	89	75	78	92
Total Recoverable Antimony	mg/kg dry wt		< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
Total Recoverable Tin	mg/kg dry wt		1.3	1.1	1.4	1.1	< 1.0
Heavy Metals with Mercury, Screen Level							
Total Recoverable Arsenic	mg/kg dry wt		4	5	3	3	4
Total Recoverable Cadmium	mg/kg dry wt		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt		12	16	13	12	16
Total Recoverable Copper	mg/kg dry wt		4	5	4	4	5
Total Recoverable Lead	mg/kg dry wt		25	16.5	25	31	13.2
Total Recoverable Mercury	mg/kg dry wt		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Nickel	mg/kg dry wt		8	12	8	8	12
Total Recoverable Zinc	mg/kg dry wt		80	48	83	55	40
Haloethers Trace in SVOC Soil Samples by GC-MS							
Bis(2-chloroethoxy) methane	mg/kg dry wt		< 0.16	< 0.14	< 0.17	< 0.16	< 0.14
Bis(2-chloroethyl)ether	mg/kg dry wt		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Bis(2-chloroisopropyl)ether	mg/kg dry wt		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
4-Bromophenyl phenyl ether	mg/kg dry wt		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
4-Chlorophenyl phenyl ether	mg/kg dry wt		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Nitrogen containing compounds Trace in SVOC Soil Samples, GC-MS							
N-Nitrosodiphenylamine + Diphenylamine	mg/kg dry wt		< 0.16	< 0.14	< 0.17	< 0.16	< 0.14
2,4-Dinitrotoluene	mg/kg dry wt		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
2,6-Dinitrotoluene	mg/kg dry wt		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Nitrobenzene	mg/kg dry wt		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
N-Nitrosodi-n-propylamine	mg/kg dry wt		< 0.16	< 0.14	< 0.17	< 0.16	< 0.14
Organochlorine Pesticides Trace in SVOC Soil Samples by GC-MS							
Aldrin	mg/kg dry wt		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
alpha-BHC	mg/kg dry wt		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
beta-BHC	mg/kg dry wt		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
delta-BHC	mg/kg dry wt		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
gamma-BHC (Lindane)	mg/kg dry wt		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
4,4'-DDD	mg/kg dry wt		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
4,4'-DDE	mg/kg dry wt		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
4,4'-DDT	mg/kg dry wt		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Dieldrin	mg/kg dry wt		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Endosulfan I	mg/kg dry wt		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Endosulfan II	mg/kg dry wt		< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Endosulfan sulphate	mg/kg dry wt		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2

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The tests reported herein have been performed in accordance with the terms of accreditation, with the exception of tests marked * or any comments and interpretations, which are not accredited.

Sample Type: Soil						
Sample Name:		IP03_0.1 01-Aug-2024	IP03_0.5 01-Aug-2024	Dup_L 01-Aug-2024	TP11_0.1 01-Aug-2024	TP11_0.5 01-Aug-2024
Lab Number:		3640488.1	3640488.3	3640488.8	3640488.9	3640488.11
Organochlorine Pesticides Trace in SVOC Soil Samples by GC-MS						
Endrin	mg/kg dry wt	< 0.16	< 0.14	< 0.17	< 0.16	< 0.14
Endrin ketone	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Heptachlor	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Heptachlor epoxide	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Hexachlorobenzene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Polycyclic Aromatic Hydrocarbons Trace in SVOC Soil Samples*						
Acenaphthene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthylene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Anthracene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[a]anthracene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[k]fluoranthene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
1&2-Chloronaphthalene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Chrysene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluoranthene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluorene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
2-Methylnaphthalene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Naphthalene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Pyrene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25
Phenols Trace in SVOC Soil Samples by GC-MS						
4-Chloro-3-methylphenol	mg/kg dry wt	< 0.8	< 0.7	< 0.9	< 0.8	< 0.7
2-Chlorophenol	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
2,4-Dichlorophenol	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
2,4-Dimethylphenol	mg/kg dry wt	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
3 & 4-Methylphenol (m- + p-cresol)	mg/kg dry wt	< 0.8	< 0.7	< 0.9	< 0.8	< 0.7
2-Methylphenol (o-cresol)	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
2-Nitrophenol	mg/kg dry wt	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
Pentachlorophenol (PCP)	mg/kg dry wt	< 6	< 6	< 6	< 6	< 6
Phenol	mg/kg dry wt	< 0.8	< 0.7	< 0.9	< 0.8	< 0.7
2,4,5-Trichlorophenol	mg/kg dry wt	< 0.8	< 0.7	< 0.9	< 0.8	< 0.7
2,4,6-Trichlorophenol	mg/kg dry wt	< 0.8	< 0.7	< 0.9	< 0.8	< 0.7
Plasticisers Trace in SVOC Soil Samples by GC-MS						
Bis(2-ethylhexyl)phthalate	mg/kg dry wt	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Butylbenzylphthalate	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Di(2-ethylhexyl)adipate	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Diethylphthalate	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Dimethylphthalate	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Di-n-butylphthalate	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Di-n-octylphthalate	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Other Halogenated compounds Trace in SVOC Soil Samples by GC-MS						
1,2-Dichlorobenzene	mg/kg dry wt	< 0.16	< 0.14	< 0.17	< 0.16	< 0.14
1,3-Dichlorobenzene	mg/kg dry wt	< 0.16	< 0.14	< 0.17	< 0.16	< 0.14
1,4-Dichlorobenzene	mg/kg dry wt	< 0.16	< 0.14	< 0.17	< 0.16	< 0.14
Hexachlorobutadiene	mg/kg dry wt	< 0.16	< 0.14	< 0.17	< 0.16	< 0.14
Hexachloroethane	mg/kg dry wt	< 0.16	< 0.14	< 0.17	< 0.16	< 0.14

Sample Type: Soil						
Sample Name:		IP03_0.1 01-Aug-2024	IP03_0.5 01-Aug-2024	Dup_L 01-Aug-2024	TP11_0.1 01-Aug-2024	TP11_0.5 01-Aug-2024
Lab Number:		3640488.1	3640488.3	3640488.8	3640488.9	3640488.11
Other Halogenated compounds Trace in SVOC Soil Samples by GC-MS						
1,2,4-Trichlorobenzene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Other SVOC Trace in SVOC Soil Samples by GC-MS						
Benzyl alcohol	mg/kg dry wt	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Carbazole	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Dibenzofuran	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Isophorone	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	< 20	< 20	< 20	< 20	< 20
C10 - C14	mg/kg dry wt	< 20	< 20	< 20	< 20	< 20
C15 - C36	mg/kg dry wt	< 40	< 40	< 40	< 40	< 40
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 80	< 80	< 80	< 80	< 80

Sample Name:		DUP_M 01-Aug-2024	TP10_0.1 01-Aug-2024	TP10_0.5 01-Aug-2024
Lab Number:		3640488.14	3640488.15	3640488.17
Individual Tests				
Dry Matter	g/100g as rcvd	91	78	89
Total Recoverable Antimony	mg/kg dry wt	< 0.4	< 0.4	< 0.4
Total Recoverable Tin	mg/kg dry wt	< 1.0	1.0	1.2
Heavy Metals with Mercury, Screen Level				
Total Recoverable Arsenic	mg/kg dry wt	4	10	6
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	15	12	19
Total Recoverable Copper	mg/kg dry wt	5	4	6
Total Recoverable Lead	mg/kg dry wt	13.3	19.0	16.8
Total Recoverable Mercury	mg/kg dry wt	< 0.10	< 0.10	< 0.10
Total Recoverable Nickel	mg/kg dry wt	12	7	15
Total Recoverable Zinc	mg/kg dry wt	41	51	47
Haloethers Trace in SVOC Soil Samples by GC-MS				
Bis(2-chloroethoxy) methane	mg/kg dry wt	< 0.14	< 0.16	< 0.14
Bis(2-chloroethyl)ether	mg/kg dry wt	< 0.10	< 0.10	< 0.10
Bis(2-chloroisopropyl)ether	mg/kg dry wt	< 0.10	< 0.10	< 0.10
4-Bromophenyl phenyl ether	mg/kg dry wt	< 0.10	< 0.10	< 0.10
4-Chlorophenyl phenyl ether	mg/kg dry wt	< 0.10	< 0.10	< 0.10
Nitrogen containing compounds Trace in SVOC Soil Samples, GC-MS				
N-Nitrosodiphenylamine + Diphenylamine	mg/kg dry wt	< 0.14	< 0.16	< 0.14
2,4-Dinitrotoluene	mg/kg dry wt	< 0.2	< 0.2	< 0.2
2,6-Dinitrotoluene	mg/kg dry wt	< 0.2	< 0.2	< 0.2
Nitrobenzene	mg/kg dry wt	< 0.10	< 0.10	< 0.10
N-Nitrosodi-n-propylamine	mg/kg dry wt	< 0.14	< 0.16	< 0.14
Organochlorine Pesticides Trace in SVOC Soil Samples by GC-MS				
Aldrin	mg/kg dry wt	< 0.10	< 0.10	< 0.10
alpha-BHC	mg/kg dry wt	< 0.10	< 0.10	< 0.10
beta-BHC	mg/kg dry wt	< 0.10	< 0.10	< 0.10
delta-BHC	mg/kg dry wt	< 0.10	< 0.10	< 0.10
gamma-BHC (Lindane)	mg/kg dry wt	< 0.10	< 0.10	< 0.10
4,4'-DDD	mg/kg dry wt	< 0.10	< 0.10	< 0.10
4,4'-DDE	mg/kg dry wt	< 0.10	< 0.10	< 0.10
4,4'-DDT	mg/kg dry wt	< 0.2	< 0.2	< 0.2
Dieldrin	mg/kg dry wt	< 0.10	< 0.10	< 0.10
Endosulfan I	mg/kg dry wt	< 0.2	< 0.2	< 0.2
Endosulfan II	mg/kg dry wt	< 0.5	< 0.5	< 0.5
Endosulfan sulphate	mg/kg dry wt	< 0.2	< 0.2	< 0.2
Endrin	mg/kg dry wt	< 0.14	< 0.16	< 0.14
Endrin ketone	mg/kg dry wt	< 0.2	< 0.2	< 0.2

Sample Type: Soil				
Sample Name:		DUP_M 01-Aug-2024	TP10_0.1 01-Aug-2024	TP10_0.5 01-Aug-2024
Lab Number:		3640488.14	3640488.15	3640488.17
Organochlorine Pesticides Trace in SVOC Soil Samples by GC-MS				
Heptachlor	mg/kg dry wt	< 0.10	< 0.10	< 0.10
Heptachlor epoxide	mg/kg dry wt	< 0.10	< 0.10	< 0.10
Hexachlorobenzene	mg/kg dry wt	< 0.10	< 0.10	< 0.10
Polycyclic Aromatic Hydrocarbons Trace in SVOC Soil Samples*				
Acenaphthene	mg/kg dry wt	< 0.10	< 0.10	< 0.10
Acenaphthylene	mg/kg dry wt	< 0.10	< 0.10	< 0.10
Anthracene	mg/kg dry wt	< 0.10	< 0.10	< 0.10
Benzo[a]anthracene	mg/kg dry wt	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.10	< 0.10	< 0.10
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.10	< 0.10	< 0.10
Benzo[k]fluoranthene	mg/kg dry wt	< 0.10	< 0.10	< 0.10
1&2-Chloronaphthalene	mg/kg dry wt	< 0.10	< 0.10	< 0.10
Chrysene	mg/kg dry wt	< 0.10	< 0.10	< 0.10
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.10	< 0.10	< 0.10
Fluoranthene	mg/kg dry wt	< 0.10	< 0.10	< 0.10
Fluorene	mg/kg dry wt	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.10	< 0.10	< 0.10
2-Methylnaphthalene	mg/kg dry wt	< 0.10	< 0.10	< 0.10
Naphthalene	mg/kg dry wt	< 0.10	< 0.10	< 0.10
Phenanthrene	mg/kg dry wt	< 0.10	< 0.10	< 0.10
Pyrene	mg/kg dry wt	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	< 0.25	< 0.25	< 0.25
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	< 0.25	< 0.25	< 0.25
Phenols Trace in SVOC Soil Samples by GC-MS				
4-Chloro-3-methylphenol	mg/kg dry wt	< 0.7	< 0.8	< 0.7
2-Chlorophenol	mg/kg dry wt	< 0.2	< 0.2	< 0.2
2,4-Dichlorophenol	mg/kg dry wt	< 0.2	< 0.2	< 0.2
2,4-Dimethylphenol	mg/kg dry wt	< 0.4	< 0.4	< 0.4
3 & 4-Methylphenol (m- + p-cresol)	mg/kg dry wt	< 0.7	< 0.8	< 0.7
2-Methylphenol (o-cresol)	mg/kg dry wt	< 0.2	< 0.2	< 0.2
2-Nitrophenol	mg/kg dry wt	< 0.4	< 0.4	< 0.4
Pentachlorophenol (PCP)	mg/kg dry wt	< 6	< 6	< 6
Phenol	mg/kg dry wt	< 0.7	< 0.8	< 0.7
2,4,5-Trichlorophenol	mg/kg dry wt	< 0.7	< 0.8	< 0.7
2,4,6-Trichlorophenol	mg/kg dry wt	< 0.7	< 0.8	< 0.7
Plasticisers Trace in SVOC Soil Samples by GC-MS				
Bis(2-ethylhexyl)phthalate	mg/kg dry wt	< 0.5	< 0.5	< 0.5
Butylbenzylphthalate	mg/kg dry wt	< 0.2	< 0.2	< 0.2
Di(2-ethylhexyl)adipate	mg/kg dry wt	< 0.2	< 0.2	< 0.2
Diethylphthalate	mg/kg dry wt	< 0.2	< 0.2	< 0.2
Dimethylphthalate	mg/kg dry wt	< 0.2	< 0.2	< 0.2
Di-n-butylphthalate	mg/kg dry wt	< 0.2	< 0.2	< 0.2
Di-n-octylphthalate	mg/kg dry wt	< 0.2	< 0.2	< 0.2
Other Halogenated compounds Trace in SVOC Soil Samples by GC-MS				
1,2-Dichlorobenzene	mg/kg dry wt	< 0.14	< 0.16	< 0.14
1,3-Dichlorobenzene	mg/kg dry wt	< 0.14	< 0.16	< 0.14
1,4-Dichlorobenzene	mg/kg dry wt	< 0.14	< 0.16	< 0.14
Hexachlorobutadiene	mg/kg dry wt	< 0.14	< 0.16	< 0.14
Hexachloroethane	mg/kg dry wt	< 0.14	< 0.16	< 0.14
1,2,4-Trichlorobenzene	mg/kg dry wt	< 0.10	< 0.10	< 0.10

Sample Type: Soil				
Sample Name:		DUP_M 01-Aug-2024	TP10_0.1 01-Aug-2024	TP10_0.5 01-Aug-2024
Lab Number:		3640488.14	3640488.15	3640488.17
Other SVOC Trace in SVOC Soil Samples by GC-MS				
Benzyl alcohol	mg/kg dry wt	< 1.0	< 1.0	< 1.0
Carbazole	mg/kg dry wt	< 0.10	< 0.10	< 0.10
Dibenzofuran	mg/kg dry wt	< 0.10	< 0.10	< 0.10
Isophorone	mg/kg dry wt	< 0.10	< 0.10	< 0.10
Total Petroleum Hydrocarbons in Soil				
C7 - C9	mg/kg dry wt	< 20	< 20	< 20
C10 - C14	mg/kg dry wt	< 20	< 20	< 20
C15 - C36	mg/kg dry wt	< 40	< 40	< 40
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 80	< 80	< 80

Summary of Methods

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

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Individual Tests			
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	1, 3, 8-9, 11, 14-15, 17
Dry Matter	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	1, 3, 8-9, 11, 14-15, 17
Total Recoverable Antimony	Dried sample, sieved as specified (if required). Nitric/Hydrochloric acid digestion, ICP-MS, screen level. US EPA 200.2.	0.4 mg/kg dry wt	1, 3, 8-9, 11, 14-15, 17
Total Recoverable Tin	Dried sample, sieved as specified (if required). Nitric/Hydrochloric acid digestion, ICP-MS, screen level. US EPA 200.2.	1.0 mg/kg dry wt	1, 3, 8-9, 11, 14-15, 17
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, 3, 8-9, 11, 14-15, 17
Semivolatile Organic Compounds Trace in Soil by GC-MS	Sonication extraction, GC-MS analysis. Tested on as received sample. In-house based on US EPA 8270.	0.10 - 6 mg/kg dry wt	1, 3, 8-9, 11, 14-15, 17
Total Petroleum Hydrocarbons in Soil			
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	1, 3, 8-9, 11, 14-15, 17
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, 3, 8-9, 11, 14-15, 17
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, 3, 8-9, 11, 14-15, 17
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, 3, 8-9, 11, 14-15, 17

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

Testing was completed between 02-Aug-2024 and 08-Aug-2024. For completion dates of individual analyses please contact the laboratory.

