

Technical Memo re Soil Contamination

Costco Christchurch, Fast-track Approvals Act 2024

From: Eliot Sinclair & Partners Limited

Project number: 610721

To: Abdul Deeb, Real Estate Director,
Costco Wholesale New Zealand
Ltd

Date: 19 August 2026

Purpose

This technical memorandum is in relation to soil contamination at the proposed Costco Christchurch site. The memo is a summary of existing soil contamination assessment work.

The memo is intended to be used as technical supporting documentation for a referral application under the Fast-track Approvals Act 2024 (FTAA) for the Project.

For full details of the soil contamination context refer to the 2022 Preliminary and Detailed Site Investigation (PSI/DSI) completed by Eliot Sinclair & Partners Ltd (Project ref. 501827) in **Appendix 1** of this report.

The 2022 report was for a previous site development proposal though is directly relevant to the current 2026 Costco proposal. The existing PSI/DSI applies to the entire Costco project site area.

The Project

The project involves the establishment of a new Costco retail store, additional retail activities and site establishment works at 475 Memorial Avenue, 500 and 520 Avonhead Road, and 400 Russley Road in Avonhead, Christchurch. Refer to site area in Figure 1.

Previous work & existing documents

Over a period of several years the site has been subject to iterations of assessment to characterise two forms of hazard: geotechnical (natural) hazards and soil contamination. We have produced a separate companion memo covering natural hazards.

The site is on the ECan Listed Land Use Register (LLUR). The LLUR is a publicly available database of sites where hazardous activities and industries have been located throughout Canterbury.

HAIL¹ activities identified in localised areas of the site include:

- Historical market garden (HAIL A10)
- Uncontrolled fill (HAIL G3)
- Rubbish, soil stockpiles and burn piles (HAIL G5)
- Derelict and habitable buildings potentially containing asbestos (HAIL E1)

Soil contamination has been characterised via reporting from Eliot Sinclair & Partners Ltd (2018 & 2022). The objective of the 2022 reporting was to prepare a combined Preliminary and Detailed Site Investigation (PSI/DSI) and incorporating the 2018 work.

Eliot Sinclair's 2022 reporting addresses soil contamination in general accordance with best-practice industry guidance, including the Ministry for the Environment (MfE) Contaminated Land Management Guidelines (CLMG) No. 1² and No. 5³, the National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health, Regulations 2011 (NESCS)⁴ and BRANZ (2017) New Zealand Guidelines for Managing and Assessing Asbestos in Soil⁵.

The site has been identified as HAIL land therefore the NESCS applies. The proposal requires consent as a controlled activity.

The 2022 report was used as technical supporting documentation for an application to Christchurch City Council (CCC) for subdivision consent.

CCC consent RMA/2022/1411 addressing subdivision, land use and NESCS was granted on 15 November 2023, and supported by an Independent Hearing Commissioner's report (30 October 2023). Refer to consented Scheme Plan area in Figure 2.

2023 Key findings

The CCC's 2023 specialist review of the Eliot Sinclair 2022 report for consent RMA/2022/1411 provided the following comments to the consenting officer:

"The DSI produced by Eliot Sinclair confirms Stage 1A of this development is suitable for commercial/industrial use. The majority of the soils contain contaminants at or below background levels however asbestos fibres in the former gravel pit and a couple of samples from the historic market garden area returned heavy metal results above background levels, making the activity controlled under the NES.

A good site management plan will be sufficient to manage any risks and this should also address dust control. Provided this is followed any adverse effects will be less than minor".

Note: The consent relates to the previous 'Stage 1A' development area, essentially being the northern half of the Costco project site area; refer to Figure 2. The 2022 PSI/DSI covers the entire site area; refer to Figure 1.

Good practice consent conditions

The 2022 applicant volunteered standard soil contamination management provisions, which were adopted by Council and included as conditions in consent RMA/2022/1411.

Accidental discovery protocol

The 2022 PSI/DSI includes normal risk management provisions, including for an Accidental Discovery Protocol to be applied during construction. This is a good practice measure to address unexpected discovery of suspect or actual contaminated ground.

² Ministry for the Environment (MfE) Contaminated Land Management Guidelines No. 1. Reporting on Contaminated Sites in New Zealand. (Revised 2021).

³ Ministry for the Environment (MfE) Contaminated Land Management Guidelines No. 5. Site Investigation and analysis of soils (Revised 2021)

⁴ National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health (NES)

⁵ BRANZ, 2017. New Zealand Guidelines for Managing and Assessing Asbestos in Soil.

More recent site work

Since the 2022 PSI/DSI reporting, dwellings at 400 Russley Road and 500 Avonhead Road have been demolished and their sites cleared to ground level in 2022 and 2024, respectively.

500 Avonhead Road was identified as being a potential source of soil contamination. Subsequent post-demolition soil testing and reporting by Eliot Sinclair confirmed the site does not need remediation, though soil from some parts of the site are to be disposed of at an approved facility, which is a common occurrence for Christchurch land development.

Conclusions

The large site area includes localised areas of historical contamination typical of rural-residential land usages, including burn pads, uncontrolled fill, market garden and older structures.

The site has been assessed under best-practice industry guidance and with a large portion of it previously consented for subdivision (RMA/2022/1411) and with standard consent conditions and good practice site management provisions to be applied.

The same standard good practice site management provisions apply to the entire Costco project area. The identified contaminated areas will be addressed during site development under normal construction management practices.

The site is suitable for the proposed Costco development.

Enc. Figures 1 & 2

Appendix 1: Eliot Sinclair (2022) Preliminary & Detailed Site Investigation (PSI/DSI); Ref. 501827, April 2022.

Figures



Figure 1. Costco site area – the same area addressed in the 2022 PSI/DSI reporting

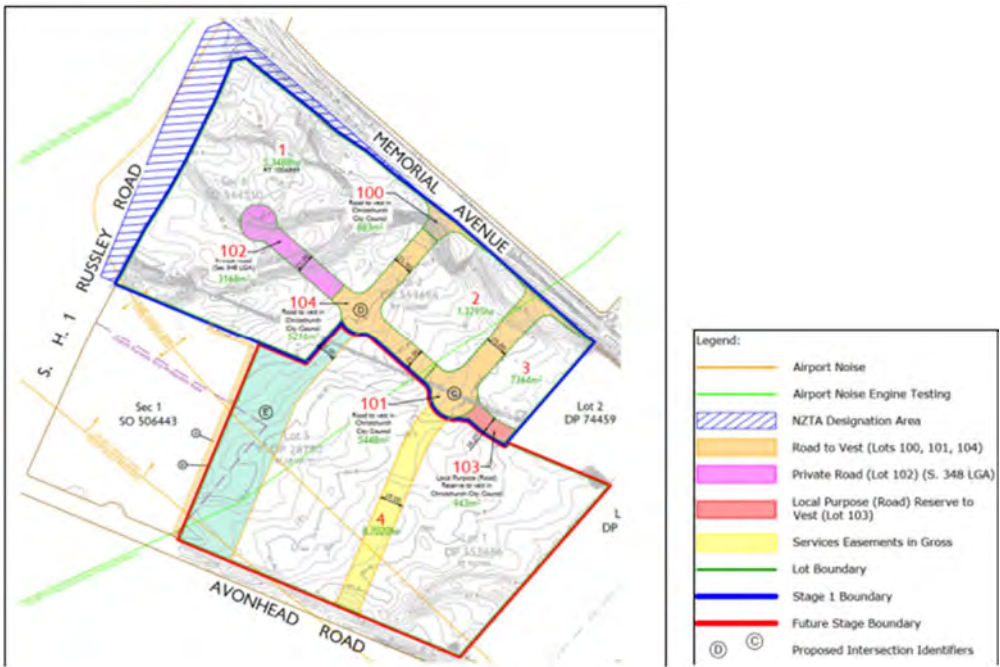
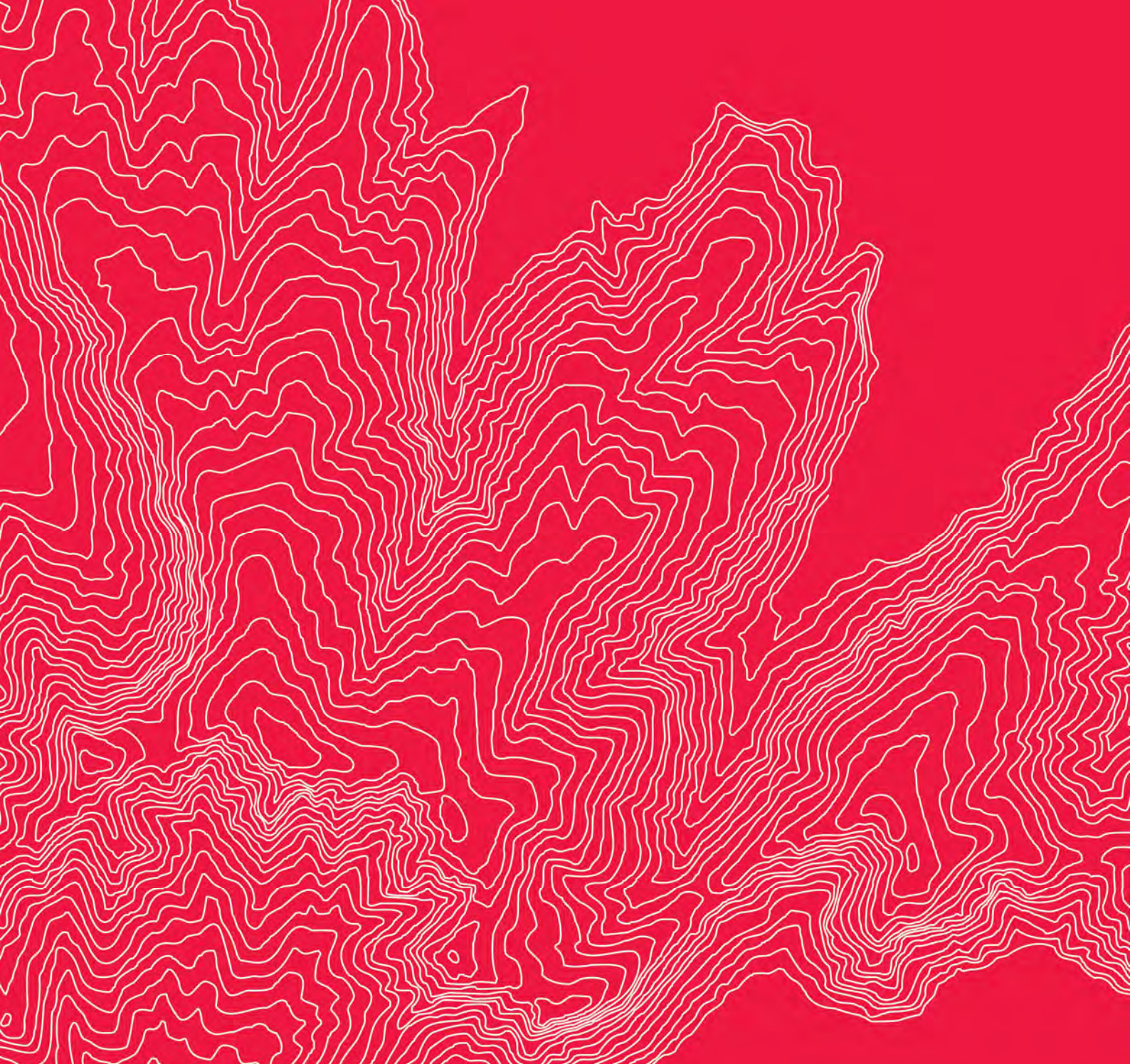


Figure 2. RMA/2022/1411 Scheme plan. The granted consent covers the outlined blue area.

Appendix 1

Eliot Sinclair (2022) Preliminary & Detailed Site Investigation; Ref. 501827, April 2022



Preliminary and Detailed Site Investigation

**eliot
sinclair**

**400 Russley Rd, 475 Memorial Ave and
500 & 520 Avonhead Road**

Prepared for Miles Premises Limited
501827

Preliminary and Detailed Site Investigation

400 Russley Rd, 475 Memorial Ave and 500 & 520 Avonhead Road

Prepared for Miles Premises Limited

501827

Quality Control Certificate

Eliot Sinclair & Partners Limited

eliotsinclair.co.nz

Action	Name	Signature	Date
Prepared by:	Lauryn Heaton Engineering Geologist PMEG, BSc (Geology), NZGS		25/03/2022
Reviewed by:	Kristel Franklin Engineering Geologist MSc (HAZM) BSc (Geology) CMEngNZ PEngGeol SQEP		22/04/2022
Directed and approved for release by:	Warren Haynes Surveyor Director BSurv FS+SNZ RPSurv LCS		22/04/2022
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Executive Summary

Site Address	400 Russley Rd, 475 Memorial Ave, and 500 & 520 Avonhead Road
Legal Description	Sec 8 SO 544350, Lots 1 and 2 DP 553686 and Lot 5 DP 28780
Site Area	Total: 176,800 m² • Sec 8: 29,700 m² • Lot 1: 43,700 m² • Lot 2: 62,900 m² • Lot 5: 40,500 m²
Local Authority	Christchurch City Council
Owner	Miles Premises Limited
Proposed Activity	Commercial/Industrial Development
Former and current land uses	Former land use: Commercial (Market Garden) and rural residential (25% Produce). Current land use: The land at 520 Avonhead road is being used for residential (10% produce) purposes. The other allotments are currently vacant land.
Current Zoning	Industrial Park
Adopted NESCS land use scenario	Commercial/indoor outdoor worker (unpaved)
Potential HAIL activities identified	Based on 2018 and 2022 desktop reviews and site walkover: • Historical market garden (HAIL A10) • Uncontrolled fill has been added to the excavated gravel pit and pond (HAIL G3) • Rubbish, soil stockpiles and burn piles (HAIL G5) • Derelict and habitable buildings potentially containing asbestos (HAIL E1)
Soil Investigations	2018 Investigations: • Methodology: Test pits were excavated in the small pond and gravel pit areas. Soil testing comprised of collecting samples from soil layers of the test pits, taking sixteen approximately grid spaced surface soil samples across the market garden investigation area, and taking three samples in increasing distance from the centre of the burn pad. Samples were collected on 1 July 2018. • Contaminants of concern are asbestos, PAHs, and heavy metals • Heavy metals were within the NESCS commercial guideline criteria across the gravel pit and market garden area. The NESCS commercial criteria was exceeded at BP1 in the Burn Pad site with arsenic (criteria of 70.0 mg/kg) concentrations of 111.0 mg/kg. The sample at BP1 was exceeded the Burwood Landfill criteria for disposal.

- PAHs from all samples were all found to be below the laboratory limit of reporting.
- No asbestos was detected in the roofing material at 500 Avonhead Road.

2022 Investigations:

- Methodology: Walking across the site and noting signs of potential contamination, undertaken on 18 February 2022.
- Methodology: Test pits were excavated in the larger pond, stockpiles, and gravel pit areas. Soil testing comprised of collecting samples from uncontrolled fill layers of the test pits and taking sixteen approximately grid spaced surface soil samples across the market garden investigation area. Samples were collected on 16 March 2022.
- Contaminants of concern are asbestos, OCPs, and heavy metals.
- Organochlorine Pesticides (OCPs) in the market garden area were within the NESCS commercial guideline criteria of 1000 mg/kg for the total DDT isomers, and 160 mg/kg for Aldrin and Dieldrin or combined.
- Heavy metals were recorded as being within the NESCS commercial criteria across the site. One sample (MG-16) was above the recent region background criteria for lead (40.96 mg/kg), with concentrations of 95 mg/kg, and zinc (93.94 mg/kg), with concentrations of 103 mg/kg. All samples were within the Burwood Landfill Criteria for disposal.
- Asbestos was detected within two of the soil samples taken from the gravel pit area. The concentrations of asbestos were below 0.001%. No other samples detected asbestos across the site.

Conclusions

All samples, with the exception of the 2018 burn pad, recorded soil contaminant concentrations below NESCS standards for commercial/industrial land use.

Two samples from the gravel pit area were identified as containing asbestos. The asbestos concentrations were within the BRANZ guidelines for commercial land use. No other samples had detections of asbestos.

Only samples in the gravel pit and burn pad were above recent regional background concentration levels for heavy metals.

Due to the low concentrations of heavy metals, PAHs, OCPs, and asbestos, the site is considered suitable for commercial land-use.

All samples analysed at the pond, market garden and stockpiles were within the Burwood Landfill criteria for disposal. The burnpad and gravel pit areas require disposal of soil at an alternate managed facility, as they are not within the criteria for disposal at Burwood Landfill.

Recommendations	Sampling must be undertaken following the demolition of the residential structures. A Remedial Action Plan (RAP) is required for the burn pad at 520 Avonhead Road, gravel pit, and existing dwelling areas. This must be submitted to Council for approval prior to completing any remedial work. Site validation investigations and reporting (SVR) will be required to confirm that contaminant concentrations in the targeted areas are below the applicable standard in Regulation 7 of the NESCS for commercial land use.
NESCS Activity Status	Subdivision or change of use requires consent under the NESCS for a controlled activity (if contamination from the burn pad has been successfully removed and the area is validated), or for a restricted discretionary activity if the remediation is undertaken as part of the subdivision-related earthworks.

1. Introduction

Eliot Sinclair has been engaged by Miles Premises Limited to undertake a Preliminary and Detailed Site Investigation (PSI/DSI) of the land located at 400 Russley Road, 475 Memorial Avenue and 500 & 520 Avonhead Road, Christchurch ('the site').

The purpose of the assessment is to determine and inform the Client of any soil contamination which has occurred as a result of previous or current HAIL activities.

The report is intended to be used as technical supporting documentation for resource consent application purposes.

2. Objective and Scope

The objective of the investigation was to prepare a combined PSI/DSI in general accordance with the Ministry for the Environment (MfE) Contaminated Land Management Guidelines (CLMG) No. 1¹ and 5², the National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health, Regulations 2011 (NESC3)³ and BRANZ (2017) 'New Zealand Guidelines for Managing and Assessing Asbestos in Soil'⁴.

The scope of work comprised:

- Reviewing Environment Canterbury's Listed Land Use Register (LLUR) and resource consent database.
- Reviewing historical and recent aerial images of the site taken between 1940 and 2020.
- Reviewing information on the property file held by the Christchurch City Council (CCC).
- Owner interview
- Conducting a site walkover inspection.
- Conduct a targeted and grid spaced soil-sampling programme to determine the concentrations of any residual soil contamination across the site.
- Assess the results and potential effects of soil concentrations on human health.
- Compilation of the findings in accordance with the NESC3³, MfE's CLMG 1¹ and 5², and BRANZ 2017⁴.

Our assessment has been undertaken in two phases (2018 & 2022) as we worked on two different development plans for two different Clients. Where relevant we present the 2018 and 2022 work separately, but together we provide a holistic review of the site using all the information available to us.

¹ Ministry for the Environment (MfE) Contaminated Land Management Guidelines No. 1. Reporting on Contaminated Sites in New Zealand. (Revised 2021).

² Ministry for the Environment (MfE) Contaminated Land Management Guidelines No. 5. Site Investigation and analysis of soils. (Revised 2021).

³ Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 administered by the Ministry for the Environment

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

3. Site Identification

The site is generally gently undulating and comprises a total area of around 176,800 m². It is currently zoned by CCC as 'Industrial Park'. Refer to Table 1.

Site identification details are summarised in Table 1 and the site location shown on Figure 1.

Table 1. Site identification

Details	
Street address	400 Russley Rd, 475 Memorial Ave, and 500 & 520 Avonhead Road
Legal description	Sec 8 SO 544350, Lot 2 DP 553686, Lot 1 DP 553686, & Lot 5 DP 28780
Total area	~176,800 m ²
Locality map	Refer to Figure 1
Current site plan	Refer to Figure 2

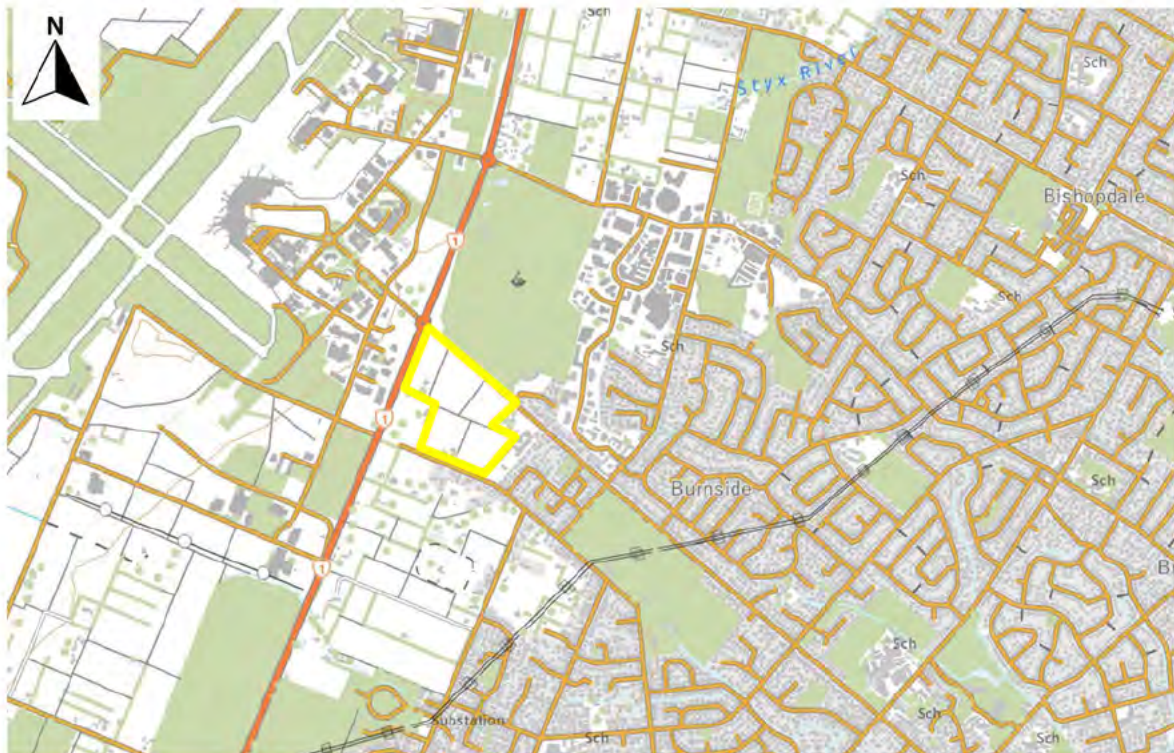


Figure 1: Location map of the site. Base map sourced from Canterbury Maps.



Figure 2: Current Site Plan. Base aerial sourced from Canterbury Maps.

4. Proposed Site Use

It is proposed to undertake a subdivision of the allotments to establish a commercial development. The development will comprise of a boundary adjustment, the addition of roads across the site, and construction of new infrastructure and buildings.

Refer to Appendix A for the Application for Subdivision Consent plan.

5. Site Description

5.1. Site Layout

The site currently comprises four allotments, which contain fenced paddocks and residential structures. 520 Avonhead road is presently occupied while the other allotments are vacant. Figure 2 shows the outline of the site boundaries and individual lots.

5.2. Environmental setting

Table 2 below summarises the environmental setting of the site:

Table 2. Site conditions and Environmental Setting

Miles Premises Memorial Avenue	
Current land use	Residential/Rural Residential
Neighbouring land use	North: Memorial Avenue and golf course East: Commodore Hotel and residential South: Avonhead Road and residential/rural residential West: A rural residential property to the southwest, Russley Road/State Highway 1 and commercial
District plan zoning	Industrial Park
Adopted NESCS land use scenario	Commercial/indoor outdoor worker (unpaved)
Geology	Geological mapping for the area indicates the site is underlain by "Modern River floodplain/low-level degradation terrace, Unweathered, variably sorted gravel/sand/silt/clay (Q1a)" ⁵ . ECAN records indicate that the specific geology of this site includes Waimakariri silt, Selwyn loam over sand, and Rangitata stony sand ⁶ .
Surface water	There is a shallow pond overgrown with dense vegetation and long grass located south of the existing derelict building within 400 Russley Road. The pond appears to feed into a shallow surface drain crossing the centre of the site, running from west to east. A small ornamental pond (approximately 2m diameter) is located south of the dwelling at 500 Avonhead Road.
Groundwater	Riley Consultants installed piezometers within three boreholes (BH1, BH2 and BH3). Over four monitoring rounds between 8 March 2016 and 17 March 2016, groundwater was recorded between ~5.6 and 8.7m below ground level. Piezometric contours indicate that groundwater is flowing in a general south-eastern direction.
Topography	The site is generally flat to gently undulating.

⁵ GNS Science. <https://data.gns.cri.nz/geology/>

⁶ <https://mapviewer.canterburymaps.govt.nz/>

5.3. Current Site Uses

The current site uses have been summarised as follows:

- Dwellings located within 400 Russley Road and 500 Avonhead Road are presently not in use and are waiting on demolition.
- 520 Avonhead Road is presently being used for residential purposes.
- 475 Memorial Avenue has no building structures and is currently vacant land.

5.4. Site Inspection

5.4.1. 1 July 2018

A systematic site inspection was undertaken on 1 July 2018 with subsequent site inspections at the time of soil sample collection on 30 October 2019 and 7 November 2019 (refer to Appendix B for the site photographs). The following was noted:

- Most of the site is grassed paddocks.
- The area of the former (gravel pit) excavation along Memorial Avenue has undulating non-natural ground features indicating the area has likely been filled (HAIL G3).
- A stockpile of round bales of hay is present in the northeast part of 475 Memorial Avenue. No rubbish was observed in the stockpile. There was no sign of it being burned.
- An open drain is present through the middle of the site, which extends from west to east where it terminates at the east boundary.
- The dwelling located at 500 Avonhead Road has decramastic roof tiles which at the time of construction were potentially constructed with asbestos containing material. The roof tile coating is in a deteriorated condition and stormwater may have been washing asbestos fibres off the roof and onto the ground (HAIL E1). The downpipe on the southwest corner of the house was missing and accordingly enabled stormwater to drain to land next to the dwelling.
- A small ornamental pond is located south of the residential dwelling at 500 Avonhead Road.
- There were various animal pens north of the outbuildings near the dwelling at 500 Avonhead Road. No sheep dip or spray race was visible.
- Various cars and car parts are present around the dwelling at 500 Avonhead Road. No bulk storage of oil or fuel was observed.
- The outbuildings present on the southeast part of the site are constructed with metal cladding and metal roofing.
- Various outbuildings with building materials storage were present around the dwelling.
- A burn pad/burn barrel was present in the garden north of the dwelling at 520 Avonside Road. There is evidence of rubbish having been burned. Much of the burning appeared to be restricted to the barrel, but a circle of burn residue and burned material extends approximately 2m from the burn barrel (HAIL G5).
- During the 2018 site inspection it was noted that to the northwest of the dwelling there was an area with dark ash and with traces of rubbish. It appears that some of the ash from the burn pad may have been deposited there (HAIL G5). By the 2019 site inspection this area was no longer discernible.
- During the 2018 site inspection the paddock in the west part of 520 Avonside Road is being used to store rental campervans. During the 2019 site inspection the campervans were no longer present.

5.4.2. Site Inspection 18 February 2022

Additional site inspections were carried out by Eliot Sinclair on 18 February 2022 and the following was noted:

- The burn pad at 520 Avonhead Road is now a subdued feature, with the only signs being a circular area of dirt with no growth of vegetation.
- Old timber outbuildings were identified at 520 Avonhead Road. These were filled with dis-used household belongings.
- Two slash piles were identified: one in the southeast paddock and the other to the southwest paddock. These were confirmed by the Client to be primarily organic waste.
- The shallow pond area was overgrown with thick vegetation.
- Four piles of farm debris were identified: one in the drain, one to the north of the pond, one near the building at 500 Avonhead Road, and one just south of 455 Memorial Avenue (northeast area of the site).
- Five old rusty oil drums (44 gallon) were identified along the northeast boundary fence of the site. These contained holes in the top and were mostly full of water (no sheen), which we assume as rainwater.
- Beehives were present around the eastern boundary of the site.
- Potential ACM sheeting was detected outside of the dwelling at 400 Russley Road. Small fragments were visible on the doorstep which appeared to have been sourced from the deteriorating building.
- No signs of surface soil contamination were visible in the vehicle parking area (i.e., no oil staining).
- Near the gravel pit, hay bales were previously identified in the 2019 DSI, which have since been removed. Spade holes were dug in this location, but only rich topsoil encountered and no obvious signs of contamination were present (i.e., assessed as not related to a burn pad).
- A water tap and concrete trough in long grass were identified near the north-eastern boundary of the site.
- A galvanised trough was identified near the western boundary, north of the residential dwelling, at 520 Avonhead Road
- The backfilled gravel pit area was examined and is a subdued feature and grassed as the adjoining paddock area.