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

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

Ara Heron BSc (Tech)
Client Services Manager - Environmental

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Certificate of Analysis

Client:	Beca Limited	**Lab No:**	3640489	A2Pv1
Contact:	Stuart Caird	**Date Received:**	01-Aug-2024	
	C/- Beca Limited	**Date Reported:**	05-Aug-2024	
	PO Box 13960	**Quote No:**	129425	
	Christchurch 8141	**Order No:**		
		Client Reference:	Rolleston 338703/800	
		Submitted By:	Stuart Caird	

Sample Type: Soil

Sample Name:		TP03_0.1 01-Aug-2024	TP03_0.5 01-Aug-2024	TP11_0.1 01-Aug-2024	TP11_0.5 01-Aug-2024	TP10_0.1 01-Aug-2024
Lab Number:		3640489.1	3640489.3	3640489.8	3640489.10	3640489.13
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	736.3	1,117.7	722.5	1,029.5	743.0
Dry Weight	g	598.1	1,070.1	592.9	979.6	595.3
Moisture*	%	19	4	18	5	20
Sample Fraction >10mm	g dry wt	121.5	709.2	96.8	404.9	87.3
Sample Fraction <10mm to >2mm	g dry wt	179.5	148.9	142.2	323.1	95.3
Sample Fraction <2mm	g dry wt	295.2	211.4	351.9	251.0	410.5
<2mm Subsample Weight	g dry wt	51.0	59.7	53.4	59.4	58.3
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:		TP10_0.5 01-Aug-2024
Lab Number:		3640489.15
Asbestos Presence / Absence		Asbestos NOT detected.
Description of Asbestos Form		-
Asbestos in ACM as % of Total Sample*	% w/w	< 0.001
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	% w/w	< 0.001
Asbestos as Fibrous Asbestos as % of Total Sample*	% w/w	< 0.001
Asbestos as Asbestos Fines as % of Total Sample*	% w/w	< 0.001
As Received Weight	g	1,079.2
Dry Weight	g	1,018.3
Moisture*	%	6
Sample Fraction >10mm	g dry wt	536.4

This Laboratory is accredited by International Accreditation New Zealand (IANZ), which represents New Zealand in the International Laboratory Accreditation Cooperation (ILAC). Through the ILAC Mutual Recognition Arrangement (ILAC-MRA) this accreditation is internationally recognised.
The tests reported herein have been performed in accordance with the terms of accreditation, with the exception of tests marked * or any comments and interpretations, which are not accredited.

Sample Type: Soil		
Sample Name:		TP10_0.5 01-Aug-2024
Lab Number:		3640489.15
Sample Fraction <10mm to >2mm	g dry wt	288.7
Sample Fraction <2mm	g dry wt	192.4
<2mm Subsample Weight	g dry wt	53.8
Weight of Asbestos in ACM (Non-Friable)	g dry wt	< 0.00001
Weight of Asbestos as Fibrous Asbestos (Friable)	g dry wt	< 0.00001
Weight of Asbestos as Asbestos Fines (Friable)*	g dry wt	< 0.00001

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

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

The following assumptions have been made:

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

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

Summary of Methods

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

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
New Zealand Guidelines Semi Quantitative Asbestos in Soil			
As Received Weight	Measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g	1, 3, 8, 10, 13, 15
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g	1, 3, 8, 10, 13, 15
Moisture*	Sample dried at 100 to 105°C. Calculation = (As received weight - Dry weight) / as received weight x 100.	1 %	1, 3, 8, 10, 13, 15
Sample Fraction >10mm	Sample dried at 100 to 105°C, 10mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1, 3, 8, 10, 13, 15
Sample Fraction <10mm to >2mm	Sample dried at 100 to 105°C, 10mm and 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1, 3, 8, 10, 13, 15
Sample Fraction <2mm	Sample dried at 100 to 105°C, 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1, 3, 8, 10, 13, 15
Asbestos Presence / Absence	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0.01%	1, 3, 8, 10, 13, 15
Description of Asbestos Form	Description of asbestos form and/or shape if present.	-	1, 3, 8, 10, 13, 15
Weight of Asbestos in ACM (Non-Friable)	Measurement on analytical balance, from the >10mm Fraction. Weight of asbestos based on assessment of ACM form. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 3, 8, 10, 13, 15

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
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, 3, 8, 10, 13, 15
Weight of Asbestos as Fibrous Asbestos (Friable)	Measurement on analytical balance, from the >10mm Fraction. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 3, 8, 10, 13, 15
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, 3, 8, 10, 13, 15
Weight of Asbestos as Asbestos Fines (Friable)*	Measurement on analytical balance, from the <10mm Fractions. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 3, 8, 10, 13, 15
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, 3, 8, 10, 13, 15
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, 3, 8, 10, 13, 15

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

Testing was completed on 05-Aug-2024. For completion dates of individual analyses please contact the laboratory.

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

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

Dexter Paguirigan Dip Chem Engineering Tech
Laboratory Technician - Asbestos

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

Testing was completed between 27-Jun-2024 and 08-Jul-2024. For completion dates of individual analyses please contact the laboratory.

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

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Ara Heron BSc (Tech)
Client Services Manager - Environmental

R J Hill Laboratories Limited
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Private Bag 3205
Hamilton 3240 New Zealand

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+64 7 858 2000
mail@hill-labs.co.nz
www.hill-labs.co.nz

Certificate of Analysis

Client:	Beca Limited	**Lab No:**	3628493 SPv1
Contact:	Stuart Caird	**Date Received:**	16-Jul-2024
	C/- Beca Limited	**Date Reported:**	26-Jul-2024
	PO Box 13960	**Quote No:**	129425
	Christchurch 8141	**Order No:**	
		Client Reference:	3338703/800
		Submitted By:	Maisie Hopkins

Sample Type: Soil

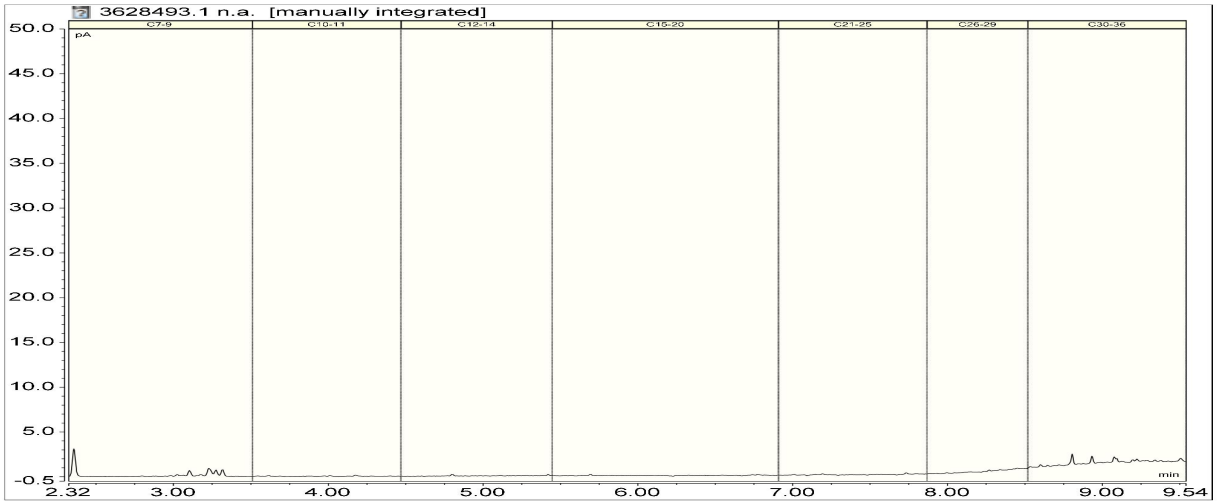
		Sample Name:	PP25_0.2 16-Jul-2024	PP01_0.1 16-Jul-2024	IP12_0.05 15-Jul-2024	IP12_0.5 15-Jul-2024
		Lab Number:	3628493.2	3628493.7	3628493.12	3628493.14
Individual Tests						
Dry Matter	g/100g as rcvd		95	94	85	97
Heavy Metals with Mercury, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt		4	3	3	4
Total Recoverable Cadmium	mg/kg dry wt		0.22	0.38	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt		12	12	13	14
Total Recoverable Copper	mg/kg dry wt		11	7	11	5
Total Recoverable Lead	mg/kg dry wt		93	47	70	14.0
Total Recoverable Mercury	mg/kg dry wt		< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Nickel	mg/kg dry wt		9	9	7	11
Total Recoverable Zinc	mg/kg dry wt		55	41	67	41
Polycyclic Aromatic Hydrocarbons Screening in Soil*						
Total of Reported PAHs in Soil	mg/kg dry wt		0.5	< 0.3	1.0	< 0.3
1-Methylnaphthalene	mg/kg dry wt		< 0.011	< 0.011	0.014	< 0.011
2-Methylnaphthalene	mg/kg dry wt		< 0.011	< 0.011	0.013	< 0.011
Acenaphthylene	mg/kg dry wt		0.012	< 0.011	0.015	< 0.011
Acenaphthene	mg/kg dry wt		< 0.011	< 0.011	< 0.012	< 0.011
Anthracene	mg/kg dry wt		0.011	< 0.011	0.016	< 0.011
Benzo[a]anthracene	mg/kg dry wt		0.033	< 0.011	0.061	< 0.011
Benzo[a]pyrene (BAP)	mg/kg dry wt		0.037	< 0.011	0.075	< 0.011
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt		0.056	< 0.025	0.109	< 0.025
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt		0.056	< 0.025	0.108	< 0.025
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt		0.043	< 0.011	0.083	< 0.011
Benzo[e]pyrene	mg/kg dry wt		0.022	< 0.011	0.044	< 0.011
Benzo[g,h,i]perylene	mg/kg dry wt		0.022	< 0.011	0.044	< 0.011
Benzo[k]fluoranthene	mg/kg dry wt		0.017	< 0.011	0.035	< 0.011
Chrysene	mg/kg dry wt		0.034	< 0.011	0.067	< 0.011
Dibenzo[a,h]anthracene	mg/kg dry wt		< 0.011	< 0.011	< 0.012	< 0.011
Fluoranthene	mg/kg dry wt		0.072	< 0.011	0.153	< 0.011
Fluorene	mg/kg dry wt		< 0.011	< 0.011	< 0.012	< 0.011
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt		0.023	< 0.011	0.048	< 0.011
Naphthalene	mg/kg dry wt		< 0.06	< 0.06	< 0.06	< 0.06
Perylene	mg/kg dry wt		< 0.011	< 0.011	0.016	< 0.011
Phenanthrene	mg/kg dry wt		0.052	< 0.011	0.096	< 0.011
Pyrene	mg/kg dry wt		0.072	< 0.011	0.150	< 0.011

This Laboratory is accredited by International Accreditation New Zealand (IANZ), which represents New Zealand in the International Laboratory Accreditation Cooperation (ILAC). Through the ILAC Mutual Recognition Arrangement (ILAC-MRA) this accreditation is internationally recognised.
The tests reported herein have been performed in accordance with the terms of accreditation, with the exception of tests marked * or any comments and interpretations, which are not accredited.

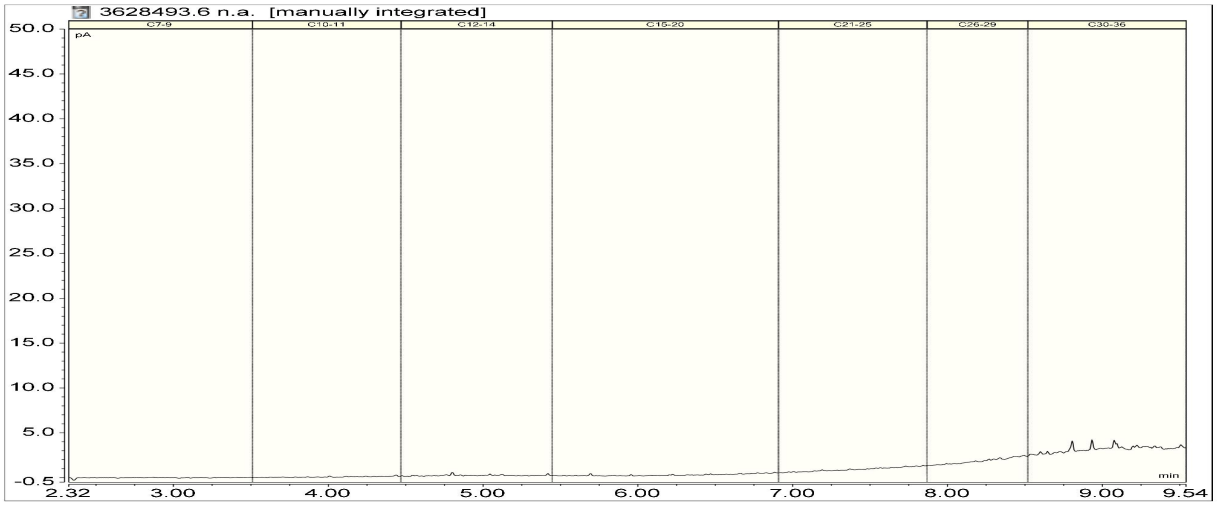
Sample Type: Soil					
Sample Name:		PP25_0.2 16-Jul-2024	PP01_0.1 16-Jul-2024	IP12_0.05 15-Jul-2024	IP12_0.5 15-Jul-2024
Lab Number:		3628493.2	3628493.7	3628493.12	3628493.14
Total Petroleum Hydrocarbons in Soil					
C7 - C9	mg/kg dry wt	< 20	< 20	< 20	< 20
C10 - C14	mg/kg dry wt	< 20	< 20	< 20	< 20
C15 - C36	mg/kg dry wt	< 40	< 40	78	< 40
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 80	< 80	83	< 80

Sample Type: Roading Material				
Sample Name:		PP25_0.1 16-Jul-2024	PP01_0.05 16-Jul-2024	PP01_0.40 16-Jul-2024
Lab Number:		3628493.1	3628493.6	3628493.9
Individual Tests				
Total Recoverable Mercury*	mg/kg dry wt	< 0.10	< 0.10	< 0.10
Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn*				
Total Recoverable Arsenic	mg/kg as rcvd	< 2	< 2	< 2
Total Recoverable Cadmium*	mg/kg as rcvd	< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg as rcvd	5	3	6
Total Recoverable Copper	mg/kg as rcvd	8 #1	4	4
Total Recoverable Lead	mg/kg as rcvd	52 #1	55	29
Total Recoverable Nickel	mg/kg as rcvd	3	3	5
Total Recoverable Zinc	mg/kg as rcvd	29	24	23
Polycyclic Aromatic Hydrocarbons Screening in Rock*				
1-Methylnaphthalene*	mg/kg as rcvd	< 0.10	0.52	< 0.10
2-Methylnaphthalene*	mg/kg as rcvd	< 0.15	0.59	< 0.15
Acenaphthylene*	mg/kg as rcvd	< 0.10	< 0.10	< 0.10
Acenaphthene*	mg/kg as rcvd	< 0.10	< 0.10	< 0.10
Anthracene*	mg/kg as rcvd	< 0.10	< 0.10	< 0.10
Benzo[a]anthracene*	mg/kg as rcvd	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene (BAP)*	mg/kg as rcvd	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg as rcvd	< 0.24	< 0.24	< 0.24
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg as rcvd	< 0.3	< 0.3	< 0.3
Benzo[b]fluoranthene + Benzo[j] fluoranthene*	mg/kg as rcvd	< 0.10	< 0.10	< 0.10
Benzo[e]pyrene*	mg/kg as rcvd	0.12	0.12	< 0.10
Benzo[g,h,i]perylene*	mg/kg as rcvd	< 0.10	< 0.10	< 0.10
Benzo[k]fluoranthene*	mg/kg as rcvd	< 0.10	< 0.10	< 0.10
Chrysene*	mg/kg as rcvd	< 0.10	0.11	< 0.10
Dibenzo[a,h]anthracene*	mg/kg as rcvd	< 0.10	< 0.10	< 0.10
Fluoranthene*	mg/kg as rcvd	< 0.10	< 0.10	< 0.10
Fluorene*	mg/kg as rcvd	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)pyrene*	mg/kg as rcvd	< 0.10	< 0.10	< 0.10
Naphthalene*	mg/kg as rcvd	< 0.5	< 0.5	< 0.5
Perylene*	mg/kg as rcvd	< 0.10	< 0.10	< 0.10
Phenanthrene*	mg/kg as rcvd	< 0.10	0.28	< 0.10
Pyrene*	mg/kg as rcvd	< 0.10	0.10	< 0.10
Total of Reported PAHs*	mg/kg as rcvd	< 3	3	< 3
Total Petroleum Hydrocarbons in Rock*				
C7 - C9*	mg/kg as rcvd	< 140	< 140	151
C10 - C14*	mg/kg as rcvd	< 120	157	< 120
C15 - C36*	mg/kg as rcvd	1,110	3,000	340
Total hydrocarbons (C7 - C36)*	mg/kg as rcvd	1,230	3,200	500

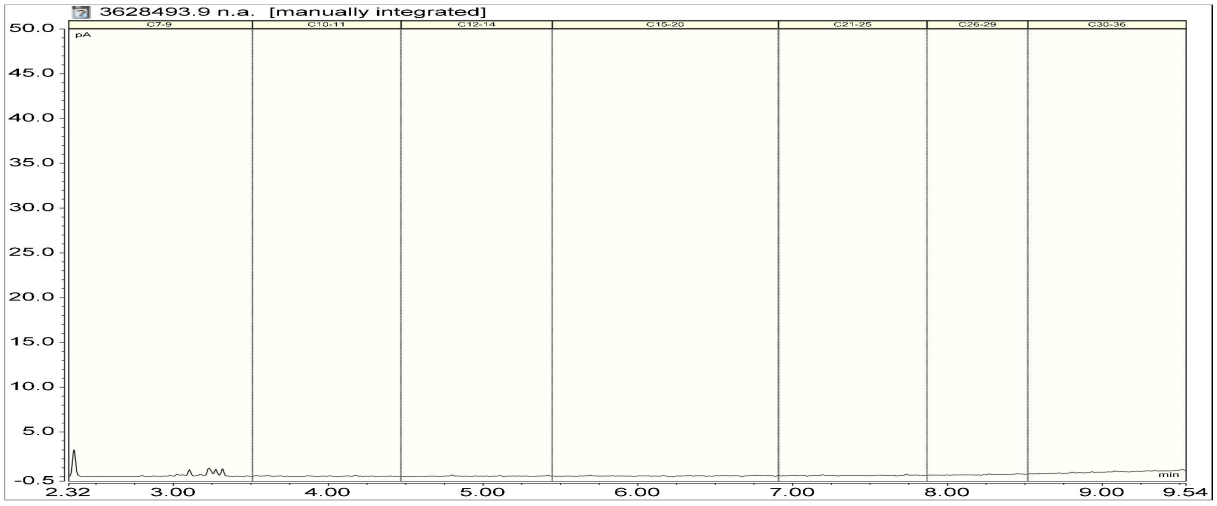
3628493.1
PP25_0.1 16-Jul-2024
Client Chromatogram for TPH by FID



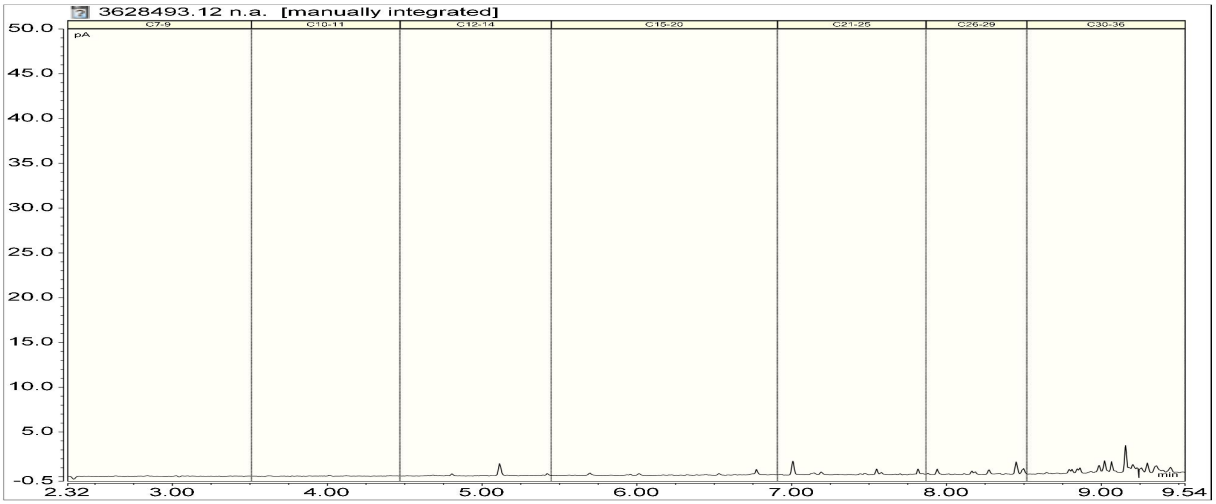
3628493.6
PP01_0.05 16-Jul-2024
Client Chromatogram for TPH by FID



3628493.9
PP01_0.40 16-Jul-2024
Client Chromatogram for TPH by FID



3628493.12
IP12_0.05 15-Jul-2024
Client Chromatogram for TPH by FID



Analyst's Comments

#1 It should be noted that the replicate analyses performed on this sample as part of our in-house Quality Assurance procedures showed greater variation than would normally be expected. This may reflect the heterogeneity of the sample.

Summary of Methods

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

Sample Type: Soil

Test	Method Description	Default Detection Limit	Sample No
Individual Tests			
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	2, 7, 12, 14
Total of Reported PAHs in Soil	Sonication extraction, GC-MS/MS analysis. In-house based on US EPA 8270.	0.03 mg/kg dry wt	2, 7, 12, 14
Dry Matter	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	2, 7, 12, 14
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	BaP Potency Equivalence calculated from; Benzo(a)anthracene x 0.1 + Benzo(b)fluoranthene x 0.1 + Benzo(j)fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Benzo(a)pyrene x 1.0 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Fluoranthene x 0.01 + Indeno(1,2,3-c,d)pyrene x 0.1. Ministry for the Environment. 2011. Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health. Wellington: Ministry for the Environment.	0.024 mg/kg dry wt	2, 7, 12, 14
Benzo[a]pyrene Toxic Equivalence (TEF)*	Benzo[a]pyrene Toxic Equivalence (TEF) calculated from; Benzo[a]pyrene x 1.0 + Benzo(a)anthracene x 0.1 + Benzo(b) fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Indeno(1,2,3-c,d)pyrene x 0.1. Guidelines for assessing and managing contaminated gasworks sites in New Zealand (GMG) (MfE, 1997).	0.024 mg/kg dry wt	2, 7, 12, 14
TPH Oil Industry Profile + PAHscreen	Sonication extraction, GC-FID and GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8015 and US EPA 8270.	0.010 - 70 mg/kg dry wt	2, 7, 12, 14
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, 7, 12, 14
Total Petroleum Hydrocarbons in Soil			
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	2, 7, 12, 14
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, 7, 12, 14

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	2, 7, 12, 14
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, 7, 12, 14

Sample Type: Roading Material			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Individual Tests			
SHOC Macro Extraction 10x Dilution*		-	1, 6, 9
Macro Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	1, 6, 9
Total Recoverable Arsenic	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 6, 9
Total Recoverable Cadmium*	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg as rcvd	1, 6, 9
Total Recoverable Chromium	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 6, 9
Total Recoverable Copper	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 6, 9
Total Recoverable Lead	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.4 mg/kg as rcvd	1, 6, 9
Total Recoverable Mercury*	Dried sample, Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg dry wt	1, 6, 9
Total Recoverable Nickel	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 6, 9
Total Recoverable Zinc	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	4 mg/kg as rcvd	1, 6, 9
Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn*	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 - 4 mg/kg as rcvd	1, 6, 9
Total Petroleum Hydrocarbons in Rock			
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	1, 6, 9, 12
C7 - C9*	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg as rcvd	1, 6, 9
C10 - C14*	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg as rcvd	1, 6, 9
C15 - C36*	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg as rcvd	1, 6, 9
Total hydrocarbons (C7 - C36)*	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg as rcvd	1, 6, 9

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

Testing was completed between 17-Jul-2024 and 26-Jul-2024. For completion dates of individual analyses please contact the laboratory.

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

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Kim Harrison MSc
Client Services Manager - Environmental

Hill Laboratories
TRIED, TESTED AND TRUSTED

ANALYSIS REQUEST

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

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T +64 7 858 2000
E mail@hill-labs.co.nz
W www.hill-laboratories.com

Job No. **361 7400**

Date Recv: 01-Jul-24 15:57

Received by: Megan Cambus

3136174006

Quote No	129425
Primary Contact	Stuart Caird
Submitted By	
Client Name	Beca Limited
Address	PO Box 13960, Christchurch 8141
	Postcode
Phone	*Mobile*
Email	
Charge To	Beca Limited
Client Reference	3338703/800
Order No	

Results To *Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.*

☑ Email Primary Contact ☐ Email Submitter ☐ Email Client

☑ Email Other ESdat_AU+BECA@ESdatLabSync.net

☑ Other Maisie.Watkins@beca.com

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories
Date & Time: 1.7.24
Name: S. CAIRD
Signature:

☑ Tick if you require COC to be emailed back

Received at Hill Laboratories *(Refer to Lab created Job No above)*
Date & Time:
Name:
Signature:

Condition ☐ Room Temp ☐ Chilled ☐ Frozen
Temp: 13.3

ADDITIONAL INFORMATION / KNOWN HAZARDS

Please use client reference above as 'project ID' when providing results in ESdat format.

Priority ☐ Low ☐ Normal ☑ High
☐ Urgent (ASAP, extra charge applies, please contact lab first)

Requested Reporting Date:

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
1	TP06-0.1	1.7.24		Soil	HM+Hg, TPH, PAH
2	TP06-0.3				Hold Cold
3	TP06-0.5				HM+Hg, TPH, PAH
4	TP06-0.7				Hold Cold
5	TP06-1.0				
6	TP06-1.5				
7	TP06-2.0				
8	TP06-3.0				
9	TP06-4.0				
10	TP08-0.1				HM+Hg, TPH, PAH
11	TP08-0.3				Hold Cold
12	TP08-0.5				HM+Hg, TPH, PAH

Continued on next page

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
13	TP08_0.7	1.7.24		SOIL	HAS COD
14	TP08_1.0				
15	TP08_1.5				
16	TP08_2.0				
17	TP03_01				Lim+Hg, TPH, PAH
18	TP03_0.3				HAS COD
19	TP03_0.5				Lim+Hg, TPH, PAH
20	TP03_0.7				HAS COD
21	TP03_1.0				
22	TP03_1.5				
23	TP03_2.0				
24	DUP_E				Lim+Hg, TPH, PAH
25	BH02_0.1-0.2				Lim+Hg, TPH, PAH
26	BH02_0.3-0.4				HAS COD
27	BH02_0.5-0.7				Lim+Hg, TPH, PAH
28	BH02_0.8-1.0				HAS COD
29	BH02_1.5-1.7				HAS COD
30	TP02_0.1				Lim+Hg, TPH, PAH
31	TP02_0.3				HAS COD
32	TP02_0.5				Lim+Hg, TPH, PAH
33	TP02_0.7				HAS COD
34	TP02_1.0				
35	TP02_1.5				
36	TP02_2.0				
37					
38					
39					
40					

R J Hill Laboratories Limited
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Private Bag 3205
Hamilton 3240 New Zealand

0508 HILL LAB (44 555 22)
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Job Information Summary

Client:	Beca Limited	**Lab No:**	3617400
Contact:	Stuart Caird	**Date Registered:**	02-Jul-2024 10:00 am
	C/- Beca Limited	**Priority:**	High
	PO Box 13960	**Quote No:**	129425
	Christchurch 8141	**Order No:**	
		Client Reference:	338703/800
		Add. Client Ref:	
		Submitted By:	Maisie Hopkins
		Charge To:	Beca Limited
		Target Date*:	04-Jul-2024 4:30 pm

* As the samples require analysis at a Hill Labs location that is different to where they were received, the Target Date for reporting has been extended.

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	TP06_0.1 01-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
2	TP06_0.3 01-Jul-2024	Soil	GSoil300	Hold Cold
3	TP06_0.5 01-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
4	TP06_0.7 01-Jul-2024	Soil	GSoil300	Hold Cold
5	TP06_1.0 01-Jul-2024	Soil	GSoil300	Hold Cold
6	TP06_1.5 01-Jul-2024	Soil	GSoil300	Hold Cold
7	TP06_2.0 01-Jul-2024	Soil	GSoil300	Hold Cold
8	TP06_3.0 01-Jul-2024	Soil	GSoil300	Hold Cold
9	TP06_4.0 01-Jul-2024	Soil	GSoil300	Hold Cold
10	TP08_0.1 01-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
11	TP08_0.3 01-Jul-2024	Soil	GSoil300	Hold Cold
12	TP08_0.5 01-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
13	TP08_0.7 01-Jul-2024	Soil	GSoil300	Hold Cold
14	TP08_1.0 01-Jul-2024	Soil	GSoil300	Hold Cold
15	TP08_1.5 01-Jul-2024	Soil	GSoil300	Hold Cold
16	TP08_2.0 01-Jul-2024	Soil	GSoil300	Hold Cold
17	TP03_0.1 01-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
18	TP03_0.3 01-Jul-2024	Soil	GSoil300	Hold Cold
19	TP03_0.5 01-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
20	TP03_0.7 01-Jul-2024	Soil	GSoil300	Hold Cold
21	TP03_1.0 01-Jul-2024	Soil	GSoil300	Hold Cold
22	TP03_1.5 01-Jul-2024	Soil	GSoil300	Hold Cold
23	TP03_2.0 01-Jul-2024	Soil	GSoil300	Hold Cold
24	DUP_E 01-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
25	BH02_0.1-0.2 01-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
26	BH02_0.3-0.4 01-Jul-2024	Soil	GSoil300	Hold Cold
27	BH02_0.5-0.7 01-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
28	BH02_0.8-1.0 01-Jul-2024	Soil	GSoil300	Hold Cold
29	BH02_1.5-1.7 01-Jul-2024	Soil	GSoil300	Hold Cold
30	IP02_0.1 01-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
31	IP02_0.3 01-Jul-2024	Soil	GSoil300	Hold Cold
32	IP02_0.5 01-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
33	IP02_0.7 01-Jul-2024	Soil	GSoil300	Hold Cold
34	IP02_1.0 01-Jul-2024	Soil	GSoil300	Hold Cold
35	IP02_1.5 01-Jul-2024	Soil	GSoil300	Hold Cold
36	IP02_2.0 01-Jul-2024	Soil	cGSoil	Hold Cold

Summary of Methods

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

Sample Type: Soil

Test	Method Description	Default Detection Limit	Sample No
Individual Tests			
Environmental Solids Sample Drying	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	1, 3, 10, 12, 17, 19, 24-25, 27, 30, 32
Total of Reported PAHs in Soil	Sonication extraction, GC-MS/MS analysis. In-house based on US EPA 8270.	0.03 mg/kg dry wt	1, 3, 10, 12, 17, 19, 24-25, 27, 30, 32
Dry Matter	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	1, 3, 10, 12, 17, 19, 24-25, 27, 30, 32
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	BaP Potency Equivalence calculated from; Benzo(a) anthracene x 0.1 + Benzo(b)fluoranthene x 0.1 + Benzo(j) fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Benzo(a) pyrene x 1.0 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Fluoranthene x 0.01 + Indeno(1,2,3-c,d)pyrene x 0.1. Ministry for the Environment. 2011. Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health. Wellington: Ministry for the Environment.	0.024 mg/kg dry wt	1, 3, 10, 12, 17, 19, 24-25, 27, 30, 32
Benzo[a]pyrene Toxic Equivalence (TEF)	Benzo[a]pyrene Toxic Equivalence (TEF) calculated from; Benzo[a]pyrene x 1.0 + Benzo(a)anthracene x 0.1 + Benzo(b)fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Indeno(1,2,3-c,d)pyrene x 0.1. Guidelines for assessing and managing contaminated gasworks sites in New Zealand (GMG) (MfE, 1997).	0.024 mg/kg dry wt	1, 3, 10, 12, 17, 19, 24-25, 27, 30, 32
TPH Oil Industry Profile + PAHscreen	Sonication extraction, GC-FID and GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8015 and US EPA 8270.	0.010 - 70 mg/kg dry wt	1, 3, 10, 12, 17, 19, 24-25, 27, 30, 32
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, 3, 10, 12, 17, 19, 24-25, 27, 30, 32
Total Petroleum Hydrocarbons in Soil			
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	1, 3, 10, 12, 17, 19, 24-25, 27, 30, 32
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	1, 3, 10, 12, 17, 19, 24-25, 27, 30, 32
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, 3, 10, 12, 17, 19, 24-25, 27, 30, 32
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, 3, 10, 12, 17, 19, 24-25, 27, 30, 32

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ANALYSIS REQUEST

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Job No: **363 1687**

Date Recv: 19-Jul-24 13:36

Received by: Eila-Rose Jones

Quote No	129425
Primary Contact	Stuart Caird
Submitted By	Stuart Caird
Client Name	Beca Limited
Address	PO Box 13960, Christchurch 8141
	Postcode
Phone	*Mobile*
Email	
Charge To	Beca Limited
Client Reference	3338703/800
Order No	

Results To *Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.*

☑ Email Primary Contact ☐ Email Submitter ☐ Email Client

☑ Email Other ESdat_AU+BECA@ESdatLabSync.net

☐ Other

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories	Date & Time: 19.7.24
	Name: S.CAIRD
☑ Tick if you require COC to be emailed back	Signature:
Received at Hill Laboratories (Refer to Lab created Job No above)	Date & Time:
	Name:
	Signature:
Condition ☐ Room Temp ☐ Chilled ☐ Frozen	Temp: 14.1

ADDITIONAL INFORMATION / KNOWN HAZARDS

Please use client reference above as 'project ID' when providing results in ESdat format.