5.4.3. Soil testing 16 March 2022

Soil sampling was undertaken for the purposes of a detailed site investigation on 16 March 2022. The following testing was undertaken:

- Nine test pits were excavated in the gravel pit area. Six of these pits were sampled due to the presence of uncontrolled fill. Two samples were taken for each pit.
- Sixteen samples were collected from the market garden area.
- Four test pits were excavated in the shallow pond. Two samples were taken from the controlled fill in POND 03 and POND 04.
- Three test pits were excavated in the stockpile area at 400 Russley Road. One sample was collected from each test pit.

Representative photographs taken during the 2022 site visits are attached in Appendix C.

6. Former Site Use

6.1. Review of the Christchurch City Council Information

Property Files for 475 Memorial Avenue and 500 Avonhead Road were reviewed on 20 April 2018 with the property files for 520 Avonhead Road and 400 Russley Road reviewed on 8 November 2019. The following was noted:

- Building permit to erect the dwelling on 500 Avonhead Road, dated 1973. The building plans showed the roof was designed with decramastic tiles. Decramastic tiles of this age are likely to contain asbestos fibres. Given the age of the roof it is likely for it to be in a somewhat deteriorated condition (possible HAIL E1).
- Building permit to erect a hayshed on 500 Avonhead Road. Dated 1979.
- Building permit to erect a dwelling on 520 Avonhead Road. Dated 1975.
- Building permit to erect the dwelling on 520 Avonhead Road. A concrete roof is specified. Dated 1985.
- Resource consent application to park up to 800 campervans on 520 Avonhead Road. Dated 2015.
- A notice to connect the dwelling at 500 Avonhead Road to the city sewer system. Dated 2001.
- Certificate of compliance to erect a tunnel house and 4 shade houses at 520 Avonhead Road. Based on review of aerial images this project was never undertaken. Dated 2007.
- A proposal to create a hotel on the corner of Memorial Avenue and Russley Road. The proposal was declined. Dated 1975.
- Building plans for the dwelling at 400 Russley Road. Dated 1984.

The Christchurch City Council property file contains information that indicates that there is a potential for the occurrence of HAIL activity E1- asbestos containing building materials in deteriorated condition at 500 Avonhead Road.

6.2. Review of Environment Canterbury information

6.2.1. Listed Land Use Register

The LLUR is a database containing records of contaminated, potentially contaminated and remediated (previously contaminated) sites in Canterbury. It is not an exhaustive database, i.e., an unregistered site does not confirm that there have never been any HAIL activities undertaken on the site in the past. Refer to Appendix D for a copy of the report.

None of the lots included in this site were listed on the current LLUR, based on the search in March 2022.

The following neighbouring sites are currently listed on the LLUR:

- The land south of 520 Avonhead road (site number SIT26475) is currently listed as a HAIL A10 defined as "Persistent pesticide bulk storage or use" and is recorded as "Not Investigated".
- The Russley Golf Course to the north of the site (north of Memorial Ave) is listed as having the following HAIL activities: G3 - Landfill sites, A10 - Persistent pesticide bulk storage or use, and A17 - Storage tanks or drums for fuel, chemicals or liquid waste. The site SIT27947 is recorded as "partially investigated", and the site SIT911 is recorded as "superseded".
- Land to the northwest of the site is listed as a HAIL A17 defined as "storage tanks or drums for fuel, chemicals or liquid waste" and a HAIL I, defined as "any other land". Site number SIT3172 is recorded as "partially investigated" while site number SIT29204 has not been investigated.

- To the southeast of the site (number SIT914), the land is currently listed as having a HAIL A17, as defined above. This has not been investigated.

6.2.2. Resource consents database

The ECan Resource Consent Database was reviewed to determine if there are any discharge consent, or if bulk storage of hazardous materials were recorded for the site, as these activities can present a risk of ground contamination. Two resource consents have been issued for the site, one of which is still active.

- Consent CRC042818, located at Memorial Avenue, gives consent to discharge stormwater into the ground. This consent has been active since July 2004.
- Consent CRC020619, located in at Memorial Avenue, gives consent to install bores for domestic, stock water and irrigation purposes. The consent expired in October 2004.

Other nearby consents have been noted as follows:

- Ten resource consents have been issued within 100m of the site boundary. Eight consents allow for the take and use of groundwater or for stormwater discharge. It is considered unlikely that these activities would have led to ground contamination on the site, and no new consents have been given to any properties within 100 m of the site since the 2019 DSI report.
- Consent CRC991066, located ~65m to the northeast and issued in 1999, relates to discharge of contaminants to air from diesel oil fired boilers. The condition of the tanks is unknown. The general groundwater flow is to the south-east, so if the tanks are leaking then the diesel would be flowing away from the site.
- Consent CRC141040, located ~20m to the northwest of the site boundary, relates to discharge of contaminants to air that may be generated from the remediation of the Brevet Landfill. According to a New Zealand Transport Agency report⁷, part of the Brevet Landfill was remediated with landfill material being removed during the construction of the State Highway 1 overpass. However, the landfill itself was located approximately 200m to the northwest of the site, and it would be unlikely for any contaminants to travel this distance through the soil to the site.

6.2.3. Summary

There are no known off-site activities on neighbouring land that are likely to impact the site.

⁷ NZTA 62185 Harewood Road to Avonhead Park Landfill Water Quality Report. New Zealand Transport Agency. 2013.

6.3. Review of aerial photographs

Historical images from Canterbury Maps Viewer⁶, and Google Earth (GE)⁸ were reviewed. The reviewed images were taken between 1940 and 2020 and are attached in Appendix E.

Table 3. Aerial photography reviewed for this assessment (source: Canterbury Maps and Google Earth)

Date of photograph	Land use, site features, identified HAIL area(s)
1940-1944	shows the site being mainly used for cropping and/or grazing. An excavated area approximately 85m across is located along the north edge of the site along the boundary with Memorial Avenue. A surface drain is visible crossing the middle of the site from west to east.
1945-1949	shows the site relatively unchanged from previous imagery.
1955-1959	shows the site is relatively unchanged from previous imagery. The previous large paddocks are now fenced into smaller paddocks.
1965-1969	shows the site is relatively unchanged from previous imagery.
1970-1974	shows the excavated area in the north part of site has been filled (potential HAIL G3) with this area now connected to Memorial Avenue by a dirt path. The current dwelling and various outbuildings are now present at 500 Avonhead Road. The remainder of the site appears still used for cropping and/or grazing.
1975-1979	shows the excavated area on the north part of the site has now been grassed over. A newly excavated pond area is now present on the south part of 400 Russley Road. A suspected overland flow path that appears more pronounced than from previous imagery extends from this newly excavated area toward the northeast. The remainder of the site is relatively unchanged from previous imagery.
1980-1984	shows stockpiles of material on the northeast part of the site (potentially HAIL G5). There is a dark area on east edge of the site near the end of the drain that may be a small excavation. During the site inspection this depression was still visible. There are additional outbuildings around the dwelling on the southeast part of the site. The excavated area in the south part of 400 Russley Road has no longer visible and may have been filled (potential HAIL G3). A new larger excavation is now visible to the north of the previous excavation. This is also suspected to be a drainage pond.
1985-1989	shows the dwelling at 400 Russley Road is now present. The dwelling at 520 Avonhead Road is also now present. Additional soil stockpiles are visible near in the northeast part of the site (potential HAIL G5). The remainder of the site is relatively unchanged from previous imagery and appears to be used for cropping/grazing.
1990-1994	shows the northeast part of the site likely being used as a market garden (potential HAIL A10) with crop rows visible. The stockpiles are no longer visible. The excavated area at 400 Russley Road is no longer visible. During the site inspection it was revealed that the depression is still present and is now within the area of dense vegetation. The remainder of the site is relatively unchanged from previous imagery.
1995-1999	shows stockpiles of material along the northeast part of the site (potentially HAIL G5). Larger vegetation is now present in the southwest part of 400 Russley Road in place of the smaller pond. The remainder of the site is relatively unchanged from previous imagery.
2000-2004	shows the market gardens are no longer visible. The remainder of the site appears unchanged from previous imagery.
2004-2010	shows the site relatively unchanged from previous imagery.
2 Oct 2017	show various outbuildings and stockpiles of material now present near the dwelling at 400 Russley Road. A stockpile of material is present on the northeast part of 475 Memorial Avenue. During the site visit this was found to be a stockpile of haybales (non-HAIL). The remainder of the site appears relatively unchanged from previous imagery.
25 Aug 2018 (Google Earth)	show the west part of 520 Avonhead Road used as a storage for vehicles. The remainder of the site appears relatively unchanged.
Jan 2020 (Google Earth)	Circus set up at the northern part of the site.
Nov 2020 (Google Earth)	Two slash piles present within 520 Avonhead Road. Vegetation around 400 Russley Road has been removed. Slash pile is present to the southeast of the site. The remainder of the site appears relatively unchanged.

⁸ <https://earth.google.com/web/>

6.4. Owner Interview

Correspondence with the owner was carried out to gather information on the suspected burn pads in the paddocks in the southern area of the site. It was confirmed that these were not burn piles, but piles of slash sourced from the trees at 520 Avonhead Road. The two slash piles were noted to contain only natural timber and the owner was not aware of any fires at these slash piles.

7. Sampling and Analysis Plan

7.1. Contaminants of potential concern

Based on our review of the historical aerial imagery, desktop study and our site walkover on 18 February 2022, we have identified the following potential contaminants of concern in Table 4.

Table 4. Contaminant summary table

Potential Contaminant Sources	HAIL Reference	Contaminants of Concern
Uncontrolled fill added to excavation pit and the excavated pond	HAIL G3	- Metals: Arsenic and lead. - Asbestos
Existing derelict and habitable buildings	HAIL E1	ACM
Market Garden Area	HAIL A10	- Heavy Metals - OCPs
Burn Piles, Stockpiles, slash piles, rubbish piles	HAIL G5	- Metals: Arsenic and lead. - Asbestos - Polycyclic aromatic hydrocarbons (PAHs)

7.2. Background concentration level & contaminant standard

The adopted NESCS Soil Contaminant Standard (SCS) for the proposed subdivision is Commercial/indoor outdoor worker (unpaved). Contaminant concentrations are also compared against natural background concentrations of 'Recent: Regional'. This informs soil disposal options (if required), and NESCS consenting requirements.

To assess asbestos contamination, concentrations were compared to the guideline values that are set out by BRANZ New Zealand's 'Guideline for Assessing and Managing Asbestos in Soil'.

To assess soil disposal options the soil concentrations were compared to Burwood Landfill acceptance criteria.

7.3. Soil Sampling Rationale and Methodology

7.3.1. 2018 Soil Sampling

A sampling regime was developed to assess soils that might have been affected by the identified potential HAIL activities.

Contaminants of concern are arsenic and heavy metals, polycyclic aromatic hydrocarbons (PAHs), and asbestos.

The investigation comprised sampling of various areas across the site which are listed below. Refer to Appendix F for Eliot Sinclair's soil analysis summary table, Appendix G for Hill Laboratories Certificate of Analysis reports, Appendix H for the 2018 sample location plans and Appendix I for the 2022 soil sample locations.

1. In the north part of the site is a historical gravel extraction pit that has subsequently been filled. Nine test pits were excavated (TP1 to TP9) to investigate the fill material encountered. Samples were collected from encountered layers of fill and insitu soils. Locations TP1 and TP8 did not

encounter fill material and samples from these locations were put on hold at the laboratory. All other locations (TP2, TP3, TP4, TP5, TP6, TP7 and TP9) were tested for seven trace elements.

2. South of the dwelling at 400 Russley Road a pond was excavated and then subsequently filled. Three test pits (TP10, TP12 and TP13) were excavated within the area of the historical pond investigate the fill material encountered. A fourth location (TP11) was not excavated due to a lack of access for the digger. Location TP10 did not encounter any fill material and no samples were collected. Locations TP12 & TP13 encountered homogenous fill from surface to 1.4-1.5m bgl. Samples were collected from surface to 1.0m bgl and from 1.0m bgl to 1.4-1.5m bgl. Samples from surface to 1.0m bgl were analysed for trace elements and the deeper samples were held cold at the laboratory.
3. The dwelling at 500 Avonhead Road has a roof comprising decramastic tiles which are likely to contain asbestos. Sample ASB1 was collected from the southwest corner of the house from under a missing downspout, sample ASB2 was collected from the southeast corner of the house adjacent to an intact downspout and sample ASB3 was taken from the northwest part of the dwelling where the easterly may have blown asbestos fibres onto the ground. All samples were tested for asbestos presence/absence.
4. Three samples (BP1, BP2 & BP3) were collected from the burn pad at 520 Avonhead Road. Samples were collected from the surface to 50mm bgl. BP1 was collected from adjacent to the burn barrel at the centre of the burn pad, BP2 was collected from approximately 1m out from the centre and BP3 was collected from the outer edge of the burn pad approximately 2.0m from the centre.

7.3.2. 2022 Soil Sampling

The 2022 work provided the opportunity to address additional site features and/or review previous work and updated practices since 2018. The supplementary sampling strategy consisted of a targeted sampling plan to investigate the potential contaminants recorded in our desktop investigations and observed during our site walkover inspection on 18 February 2022. Our soil investigation summary is detailed in Table 5.

The investigation comprised sampling of various areas across the site which are listed below. Refer to Appendix F for Eliot Sinclair's soil analysis summary table, Appendix G for Hill Laboratories Certificate of Analysis reports, Appendix H for the 2018 sample location plans and Appendix I for the 2022 soil sample locations.