Priority ☐ Low ☐ Normal ☑ High

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

Requested Reporting Date:

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
1	TP02_0.1	19.7.24		SOIL	Hold, TRH, Trace SVOC, BTEX, Asbestos (SQ)
2	TP02_0.3	↓		↓	Hold (ref)
3	TP02_0.5				Hold, TRH, Trace SVOC, BTEX, Asbestos (SQ)
4	TP02_0.7				Hold (ref)
5	TP02_1.0				Hold (ref)
6	TP02_1.5				Hold (ref)
7	TP04_0.1				Hold, TRH, Trace SVOC, BTEX, Asbestos (SQ)
8	TP04_0.5				↓ ↓ ↓
9	TP04_0.7				Hold (ref)
10	TP04_01.0				Hold, TRH, Trace SVOC, BTEX, Asbestos (SQ)
11	TP04_1.3				Hold, TRH, Trace SVOC, BTEX, Asbestos, Cyanide
12	TP04_1.5	↓		↓	↓ ↓ ↓ ↓

Continued on next page

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
13	TP4_2.0	19.7.24		SOIL	H2O (x2)
14	TP4_2.5	↓		↓	H2O (x2)
15	TP4_3.0	↓		↓	H2O (x2)
16					
17					
18					
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28					
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38					
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Job Information Summary

Client:	Beca Limited	**Lab No:**	3631687
Contact:	Stuart Caird	**Date Registered:**	20-Jul-2024 12:13 pm
	C/- Beca Limited	**Priority:**	High
	PO Box 13960	**Quote No:**	129425
	Christchurch 8141	**Order No:**	
		Client Reference:	3338703/800
		Add. Client Ref:	
		Submitted By:	Stuart Caird
		Charge To:	Beca Limited
		Target Date:	26-Jul-2024 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	TP02_0.1 19-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, Semivolatile Organic Compounds Trace in Soil by GC-MS, TPH + BTEX profile, Soil
2	TP02_0.3 19-Jul-2024	Soil	GSoil300	Hold Cold
3	TP02_0.5 19-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, Semivolatile Organic Compounds Trace in Soil by GC-MS, TPH + BTEX profile, Soil
4	TP02_0.7 19-Jul-2024	Soil	GSoil300	Hold Cold
5	TP02_1.0 19-Jul-2024	Soil	GSoil300	Hold Cold
6	TP02_1.5 19-Jul-2024	Soil	GSoil300	Hold Cold
7	TP04_0.1 19-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, Semivolatile Organic Compounds Trace in Soil by GC-MS, TPH + BTEX profile, Soil
8	TP04_0.5 19-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, Semivolatile Organic Compounds Trace in Soil by GC-MS, TPH + BTEX profile, Soil
9	TP04_0.7 19-Jul-2024	Soil	cGSoil	Hold Cold
10	TP04_1.0 19-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, Semivolatile Organic Compounds Trace in Soil by GC-MS, TPH + BTEX profile, Soil
11	TP04_1.3 19-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, Total Cyanide, Semivolatile Organic Compounds Trace in Soil by GC-MS, TPH + BTEX profile, Soil
12	TP04_1.5 19-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, Semivolatile Organic Compounds Trace in Soil by GC-MS, TPH + BTEX profile, Soil, Total Cyanide
13	TP04_2.0 19-Jul-2024	Soil	GSoil300	Hold Cold
14	TP04_2.5 19-Jul-2024	Soil	GSoil300	Hold Cold
15	TP04_3.0 19-Jul-2024	Soil	GSoil300	Hold Cold

Summary of Methods

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

Sample Type: Soil

Test	Method Description	Default Detection Limit	Sample No
Individual Tests			
Environmental Solids Sample Drying	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	1, 3, 7-8, 10-12

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Dry Matter	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	1, 3, 7-8, 10-12
Total Cyanide Distillation	Distillation of sample as received. APHA 4500-CN^- C (modified) : Online Edition.	-	11-12
Total Cyanide	Distillation, colorimetry. APHA 4500-CN^- C (modified) : Online Edition & Skalar Method I295-004(+P14). ISO 14403:2012(E).	0.10 mg/kg dry wt	11-12
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, 3, 7-8, 10-12
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, 3, 7-8, 10-12
Semivolatile Organic Compounds Trace in Soil by GC-MS	Sonication extraction, GC-MS analysis. Tested on as received sample. In-house based on US EPA 8270.	0.10 - 6 mg/kg dry wt	1, 3, 7-8, 10-12
Total Petroleum Hydrocarbons in Soil			
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	1, 3, 7-8, 10-12
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	1, 3, 7-8, 10-12
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, 3, 7-8, 10-12
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, 3, 7-8, 10-12
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, 3, 7-8, 10-12

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ANALYSIS REQUEST

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Job No: **362 8493**

Date Recv: 16-Jul-24 14:54

Received by: Brittney McLean

3136284934

Quote No 129425

Primary Contact Stuart Caird

Submitted By Maisie Hopkins

Client Name Beca Limited

Address PO Box 13960, Christchurch 8141

Postcode

Phone *Mobile*

Email

Charge To Beca Limited

Client Reference 3338703/800

Order No

Results To *Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.*

☑ Email Primary Contact ☐ Email Submitter ☐ Email Client

☑ Email Other ESdat_AU+BECA@ESdatLabSync.net

☐ Other

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories Date & Time: 16/7/24

Name: M. Hopkins

☐ Tick if you require COC to be emailed back Signature:

Received at Hill Laboratories (Refer to Lab created Job No above) Date & Time:

Name:

Signature:

Condition ☐ Room Temp ☐ Chilled ☐ Frozen Temp: 7.0

ADDITIONAL INFORMATION / KNOWN HAZARDS

Please use client reference above as 'project ID' when providing results in ESdat format.

Priority ☐ Low ☐ Normal ☑ High

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

Requested Reporting Date:

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
1	PP25_0.1	16/7/24		ASPHALT	HM's+Hg, TPH, PAH
2	PP25_0.2			SOIL	HM's+Hg, TPH+PAH
3	PP25_0.35				HOLD COLD
4	PP25_0.5				" "
5	PP25_0.9				" "
6	PP01_0.05			Asphalt	HM's+Hg, TPH+PAH
7	PP01_0.1			SOIL	HM's+Hg, TPH+PAH
8	PP01_0.35			SOIL	HOLD COLD
9	PP01_0.40			Asphalt	HM's+Hg, TPH+PAH
10	PP01_0.50			SOIL	HOLD COLD
11	PP01_0.80			SOIL	HOLD COLD
12	TP12_0.05	15/7/24		SOIL	HM's+Hg, TPH+PAH

Continued on next page

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
13	IP12_0.3	15/7/24		SOIL	HOLD COLD
14	IP12_0.5				HMS+Hg, TPH+PAH
15	IP12_0.7				HOLD COLD
16	IP12_1.0				
17	IP12_1.5				
18	IP12_2.0				
19					
20					
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26					
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Job Information Summary

Client:	Beca Limited	**Lab No:**	3628493
Contact:	Stuart Caird	**Date Registered:**	17-Jul-2024 9:26 am
	C/- Beca Limited	**Priority:**	High
	PO Box 13960	**Quote No:**	129425
	Christchurch 8141	**Order No:**	
		Client Reference:	3338703/800
		Add. Client Ref:	
		Submitted By:	Maisie Hopkins
		Charge To:	Beca Limited
		Target Date:	25-Jul-2024 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	PP25_0.1 16-Jul-2024	Roading Material	GSoil300	TPH Oil Industry Profile + PAHscreen, Rock, Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn, Total Recoverable Mercury
2	PP25_0.2 16-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
3	PP25_0.35 16-Jul-2024	Soil	GSoil300	Hold Cold
4	PP25_0.5 16-Jul-2024	Soil	GSoil300	Hold Cold
5	PP25_0.9 16-Jul-2024	Soil	GSoil300	Hold Cold
6	PP01_0.05 16-Jul-2024	Roading Material	GSoil300	TPH Oil Industry Profile + PAHscreen, Rock, Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn, Total Recoverable Mercury
7	PP01_0.1 16-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
8	PP01_0.35 16-Jul-2024	Soil	GSoil300	Hold Cold
9	PP01_0.40 16-Jul-2024	Roading Material	GSoil300	TPH Oil Industry Profile + PAHscreen, Rock, Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn, Total Recoverable Mercury
10	PP01_0.50 16-Jul-2024	Soil	GSoil300	Hold Cold
11	PP01_0.80 16-Jul-2024	Soil	GSoil300	Hold Cold
12	IP12_0.05 15-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
13	IP12_0.3 15-Jul-2024	Soil	GSoil300	Hold Cold
14	IP12_0.5 15-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
15	IP12_0.7 15-Jul-2024	Soil	GSoil300	Hold Cold
16	IP12_1.0 15-Jul-2024	Soil	GSoil300	Hold Cold
17	IP12_1.5 15-Jul-2024	Soil	GSoil300	Hold Cold
18	IP12_2.0 15-Jul-2024	Soil	GSoil300	Hold Cold

Summary of Methods

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

Sample Type: Soil

Test	Method Description	Default Detection Limit	Sample No
Individual Tests			
Environmental Solids Sample Drying	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	2, 7, 12, 14

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Total of Reported PAHs in Soil	Sonication extraction, GC-MS/MS analysis. In-house based on US EPA 8270.	0.03 mg/kg dry wt	2, 7, 12, 14
Dry Matter	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	2, 7, 12, 14
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	BaP Potency Equivalence calculated from; Benzo(a) anthracene x 0.1 + Benzo(b)fluoranthene x 0.1 + Benzo(j) fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Benzo(a) pyrene x 1.0 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Fluoranthene x 0.01 + Indeno(1,2,3-c,d)pyrene x 0.1. Ministry for the Environment. 2011. Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health. Wellington: Ministry for the Environment.	0.024 mg/kg dry wt	2, 7, 12, 14
Benzo[a]pyrene Toxic Equivalence (TEF)	Benzo[a]pyrene Toxic Equivalence (TEF) calculated from; Benzo[a]pyrene x 1.0 + Benzo(a)anthracene x 0.1 + Benzo(b)fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Indeno(1,2,3-c,d)pyrene x 0.1. Guidelines for assessing and managing contaminated gasworks sites in New Zealand (GMG) (MfE, 1997).	0.024 mg/kg dry wt	2, 7, 12, 14
TPH Oil Industry Profile + PAHscreen	Sonication extraction, GC-FID and GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8015 and US EPA 8270.	0.010 - 70 mg/kg dry wt	2, 7, 12, 14
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, 7, 12, 14
Total Petroleum Hydrocarbons in Soil			
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	2, 7, 12, 14
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, 7, 12, 14
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, 7, 12, 14
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, 7, 12, 14

Sample Type: Roading Material			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Individual Tests			
SHOC Macro Extraction 10x Dilution		-	1, 6, 9
Macro Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	1, 6, 9
Total Recoverable Arsenic	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 6, 9
Total Recoverable Cadmium	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg as rcvd	1, 6, 9
Total Recoverable Chromium	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 6, 9
Total Recoverable Copper	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 6, 9
Total Recoverable Lead	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.4 mg/kg as rcvd	1, 6, 9
Total Recoverable Mercury	Dried sample, Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg dry wt	1, 6, 9
Total Recoverable Nickel	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 6, 9
Total Recoverable Zinc	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	4 mg/kg as rcvd	1, 6, 9
Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 - 4 mg/kg as rcvd	1, 6, 9
Total Petroleum Hydrocarbons in Rock			
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	1-2, 6-7, 9, 12, 14

Sample Type: Roading Material			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg as rcvd	1, 6, 9
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg as rcvd	1, 6, 9
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg as rcvd	1, 6, 9
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg as rcvd	1, 6, 9

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ANALYSIS REQUEST

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Private Bag 3205
Hamilton 3240, New Zealand

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Job No: Date Recv: 01-Aug-24 14:57
364 0488
Received by: Brittney McLean
3136404880

Quote No	129425
Primary Contact	Stuart Caird
Submitted By	
Client Name	Beca Limited
Address	PO Box 13960, Christchurch 8141
	Postcode
Phone	*Mobile*
Email	
Charge To	Beca Limited
Client Reference	3338703/800
Order No	

Results To *Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.*

☑ *Email Primary Contact* ☐ *Email Submitter* ☐ *Email Client*
☑ *Email Other* ESdat_AU+BECA@ESdatLabSync.net
☐ *Other*

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories
Date & Time: 1.8.24
Name: S.CAIRD
☑ *Tick if you require COC to be emailed back*
Signature: [signature]

Received at Hill Laboratories *(Refer to Lab created Job No above)*
Date & Time:
Name:
Signature:

Condition ☐ *Room Temp* ☐ *Chilled* ☐ *Frozen* Temp: 9.9

ADDITIONAL INFORMATION / KNOWN HAZARDS

Please use client reference above as 'project ID' when providing results in ESdat format.

Priority ☐ **Low** ☐ **Normal** ☑ **High**
☐ **Urgent** (ASAP, extra charge applies, please contact lab first)

Requested Reporting Date:

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
1	TP03_0.1	1.8.24		SOIL	HM + Hg, TPH, Trace SVOC, Antimony, Tin, Asbestos (SQ)
2	TP03_0.3	↓		↓	Hold (cold)
3	TP03_0.5				HM+Hg, TPH, Trace SVOC, Antimony, Tin, Asbestos (SQ)
4	TP03_0.7				Hold (cold)
5	TP03_1.0				Hold (cold)
6	TP03_1.5				Hold (cold)
7	TP03_2.0				Hold (cold)
8	Dup_C				HM+Hg, TPH, Trace SVOC, Antimony, Tin
9	TP11_0.1				HM+Hg, TPH, Trace SVOC, Antimony, Tin, Asbestos (SQ)
10	TP11_0.3				Hold (cold)
11	TP11_0.5				HM+Hg, TPH, Trace SVOC, Antimony, Tin, Asbestos (SQ)
12	TP11_0.7	↓		↓	Hold (cold)

Continued on next page

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
13	TP11_1.0	1.8.24		SOIL	Hold Cold
14	Dup_M				HM+Hg, TRH, Trace SVOC, Antimony, Tin
15	TP10_0.1				HMHg, TRH, Trace SVOC, Antimony, Tin, Asbestos (
16	TP10_0.3				Hold Cold
17	TP10_0.5				HMHg, TRH, Trace SVOC, Antimony, Tin Asbestos (SQ)
18	TP10_0.7				Hold Cold
19	TP10_1.0				Hold Cold
20					
21					
22					
23					
24					
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26					
27					
28					
29					
30					
31					
32					
33					
34					
35					
36					
37					
38					
39					
40					

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Hamilton 3240 New Zealand

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www.**hill-labs**.co.nz

Job Information Summary

Client:	Beca Limited	**Lab No:**	3640488
Contact:	Stuart Caird	**Date Registered:**	02-Aug-2024 10:07 am
	C/- Beca Limited	**Priority:**	High
	PO Box 13960	**Quote No:**	129425
	Christchurch 8141	**Order No:**	
		Client Reference:	3338703/800
		Add. Client Ref:	
		Submitted By:	Stuart Caird
		Charge To:	Beca Limited
		Target Date:	08-Aug-2024 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	IP03_0.1 01-Aug-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, Total Recoverable Antimony, Total Recoverable Tin, Semivolatile Organic Compounds Trace in Soil by GC-MS, Total Petroleum Hydrocarbons in Soil
2	IP03_0.3 01-Aug-2024	Soil	GSoil300	Hold Cold
3	IP03_0.5 01-Aug-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, Total Recoverable Antimony, Total Recoverable Tin, Semivolatile Organic Compounds Trace in Soil by GC-MS, Total Petroleum Hydrocarbons in Soil
4	IP03_0.7 01-Aug-2024	Soil	GSoil300	Hold Cold
5	IP03_1.0 01-Aug-2024	Soil	GSoil300	Hold Cold
6	IP03_1.5 01-Aug-2024	Soil	GSoil300	Hold Cold
7	IP03_2.0 01-Aug-2024	Soil	GSoil300	Hold Cold
8	Dup_L 01-Aug-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, Total Recoverable Antimony, Total Recoverable Tin, Semivolatile Organic Compounds Trace in Soil by GC-MS, Total Petroleum Hydrocarbons in Soil
9	TP11_0.1 01-Aug-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, Total Recoverable Antimony, Total Recoverable Tin, Semivolatile Organic Compounds Trace in Soil by GC-MS, Total Petroleum Hydrocarbons in Soil
10	TP11_0.3 01-Aug-2024	Soil	GSoil300	Hold Cold
11	TP11_0.5 01-Aug-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, Total Recoverable Antimony, Total Recoverable Tin, Semivolatile Organic Compounds Trace in Soil by GC-MS, Total Petroleum Hydrocarbons in Soil
12	TP11_0.7 01-Aug-2024	Soil	GSoil300	Hold Cold
13	TP11_1.0 01-Aug-2024	Soil	GSoil300	Hold Cold
14	DUP_M 01-Aug-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, Total Recoverable Antimony, Total Recoverable Tin, Semivolatile Organic Compounds Trace in Soil by GC-MS, Total Petroleum Hydrocarbons in Soil
15	TP10_0.1 01-Aug-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, Total Recoverable Antimony, Total Recoverable Tin, Semivolatile Organic Compounds Trace in Soil by GC-MS, Total Petroleum Hydrocarbons in Soil
16	TP10_0.3 01-Aug-2024	Soil	GSoil300	Hold Cold
17	TP10_0.5 01-Aug-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, Total Recoverable Antimony, Total Recoverable Tin, Semivolatile Organic Compounds Trace in Soil by GC-MS, Total Petroleum Hydrocarbons in Soil
18	TP10_0.7 01-Aug-2024	Soil	GSoil300	Hold Cold
19	TP10_1.0 01-Aug-2024	Soil	GSoil300	Hold Cold

Summary of Methods

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

Sample Type: Soil

Test	Method Description	Default Detection Limit	Sample No
Individual Tests			
Environmental Solids Sample Drying	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	1, 3, 8-9, 11, 14-15, 17
Dry Matter	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	1, 3, 8-9, 11, 14-15, 17
Total Recoverable Antimony	Dried sample, sieved as specified (if required). Nitric/Hydrochloric acid digestion, ICP-MS, screen level. US EPA 200.2.	0.4 mg/kg dry wt	1, 3, 8-9, 11, 14-15, 17
Total Recoverable Tin	Dried sample, sieved as specified (if required). Nitric/Hydrochloric acid digestion, ICP-MS, screen level. US EPA 200.2.	1.0 mg/kg dry wt	1, 3, 8-9, 11, 14-15, 17
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, 3, 8-9, 11, 14-15, 17
Semivolatile Organic Compounds Trace in Soil by GC-MS	Sonication extraction, GC-MS analysis. Tested on as received sample. In-house based on US EPA 8270.	0.10 - 6 mg/kg dry wt	1, 3, 8-9, 11, 14-15, 17
Total Petroleum Hydrocarbons in Soil			
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	1, 3, 8-9, 11, 14-15, 17
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	1, 3, 8-9, 11, 14-15, 17
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, 3, 8-9, 11, 14-15, 17
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, 3, 8-9, 11, 14-15, 17
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, 3, 8-9, 11, 14-15, 17

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, 3, 10, 12, 17, 19, 24-25, 27, 30, 32

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ANALYSIS REQUEST

R J Hill Laboratories Limited
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E mail@hill-labs.co.nz
W www.hill-laboratories.com

Job No: 364 0489
Date Recv: 01-Aug-24 14:57
Received by: Brittney McLean

Quote No	129425
Primary Contact	Stuart Caird
Submitted By	
Client Name	Beca Limited
Address	PO Box 13960, Christchurch 8141
	Postcode
Phone	*Mobile*
Email	
Charge To	Beca Limited
Client Reference	3338703/800
Order No	

Results To *Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.*

☑ Email Primary Contact ☐ Email Submitter ☐ Email Client
☑ Email Other ESdat_AU+BECA@ESdatLabSync.net
☐ Other

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories	*Date & Time:* 1.8.24
☑ *Tick if you require COC to be emailed back*	*Name:* S. CAIRD
	Signature:
Received at Hill Laboratories *(Refer to Lab created Job No above)*	*Date & Time:*
	Name:
	Signature:
Condition ☐ Room Temp ☐ Chilled ☐ Frozen	*Temp:* 9.9

ADDITIONAL INFORMATION / KNOWN HAZARDS

Please use client reference above as 'project ID' when providing results in ESdat format.

Priority ☐ Low ☐ Normal ☑ High
☐ **Urgent** (ASAP, extra charge applies, please contact lab first)

Requested Reporting Date:

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
1	IP03_0.1	1.8.24		SOIL	Hmn Hg, TPH, Trace Suite, Antimony, Tin, Asbestos (SQ)
2	IP03_0.3				Hold (CD)
3	IP03_0.5				Hmn Hg, TPH, Trace Suite, Antimony, Tin, Asbestos (SQ)
4	IP03_0.7				Hold (CD)
5	IP03_1.0				Hold (CD)
6	IP03_1.5				Hold (CD)
7	IP03_2.0				Hold (CD)
8	DUP_L				Hmn Hg, TPH, Trace Suite, Antimony, Tin
9	TP11_0.1				Hmn Hg, TPH, Trace Suite, Antimony, Tin, Asbestos (SQ)
10	TP11_0.3				Hold (CD)
11	TP11_0.5				Hmn Hg, TPH, Trace Suite, Antimony, Tin, Asbestos (SQ)
12	TP11_0.7				Hold (CD)

Continued on next page

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
13	TP11_1.0	1.8.24		SOIL	Hold
14	Dup_M	↓		↓	Hg, TPH, Trace SVOC, Antimony, Tin
15	TP10_0.1				Hg, TPH, Trace SVOC, Antimony, Tin, Asbestos (S
16	TP10_0.3				Hold
17	TP10_05				Hg, TPH, Trace SVOC, Antimony, Tin, Asbestos (SQ)
18	TP10_0.7				Hold
19	TP10_1.0	↓		↓	Hold
20					
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30					
31					
32					
33					
34					
35					
36					
37					
38					
39					
40					

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www.**hill-labs**.co.nz

Job Information Summary

Client:	Beca Limited	**Lab No:**	3640489
Contact:	Stuart Caird	**Date Registered:**	02-Aug-2024 8:25 am
	C/- Beca Limited	**Priority:**	High
	PO Box 13960	**Quote No:**	129425
	Christchurch 8141	**Order No:**	
		Client Reference:	Rolleston 338703/800
		Add. Client Ref:	
		Submitted By:	Stuart Caird
		Charge To:	Beca Limited
		Target Date:	05-Aug-2024 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	TP03_0.1 01-Aug-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil, Asbestos in Soil ESdat Electronic Transfer
2	TP03_0.3 01-Aug-2024	Soil	PSoil500Asb	Hold
3	TP03_0.5 01-Aug-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil, Asbestos in Soil ESdat Electronic Transfer
4	TP03_0.7 01-Aug-2024	Soil	PSoil500Asb	Hold
5	TP03_1.0 01-Aug-2024	Soil	PSoil500Asb	Hold
6	TP03_1.5 01-Aug-2024	Soil	PSoil500Asb	Hold
7	TP03_2.0 01-Aug-2024	Soil	PSoil500Asb	Hold
8	TP11_0.1 01-Aug-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil, Asbestos in Soil ESdat Electronic Transfer
9	TP11_0.3 01-Aug-2024	Soil	PSoil500Asb	Hold
10	TP11_0.5 01-Aug-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil, Asbestos in Soil ESdat Electronic Transfer
11	TP11_0.7 01-Aug-2024	Soil	PSoil500Asb	Hold
12	TP11_1.0 01-Aug-2024	Soil	PSoil500Asb	Hold
13	TP10_0.1 01-Aug-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil, Asbestos in Soil ESdat Electronic Transfer
14	TP10_0.3 01-Aug-2024	Soil	PSoil500Asb	Hold
15	TP10_0.5 01-Aug-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil, Asbestos in Soil ESdat Electronic Transfer
16	TP10_0.7 01-Aug-2024	Soil	PSoil500Asb	Hold
17	TP10_1.0 01-Aug-2024	Soil	PSoil500Asb	Hold

Summary of Methods

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

Sample Type: Soil

Test	Method Description	Default Detection Limit	Sample No
New Zealand Guidelines Semi Quantitative Asbestos in Soil			
As Received Weight	Measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g	1, 3, 8, 10, 13, 15
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g	1, 3, 8, 10, 13, 15
Moisture	Sample dried at 100 to 105°C. Calculation = (As received weight - Dry weight) / as received weight x 100.	1 %	1, 3, 8, 10, 13, 15
Sample Fraction >10mm	Sample dried at 100 to 105°C, 10mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1, 3, 8, 10, 13, 15

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Sample Fraction <10mm to >2mm	Sample dried at 100 to 105°C, 10mm and 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1, 3, 8, 10, 13, 15
Sample Fraction <2mm	Sample dried at 100 to 105°C, 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1, 3, 8, 10, 13, 15
Asbestos Presence / Absence	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0.01%	1, 3, 8, 10, 13, 15
Description of Asbestos Form	Description of asbestos form and/or shape if present.	-	1, 3, 8, 10, 13, 15
Weight of Asbestos in ACM (Non-Friable)	Measurement on analytical balance, from the >10mm Fraction. Weight of asbestos based on assessment of ACM form. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 3, 8, 10, 13, 15
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, 3, 8, 10, 13, 15
Weight of Asbestos as Fibrous Asbestos (Friable)	Measurement on analytical balance, from the >10mm Fraction. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 3, 8, 10, 13, 15
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, 3, 8, 10, 13, 15
Weight of Asbestos as Asbestos Fines (Friable)	Measurement on analytical balance, from the <10mm Fractions. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 3, 8, 10, 13, 15
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, 3, 8, 10, 13, 15
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, 3, 8, 10, 13, 15
Asbestos in Soil ESdat Electronic Transfer			
Amosite	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0 Detect	1, 3, 8, 10, 13, 15
Chrysotile	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0 Detect	1, 3, 8, 10, 13, 15
Crocidolite	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0 Detect	1, 3, 8, 10, 13, 15

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ANALYSIS REQUEST

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

Job No. **361 5000**

Date Recv: 26-Jun-24 16:02

Received by: Eila-Rose Jones

3136150006

T 0508 HILL LAB (44 555 2
T +64 7 858 2000
E mail@hill-labs.co.nz
W www.hill-laboratories.com

Quote No 129425

Primary Contact Stuart Caird

Submitted By

Client Name Beca Limited

Address PO Box 13960, Christchurch 8141

Postcode

Phone *Mobile*

Email

Charge To Beca Limited

Client Reference 3338703/800

Order No

Results To *Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.*

☑ Email Primary Contact ☐ Email Submitter ☐ Email Client

☑ Email Other ESdat_AU+BECA@ESdatLabSync.net

☑ Other Maisie.hopkins@beca.com

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories
Date & Time: 26.6.24
Name: S.CAIRD
Signature:

☑ *Tick if you require COC to be emailed back*

Received at Hill Laboratories
(Refer to Lab created Job No above)
Date & Time:
Name:
Signature:

Condition ☐ Room Temp ☐ Chilled ☐ Frozen
Temp: 12.2

ADDITIONAL INFORMATION / KNOWN HAZARDS

Please use client reference above as 'project ID' when providing results in ESdat format.

Priority ☐ Low ☐ Normal ☑ High
☐ Urgent (ASAP, extra charge applies, please contact lab first)

Requested Reporting Date:

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
1	PP03_0.05	26.6.24		Asbestos	Hmt Hg, PAH, TPH
2	PP03_0.15			SOIL	Hold (oil)
3	PP03_0.3				Hmt Hg, PAH, TPH
4	PP03_0.7				Hold (oil)
5	PP03_1.0				Hold (oil)
6	PP02_0.05			Asbestos	Hmt Hg, PAH, TPH
7	PP02_0.15			SOIL	Hold (oil)
8	PP02_0.3				Hmt Hg, PAH, TPH
9	PP02_0.5				Hold (oil)
10	PP02-0.8				Hold (oil)
11					
12					

Continued on next page

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Job Information Summary

Client:	Beca Limited	**Lab No:**	3615000
Contact:	Stuart Caird	**Date Registered:**	27-Jun-2024 9:47 am
	C/- Beca Limited	**Priority:**	High
	PO Box 13960	**Quote No:**	129425
	Christchurch 8141	**Order No:**	
		Client Reference:	3338703/800
		Add. Client Ref:	
		Submitted By:	Stuart Caird
		Charge To:	Beca Limited
		Target Date:	08-Jul-2024 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	PP03_0.05 26-Jun-2024	Roading Material	cGSoil	TPH Oil Industry Profile + PAHscreen, Rock, Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn, Total Recoverable Mercury
2	PP03_0.15 26-Jun-2024	Soil	cGSoil	Hold Cold
3	PP03_0.3 26-Jun-2024	Soil	cGSoil	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
4	PP03_0.7 26-Jun-2024	Soil	cGSoil	Hold Cold
5	PP03_1.0 26-Jun-2024	Soil	cGSoil	Hold Cold
6	PP02_0.05 26-Jun-2024	Roading Material	cGSoil	TPH Oil Industry Profile + PAHscreen, Rock, Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn, Total Recoverable Mercury
7	PP02_0.15 26-Jun-2024	Soil	cGSoil	Hold Cold
8	PP02_0.3 26-Jun-2024	Soil	cGSoil	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
9	PP02_0.5 26-Jun-2024	Soil	cGSoil	Hold Cold
10	PP02_0.8 26-Jun-2024	Soil	cGSoil	Hold Cold

Summary of Methods

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

Sample Type: Soil

Test	Method Description	Default Detection Limit	Sample No
Individual Tests			
Environmental Solids Sample Drying	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	3, 8
Total of Reported PAHs in Soil	Sonication extraction, GC-MS/MS analysis. In-house based on US EPA 8270.	0.03 mg/kg dry wt	3, 8
Dry Matter	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	3, 8
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	BaP Potency Equivalence calculated from; Benzo(a) anthracene x 0.1 + Benzo(b)fluoranthene x 0.1 + Benzo(j) fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Benzo(a) pyrene x 1.0 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Fluoranthene x 0.01 + Indeno(1,2,3-c,d)pyrene x 0.1. Ministry for the Environment. 2011. Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health. Wellington: Ministry for the Environment.	0.024 mg/kg dry wt	3, 8

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Benzo[a]pyrene Toxic Equivalence (TEF)	Benzo[a]pyrene Toxic Equivalence (TEF) calculated from; Benzo[a]pyrene x 1.0 + Benzo(a)anthracene x 0.1 + Benzo(b)fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Indeno(1,2,3-c,d)pyrene x 0.1. Guidelines for assessing and managing contaminated gasworks sites in New Zealand (GMG) (MfE, 1997).	0.024 mg/kg dry wt	3, 8
TPH Oil Industry Profile + PAHscreen	Sonication extraction, GC-FID and GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8015 and US EPA 8270.	0.010 - 70 mg/kg dry wt	3, 8
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	3, 8
Total Petroleum Hydrocarbons in Soil			
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	3, 8
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	3, 8
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	3, 8
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	3, 8

Sample Type: Roading Material			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Individual Tests			
SHOC Macro Extraction 10x Dilution		-	1, 6
Macro Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	1, 6
Total Recoverable Arsenic	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 6
Total Recoverable Cadmium	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg as rcvd	1, 6
Total Recoverable Chromium	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 6
Total Recoverable Copper	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 6
Total Recoverable Lead	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.4 mg/kg as rcvd	1, 6
Total Recoverable Mercury	Dried sample, Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg dry wt	1, 6
Total Recoverable Nickel	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 6
Total Recoverable Zinc	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	4 mg/kg as rcvd	1, 6
Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 - 4 mg/kg as rcvd	1, 6
Total Petroleum Hydrocarbons in Rock			
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	1, 3, 6, 8
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg as rcvd	1, 6
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg as rcvd	1, 6
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg as rcvd	1, 6
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg as rcvd	1, 6

ANALYSIS REQUEST

Job No: 360 8971 Date Recv: 18-Jun-24 14:31

Received by: Harsharan Kaur

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

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

Quote No 129425

Primary Contact Stuart Caird 207619

Submitted By 207619

Client Name Beca Limited 106407

Address PO Box 13960, Christchurch 8141

Phone 03 366 3521 *Mobile*

Email

Charge To Beca Limited 76225

Client Reference ~~Rolleston~~ 3338703 | 800

Order No

Results To *Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.*

- [x] *Email Primary Contact* [ ] *Email Submitter* [ ] *Email Client*
- [x] *Email Other* Esdat_Au+Beca@Esdatlabsync.net
- [x] *Other* melissa.fletcher@beca.com.

Dates of testing are not routinely included in the Certificates of Analysis. Please inform the laboratory if you would like this information reported.

CHAIN OF CUSTODY RECORD

Sent to Hill Labs
- [x] *Tick if you require COC to be emailed back*

Date & Time: 18/6/24
Name: M. Fletcher
Signature: MFletcher

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

Condition [ ] *Room Temp* [x] *Chilled* [ ] *Frozen* *Temp:* 12.3

[ ] Sample & Analysis details checked
Signature:

ADDITIONAL INFORMATION / KNOWN HAZARDS

Priority [ ] Low [ ] Normal [x] High

[ ] **Urgent** (ASAP, extra charge applies, please contact lab first)

NOTE: The estimated turnaround time for the types and number of samples and analyses specified on this quote is by 4:30 pm, 3 working days following the day of receipt of the samples at the laboratory.

Requested Reporting Date:

Quoted Sample Types

Soil (Soil)

No.	Sample Name	Sample Date/Time	Sample Type	Tests Required
1	TP07_0.1	18/6/2024	Soil	Heavy metals + hg, PAH, TPH
2	TP07_0.3			ON HOLD
3	TP07_0.5			Heavy metals + hg, PAH, TPH
4	TP07_1.0			ON HOLD
5	TP07_1.5			ON HOLD
6	TP07_2.0			ON HOLD.
7	IP01_0.1			Heavy metals + hg, PAH, TPH
8	IP01_0.3			ON HOLD
9	IP01_0.5			Heavy metals + Hg, PAH, TPH
10	IP01_1.0			ON HOLD

vity: General

No.	Sample Name	Sample Date	Sample Type	Tests Required
11	IP01_1.5	18/6	Soil	ON HOLD
12	IP01_2.0	↓	Soil	ON HOLD.
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				

R J Hill Laboratories Limited
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Hamilton 3240 New Zealand

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www.**hill-labs**.co.nz

Job Information Summary

Client:	Beca Limited	**Lab No:**	3608971
Contact:	Stuart Caird	**Date Registered:**	19-Jun-2024 10:30 am
	C/- Beca Limited	**Priority:**	High
	PO Box 13960	**Quote No:**	129425
	Christchurch 8141	**Order No:**	
		Client Reference:	3338703/800
		Add. Client Ref:	
		Submitted By:	Melissa Fletcher
		Charge To:	Beca Limited
		Target Date*:	21-Jun-2024 4:30 pm

* As the samples require analysis at a Hill Labs location that is different to where they were received, the Target Date for reporting has been extended.