Table 5. Investigation summary table

Identified HAIL activities	Sampling rationale and methodology	Sample ID and Analytes
Burn Piles, Stockpiles, slash piles, rubbish piles (HAIL G5)	The contaminants of concern for burn piles, rubbish piles and stockpiles include priority metals (As, Cd, Cr, Cu, Pb, Ni, and Zn) and asbestos. Method: Targeted soil samples to analyse at an accredited laboratory for metals, Semi-quantitative analysis of asbestos in soil in accordance with NZ guidelines.	Sample ID: SPA-01, SPA-02, & SPA-03 Analytes: As, Cd, Cr, Cu, Pb, Ni, Zn, Asbestos Fines/Fibrous Asbestos
Uncontrolled fill added to excavation pit and potentially uncontrolled fill in the excavated pond (HAIL G3)	The contaminants of concern for uncontrolled fill includes asbestos and metals (metals analysis completed in 2018). Method: Targeted soil samples to analyse at an accredited laboratory for metals, Semi-quantitative analysis of asbestos in soil in accordance with NZ guidelines.	Sample ID: GP01 0.3 – 0.8 m, GP01 0.8 – 1.5 m, GP02a Fill, GP02b Fill, GP03 0 – 0.1 m, GP03 1.0 – 1.4 m, GP04 0 – 0.7 m, GP04 0.7 – 1.2 m, GP05 0 – 0.7 m, GP05 0.7 – 1.4 m, GP06 0 – 0.8 m, POND 03 0 - 0.12 m, and POND 4 0 - 0.7 m. Analytes: Asbestos Fines/Fibrous Asbestos
Market garden, pesticides potentially used to grow crops (HAIL A10)	The contaminants of concern for pesticides include the priority metals (As, Cd, Cr, Cu, Pb, Ni, and Zn) and Organochlorine Pesticides (OCPs). Method: Targeted soil samples to analyse at an accredited laboratory for the priority heavy metals,	Sample ID: MG 01, MG 02, MG 03, MG04, MG 05, MG 06, MG 07, MG 08, MG 09, MG 10, MG 11, MG 12, MG 13, MG 14, MG 15, MG 16. Analytes: As, Cd, Cr, Cu, Pb, Ni, Zn and OCPs
Future demolition of building structures and soil disturbance during earthworks (HAIL E1)	The contaminants of concern for former building structures include the priority metals arsenic, lead and asbestos. Method: Controlled demolition will be required due to the potential for asbestos containing materials.	Sampling to be undertaken after demolition works. Analytes: Asbestos Fines/Fibrous Asbestos and ACM

Identified HAIL activities	Sampling rationale and methodology	Sample ID and Analytes
	After demolition: Obtain soil samples to analyse at an accredited laboratory for the priority heavy metals and semi-quantitative analysis of asbestos in soil in accordance with NZ guidelines.	

7.4. Field Quality Assurance and Quality Control

The fieldwork was conducted in accordance with MfE's CLMG No. 5² and followed a uniform and systematic approach comprising the following procedures:

- Decontamination: Wiping residual soil from the soil sampling equipment after each sample, and then rinsing with pressurised deionised water and Decon90, before collecting any new soil samples.
- Sample ID procedures: Soil samples were immediately transferred to a laboratory supplied glass jar and or 500ml plastic tub. Each sample was labelled with a unique identifier, sampling date and job reference.
- Chain of Custody (CoC): A chain of custody form is completed for each batch of samples.

7.5. Laboratory Quality Assurance and Quality Control

Soil samples were analysed by Hill Laboratories Ltd. Hill Laboratories 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.

Hill laboratories have carried out Quality Assurance reports for heavy metal and asbestos soil samples. Refer to Appendix G for Hill Laboratories Certificate of Analysis reports.

8. Sampling Results

8.1. 2018 Investigations

8.1.1. Overview

A total of 42 samples were collected from targeted locations across the site to assess the impact of the former potential HAIL activities identified during the site history review. Results from these tests are discussed in the following sections.

Refer to Appendix F for Eliot Sinclair's soil analysis summary table, Appendix G for Hill Laboratories Certificate of Analysis reports, Appendix H for the 2018 sample location plans and Appendix I for the 2022 soil sample locations.

8.1.2. Historical Gravel Extraction Pit

Fifteen samples from Test Pits TP2 to TP7 & TP9 were analysed for metals (arsenic, cadmium, chromium, copper, lead, nickel and zinc). Results from all samples were recorded below NESCS standards for commercial/industrial land use.

Samples from test pits TP2, TP4, TP5, TP6 and TP7 recorded trace element levels below background for the Region Recent soil type.

Test pits TP3 and TP9 showed various analytes above background with lead results exceeding the ANZECC ISQG high levels.

All test results were below Burwood Landfill acceptance criteria.

8.1.3. Historical Market Garden Area

Four composite samples (MG1-4, MG5-8, MG9-12 and MG13-16) from 16 locations were analysed for seven trace elements. The sample results have been superseded by the 2022 Market Garden samples.

8.1.4. Burn Pad/Burn Barrel

One burn pad was observed to the north of the residential dwelling at 520 Avonhead Road. Three samples (BP1, BP2 & BP3) were collected in increasing distance from the centre of the burn pad with BP1 being collected from the centre, BP2 collected 1.0m north of the centre and BP3 collected from the edge of the visible burn area 2m northwest of the centre of the burn pad. Samples were analysed for trace elements and Polycyclic Aromatic Hydrocarbons (PAHs).

Sample BP1 comprising ash and soil from the centre of the burn pad recorded an arsenic concentration exceeding the NESCS soil contaminant standard for commercial/industrial land-use. The arsenic concentration also exceeds Burwood Landfill acceptance criteria. ANZECC ISQG high sediment guideline values were exceeded by arsenic, lead, and zinc concentrations.

Sample BP2 showed various analytes exceeding background levels, but no other criteria were exceeded. Sample BP3 did not show contaminant concentrations exceeding background levels.

PAHs from all samples were all found to be below the laboratory limit of reporting.

8.1.5. Roofing material at 500 Avonhead Road

Three samples were collected from around the outside of the dwelling at 500 Avonhead Road. The dwelling was suspected to have asbestos containing roofing material that could have resulted in localised ground contamination.

All samples were recorded by the laboratory as having '*no asbestos detected*' indicating that either the roofing materials do not contain asbestos or that the asbestos has not migrated into the soils.

8.2. 2022 Investigations

8.2.1. Overview

A total of 35 samples have been collected from targeted locations across the site, including the shallow pond area and nearby stockpiles, historic gravel pit, and the market garden area. The purpose of this testing was to assess the impact of the historical HAIL activities identified during the desk study review and preliminary site walkover. Results from these tests are discussed below in the following sections.

Refer to Appendix F for Eliot Sinclair's soil analysis summary table, Appendix G for Hill Laboratories Certificate of Analysis reports, Appendix H for the 2018 sample location plans and Appendix I for the 2022 soil sample locations..

8.2.2. Historical Gravel Extraction Pit

Nine test pits were excavated in the historic gravel pit. Of these, six test pits contained uncontrolled fill and were sampled for asbestos.

Asbestos was detected in two of the eleven soil samples collected from the gravel pit area. These were taken from test pits one (GP 01 0.8 - 1.5 m) and two (GP 02a Fill). The samples contained < 0.001% w/w of fibrous asbestos, which is within the BRANZ guideline criteria for commercial land use.

No asbestos was detected in the other gravel pit samples.

8.2.3. Historical Market Garden Area

Sampling was undertaken in the Market Garden area to test for metals using a systematic sampling pattern. A total of sixteen samples (MG-01 through to MG-16) were collected in the market garden area.

All sixteen samples were within the NESCS criteria for commercial land use. One sample (MG 16) was above recent regional background concentrations for lead and zinc.

All samples were within the Burwood Landfill acceptance criteria.

8.2.4. Pond and Stockpiles

Sampling was undertaken in the shallow pond at 400 Russley Road to test for metal concentrations using a systematic sampling pattern. Two samples were collected (POND 03 and POND 04), and results for both were below the NESCS commercial guidelines and recent regional background levels.

The nearby stockpiles were sampled for metals and asbestos analysis. Three samples were collected (SPA-01, SPA-02, and SPA-03). Results were all below the NESCS commercial guidelines and recent regional background levels.

8.3. NESCS Commercial/indoor outdoor worker (unpaved) Criteria

- None of the samples exceeded the NESCS commercial guidelines for metals in the 2022 investigations.
- The burn drum/pad identified in 2018 was found to exceed the NESCS commercial guideline for arsenic at location BP1. The arsenic concentration also exceeds Burwood Landfill acceptance criteria. ANZECC ISQG high sediment guideline values were exceeded by arsenic, lead and zinc concentrations.
- All other samples analysed in 2018 were within the NESCS commercial guidelines for heavy metals.

8.4. Comparison to background concentrations

8.4.1. 2018

- [Former gravel pit] Samples from test pits TP2, TP4, TP5, TP6 and TP7 recorded trace element levels below background for the Region Recent soil type.
- [Former gravel pit] Test pits TP3 and TP9 showed various analytes above background with lead results exceeding the ANZECC ISQG high levels.
- [Burn pad] Sample BP2 showed various analytes exceeding background levels, but no other criteria were exceeded.
- [Burn pad] Sample BP3 did not show contaminant concentrations exceeding background levels.
- [Markey garden area] All results from the market garden area were recorded below background levels for the Recent Regional soils present on the site.

8.4.2. 2022

- [Markey garden area] The concentration of lead at sample location "MG-16" was reported above the recent regional background guideline value of 40.96 mg/kg, with a recorded concentration of 95 mg/kg.
- [Markey garden area] The concentration of zinc at sample location "MG-16" was reported above the recent regional background guideline value of 93.94 mg/kg, with a recorded concentration of 103 mg/kg.

8.5. BRANZ Asbestos in Soil – Commercial Criteria

- Asbestos soil samples taken at Stockpile A (SPA) and the pond did not detect any asbestos.
- In the gravel pit (GP), asbestos was only detected in two of the eleven samples. Asbestos in the form of "loose fibres" was detected within samples "GP 01 0.8-1.5 m" and "GP 02a Fill". The concentration of fibrous asbestos and asbestos fines were below the BRANZ guideline criteria of 0.001% w/w for commercial land.
- Roofing material at 500 Avonhead Road was analysed in 2018 and was recorded as having 'no asbestos detected'.

8.6. ANZECC ISQG high guideline values

- Contaminant concentrations from the burn pad exceed the ANZECC ISQG high guideline values. As good practice, any remediation of the burn pad should be sensitive to exceedance of ANZECC ISQG high guideline values and appropriate sediment control should be in place, but there is no surface water near the burn pad, so there is no likely pathway for contaminated sediment to reach nearby waterways.

8.7. Soil Disposal

- The soil sample collected from BP1 near the burn pad at 520 Avonhead Road was not within the disposal criteria for Burwood landfill. The soil around the burn pad must be removed to a managed disposal facility.
- Burwood landfill will not accept soil containing asbestos. The excavated soil from the gravel pit must be sent to an alternative managed disposal facility.
- All other tested samples were suitable for disposal at Burwood landfill. This includes the market garden, gravel pit, stockpile, and pond areas displayed on the location plans in Appendix I.

9. Risk Assessment

9.1. Conceptual Site Model

A CSM helps to identify whether a complete exposure pathway exists. An exposure pathway must include a contaminant source, a transport mechanism, and a receptor. If one of these components does not exist, or can be removed, then the exposure pathway is incomplete. If the exposure pathway is incomplete, then there is little risk to human health or the environment at the specified location.

A CSM is provided in Table 6, which combines the 2018 and 2022 investigations.

Table 6. Conceptual Site Model

Contaminant Source	Transport Mechanism	Receptor
- Burn Piles, burn pad, stockpiles (HAIL G5) - Uncontrolled fill in the pond and gravel pit (HAIL G3) - Market Garden Area (HAIL A10) - Future demolition of building structures and soil disturbance during earthworks (HAIL E1)	- Inhalation of dust - Ingestion of soil and dust - Dermal contact with soil	Workers during earthworks, future site occupiers and the surrounding environment

9.2. Assessment

Our assessment has demonstrated that the identified soil contamination present on site, with the exception of the 2018 burn pad and the gravel pit, is within the applicable standard in Regulation 7 of the NESCS.

Based on the reviewed information, site walkover and the CSM we cannot conclude that the exposure pathway resulting in potential ground contamination, is incomplete.

Accordingly, soil sampling was recommended with the following data quality objectives:

- Collect sufficient soil samples across the investigation area to enable a ground contamination assessment for the identified contaminants of concern (arsenic, lead, and PAHs)
- Assess the test results against NESCS³ soil contaminant standards
- Provide recommendations

10. Conclusions and Recommendations

There have been several historical HAIL activities on this site. A total of 77 samples were taken from targeted locations across the site to be analysed. Of these, 42 were taken in 2018 and 35 were collected in 2022.

Of the samples gathered in 2018, only the burn area was identified as having elevated contaminants. The burn pad at 520 Avonhead Road exceeded the commercial/industrial standard for arsenic at location BP1. Arsenic levels at location BP2 located 1.0m from BP1 showed arsenic levels only exceeding background level. This would indicate that the area of soil affected by burning of various materials is limited to a localised 'hotspot', i.e., the source of contamination is small.

All 2022 samples recorded concentrations below NESCS standards for commercial/industrial land use, with all but one showing contaminants below recent regional background concentration levels.

Two samples from the gravel pit area were identified as containing asbestos. The asbestos concentrations were within the BRANZ guidelines for commercial land use. No other samples had detections of asbestos.

Due to the low concentrations of metals, PAHs, OCPs, and asbestos, the site is considered suitable for commercial land-use. All samples analysed at the pond, market garden and stockpiles were within the Burwood Landfill criteria for disposal. The burnpad and gravel pit areas require disposal of soil at an alternate managed facility, as they are not within the criteria for disposal at Burwood Landfill.

We recommend sampling following the demolition of the three residential structures on site, due to the potential presence of asbestos containing materials (ACM). Additionally, the farm debris, timber outbuildings, and oil drums should be removed from the site. These targeted locations should then be inspected for signs of contamination.

To enable the proposed commercial subdivision and future commercial occupation, a Remedial Action Plan (RAP) is required which details a plan of action to remediate the contaminated areas, identified as the burn pad at 520 Avonhead Road, the historical gravel pit area, and the existing residential dwellings. The RAP must be submitted to Council for approval prior to completing any remedial work.

Following approval of the RAP and completion of the remedial actions, site validation investigations and reporting (SVR) will be required to confirm that contaminant concentrations at these targeted locations are below the applicable standard in Regulation 7 of the NESCS for commercial land use.

We assess the NESCS activity status to be restricted discretionary.

It is recommended that if any unusual or contaminated materials are encountered during any site works that the requirements of the Accidental Discovery Protocol provided in this report are followed.

11. Accidental Discovery Protocol

This ground contamination assessment is based on a desktop study, walkover inspections, our site investigations on 2018 & 2022, and a limited number of soil sample results across the large site area.

It is possible that unidentified contamination may be present on the site that is not currently known or was not encountered by the investigations outlined in this report.

Therefore, if any of the following materials are encountered during future earthworks the actions provided below must be followed.

Potential contamination:

- Stained or odorous soil
- Slag, ash, charcoal
- Refuse comprising putrescible waste, metal, or plastics
- Obvious fill material or buried topsoil that is not natural
- Asbestos (bonded) in asbestos cement material (ACM) or friable (e.g., in insulation material)

Actions:

- Works must stop immediately in the area of the discovery, and the site must be secured to stop people entering the area where potential contamination was encountered.
- Contact a contaminated land specialist. Eliot Sinclair (03 379 4014) can assist, assess the risk, and can determine a practicable course of action.

This ADP should be incorporated into the Construction Management Plan.

12. Limitations

This report has been prepared by Eliot Sinclair & Partners Limited ("Eliot Sinclair") only for the intended purpose as a Preliminary and Detailed Site Investigation report to support resource consent application.

The report is based on:

- Reviewing Environment Canterbury's Listed Land Use Register (LLUR) and resource consent database.
- Reviewing historical and recent aerial images of the site taken between 1940 and 2020 from Google Earth and Canterbury Maps.
- The National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health, Regulations 2011 (NESCS)³.
- The Ministry for the Environment (MfE) Contaminated Land Management Guidelines (CLMG) No. 1¹ and 5².
- Eliot Sinclair's desktop study, PSI walkover undertaken on 18 February 2022, and soil sample investigations undertaken on 16 March 2022.
- Hill Laboratories soil sample analysis and reporting.

Where data supplied by Miles Premises Limited or other external sources, including previous site investigation reports, have been relied upon, it has been assumed that the information is correct unless otherwise stated. No responsibility is accepted by Eliot Sinclair for incomplete or inaccurate data supplied by other parties.

Whilst every care and reasonable effort has been taken during our investigation and interpretation of the subsurface conditions to ensure that the conclusions drawn, and the opinions and recommendations expressed are correct at the time of reporting, Eliot Sinclair has not performed an assessment of all possible conditions or circumstances that may exist at the site. Variations in conditions may occur between investigatory locations and there may be conditions such as uncontrolled fill that were not detected by the scope of the investigation that was carried out or have been covered over or obscured over time. Eliot Sinclair does not provide any warranty, either express or implied, that all conditions will conform exactly to the assessments contained in this report.

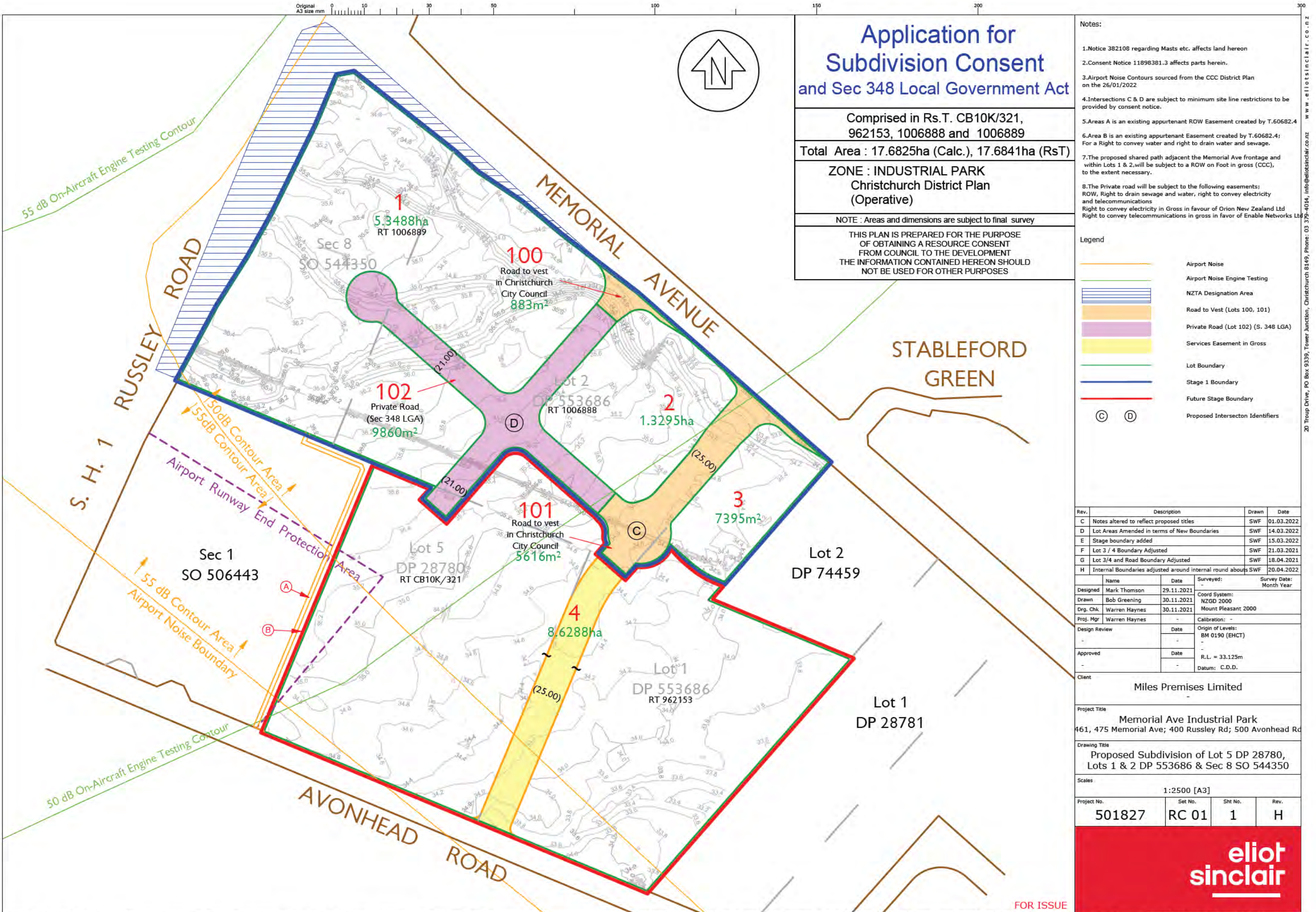
The exposure of conditions that vary from those described in this report, or any future update of the NESCS³, BRANZ⁴, or CLMG¹² may require a review of our recommendations. Eliot Sinclair should be contacted to confirm the validity of this report should any of these occur.

This report has been prepared for the benefit of Miles Premises Limited and the Christchurch City Council for the purposes as stated above. This report is specifically prepared for the proposed subdivision and should not be used to support any future consent application without prior review and approval by Eliot Sinclair. No liability is accepted by Eliot Sinclair or any of their employees with respect to the use of this report, in whole or in part, for any other purpose or by any other party.

13. References

- Environment Canterbury. (2021, July 21). *Canterbury Maps Viewer*. Retrieved from <https://mapviewer.canterburymaps.govt.nz/>
- Environment Canterbury. (2021, July 20). *Listed Land Use Register (LLUR)*. Retrieved from <https://llur.ecan.govt.nz/home>
- Ministry for the Environment. (2021). *Contaminated land management guidelines No. 1: Reporting on contaminated sites in New Zealand (Revised 2021)*. Wellington: Ministry for the Environment.
- Ministry for the Environment. (2021). *Contaminated land management guidelines No 5: Site investigation and analysis of soils (Revised 2021)*. Wellington: Ministry for the Environment.

Appendix A. Application for Subdivision Consent plan



Application for Subdivision Consent and Sec 348 Local Government Act

Comprised in Rs.T. CB10K/321, 962153, 1006888 and 1006889

Total Area : 17.6825ha (Calc.), 17.6841ha (RsT)

ZONE : INDUSTRIAL PARK
Christchurch District Plan
(Operative)

NOTE : Areas and dimensions are subject to final survey

THIS PLAN IS PREPARED FOR THE PURPOSE OF OBTAINING A RESOURCE CONSENT FROM COUNCIL TO THE DEVELOPMENT THE INFORMATION CONTAINED HEREON SHOULD NOT BE USED FOR OTHER PURPOSES

- Notes:
- 1.Notice 382108 regarding Masts etc. affects land hereon
 - 2.Consent Notice 11898381.3 affects parts herein.
 - 3.Airport Noise Contours sourced from the CCC District Plan on the 26/01/2022
 - 4.Intersections C & D are subject to minimum site line restrictions to be provided by consent notice.
 - 5.Areas A is an existing appurtenant ROW Easement created by T.60682.4
 - 6.Area B is an existing appurtenant Easement created by T.60682.4; For a Right to convey water and right to drain water and sewage.
 - 7.The proposed shared path adjacent the Memorial Ave frontage and within Lots 1 & 2, will be subject to a ROW on Foot in gross (CCC), to the extent necessary.
 - 8.The Private road will be subject to the following easements; ROW, Right to drain sewage and water, right to convey electricity and telecommunications Right to convey electricity in Gross in favour of Orion New Zealand Ltd Right to convey telecommunications in gross in favor of Enable Networks Ltd

Legend

- Airport Noise
- Airport Noise Engine Testing
- NZTA Designation Area
- Road to Vest (Lots 100, 101)
- Private Road (Lot 102) (S. 348 LGA)
- Services Easement in Gross
- Lot Boundary
- Stage 1 Boundary
- Future Stage Boundary
- Proposed Intersection Identifiers

Rev.	Description	Drawn	Date
C	Notes altered to reflect proposed titles	SWF	01.03.2022
D	Lot Areas Amended in terms of New Boundaries	SWF	14.03.2022
E	Stage boundary added	SWF	15.03.2022
F	Lot 3 / 4 Boundary Adjusted	SWF	21.03.2021
G	Lot 3/4 and Road Boundary Adjusted	SWF	18.04.2021
H	Internal Boundaries adjusted around internal roundabouts SWF	SWF	20.04.2022

Name	Date	Surveyed:	Survey Date:
Designed	Mark Thomson	29.11.2021	Month Year
Drawn	Bob Greening	30.11.2021	
Org. Chk	Warren Haynes	30.11.2021	
Proj. Mgr	Warren Haynes	-	
Design Review	-	-	
Approved	-	-	
Client	-	-	

Coord System:	NZGD 2000
Mount Pleasant	2000
Calibration:	-
Origin of Levels:	BM 0190 (EHCT)
R.L. =	33.125m
Datum:	C.D.D.

Client	Miles Premises Limited
Project Title	Memorial Ave Industrial Park 461, 475 Memorial Ave; 400 Russley Rd; 500 Avonhead Rd
Drawing Title	Proposed Subdivision of Lot 5 DP 28780, Lots 1 & 2 DP 553686 & Sec 8 SO 544350
Scales	1:2500 [A3]
Project No.	501827
Set No.	RC 01
Sht No.	1
Rev.	H



Appendix B. Representative Site Photographs – July 2018

Site Walkover









Test Pits





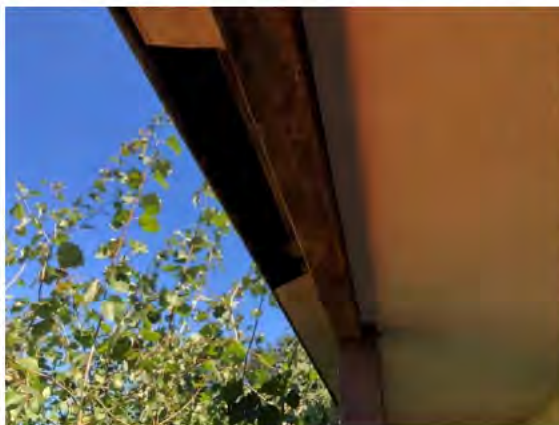
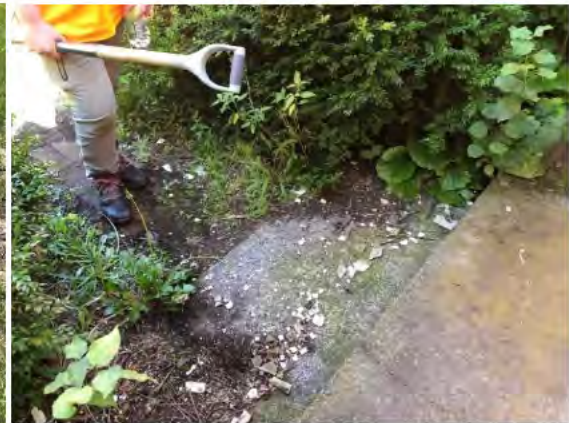






Appendix C. Representative Site Photographs – February 2022













Gravel Pit Area







Pond and Stockpiles







Market Garden Area



Appendix D. LLUR Report



Customer Services
P. 03 353 9007 or 0800 324 636

PO Box 345
Christchurch 8140

P. 03 365 3828
F. 03 365 3194
E. ecinfo@ecan.govt.nz

www.ecan.govt.nz

Dear Sir/Madam

Thank you for submitting your property enquiry from our Listed Land Use Register (LLUR). The LLUR holds information about sites that have been used or are currently used for activities which have the potential to cause contamination.

The LLUR statement shows the land parcel(s) you enquired about and provides information regarding any potential LLUR sites within a specified radius.

Please note that if a property is not currently registered on the LLUR, it does not mean that an activity with the potential to cause contamination has never occurred, or is not currently occurring there. The LLUR database is not complete, and new sites are regularly being added as we receive information and conduct our own investigations into current and historic land uses.

The LLUR only contains information held by Environment Canterbury in relation to contaminated or potentially contaminated land; additional relevant information may be held in other files (for example consent and enforcement files).