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	TP07_0.1 18-Jun-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
2	TP07_0.3 18-Jun-2024	Soil	GSoil300	Hold Cold
3	TP07_0.5 18-Jun-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
4	TP07_1.0 18-Jun-2024	Soil	GSoil300	Hold Cold
5	TP07_1.5 18-Jun-2024	Soil	GSoil300	Hold Cold
6	TP07_2.0 18-Jun-2024	Soil	GSoil300	Hold Cold
7	IP01_0.1 18-Jun-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
8	IP01_0.3 18-Jun-2024	Soil	GSoil300	Hold Cold
9	IP01_0.5 18-Jun-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
10	IP01_1.0 18-Jun-2024	Soil	GSoil300	Hold Cold
11	IP01_1.5 18-Jun-2024	Soil	GSoil300	Hold Cold
12	IP01_2.0 18-Jun-2024	Soil	GSoil300	Hold Cold

Summary of Methods

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

Sample Type: Soil

Test	Method Description	Default Detection Limit	Sample No
Individual Tests			
Environmental Solids Sample Drying	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	1, 3, 7, 9
Total of Reported PAHs in Soil	Sonication extraction, GC-MS/MS analysis. In-house based on US EPA 8270.	0.03 mg/kg dry wt	1, 3, 7, 9
Dry Matter	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	1, 3, 7, 9
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	BaP Potency Equivalence calculated from; Benzo(a) anthracene x 0.1 + Benzo(b)fluoranthene x 0.1 + Benzo(j) fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Benzo(a) pyrene x 1.0 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Fluoranthene x 0.01 + Indeno(1,2,3-c,d)pyrene x 0.1. Ministry for the Environment. 2011. Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health. Wellington: Ministry for the Environment.	0.024 mg/kg dry wt	1, 3, 7, 9

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Benzo[a]pyrene Toxic Equivalence (TEF)	Benzo[a]pyrene Toxic Equivalence (TEF) calculated from; Benzo[a]pyrene x 1.0 + Benzo(a)anthracene x 0.1 + Benzo(b)fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Indeno(1,2,3-c,d)pyrene x 0.1. Guidelines for assessing and managing contaminated gasworks sites in New Zealand (GMG) (MfE, 1997).	0.024 mg/kg dry wt	1, 3, 7, 9
TPH Oil Industry Profile + PAHscreen	Sonication extraction, GC-FID and GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8015 and US EPA 8270.	0.010 - 70 mg/kg dry wt	1, 3, 7, 9
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, 3, 7, 9
Total Petroleum Hydrocarbons in Soil			
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	1, 3, 7, 9
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	1, 3, 7, 9
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, 3, 7, 9
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, 3, 7, 9
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, 3, 7, 9

Hill Laboratories
TRIED, TESTED AND TRUSTED

ANALYSIS REQUEST

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

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

Job No: **362 6395**
Date Recv: 12-Jul-24 13:38
Received by: Eila-Rose Jones

Quote No	129425
Primary Contact	Stuart Caird
Submitted By	Stuart Caird
Client Name	Beca Limited
Address	PO Box 13960, Christchurch 8141
	Postcode
Phone	*Mobile*
Email	
Charge To	Beca Limited
Client Reference	3338703/800
Order No	

Results To *Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.*

☑ Email Primary Contact ☐ Email Submitter ☐ Email Client
☑ Email Other ESdat_AU+BECA@ESdatLabSync.net
☐ Other

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories Date & Time: 12.7.24
☑ Tick if you require COC to be emailed back Name: S. CAIRD
Signature:

Received at Hill Laboratories (Refer to Lab created Job No above) Date & Time:
Name:
Signature:

Condition ☐ Room Temp ☐ Chilled ☐ Frozen Temp: 11.9

ADDITIONAL INFORMATION / KNOWN HAZARDS

Please use client reference above as 'project ID' when providing results in ESdat format.

Priority ☐ Low ☐ Normal ☑ High
☐ Urgent (ASAP, extra charge applies, please contact lab first)

Requested Reporting Date:

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
1	PP18_0.05	12.7.24		Asphalt	HM+Lig, PAH, TPH
2	PP18_0.15			SOIL	HM+Lig, PAH, TPH
3	PP18_0.25			SOIL	Hold
4	PP18_0.35			Asphalt	HM+Lig, PAH, TPH
5	PP18_0.4			SOIL	Hold
6	PP18_0.6			SOIL	Hold
7	PP04_0.05			Asphalt	HM+Lig, PAH, TPH
8	PP04_0.1			Soil	Hold HM+Lig, TPH, PAH
9	PP04_0.15			Asphalt	HM+Lig, PAH, TPH
10	PP04_0.3			Soil	Hold
11	PP04_0.5			Soil	Hold
12	PP04_0.7			Soil	Hold

Continued on next page

R J Hill Laboratories Limited
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mail@hill-labs.co.nz
www.**hill-labs**.co.nz

Job Information Summary

Client:	Beca Limited	**Lab No:**	3626395
Contact:	Stuart Caird	**Date Registered:**	13-Jul-2024 12:01 pm
	C/- Beca Limited	**Priority:**	High
	PO Box 13960	**Quote No:**	129425
	Christchurch 8141	**Order No:**	3338703/800
		Client Reference:	Rolleston 338703
		Add. Client Ref:	
		Submitted By:	Stuart Caird
		Charge To:	Beca Limited
		Target Date:	23-Jul-2024 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	PP18_0.05 12-Jul-2024	Roading Material	GSoil300	TPH Oil Industry Profile + PAHscreen, Rock, Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn, Total Recoverable Mercury
2	PP18_0.15 12-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
3	PP18_0.25 12-Jul-2024	Soil	GSoil300	Hold Cold
4	PP18_0.35 12-Jul-2024	Roading Material	GSoil300	TPH Oil Industry Profile + PAHscreen, Rock, Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn, Total Recoverable Mercury
5	PP18_0.4 12-Jul-2024	Soil	GSoil300	Hold Cold
6	PP18_0.6 12-Jul-2024	Soil	GSoil300	Hold Cold
7	PP04_0.05 12-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
8	PP04_0.1 12-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
9	PP04_0.15 12-Jul-2024	Roading Material	GSoil300	TPH Oil Industry Profile + PAHscreen, Rock, Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn, Total Recoverable Mercury
10	PP04_0.3 12-Jul-2024	Soil	GSoil300	Hold Cold
11	PP04_0.5 12-Jul-2024	Soil	GSoil300	Hold Cold
12	PP04_0.7 12-Jul-2024	Soil	GSoil300	Hold Cold

Summary of Methods

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

Sample Type: Soil

Test	Method Description	Default Detection Limit	Sample No
Individual Tests			
Environmental Solids Sample Drying	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	2, 7-8
Total of Reported PAHs in Soil	Sonication extraction, GC-MS/MS analysis. In-house based on US EPA 8270.	0.03 mg/kg dry wt	2, 7-8
Dry Matter	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	2, 7-8

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	BaP Potency Equivalence calculated from; Benzo(a) anthracene x 0.1 + Benzo(b)fluoranthene x 0.1 + Benzo(j) fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Benzo(a) pyrene x 1.0 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Fluoranthene x 0.01 + Indeno(1,2,3-c,d)pyrene x 0.1. Ministry for the Environment. 2011. Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health. Wellington: Ministry for the Environment.	0.024 mg/kg dry wt	2, 7-8
Benzo[a]pyrene Toxic Equivalence (TEF)	Benzo[a]pyrene Toxic Equivalence (TEF) calculated from; Benzo[a]pyrene x 1.0 + Benzo(a)anthracene x 0.1 + Benzo(b)fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Indeno(1,2,3-c,d)pyrene x 0.1. Guidelines for assessing and managing contaminated gasworks sites in New Zealand (GMG) (MfE, 1997).	0.024 mg/kg dry wt	2, 7-8
TPH Oil Industry Profile + PAHscreen	Sonication extraction, GC-FID and GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8015 and US EPA 8270.	0.010 - 70 mg/kg dry wt	2, 7-8
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, 7-8
Total Petroleum Hydrocarbons in Soil			
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	2, 7-8
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, 7-8
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, 7-8
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, 7-8

Sample Type: Roading Material			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Individual Tests			
SHOC Macro Extraction 10x Dilution		-	1, 4, 9
Macro Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	1, 4, 9
Total Recoverable Arsenic	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 4, 9
Total Recoverable Cadmium	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg as rcvd	1, 4, 9
Total Recoverable Chromium	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 4, 9
Total Recoverable Copper	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 4, 9
Total Recoverable Lead	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.4 mg/kg as rcvd	1, 4, 9
Total Recoverable Mercury	Dried sample, Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg dry wt	1, 4, 9
Total Recoverable Nickel	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 4, 9
Total Recoverable Zinc	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	4 mg/kg as rcvd	1, 4, 9
Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 - 4 mg/kg as rcvd	1, 4, 9
Total Petroleum Hydrocarbons in Rock			
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	1-2, 4, 7-9
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg as rcvd	1, 4, 9
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg as rcvd	1, 4, 9
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg as rcvd	1, 4, 9

Sample Type: Roading Material			
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 as rcvd	1, 4, 9

Hill Laboratories
TRIED, TESTED AND TRUSTED

ANALYSIS REQUEST

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

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Job No: **363 1688**

Date Recv: 19-Jul-24 13:36

Received by: Eila-Rose Jones

3136316884

Quote No	129425
Primary Contact	Stuart Caird
Submitted By	Stuart Caird
Client Name	Beca Limited
Address	PO Box 13960, Christchurch 8141
	Postcode
Phone	*Mobile*
Email	
Charge To	Beca Limited
Client Reference	3338703/800
Order No	

Results To *Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.*

☑ Email Primary Contact ☐ Email Submitter ☐ Email Client

☑ Email Other ESdat_AU+BECA@ESdatLabSync.net

☐ Other

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories
Date & Time: 19.7.24
Name: S. CAIRD
Signature:

☑ Tick if you require COC to be emailed back

Received at Hill Laboratories *(Refer to Lab created Job No above)*
Date & Time:
Name:
Signature:

Condition ☐ Room Temp ☐ Chilled ☐ Frozen
Temp: 14.1

ADDITIONAL INFORMATION / KNOWN HAZARDS

Please use client reference above as 'project ID' when providing results in ESdat format.

Priority ☐ Low ☐ Normal ☑ High
☐ **Urgent** (ASAP, extra charge applies, please contact lab first)

Requested Reporting Date:

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
1	TP02_0.1	19.7.24		SOIL	UMTHg, TRH, Trace SVOC, BTEX, Asbestos (SQ)
2	TP02_0.3	↓		↓	Hold (cold)
3	TP02_0.5				UMTHg, TRH, Trace SVOC, BTEX, Asbestos (SQ)
4	TP02_0.7				Hold (cold)
5	TP02_1.0				Hold (cold)
6	TP02_1.5				Hold (cold)
7	TP04_0.1				UMTHg, TRH, Trace SVOC, BTEX, Asbestos (SQ)
8	TP04_0.5				↓ ↓ ↓
9	TP04_0.7				Hold (cold)
10	TP04_1.0				UMTHg, TRH, Trace SVOC, BTEX, Asbestos (SQ)
11	TP04_1.3				UMTHg, TRH, Trace SVOC, BTEX, Asbestos, Cyanide
12	TP04_1.5	↓		↓	↓ ↓ ↓ ↓

Continued on next page

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
13	Mat_2.0	19.7.24		SOIL	HOLD (WD
14	Mat_2.5	↓		↓	HOLD (WD
15	Mat_3.0	↓		↓	HOLD (WD
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					
31					
32					
33					
34					
35					
36					
37					
38					
39					
40					

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Job Information Summary

Client:	Beca Limited	**Lab No:**	3631688
Contact:	Stuart Caird	**Date Registered:**	19-Jul-2024 3:03 pm
	C/- Beca Limited	**Priority:**	High
	PO Box 13960	**Quote No:**	129425
	Christchurch 8141	**Order No:**	
		Client Reference:	3338703/800
		Add. Client Ref:	
		Submitted By:	Stuart Caird
		Charge To:	Beca Limited
		Target Date:	23-Jul-2024 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	TP02_0.1 19-Jul-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil, Asbestos in Soil ESdat Electronic Transfer
2	TP02_0.3 19-Jul-2024	Soil	PSoil500Asb	Hold Cold
3	TP02_0.5 19-Jul-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil, Asbestos in Soil ESdat Electronic Transfer
4	TP02_0.7 19-Jul-2024	Soil	PSoil500Asb	Hold Cold
5	TP02_1.0 19-Jul-2024	Soil	PSoil500Asb	Hold Cold
6	TP02_1.5 19-Jul-2024	Soil	PSoil500Asb	Hold Cold
7	TP04_0.1 19-Jul-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil, Asbestos in Soil ESdat Electronic Transfer
8	TP04_0.5 19-Jul-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil, Asbestos in Soil ESdat Electronic Transfer
9	TP04_0.7 19-Jul-2024	Soil	PSoil500Asb	Hold Cold
10	TP04_1.0 19-Jul-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil, Asbestos in Soil ESdat Electronic Transfer
11	TP04_1.3 19-Jul-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil, Asbestos in Soil ESdat Electronic Transfer
12	TP04_1.5 19-Jul-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil, Asbestos in Soil ESdat Electronic Transfer
13	TP04_2.0 19-Jul-2024	Soil	PSoil500Asb	Hold Cold
14	TP04_2.5 19-Jul-2024	Soil	PSoil500Asb	Hold Cold
15	TP04_3.0 19-Jul-2024	Soil	PSoil500Asb	Hold Cold

Summary of Methods

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

Sample Type: Soil

Test	Method Description	Default Detection Limit	Sample No
New Zealand Guidelines Semi Quantitative Asbestos in Soil			
As Received Weight	Measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g	1, 3, 7-8, 10-12
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g	1, 3, 7-8, 10-12
Moisture	Sample dried at 100 to 105°C. Calculation = (As received weight - Dry weight) / as received weight x 100.	1 %	1, 3, 7-8, 10-12
Sample Fraction >10mm	Sample dried at 100 to 105°C, 10mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1, 3, 7-8, 10-12

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Sample Fraction <10mm to >2mm	Sample dried at 100 to 105°C, 10mm and 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1, 3, 7-8, 10-12
Sample Fraction <2mm	Sample dried at 100 to 105°C, 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1, 3, 7-8, 10-12
Asbestos Presence / Absence	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0.01%	1, 3, 7-8, 10-12
Description of Asbestos Form	Description of asbestos form and/or shape if present.	-	1, 3, 7-8, 10-12
Weight of Asbestos in ACM (Non-Friable)	Measurement on analytical balance, from the >10mm Fraction. Weight of asbestos based on assessment of ACM form. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 3, 7-8, 10-12
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, 3, 7-8, 10-12
Weight of Asbestos as Fibrous Asbestos (Friable)	Measurement on analytical balance, from the >10mm Fraction. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 3, 7-8, 10-12
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, 3, 7-8, 10-12
Weight of Asbestos as Asbestos Fines (Friable)	Measurement on analytical balance, from the <10mm Fractions. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 3, 7-8, 10-12
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, 3, 7-8, 10-12
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, 3, 7-8, 10-12
Asbestos in Soil ESdat Electronic Transfer			
Amosite	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0 Detect	1, 3, 7-8, 10-12
Chrysotile	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0 Detect	1, 3, 7-8, 10-12
Crocidolite	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0 Detect	1, 3, 7-8, 10-12