Please contact Environment Canterbury if you wish to discuss the contents of this property statement.

Yours sincerely

Contaminated Sites Team

Property Statement from the Listed Land Use Register

Visit ecan.govt.nz/HAIL for more information or
contact Customer Services at ecan.govt.nz/contact/ and quote ENQ311993

Date generated: 20 April 2022
Land parcels: Lot 5 DP 28780



The information presented in this map is specific to the property you have selected. Information on nearby properties may not be shown on this map, even if the property is visible.

Sites at a glance

 Sites within enquiry area

There are no sites associated with the area of enquiry.

More detail about the sites

There are no sites associated with the area of enquiry.

Disclaimer

The enclosed information is derived from Environment Canterbury's Listed Land Use Register and is made available to you under the Local Government Official Information and Meetings Act 1987.

The information contained in this report reflects the current records held by Environment Canterbury regarding the activities undertaken on the site, its possible contamination and based on that information, the categorisation of the site. Environment Canterbury has not verified the

accuracy or completeness of this information. It is released only as a copy of Environment Canterbury's records and is not intended to provide a full, complete or totally accurate assessment of the site. It is provided on the basis that Environment Canterbury makes no warranty or representation regarding the reliability, accuracy or completeness of the information provided or the level of contamination (if any) at the relevant site or that the site is suitable or otherwise for any particular purpose. Environment Canterbury accepts no responsibility for any loss, cost, damage or expense any person may incur as a result of the use, reference to or reliance on the information contained in this report.

Any person receiving and using this information is bound by the provisions of the Privacy Act 1993.

Property Statement from the Listed Land Use Register

Visit ecan.govt.nz/HAIL for more information or
contact Customer Services at ecan.govt.nz/contact/ and quote ENQ311991

Date generated: 20 April 2022
Land parcels: Lot 1 DP 553686



The information presented in this map is specific to the property you have selected. Information on nearby properties may not be shown on this map, even if the property is visible.

Sites at a glance

 **Sites within enquiry area**

There are no sites associated with the area of enquiry.

More detail about the sites

There are no sites associated with the area of enquiry.

Disclaimer

The enclosed information is derived from Environment Canterbury's Listed Land Use Register and is made available to you under the Local Government Official Information and Meetings Act 1987.

The information contained in this report reflects the current records held by Environment Canterbury regarding the activities undertaken on the site, its possible contamination and based on that information, the categorisation of the site. Environment Canterbury has not verified the

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Any person receiving and using this information is bound by the provisions of the Privacy Act 1993.

Property Statement from the Listed Land Use Register

Visit ecan.govt.nz/HAIL for more information or
contact Customer Services at ecan.govt.nz/contact/ and quote ENQ311994

Date generated: 20 April 2022
Land parcels: Lot 2 DP 553686



The information presented in this map is specific to the property you have selected. Information on nearby properties may not be shown on this map, even if the property is visible.

Sites at a glance

Sites within enquiry area

There are no sites associated with the area of enquiry.

More detail about the sites

There are no sites associated with the area of enquiry.

Disclaimer

The enclosed information is derived from Environment Canterbury's Listed Land Use Register and is made available to you under the Local Government Official Information and Meetings Act 1987.

The information contained in this report reflects the current records held by Environment Canterbury regarding the activities undertaken on the site, its possible contamination and based on that information, the categorisation of the site. Environment Canterbury has not verified the

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Any person receiving and using this information is bound by the provisions of the Privacy Act 1993.

Property Statement from the Listed Land Use Register

Visit ecan.govt.nz/HAIL for more information or
contact Customer Services at ecan.govt.nz/contact/ and quote ENQ311990

Date generated: 20 April 2022
Land parcels: Section 8 SO 544350



The information presented in this map is specific to the property you have selected. Information on nearby properties may not be shown on this map, even if the property is visible.

Sites at a glance

 **Sites within enquiry area**

There are no sites associated with the area of enquiry.

More detail about the sites

There are no sites associated with the area of enquiry.

Disclaimer

The enclosed information is derived from Environment Canterbury's Listed Land Use Register and is made available to you under the Local Government Official Information and Meetings Act 1987.

The information contained in this report reflects the current records held by Environment Canterbury regarding the activities undertaken on the site, its possible contamination and based on that information, the categorisation of the site. Environment Canterbury has not verified the

accuracy or completeness of this information. It is released only as a copy of Environment Canterbury's records and is not intended to provide a full, complete or totally accurate assessment of the site. It is provided on the basis that Environment Canterbury makes no warranty or representation regarding the reliability, accuracy or completeness of the information provided or the level of contamination (if any) at the relevant site or that the site is suitable or otherwise for any particular purpose. Environment Canterbury accepts no responsibility for any loss, cost, damage or expense any person may incur as a result of the use, reference to or reliance on the information contained in this report.

Any person receiving and using this information is bound by the provisions of the Privacy Act 1993.

Appendix E. Historical Aerial Imagery

Photos - 1952_Crown_592_D_10.jpg 31%

 See all photos

+ Add to



 Edit & Create

by LINZ CC-BY 3.0



Photos - 1961_Crown_1408_3146_8.jpg 45%

 See all photos

+ Add to



Photos - 1973_Crown_2634_F_30.jpg 26%

 See all photos

+ Add to



Photos - 1976_Crown_2980_A_9.jpg 137%

 See all photos

+ Add to



Photos - 1979_Crown_5468_M_3.jpg 81%

See all photos

+ Add to



Edit &



Photos - 1984_Crown_8389_F_12.jpg 70%

See all photos

+ Add to



Edit &

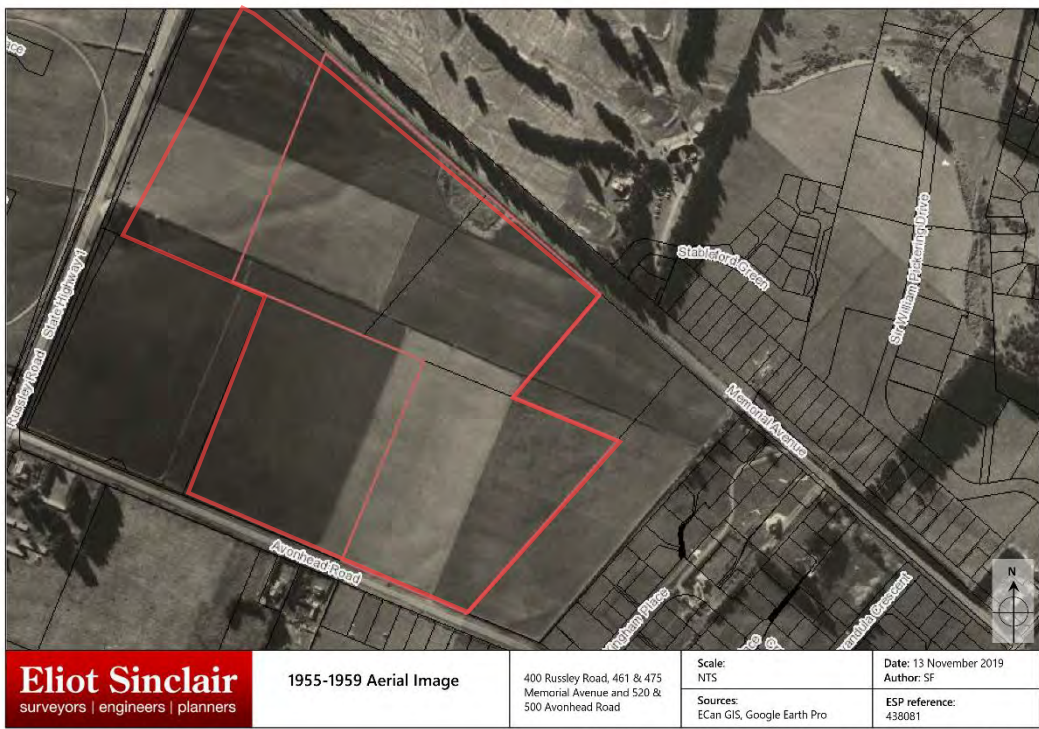


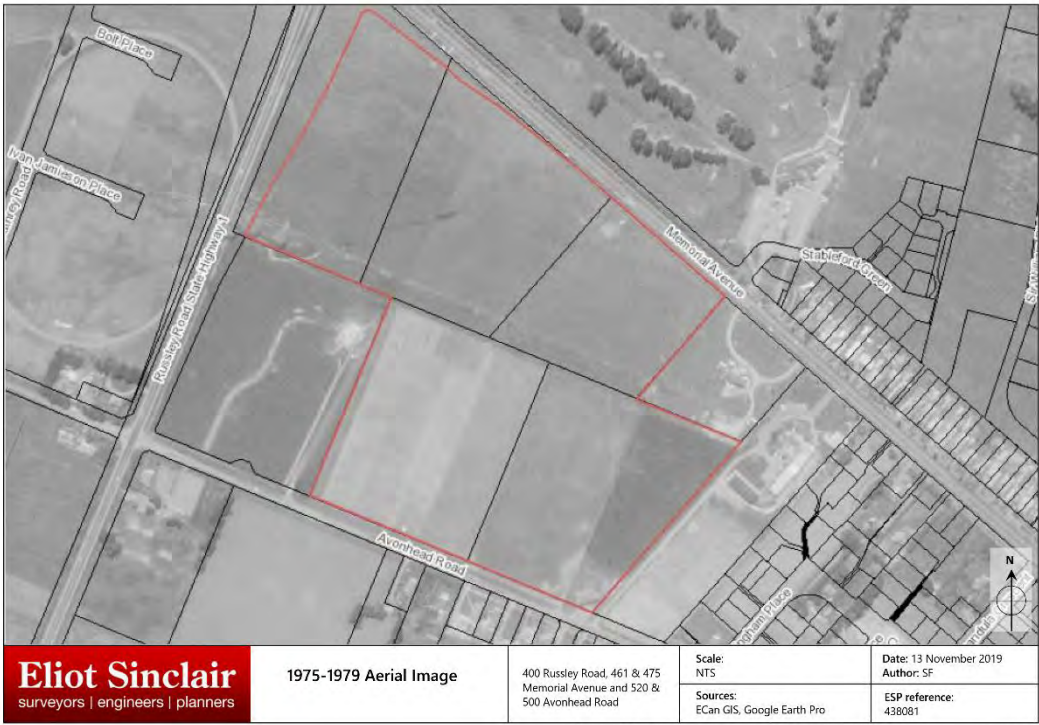
 See all photos

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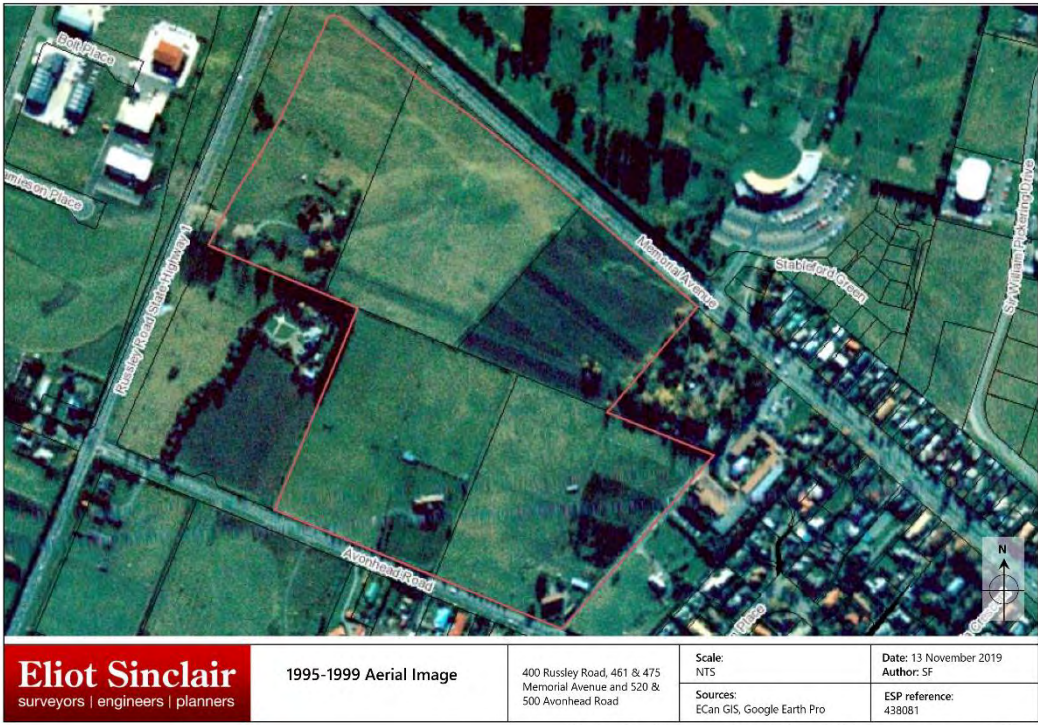
