F

Appendix F – Results Analysis Tables

Beca

Results Analysis Table - Heavy Metals

						Metals									
						Antimony	Arsenic	Cadmium	Chromium (III+VI)	Copper	Lead	Mercury	Nickel	Tin	Zinc
Key and Standards						mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
MfE Hazardous Waste Guidelines Class A Screening [6]						12	100	20	-	100	100	4	200	20,000	200
Background Concentrations (Heavy Metals) [5]						-	**6.35**	**0.14**	**19.89**	**11.68**	**19.75**	**0.07**	**13.91**	-	**69.58**
Eco SGVs Investigation Trigger (80%) Values [4]						-	*60*	*12*	*390*	-	*900*	-	-	-	-
Australian NEPM Measure 1999 (updated 2013) - Commerical/Industrial [2]						-	-	-	-	-	-	-	6,000	-	400,000
NESCS Commercial/industrial outoor worker (unpaved) [1]						-	70	1,300	6,300	10,000	3,300	4,200	-	-	-
3608971	**3608971_1**	**TP07_0.1**	**Road Verge South of SH1**	**18 Jun 2024**	**0.1**	-	3	<0.10	11	6	**38**	<0.10	7	-	54
3608971	**3608971_3**	**TP07_0.5**	**Road Verge South of SH1**	**18 Jun 2024**	**0.5**	-	4	<0.10	15	5	16	<0.10	11	-	47
3608971	**3608971_7**	**IP01_0.1**	**Road Verge South of SH1**	**18 Jun 2024**	**0.1**	-	4	<0.10	12	7	**47**	<0.10	8	-	**70**
3608971	**3608971_9**	**IP01_0.5**	**Road Verge South of SH1**	**18 Jun 2024**	**0.5**	-	5	<0.10	17	5	**20**	<0.10	11	-	56
3617400	**3617400_1**	**TP06_0.1**	**Road Verge South of SH1**	**01 Jul 2024**	**0.1**	-	3	<0.10	13	6	**33**	<0.10	7	-	54
3617400	**3617400_3**	**TP06_0.5**	**Road Verge South of SH1**	**01 Jul 2024**	**0.5**	-	4	<0.10	14	4	14	<0.10	11	-	40
3617400	**3617400_17**	**TP03_0.1**	**Proposed Roundabout**	**01 Jul 2024**	**0.1**	-	3	<0.10	10	4	**19.8**	<0.10	6	-	46
3617400	**3617400_19**	**TP03_0.5**	**Proposed Roundabout**	**01 Jul 2024**	**0.5**	-	4	<0.10	15	4	15.3	<0.10	9	-	40
3631687	**3631687_1**	**TP02_0.1**	**Existing Railway Corridor**	**19 Jul 2024**	**0.1**	-	3	<0.10	11	9	**25**	<0.10	7	-	49
3631687	**3631687_3**	**TP02_0.5**	**Existing Railway Corridor**	**19 Jul 2024**	**0.5**	-	4	<0.10	15	4	14.9	<0.10	9	-	56
3631687	**3631687_7**	**TP04_0.1**	**Existing Railway Corridor**	**19 Jul 2024**	**0.1**	-	4	<0.10	14	**15**	**35**	<0.10	11	-	51
3631687	**3631687_8**	**TP04_0.5**	**Existing Railway Corridor**	**19 Jul 2024**	**0.5**	-	4	<0.10	14	11	**67**	<0.10	11	-	64
3631687	**3631687_10**	**TP04_1.0**	**Existing Railway Corridor**	**19 Jul 2024**	**1**	-	4	<0.10	13	5	12.7	<0.10	10	-	32
3631687	**3631687_11**	**TP04_1.3**	**Existing Railway Corridor**	**19 Jul 2024**	**1.3**	-	3	<0.10	13	3	12	<0.10	8	-	48
3631687	**3631687_12**	**TP04_1.5**	**Existing Railway Corridor**	**19 Jul 2024**	**1.5**	-	3	<0.10	12	3	11.6	<0.10	8	-	49
3640488	**3640488_9**	**TP11_0.1**	**HAIL C1 and G5**	**01 Aug 2024**	**0.1**	<0.4	3	<0.10	12	4	**31**	<0.10	8	1.1	55
3640488	**3640488_11**	**TP11_0.5**	**HAIL C1 and G6**	**01 Aug 2024**	**0.5**	<0.4	4	<0.10	16	5	13.2	<0.10	12	<1.0	40
3640488	**3640488_15**	**TP10_0.1**	**HAIL C1 and G7**	**01 Aug 2024**	**0.1**	<0.4	**10**	<0.10	12	4	19	<0.10	7	1	51
3640488	**3640488_17**	**TP10_0.5**	**HAIL C1 and G8**	**01 Aug 2024**	**0.5**	<0.4	6	<0.10	19	6	16.8	<0.10	**15**	1.2	47

Proposed Stormwater Soakage basins

						Metals									
						Antimony	Arsenic	Cadmium	Chromium (III+VI)	Copper	Lead	Mercury	Nickel	Tin	Zinc
Key and Standards						mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
MfE Hazardous Waste Guidelines Class A Screening [6]						12	100	20	-	100	100	4	200	20,000	200
Background Concentrations (Heavy Metals) [5]						-	**6.35**	**0.14**	**19.89**	**11.68**	**19.75**	**0.07**	**13.91**	-	**69.58**
Eco SGVs Investigation Trigger (80%) Values [4]						-	*60*	*12*	*390*	-	*900*	-	-	-	-
Australian NEPM Measure 1999 (updated 2013) - Commerical/Industrial [2]						-	-	-	-	-	-	-	6,000	-	400,000
NESCS Commercial/industrial outoor worker (unpaved) [1]						-	70	1,300	6,300	10,000	3,300	4,200	-	-	-
Lab Report Number	**Sample Code**	**Field ID**	**Targeting**	**Date**	**Depth (m bgl)**										
3617400	**3617400_10**	**TP08_0.1**	**Proposed Soakage Basins South of Roundabout**	**01 Jul 2024**	**0.1**	-	3	<0.10	11	4	14.7	<0.10	7	-	42
3617400	**3617400_12**	**TP08_0.5**	**Proposed Soakage Basins South of Roundabout**	**01 Jul 2024**	**0.5**	-	3	<0.10	15	4	14.0	<0.10	11	-	46
3617400	**3617400_30**	**IP02_0.1**	**Proposed Soakage Basins South of Roundabout**	**01 Jul 2024**	**0.1**	-	3	<0.10	10	4	14.9	<0.10	7	-	39
3617400	**3617400_32**	**IP02_0.5**	**Proposed Soakage Basins South of Roundabout**	**01 Jul 2024**	**0.5**	-	5	<0.10	17	5	19.1	<0.10	12	-	58
3640488	**3640488_1**	**IP03_0.1**	**Proposed Soakage Basins/ HAIL C1 and G5 North of SH1**	**01 Aug 2024**	**0.1**	<0.4	4	<0.10	12	4	**25**	<0.10	8	1.3	**80**
3640488	**3640488_3**	**IP03_0.5**	**Proposed Soakage Basins/ HAIL C1 and G5 North of SH1**	**01 Aug 2024**	**0.5**	<0.4	5	<0.10	16	5	16.5	<0.10	12	1.1	48

Annotations

(-) Not Analysed

BDL - Below Detection Limit

1 - MfE. 2012. Users' Guide: NES for Assessing and Managing Contaminants in Soil to Protect Human Health. Table B2 Soil contaminant standards for health for inorganic substances and Table B3 Soil contaminant standards for health for organic compounds

2 - Australian National Environmental Protection (Assessment of Site Contamination) Measure (NEPC 1999, amended 2013). Volume 2, Schedule B1, Table 1(A)1 Health Investigation Levels for Soil Contaminants.

4 - Landcare Research (2022).Exploring the implementation of ecological soil guildeline values for soil contaminants. Trigger value for 80% species protection selected – Tables 13, 14 and 22. TPH values applicable to 'coarse' grained soils adopted. For copper and zinc sensitive aged soil values selected

5 - Canterbury Regional Council (n.d.) online GIS Map Viewer: CanterburyMaps (Trace Elements Level 2). As the site straddles two soil groups (recent and gley soils), the most conservative level for each heavy metal was used.

6 - MfE Hazardous Waste Guidelines. Landfill Waste Acceptance Criteria and Landfill Classification, 2004. Table 1.

7 - MfE Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand (revised 2011). Module 4, Tables 4.13 and 4.14. Tier 1 soil acceptance criteria for TPH all pathways. 'Commercial/Industrial' land use and soil type 'Sandy Silt'values selected for a depth < 1m.

8 - US Environmental Protection Agency Regional Screening Levels (Industrial Soils Applied) (Nov 2023).

9 - New Zealand Guidelines for Assessing and Managing Asbestos in Soil (2017). Table 5 - Soil guideline values for asbestos in New Zealand (GAMAS).

Results Analysis Table - TPH, PAH, SVOC, Cyanide

Lab Report Number	Sample Code	Field ID	Targeting	Date	Depth	5 Compounds Analysed	Dieldrin	Endrin	g-BHC (Lindane)	53 Additional Compounds Analysed	B(a)P PEF (NZ NES)	1-Methylnaphthalene	2-methylnaphthalene	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a)anthracene	Benzo(a) pyrene	Benzo(b+j)fluoranthene
						BTEX	SVOC				PAH								
Key and Standards						mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
MfE Hazardous Waste Guidelines Class A Screening [6]						-	8	-	-	-	-	-	-	-	-	-	-	-	-
Ecan User Guide PAH Background Concentrations Christchurch [10]						-	-	-	-	-	-	-	-	0.055	0.069	0.113	0.47	0.595	0.947
Eco SGVs Investigation Trigger (80%) Values [4]						-	-	-	-	-	-	-	-	-	-	-	-	-	-
NESCS Commercial/industrial outoor worker (unpaved) [1]						-	-	-	-	-	35	-	-	-	-	-	-	-	-
USEPA RSLs Industrial Soil THQ=1.0						-	0.14	250	2.5	-	-	73	3.000	45.000	-	230.000	21	2.1	-
Module 4, Tier 1 Commercial / Industrial (SAND) [7]						-	-	-	-	-	-	-	-	-	-	-	-	-	-
3608971	3608971_1	TP07_0.1	Road Verge	18 Jun 2024	0.1	-	-	-	-	BDL	0.073	<0.012	<0.012	<0.012	<0.012	0.014	0.042	0.051	0.054
3608971	3608971_3	TP07_0.5	Road Verge	18 Jun 2024	0.5	-	-	-	-	BDL	<0.026	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011
3608971	3608971_7	IP01_0.1	Road Verge	18 Jun 2024	0.1	-	-	-	-	BDL	0.087	<0.011	<0.011	<0.011	<0.011	0.021	0.046	0.060	0.067
3608971	3608971_9	IP01_0.5	Road Verge	18 Jun 2024	0.5	-	-	-	-	BDL	<0.026	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011
3615000	3615000_3	PP03_0.3	Basecourse	26 Jun 2024	0.3	-	-	-	-	BDL	<0.025	<0.011	<0.016	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011
3615000	3615000_8	PP02_0.3	Basecourse	26 Jun 2024	0.3	-	-	-	-	BDL	<0.028	<0.012	<0.018	<0.012	<0.012	<0.012	<0.012	<0.012	<0.012
3617400	3617400_1	TP06_0.1	Road Verge	01 Jul 2024	0.1	-	-	-	-	BDL	0.100	<0.012	<0.012	<0.012	0.016	0.019	0.058	0.067	0.074
3617400	3617400_3	TP06_0.5	Road Verge	01 Jul 2024	0.5	-	-	-	-	BDL	<0.026	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011
3617400	3617400_17	TP03_0.1	General Site Sampling	01 Jul 2024	0.1	-	-	-	-	BDL	<0.030	<0.013	<0.013	<0.013	<0.013	<0.013	<0.013	<0.013	0.016
3617400	3617400_19	TP03_0.5	General Site Sampling	01 Jul 2024	0.5	-	-	-	-	BDL	<0.026	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011
3626395	3626395_2	PP18_0.15	Basecourse	12 Jul 2024	0.15	-	-	-	-	BDL	<0.025	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
3626395	3626395_8	PP04_0.1	Basecourse	12 Jul 2024	0.1	-	-	-	-	BDL	<0.025	<0.010	<0.018	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
3628493	3628493_7	PP01_0.1	Basecourse	16 Jul 2024	0.1	-	-	-	-	BDL	<0.025	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011
3631687	3631687_1	TP02_0.1	Existing Railway Corridor	19 Jul 2024	0.1	BDL	<0.10	<0.14	<0.10	BDL	<0.250	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
3631687	3631687_3	TP02_0.5	Existing Railway Corridor	19 Jul 2024	0.5	BDL	<0.10	<0.12	<0.10	BDL	<0.250	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
3631687	3631687_7	TP04_0.1	Existing Railway Corridor	19 Jul 2024	0.1	BDL	<0.10	<0.12	<0.10	BDL	<0.250	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
3631687	3631687_8	TP04_0.5	Existing Railway Corridor	19 Jul 2024	0.5	BDL	<0.10	<0.12	<0.10	BDL	0.480	-	<0.10	<0.10	<0.10	<0.10	0.33	0.33	0.35
3631687	3631687_10	TP04_1.0	General Site Sampling	19 Jul 2024	1	BDL	<0.10	<0.13	<0.10	BDL	<0.250	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
3631687	3631687_11	TP04_1.3	General Site Sampling	19 Jul 2024	1.3	BDL	<0.10	<0.13	<0.10	BDL	<0.250	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
3631687	3631687_12	TP04_1.5	General Site Sampling	19 Jul 2024	1.5	BDL	<0.10	<0.13	<0.10	BDL	<0.250	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
3640488	3640488_9	TP11_0.1	HAIL C1 and G5	01 Aug 2024	0.1	-	<0.10	<0.16	<0.10	BDL	<0.250	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
3640488	3640488_11	TP11_0.5	HAIL C1 and G6	01 Aug 2024	0.5	-	<0.10	<0.14	<0.10	BDL	<0.250	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
3640488	3640488_15	TP10_0.1	HAIL C1 and G7	01 Aug 2024	0.1	-	<0.10	<0.16	<0.10	BDL	<0.250	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
3640488	3640488_17	TP10_0.5	HAIL C1 and G8	01 Aug 2024	0.5	-	<0.10	<0.14	<0.10	BDL	<0.250	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10

Field ID	Benzo(e)pyrene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Perylene	Pyrene	PAHs (Sum of total)	C15-C36 Fraction	C7-C36 Fraction	C7-C9 Fraction	C10-C14 Fraction	Cyanide Total
	PAH													TPH				Inorganics
Key and Standards	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
MfE Hazardous Waste Guidelines Class A Screening [6]	-	-	-	-	-	-	-	-	200	-	-	-	-	-	-	-	-	-
Ecan User Guide PAH Background Concentrations Christchurch [10]	-	0.459	0.296	0.539	0.112	1.345	0.06	0.385	0.029	0.703	-	1.362	-	-	-	-	-	-
Eco SGVs Investigation Trigger (80%) Values [4]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NESCS Commercial/industrial outoor worker (unpaved) [1]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
USEPA RSLs Industrial Soil THQ=1.0	73	-	210	2.100	2.1	30.000	30.000	21	-	-	67	23.000	-	-	-	-	-	150
Module 4, Tier 1 Commercial / Industrial (SAND) [7]	-	-	-	-	-	-	-	-	190	-	-	-	-	-	-	120	1,500	-
TP07_0.1	0.023	0.028	0.020	0.047	<0.012	0.105	<0.012	0.025	<0.06	0.082	<0.012	0.105	0.6	<40	<80	<20	<20	-
TP07_0.5	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.06	<0.011	<0.011	<0.011	<0.3	<40	<80	<20	<20	-
IP01_0.1	0.030	0.032	0.025	0.060	<0.011	0.132	0.012	0.033	<0.06	0.115	<0.011	0.132	0.8	50	<80	<20	<20	-
IP01_0.5	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.06	<0.011	<0.011	<0.011	<0.3	<40	<80	<20	<20	-
PP03_0.3	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.06	<0.011	<0.011	<0.011	<0.3	<40	<80	<20	<20	-
PP02_0.3	<0.012	<0.012	<0.012	<0.012	<0.012	<0.012	<0.012	<0.012	<0.06	<0.012	<0.012	<0.012	<0.3	<40	<80	<20	<20	-
TP06_0.1	0.035	0.039	0.032	0.063	<0.012	0.160	0.014	0.039	<0.06	0.132	0.013	0.150	0.9	<40	<80	<20	<20	-
TP06_0.5	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.06	<0.011	<0.011	<0.011	<0.3	<40	<80	<20	<20	-
TP03_0.1	<0.013	<0.013	<0.013	<0.013	<0.013	0.026	<0.013	<0.013	<0.07	0.019	<0.013	0.030	<0.3	44	<80	<20	<20	-
TP03_0.5	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.06	<0.011	<0.011	<0.011	<0.3	<40	<80	<20	<20	-
PP18_0.15	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.05	<0.010	<0.010	<0.010	<0.3	<40	<80	<20	<20	-
PP04_0.1	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.05	<0.010	<0.010	<0.010	<0.3	<40	<80	<20	<20	-
PP01_0.1	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.06	<0.011	<0.011	<0.011	<0.3	<40	<80	<20	<20	-
TP02_0.1	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	<0.10	-	<40	<80	<20	<20	-
TP02_0.5	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	<0.10	-	<40	<80	<20	<20	-
TP04_0.1	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	<0.10	-	85	85	<20	<20	-
TP04_0.5	-	0.14	0.14	0.39	<0.10	0.60	<0.10	0.17	<0.10	0.37	-	0.67	-	<40	<80	<20	<20	-
TP04_1.0	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	<0.10	-	<40	<80	<20	<20	-
TP04_1.3	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	<0.10	-	<40	<80	<20	<20	<0.10
TP04_1.5	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	<0.10	-	<40	<80	<20	<20	<0.10
TP11_0.1	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	<0.10	-	<40	<80	<20	<20	-
TP11_0.5	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	<0.10	-	<40	<80	<20	<20	-
TP10_0.1	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	<0.10	-	<40	<80	<20	<20	-
TP10_0.5	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	<0.10	-	<40	<80	<20	<20	-