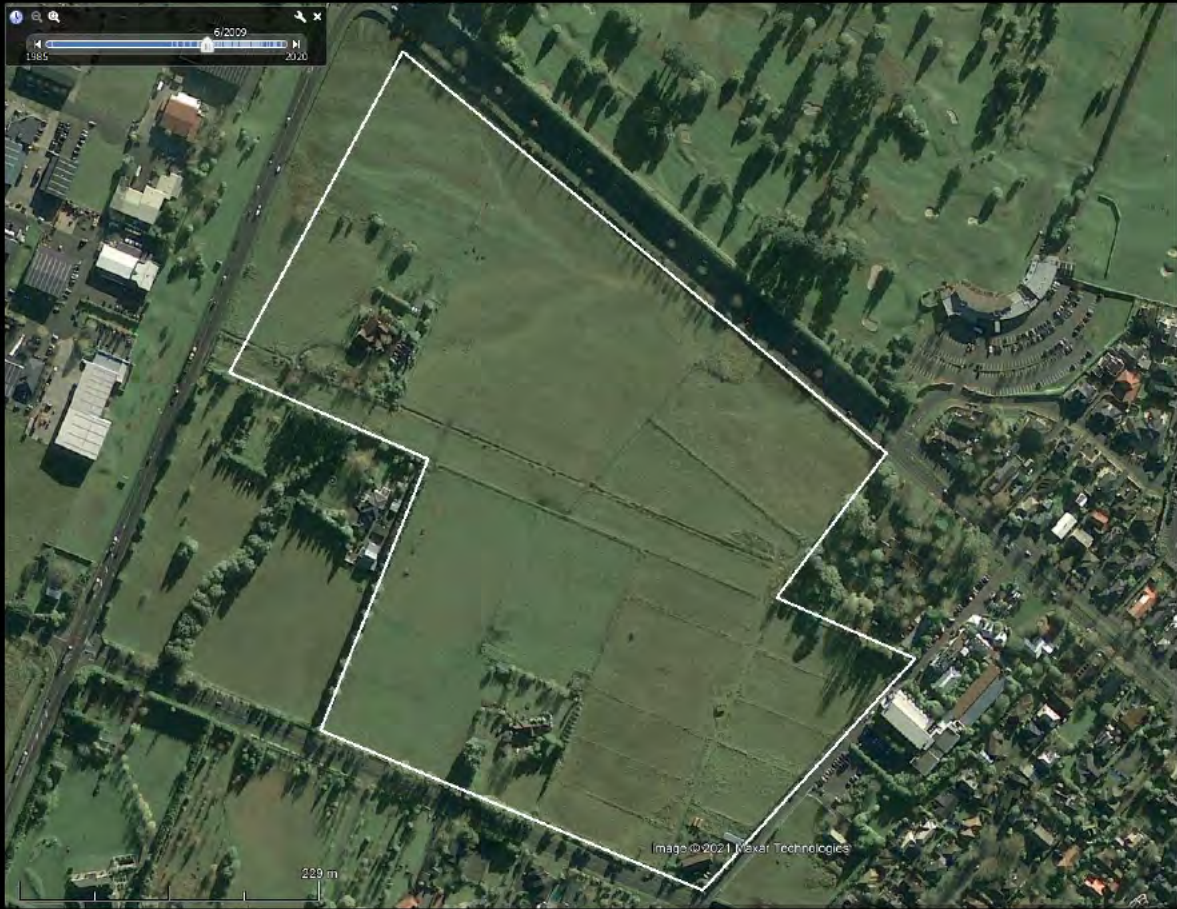
1 Historical aerial Imagery sourced from Google Earth

































































Appendix F. 2022 ESP Soil Analysis Summary Table

Job Number: 501827

XRF Reference:	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Lab Number:	2918895.1	2918895.2	2918895.3	2918895.4	2918895.5	2918895.6	2918895.7	2918895.8	2918895.9	2918895.1	2918895.11	2918895.12	2918895.13	2918895.14	2918895.15	2918895.16	2918895.17	2918895.19	2918895.21	2918895.23	2918895.24
Sample Name:	MG-01	MG-02	MG-03	MG-04	MG-05	MG-06	MG-07	MG-08	MG-09	MG-10	MG-11	MG-12	MG-13	MG-14	MG-15	MG-16	SPA-01	SPA-02	SPA-03	POHD 03 0-0.12	POHD 04 0-0.7m
Soil Type:	Silty Topsoil	Silty Topsoil	Silty Topsoil	Silty Topsoil	Silty Topsoil	Silty Topsoil	Silty Topsoil	Silty Topsoil	Silty Topsoil	Silty Topsoil	Silty Topsoil	Silty Topsoil	Silty Topsoil	Silty Topsoil	Silty Topsoil	Silty Topsoil	Silty Topsoil	Silty Topsoil	Silty Topsoil	Silt	Silt
Sample Date:	16/03/2022	16/03/2022	16/03/2022	16/03/2022	16/03/2022	16/03/2022	16/03/2022	16/03/2022	16/03/2022	16/03/2022	16/03/2022	16/03/2022	16/03/2022	16/03/2022	16/03/2022	16/03/2022	16/03/2022	16/03/2022	16/03/2022	16/03/2022	16/03/2022
Depth:	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface

NE3 SC3 Commercial

Criteria

Arsenic	70 (As)	5	5	7	5	6	5	5	6	5	5	5	5	5	4	4	6	6	5	5	3	3
Cadmium	1300 (Cd)	0.12	< 0.2	0.15	< 0.3	0.13	0.1	0.1	0.11	0.12	0.1	0.11	< 0.10	< 0.10	< 0.10	0.1	0.14	0.11	< 0.10	0.11	< 0.10	0.11
Chromium	6300 (Cr)	16	15	20	16	17	15	15	15	15	16	15	15	15	14	14	17	15	14	15	14	15
Copper	NL (Cu)	10	11	13	12	11	11	10	10	10	9	9	9	9	9	8	14	10	10	9	8	10
Lead	3300 (Pb)	20	19.1	25	30	23	19.8	18.7	20	21	21	19.4	19.7	23	40	22	95	22	21	19.7	15.5	18.9
Nickel	6000 (Ni)	13	13	17	13	14	14	13	13	13	13	13	13	12	12	12	11	14	12	13	12	13
Zinc	40000 (Zn)	64	64	78	75	72	61	59	63	61	59	61	55	57	79	60	103	59	52	57	50	63
Mercury	4200 (Hg)	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Total DDT Isomers	1000	0.07	< 0.08	< 0.08	< 0.08	0.15	0.13	0.13	0.17	0.1	0.09	< 0.08	0.1	< 0.07	0.08	< 0.07	< 0.07	---	---	---	---	---
Aldrin & Dieldrin ¹ (Combined)	140*	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	---	---	---	---	---

Background Level 2 Recent: Regional

Criteria

Arsenic	12.5B (As)	5	5	7	5	6	5	5	6	5	5	5	5	5	4	4	6	6	5	5	3	3
Cadmium	0.19 (Cd)	0.12	< 0.2	0.15	< 0.3	0.13	0.1	0.1	0.11	0.12	0.1	0.11	< 0.10	< 0.10	< 0.10	0.1	0.14	0.11	< 0.10	0.11	< 0.10	0.11
Chromium	22.7 (Cr)	16	15	20	16	17	15	15	15	15	16	15	15	15	14	14	17	15	14	15	14	15
Copper	20.3 (Cu)	10	11	13	12	11	11	10	10	10	9	9	9	9	9	8	14	10	10	9	8	10
Lead	40.96 (Pb)	20	19.1	25	30	23	19.8	18.7	20	21	21	19.4	19.7	23	40	22	95	22	21	19.7	15.5	18.9
Nickel	20.7 (Ni)	13	13	17	13	14	14	13	13	13	13	13	13	12	12	12	11	14	12	13	12	13
Zinc	93.94 (Zn)	64	64	78	75	72	61	59	63	61	59	61	55	57	79	60	103	59	52	57	50	63
Mercury	0.11 (Hg)	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Burwood Landfill acceptance

Criteria

Arsenic	80 (As)	5	5	7	5	6	5	5	6	5	5	5	5	5	4	4	6	6	5	5	3	3
Cadmium	400 (Cd)	0.12	< 0.2	0.15	< 0.3	0.13	0.1	0.1	0.11	0.12	0.1	0.11	< 0.10	< 0.10	< 0.10	0.1	0.14	0.11	< 0.10	0.11	< 0.10	0.11
Chromium	2700 (Cr)	16	15	20	16	17	15	15	15	15	16	15	15	15	14	14	17	15	14	15	14	15
Copper	>10,000 (Cu)	10	11	13	12	11	11	10	10	10	9	9	9	9	9	8	14	10	10	9	8	10
Lead	880 (Pb)	20	19.1	25	30	23	19.8	18.7	20	21	21	19.4	19.7	23	40	22	95	22	21	19.7	15.5	18.9
Nickel	600 (Ni)	13	13	17	13	14	14	13	13	13	13	13	13	12	12	12	11	14	12	13	12	13
Zinc	14000 (Zn)	64	64	78	75	72	61	59	63	61	59	61	55	57	79	60	103	59	52	57	50	63
Mercury	1800 (Hg)	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Notes:
Red highlighted cells indicate analyte concentrations exceeding its respective analyte criteria.

Yellow highlighted cells indicate analyte concentrations approaching its respective analyte criteria.

¹ The Soil Contaminant Standard (SCS) is applicable to either dieldrin or aldrin separately, or to the sum of aldrin and dieldrin if both are involved.

Appendix G. 2022 Hill Laboratories Certificate of Analysis Reports



Certificate of Analysis

Page 1 of 4

Client:	Eliot Sinclair & Partners Limited	Lab No:	2918810	A2Pv1
Contact:	Peter Ngenang	Date Received:	16-Mar-2022	
	C/- Eliot Sinclair & Partners Limited	Date Reported:	18-Mar-2022	
	PO Box 9339	Quote No:	92244	
	Tower Junction	Order No:	501827	
	Christchurch 8149	Client Reference:	501827_Memorial Ave DSI	
		Submitted By:	Peter Ngenang	

Sample Type: Soil

Sample Name:	SPA-01 16-Mar-2022	SPA-02 16-Mar-2022	SPA-03 16-Mar-2022	POND 03 0-0.12 16-Mar-2022	POND 04 0-0.7m 16-Mar-2022
Lab Number:	2918810.1	2918810.3	2918810.5	2918810.7	2918810.8
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	% w/w < 0.001	% w/w < 0.001	% w/w < 0.001	% w/w < 0.001
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	% w/w < 0.001	% w/w < 0.001	% w/w < 0.001	% w/w < 0.001	% w/w < 0.001
Asbestos as Fibrous Asbestos as % of Total Sample*	% w/w < 0.001	% w/w < 0.001	% w/w < 0.001	% w/w < 0.001	% w/w < 0.001
Asbestos as Asbestos Fines as % of Total Sample*	% w/w < 0.001	% w/w < 0.001	% w/w < 0.001	% w/w < 0.001	% w/w < 0.001
As Received Weight	g 714.8	g 787.1	g 709.3	g 815.3	g 743.4
Dry Weight	g 613.6	g 709.9	g 616.9	g 709.6	g 656.3
Moisture	% 14	% 10	% 13	% 13	% 12
Sample Fraction >10mm	g dry wt < 0.1	g dry wt 61.6	g dry wt < 0.1	g dry wt < 0.1	g dry wt < 0.1
Sample Fraction <10mm to >2mm	g dry wt 30.1	g dry wt 263.0	g dry wt 54.1	g dry wt < 0.1	g dry wt < 0.1
Sample Fraction <2mm	g dry wt 582.4	g dry wt 384.2	g dry wt 561.7	g dry wt 707.5	g dry wt 655.0
<2mm Subsample Weight	g dry wt 55.3	g dry wt 57.0	g dry wt 58.6	g dry wt 53.9	g dry wt 54.2
Weight of Asbestos in ACM (Non-Friable)	g dry wt < 0.00001	g dry wt < 0.00001	g dry wt < 0.00001	g dry wt < 0.00001	g dry wt < 0.00001
Weight of Asbestos as Fibrous Asbestos (Friable)	g dry wt < 0.00001	g dry wt < 0.00001	g dry wt < 0.00001	g dry wt < 0.00001	g dry wt < 0.00001
Weight of Asbestos as Asbestos Fines (Friable)*	g dry wt < 0.00001	g dry wt < 0.00001	g dry wt < 0.00001	g dry wt < 0.00001	g dry wt < 0.00001

Sample Name:	GP01 0.3-0.8m 16-Mar-2022	GP01 0.8-1.5m 16-Mar-2022	GP02a Fill 16-Mar-2022	GP02b Fill 16-Mar-2022	GP03 0-1.0m 16-Mar-2022
Lab Number:	2918810.9	2918810.10	2918810.11	2918810.12	2918810.13
Asbestos Presence / Absence	Asbestos NOT detected.	Chrysotile (White Asbestos) detected.	Chrysotile (White Asbestos) detected.	Asbestos NOT detected.	Asbestos NOT detected.
Description of Asbestos Form	-	Loose Fibres	Loose fibres	-	-
Asbestos in ACM as % of Total Sample*	% w/w < 0.001	% w/w < 0.001	% w/w < 0.001	% w/w < 0.001	% w/w < 0.001
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	% w/w < 0.001	% w/w < 0.001	% w/w < 0.001	% w/w < 0.001	% w/w < 0.001
Asbestos as Fibrous Asbestos as % of Total Sample*	% w/w < 0.001	% w/w < 0.001	% w/w < 0.001	% w/w < 0.001	% w/w < 0.001
Asbestos as Asbestos Fines as % of Total Sample*	% w/w < 0.001	% w/w < 0.001	% w/w < 0.001	% w/w < 0.001	% w/w < 0.001
As Received Weight	g 779.6	g 858.1	g 759.9	g 812.7	g 728.7
Dry Weight	g 688.1	g 750.5	g 666.3	g 738.5	g 609.6
Moisture	% 12	% 13	% 12	% 9	% 16



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:		GP01 0.3-0.8m 16-Mar-2022	GP01 0.8-1.5m 16-Mar-2022	GP02a Fill 16-Mar-2022	GP02b Fill 16-Mar-2022	GP03 0-1.0m 16-Mar-2022
Lab Number:		2918810.9	2918810.10	2918810.11	2918810.12	2918810.13
Sample Fraction >10mm	g dry wt	47.9	81.9	12.9	122.7	30.3
Sample Fraction <10mm to >2mm	g dry wt	125.8	158.1	136.1	121.3	66.5
Sample Fraction <2mm	g dry wt	513.4	509.4	515.7	493.6	511.7
<2mm Subsample Weight	g dry wt	57.4	57.7	57.3	54.3	56.3
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	0.00022	0.00057	< 0.00001	< 0.00001

Sample Name:		GP03 1.0-1.4m 16-Mar-2022	GP04 0-0.7m 16-Mar-2022	GP04 0.7-1.2m 16-Mar-2022	GP05 0-0.7m 16-Mar-2022	GP05 0.7-1.4m 16-Mar-2022
Lab Number:		2918810.14	2918810.15	2918810.16	2918810.17	2918810.18
Asbestos Presence / Absence		Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.
Description of Asbestos Form		-	-	-	-	-
Asbestos in ACM as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Asbestos as Fibrous Asbestos as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Asbestos as Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
As Received Weight	g	1,032.1	683.9	1,057.0	707.1	703.8
Dry Weight	g	961.3	593.2	1,020.2	622.4	641.7
Moisture	%	7	13	3	12	9
Sample Fraction >10mm	g dry wt	382.4	9.8	423.8	3.6	71.5
Sample Fraction <10mm to >2mm	g dry wt	310.8	34.9	226.1	62.5	82.6
Sample Fraction <2mm	g dry wt	266.0	547.1	369.6	554.8	486.6
<2mm Subsample Weight	g dry wt	58.0	52.0	51.8	54.4	55.5
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:		GP06 0-0.8m 16-Mar-2022				
Lab Number:		2918810.19				
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	758.3	-	-	-	-
Dry Weight	g	656.1	-	-	-	-
Moisture	%	13	-	-	-	-
Sample Fraction >10mm	g dry wt	8.6	-	-	-	-
Sample Fraction <10mm to >2mm	g dry wt	96.3	-	-	-	-
Sample Fraction <2mm	g dry wt	549.9	-	-	-	-
<2mm Subsample Weight	g dry wt	56.2	-	-	-	-