Proposed Stormwater Soakage Basins

Lab Report Number	Sample Code	Field ID	Targeting	Date	Depth	53 Additional Compounds Analysed	Dieldrin	Endrin	g-BHC (Lindane)	B(a)P PEF (NZ NES)	Acenaphthene	Acenaphthylene	Fluorene	Naphthalene	PAHs (Sum of total)	Additional 17 Compounds Analysed	C15-C36 Fraction	C7-C9 Fraction	C10-C14 Fraction	C7-C36 Fraction (Total)
						SVOC				PAH							TPH			
Key and Standards						mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
MfE Hazardous Waste Guidelines Class A Screening						-	8	-	-	-	-	-	-	200	-	-	-	-	-	-
Ecan User Guide PAH Background Concentrations Christchurch						-	-	-	-	-	0.055	0.069	0.06	0.029	-	-	-	-	-	-
Eco SGVs Investigation Trigger (80%) Values						-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NESCS Commercial/industrial outoor worker (unpaved)						-	160	-	-	35	-	-	-	-	-	-	-	-	-	-
USEPA RSLs Industrial Soil THQ=1.0						-	0.14	250	2.5	-	45.000	-	30.000		-	-	-	-	-	-
Module 4, Tier 1 Commercial / Industrial (SAND)						-	-	-	-	-	-	-	-	190	-	-	-	120	1,500	-
3617400	3617400_10	TP08_0.1	Proposed Soakage Basins	01 Jul 2024	0.1	BDL	-	-	-	<0.032	<0.014	<0.014	<0.014	<0.07	<0.4	BDL	<40	<20	<20	<80
3617400	3617400_12	TP08_0.5	Proposed Soakage Basins	01 Jul 2024	0.5	BDL	-	-	-	<0.027	<0.012	<0.012	<0.012	<0.06	<0.3	BDL	<40	<20	<20	<80
3617400	3617400_30	IP02_0.1	Proposed Soakage Basins	01 Jul 2024	0.1	BDL	-	-	-	<0.030	<0.013	<0.013	<0.013	<0.07	<0.3	BDL	<40	<20	<20	<80
3617400	3617400_32	IP02_0.5	Proposed Soakage Basins	01 Jul 2024	0.5	BDL	-	-	-	<0.027	<0.011	<0.011	<0.011	<0.06	<0.3	BDL	<40	<20	<20	<80
3640488	3640488_1	IP03_0.1	Proposed Soakage Basins/ HAIL C1 and G5	01 Aug 2024	0.1	BDL	<0.10	<0.16	<0.10	<0.250	<0.10	<0.10	<0.10	<0.10	-	BDL	<40	<20	<20	<80
3640488	3640488_3	IP03_0.5	Proposed Soakage Basins/ HAIL C1 and G6	01 Aug 2024	0.5	BDL	<0.10	<0.14	<0.10	<0.250	<0.10	<0.10	<0.10	<0.10	-	BDL	<40	<20	<20	<80

beca

Results Analysis Table (Heavy Metals) - Pavement Pits

Key and Standards						Metals									
						Antimony	Arsenic	Cadmium	Chromium (III+VI)	Copper	Lead	Mercury	Nickel	Tin	Zinc
						mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
MfE Hazardous Waste Guidelines Class A Screening [6]						12	100	20	-	100	100	4	200	20,000	200
Background Concentrations (Heavy Metals) [5]						-	**6.35**	**0.14**	**19.89**	**11.68**	**19.75**	**0.07**	**13.91**	-	**69.58**
Australian NEPM Measure 1999 (updated 2013) - Commerical/Industrial [2]						-	-	-	-	-	-	-	6,000	-	400,000
NESCS Commercial/Industrial outoor worker (unpaved) [1]						-	70	1,300	6,300	10,000	3,300	4,200	-	-	-
3615000	**3615000_1**	**PP03_0.05**	**Road Surface Material**	**26 Jun 2024**	**0.05**	-	<2	<0.10	5	4	4.7	<0.10	5	-	20
3615000	**3615000_3**	**PP03_0.3**	**Basecourse**	**26 Jun 2024**	**0.3**	-	4	<0.10	13	5	**38**	<0.10	11	-	39
3615000	**3615000_6**	**PP02_0.05**	**Road Surface Material**	**26 Jun 2024**	**0.05**	-	<2	<0.10	3	9	4.3	<0.10	6	-	17
3615000	**3615000_8**	**PP02_0.3**	**Basecourse**	**26 Jun 2024**	**0.3**	-	4	<0.10	12	4	**25**	<0.10	8	-	46
3628493	**3628493_6**	**PP01_0.05**	**Road Surface Material**	**16 Jul 2024**	**0.05**	-	<2	<0.10	3	4	**55**	<0.10	3	-	24
3628493	**3628493_7**	**PP01_0.1**	**Basecourse**	**16 Jul 2024**	**0.1**	-	3	**0.38**	12	7	**47**	<0.10	9	-	41
3628493	**3628493_9**	**PP01_0.40**	**Road Surface Material**	**16 Jul 2024**	**0.4**	-	<2	<0.10	6	4	29	<0.10	5	-	23
3626395	**3626395_1**	**PP18_0.05**	**Road Surface Material**	**12 Jul 2024**	**0.05**	-	<2	<0.10	4	**19**	15.2	<0.10	9	-	35
3626395	**3626395_2**	**PP18_0.15**	**Basecourse**	**12 Jul 2024**	**0.15**	-	4	<0.10	12	7	12.8	<0.10	10	-	41
3626395	**3626395_4**	**PP18_0.35**	**Road Surface Material**	**12 Jul 2024**	**0.35**	-	<2	<0.10	6	4	**46**	<0.10	4	-	18
3626395	**3626395_7**	**PP04_0.05**	**Road Surface Material**	**12 Jul 2024**	**0.05**	-	<2	<0.10	3	7	8.0	<0.10	4	-	29
3626395	**3626395_8**	**PP04_0.1**	**Basecourse**	**12 Jul 2024**	**0.1**	-	4	<0.10	12	9	**26**	<0.10	11	-	45
3626395	**3626395_9**	**PP04_0.15**	**Road Surface Material**	**12 Jul 2024**	**0.15**	-	<2	<0.10	4	4	**70**	<0.10	3	-	17

Results Analysis Table (TPH, PAH) - Pavement Pits

Key and Standards						PAH																						TPH			
						B(a)P PEF (NZ MES)	1-Methylnaphthalene	2-methylnaphthalene	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a)anthracene	Benzo(a) pyrene	Benzo(b+j)fluoranthene	Benzo(e)pyrene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Perylene	Pyrene	PAHs (Sum of total)	C15-C36 Fraction	C7-C9 Fraction	C10-C14 Fraction	Total hydrocarbons (C7 - C36)
						mg/kg as rcvd	mg/kg as rcvd	mg/kg as rcvd	mg/kg as rcvd	mg/kg as rcvd	mg/kg as rcvd	mg/kg as rcvd	mg/kg as rcvd	mg/kg as rcvd	mg/kg as rcvd	mg/kg as rcvd	mg/kg as rcvd	mg/kg as rcvd	mg/kg as rcvd	mg/kg as rcvd	mg/kg as rcvd	mg/kg as rcvd	mg/kg as rcvd	mg/kg as rcvd	mg/kg as rcvd	mg/kg as rcvd	mg/kg as rcvd	mg/kg as rcvd	mg/kg as rcvd	mg/kg as rcvd	mg/kg as rcvd
MfE Hazardous Waste Guidelines Class A Screening						-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	200	-	-	-	-	-	-	-	-	-
Ecan User Guide PAH Background Concentrations Christchurch						-	-	**0.055**	**0.069**	**0.113**	**0.47**	**0.595**	**0.947**	-	**0.459**	**0.296**	**0.539**	**0.112**	**1.345**	**0.06**	**0.385**	**0.029**	**0.703**	-	**1.362**	-	-	-	-	-	-
NESCS Commercial/Industrial outoor worker (unpaved)						35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
USEPA RSLs Industrial Soil THQ=1.0						-	3000	45000	-	230,000	21	2.1	-	73	-	210	2,100	2.1	30,000	30,000	21	-	-	67	23000	-	9.3	-	-	-	-
Module 4, Tier 1 Commercial / Industrial (SAND)						-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	190	-	-	-	-	-	-	120	1500	-
Lab Report Number	**Sample Code**	**Field ID**	**Targeting**	**Date**	**Depth**																										
3615000	**3615000_1**	**PP03_0.05**	**Road Surface Material**	**26 Jun 2024**	**0.05**	<0.24	0.56	0.56	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.13	0.12	<0.10	<0.10	<0.10	<0.10	<0.10	<0.5	<0.10	<0.10	<0.10	<0.10	<3	2,300	<140	<120	2,400
3615000	**3615000_3**	**PP03_0.3**	**Basecourse**	**26 Jun 2024**	**0.3**	<0.029	<0.013	<0.013	<0.013	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.012	<0.013	<0.011	<0.011	<0.011	<0.011	<0.011	<0.06	<0.011	<0.011	<0.011	<0.3	<35	<20	<20	<35
3615000	**3615000_6**	**PP02_0.05**	**Road Surface Material**	**26 Jun 2024**	**0.05**	<0.24	0.35	0.34	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	0.14	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.5	<0.10	<0.10	<0.10	<3	2,600	<140	161	2,800
3615000	**3615000_8**	**PP02_0.3**	**Basecourse**	**26 Jun 2024**	**0.3**	<0.026	<0.012	<0.013	<0.012	<0.012	<0.012	<0.012	<0.012	<0.012	<0.012	<0.012	<0.012	<0.012	<0.012	<0.012	<0.012	<0.012	<0.06	<0.012	<0.012	<0.012	<0.3	<35	<20	<20	<35
3626395	**3626395_1**	**PP18_0.05**	**Road Surface Material**	**12 Jul 2024**	**0.05**	<0.24	0.15	0.12	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.12	0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.5	<0.10	<0.10	0.17	<3	1,780	<140	<120	1,830
3626395	**3626395_2**	**PP18_0.15**	**Basecourse**	**12 Jul 2024**	**0.15**	<0.025	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.05	<0.010	<0.010	<0.010	<0.3	<30	<20	<20	<30
3626395	**3626395_4**	**PP18_0.35**	**Road Surface Material**	**12 Jul 2024**	**0.35**	<0.24	<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	<0.10	<0.10	<0.5	0.11	<0.10	<0.10	<3	1,670	<140	<120	1,730
3626395	**3626395_7**	**PP04_0.05**	**Road Surface Material**	**12 Jul 2024**	**0.05**	<0.24	0.18	0.13	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.15	0.12	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.5	<0.10	<0.10	0.25	<3	2,800	<140	<120	2,800
3626395	**3626395_8**	**PP04_0.1**	**Basecourse**	**12 Jul 2024**	**0.1**	<0.025	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.05	<0.010	<0.010	<0.010	<0.3	<30	<20	<20	<30
3626395	**3626395_9**	**PP04_0.15**	**Road Surface Material**	**12 Jul 2024**	**0.15**	<0.24	<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	<0.10	<0.10	<0.5	<0.10	<0.10	<0.10	<3	840	<140	<120	850
3628493	**3628493_9**	**PP01_0.40**	**Road Surface Material**	**16 Jul 2024**	**0.4**	<0.24	<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	<0.10	<0.10	<0.5	<0.10	<0.10	<0.10	<3	340	151	<120	500
3628493	**3628493_6**	**PP01_0.05**	**Road Surface Material**	**16 Jul 2024**	**0.05**	<0.24	0.52	0.59	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.12	<0.10	<0.10	0.11	<0.10	<0.10	<0.10	<0.10	<0.5	0.28	<0.10	0.10	3	3,000	<140	157	3,200
3628493	**3628493_7**	**PP01_0.1**	**Basecourse**	**16 Jul 2024**	**0.1**	<0.029	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.06	<0.011	<0.011	<0.011	<0.3	<40	<20	<20	<40

Annotations

(-) Not Analysed

BDL - Below Detection Limit

1 - MfE. 2012. Users' Guide: NES for Assessing and Managing Contaminants in Soil to Protect Human Health. Table B2 Soil contaminant standards for health for inorganic substances and Table B3 Soil contaminant standards for health for organic compounds

2 - Australian National Environmental Protection (Assessment of Site Contamination) Measure (NEPC 1999, amended 2013). Volume 2, Schedule B1, Table 1(A)1 Health Investigation Levels for Soil Contaminants.

4 - Landcare Research (2022).Exploring the implementation of ecological soil guildeline values for soil contaminants. Trigger value for 80% species protection selected – Tables 13, 14 and 22. TPH values applicable to 'coarse' grained soils adopted. For copper and zinc sensitive aged soil values selected

5 - Canterbury Regional Council (n.d.) online GIS Map Viewer: CanterburyMaps (Trace Elements Level 2).

6 - MfE Hazardous Waste Guidelines. Landfill Waste Acceptance Criteria and Landfill Classification, 2004. Table 1.

7 - MfE Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand (revised 2011). Module 4, Tables 4.13 and 4.14. Tier 1 soil acceptance criteria for TPH all pathways. 'Commercial/Industrial' land use and soil type 'Sandy Silt'values selected for a depth < 1m.

8 - US Environmental Protection Agency Regional Screening Levels (Industrial Soils Applied) (Nov 2023).

9 - New Zealand Guidelines for Assessing and Managing Asbestos in Soil (2017). Table 5 - Soil guideline values for asbestos in New Zealand (GAMAS).

10 - Environment Canterbury Contaminated Land Management - User Guide Background/Typical concentrations of polycyclic aromatic hydrocarbons (PAHs) in Christchurch urban soils

Results Analysis Table (Package 1) - Rolleston Access Improvements

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						Asbestos				
						Asbestos Presence/Absence	Asbestos as Asbestos Fines as % of Total Sample	Asbestos as Fibrous Asbestos as % of Total Sample	Asbestos in ACM as % of Total Sample	Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample
Key and Standards							% w/w	% w/w	% w/w	% w/w
GAMAS - Asbestos in Soil - Commercial and industrial [9]						-	-	-	0.05	0.001
Lab Report Number	**Sample Code**	**Field ID**	**Targeting**	**Date**	**Depth**					
3631688	3631688_1	TP02_0.1	Existing Railway Corridor	19 Jul 2024	0.1	Asbestos NOT detected	<0.001	<0.001	<0.001	<0.001
3631688	3631688_3	TP02_0.5	Existing Railway Corridor	19 Jul 2024	0.5	Asbestos NOT detected	<0.001	<0.001	<0.001	<0.001
3631688	3631688_7	TP04_0.1	Existing Railway Corridor	19 Jul 2024	0.1	Asbestos NOT detected	<0.001	<0.001	<0.001	<0.001
3631688	3631688_8	TP04_0.5	Existing Railway Corridor	19 Jul 2024	0.5	Asbestos NOT detected	<0.001	<0.001	<0.001	<0.001
3631688	3631688_10	TP04_1.0	Existing Railway Corridor	19 Jul 2024	1	Asbestos NOT detected	<0.001	<0.001	<0.001	<0.001
3631688	3631688_11	TP04_1.3	Existing Railway Corridor	19 Jul 2024	1.3	Asbestos NOT detected	<0.001	<0.001	<0.001	<0.001
3631688	3631688_12	TP04_1.5	Existing Railway Corridor	19 Jul 2024	1.5	Asbestos NOT detected	<0.001	<0.001	<0.001	<0.001
3640489	3640489_1	TP03_0.1	General Site Sampling	01 Aug 2024	0.1	Asbestos NOT detected	<0.001	<0.001	<0.001	<0.001
3640489	3640489_3	TP03_0.5	General Site Sampling	01 Aug 2024	0.5	Asbestos NOT detected	<0.001	<0.001	<0.001	<0.001
3640489	3640489_8	TP11_0.1	HAIL C1 and G7	01 Aug 2024	0.1	Asbestos NOT detected	<0.001	<0.001	<0.001	<0.001
3640489	3640489_10	TP11_0.5	HAIL C1 and G8	01 Aug 2024	0.5	Asbestos NOT detected	<0.001	<0.001	<0.001	<0.001
3640489	3640489_13	TP10_0.1	HAIL C1 and G9	01 Aug 2024	0.1	Asbestos NOT detected	<0.001	<0.001	<0.001	<0.001
3640489	3640489_15	TP10_0.5	HAIL C1 and G10	01 Aug 2024	0.5	Asbestos NOT detected	<0.001	<0.001	<0.001	<0.001

Annotations

9 - New Zealand Guidelines for Assessing and Managing Asbestos in Soil (2017). Table 5 - Soil guideline values for asbestos in New Zealand (GAMAS).

Limitations

This report has been prepared by Beca Ltd (Beca) solely for Waka Kotahi NZ Transport Agency (Client). Beca has been requested by the Client to provide a Detailed Site Investigation (Contamination) for the site located in Rolleston, Christchurch. This report is prepared solely for the purpose of the assessment of potential soil contamination (Scope). The contents of this report may not be used by Waka Kotahi NZ Transport Agency for any purpose other than in accordance with the stated Scope.

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