Sample Type: Soil						
Sample Name:		GP06 0-0.8m 16-Mar-2022				
Lab Number:		2918810.19				
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 Laboratories, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Soil			
Test	Method Description	Default Detection Limit	Sample No
Individual Tests			
Weight of Asbestos as Asbestos Fines in <10mm >2mm Fraction*	Measurement on analytical balance, from the <10mm >2mm Fraction. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.00001 g dry wt	1, 3, 5, 7-19
New Zealand Guidelines Semi Quantitative Asbestos in Soil			
As Received Weight	Measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	1, 3, 5, 7-19
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	1, 3, 5, 7-19
Moisture	Sample dried at 100 to 105°C. Calculation = (As received weight - Dry weight) / as received weight x 100.	1 %	1, 3, 5, 7-19
Sample Fraction >10mm	Sample dried at 100 to 105°C, 10mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g dry wt	1, 3, 5, 7-19
Sample Fraction <10mm to >2mm	Sample dried at 100 to 105°C, 10mm and 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g dry wt	1, 3, 5, 7-19
Sample Fraction <2mm	Sample dried at 100 to 105°C, 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g dry wt	1, 3, 5, 7-19
Asbestos Presence / Absence	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0.01%	1, 3, 5, 7-19
Description of Asbestos Form	Description of asbestos form and/or shape if present.	-	1, 3, 5, 7-19
Weight of Asbestos in ACM (Non-Friable)	Measurement on analytical balance, from the >10mm Fraction. Weight of asbestos based on assessment of ACM form. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 3, 5, 7-19

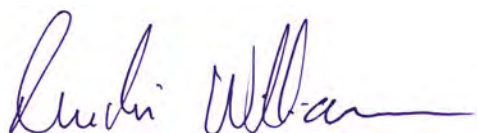
Sample Type: Soil			
Test	Method Description	Default Detection Limit	Sample No
Asbestos in ACM as % of Total Sample*	Calculated from weight of asbestos in ACM and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1, 3, 5, 7-19
Weight of Asbestos as Fibrous Asbestos (Friable)	Measurement on analytical balance, from the >10mm Fraction. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 3, 5, 7-19
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, 5, 7-19
Weight of Asbestos as Asbestos Fines (Friable)*	Measurement on analytical balance, from the <10mm Fractions. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 3, 5, 7-19
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, 5, 7-19
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, 5, 7-19

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

Testing was completed on 18-Mar-2022. For completion dates of individual analyses please contact the laboratory.

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

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Rhodri Williams BSc (Hons)
Technical Manager - Asbestos



Certificate of Analysis

Page 1 of 4

Client:	Eliot Sinclair & Partners Limited	Lab No:	2918895	SPV2
Contact:	Peter Ngenang	Date Received:	16-Mar-2022	
	C/- Eliot Sinclair & Partners Limited	Date Reported:	24-Mar-2022	
	PO Box 9339	Quote No:	92244	
	Tower Junction	Order No:	501827	
	Christchurch 8149	Client Reference:	501827_Memorial Ave DSI	
		Submitted By:	Peter Ngenang	

Sample Type: Soil

Sample Name:		MG-01 16-Mar-2022	MG-02 16-Mar-2022	MG-03 16-Mar-2022	MG-04 16-Mar-2022	MG-05 16-Mar-2022
Lab Number:		2918895.1	2918895.2	2918895.3	2918895.4	2918895.5
Individual Tests						
Dry Matter	g/100g as rcvd	84	79	80	83	82
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	5	5	7	5	6
Total Recoverable Cadmium	mg/kg dry wt	0.12	< 0.2	0.15	< 0.3	0.13
Total Recoverable Chromium	mg/kg dry wt	16	15	20	16	17
Total Recoverable Copper	mg/kg dry wt	10	11	13	12	11
Total Recoverable Lead	mg/kg dry wt	20	19.1	25	30	23
Total Recoverable Nickel	mg/kg dry wt	13	13	17	13	14
Total Recoverable Zinc	mg/kg dry wt	64	64	78	75	72
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	< 0.012	< 0.013	< 0.013	< 0.012	< 0.012
alpha-BHC	mg/kg dry wt	< 0.012	< 0.013	< 0.013	< 0.012	< 0.012
beta-BHC	mg/kg dry wt	< 0.012	< 0.013	< 0.013	< 0.012	< 0.012
delta-BHC	mg/kg dry wt	< 0.012	< 0.013	< 0.013	< 0.012	< 0.012
gamma-BHC (Lindane)	mg/kg dry wt	< 0.012	< 0.013	< 0.013	< 0.012	< 0.012
cis-Chlordane	mg/kg dry wt	< 0.012	< 0.013	< 0.013	< 0.012	< 0.012
trans-Chlordane	mg/kg dry wt	< 0.012	< 0.013	< 0.013	< 0.012	< 0.012
2,4'-DDD	mg/kg dry wt	< 0.012	< 0.013	< 0.013	< 0.012	< 0.012
4,4'-DDD	mg/kg dry wt	< 0.012	< 0.013	< 0.013	< 0.012	< 0.012
2,4'-DDE	mg/kg dry wt	< 0.012	< 0.013	< 0.013	< 0.012	< 0.012
4,4'-DDE	mg/kg dry wt	0.042	0.035	0.020	< 0.012	0.097
2,4'-DDT	mg/kg dry wt	< 0.012	< 0.013	< 0.013	< 0.012	< 0.012
4,4'-DDT	mg/kg dry wt	0.018	0.030	< 0.013	< 0.012	0.044
Total DDT Isomers	mg/kg dry wt	0.07	< 0.08	< 0.08	< 0.08	0.15
Dieldrin	mg/kg dry wt	< 0.012	< 0.013	< 0.013	< 0.012	< 0.012
Endosulfan I	mg/kg dry wt	< 0.012	< 0.013	< 0.013	< 0.012	< 0.012
Endosulfan II	mg/kg dry wt	< 0.012	< 0.013	< 0.013	< 0.012	< 0.012
Endosulfan sulphate	mg/kg dry wt	< 0.012	< 0.013	< 0.013	< 0.012	< 0.012
Endrin	mg/kg dry wt	< 0.012	< 0.013	< 0.013	< 0.012	< 0.012
Endrin aldehyde	mg/kg dry wt	< 0.012	< 0.013	< 0.013	< 0.012	< 0.012
Endrin ketone	mg/kg dry wt	< 0.012	< 0.013	< 0.013	< 0.012	< 0.012
Heptachlor	mg/kg dry wt	< 0.012	< 0.013	< 0.013	< 0.012	< 0.012
Heptachlor epoxide	mg/kg dry wt	< 0.012	< 0.013	< 0.013	< 0.012	< 0.012
Hexachlorobenzene	mg/kg dry wt	< 0.012	< 0.013	< 0.013	< 0.012	< 0.012
Methoxychlor	mg/kg dry wt	< 0.012	< 0.013	< 0.013	< 0.012	< 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:		MG-06 16-Mar-2022	MG-07 16-Mar-2022	MG-08 16-Mar-2022	MG-09 16-Mar-2022	MG-10 16-Mar-2022
Lab Number:		2918895.6	2918895.7	2918895.8	2918895.9	2918895.10
Individual Tests						
Dry Matter	g/100g as rcvd	78	85	78	84	79
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	5	5	6	5	5
Total Recoverable Cadmium	mg/kg dry wt	0.10	0.10	0.11	0.12	0.10
Total Recoverable Chromium	mg/kg dry wt	15	15	15	15	16
Total Recoverable Copper	mg/kg dry wt	11	10	10	10	9
Total Recoverable Lead	mg/kg dry wt	19.8	18.7	20	21	21
Total Recoverable Nickel	mg/kg dry wt	14	13	13	13	15
Total Recoverable Zinc	mg/kg dry wt	61	59	63	61	59
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	< 0.013	< 0.012	< 0.013	< 0.012	< 0.013
alpha-BHC	mg/kg dry wt	< 0.013	< 0.012	< 0.013	< 0.012	< 0.013
beta-BHC	mg/kg dry wt	< 0.013	< 0.012	< 0.013	< 0.012	< 0.013
delta-BHC	mg/kg dry wt	< 0.013	< 0.012	< 0.013	< 0.012	< 0.013
gamma-BHC (Lindane)	mg/kg dry wt	< 0.013	< 0.012	< 0.013	< 0.012	< 0.013
cis-Chlordane	mg/kg dry wt	< 0.013	< 0.012	< 0.013	< 0.012	< 0.013
trans-Chlordane	mg/kg dry wt	< 0.013	< 0.012	< 0.013	< 0.012	< 0.013
2,4'-DDD	mg/kg dry wt	< 0.013	< 0.012	< 0.013	< 0.012	< 0.013
4,4'-DDD	mg/kg dry wt	< 0.013	< 0.012	< 0.013	< 0.012	< 0.013
2,4'-DDE	mg/kg dry wt	< 0.013	< 0.012	< 0.013	< 0.012	< 0.013
4,4'-DDE	mg/kg dry wt	0.087	0.074	0.111	0.066	0.050
2,4'-DDT	mg/kg dry wt	< 0.013	< 0.012	< 0.013	< 0.012	< 0.013
4,4'-DDT	mg/kg dry wt	0.038	0.044	0.049	0.029	0.029
Total DDT Isomers	mg/kg dry wt	0.13	0.13	0.17	0.10	0.09
Dieldrin	mg/kg dry wt	< 0.013	< 0.012	< 0.013	< 0.012	< 0.013
Endosulfan I	mg/kg dry wt	< 0.013	< 0.012	< 0.013	< 0.012	< 0.013
Endosulfan II	mg/kg dry wt	< 0.013	< 0.012	< 0.013	< 0.012	< 0.013
Endosulfan sulphate	mg/kg dry wt	< 0.013	< 0.012	< 0.013	< 0.012	< 0.013
Endrin	mg/kg dry wt	< 0.013	< 0.012	< 0.013	< 0.012	< 0.013
Endrin aldehyde	mg/kg dry wt	< 0.013	< 0.012	< 0.013	< 0.012	< 0.013
Endrin ketone	mg/kg dry wt	< 0.013	< 0.012	< 0.013	< 0.012	< 0.013
Heptachlor	mg/kg dry wt	< 0.013	< 0.012	< 0.013	< 0.012	< 0.013
Heptachlor epoxide	mg/kg dry wt	< 0.013	< 0.012	< 0.013	< 0.012	< 0.013
Hexachlorobenzene	mg/kg dry wt	< 0.013	< 0.012	< 0.013	< 0.012	< 0.013
Methoxychlor	mg/kg dry wt	< 0.013	< 0.012	< 0.013	< 0.012	< 0.013
Sample Name:		MG-11 16-Mar-2022	MG-12 16-Mar-2022	MG-13 16-Mar-2022	MG-14 16-Mar-2022	MG-15 16-Mar-2022
Lab Number:		2918895.11	2918895.12	2918895.13	2918895.14	2918895.15
Individual Tests						
Dry Matter	g/100g as rcvd	82	83	91	92	91
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	5	5	5	4	4
Total Recoverable Cadmium	mg/kg dry wt	0.11	< 0.10	< 0.10	< 0.10	0.10
Total Recoverable Chromium	mg/kg dry wt	15	15	15	14	14
Total Recoverable Copper	mg/kg dry wt	9	9	9	9	8
Total Recoverable Lead	mg/kg dry wt	19.4	19.7	23	40	22
Total Recoverable Nickel	mg/kg dry wt	13	13	12	12	12
Total Recoverable Zinc	mg/kg dry wt	61	55	57	79	60
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	< 0.012	< 0.012	< 0.011	< 0.011	< 0.011
alpha-BHC	mg/kg dry wt	< 0.012	< 0.012	< 0.011	< 0.011	< 0.011
beta-BHC	mg/kg dry wt	< 0.012	< 0.012	< 0.011	< 0.011	< 0.011
delta-BHC	mg/kg dry wt	< 0.012	< 0.012	< 0.011	< 0.011	< 0.011
gamma-BHC (Lindane)	mg/kg dry wt	< 0.012	< 0.012	< 0.011	< 0.011	< 0.011
cis-Chlordane	mg/kg dry wt	< 0.012	< 0.012	< 0.011	< 0.011	< 0.011

Sample Type: Soil						
Sample Name:		MG-11 16-Mar-2022	MG-12 16-Mar-2022	MG-13 16-Mar-2022	MG-14 16-Mar-2022	MG-15 16-Mar-2022
Lab Number:		2918895.11	2918895.12	2918895.13	2918895.14	2918895.15
Organochlorine Pesticides Screening in Soil						
trans-Chlordane	mg/kg dry wt	< 0.012	< 0.012	< 0.011	< 0.011	< 0.011
2,4'-DDD	mg/kg dry wt	< 0.012	< 0.012	< 0.011	< 0.011	< 0.011
4,4'-DDD	mg/kg dry wt	< 0.012	< 0.012	< 0.011	< 0.011	< 0.011
2,4'-DDE	mg/kg dry wt	< 0.012	< 0.012	< 0.011	< 0.011	< 0.011
4,4'-DDE	mg/kg dry wt	0.038	0.060	0.028	0.057	0.016
2,4'-DDT	mg/kg dry wt	< 0.012	< 0.012	< 0.011	< 0.011	< 0.011
4,4'-DDT	mg/kg dry wt	0.026	0.033	0.015	0.017	< 0.011
Total DDT Isomers	mg/kg dry wt	< 0.08	0.10	< 0.07	0.08	< 0.07
Dieldrin	mg/kg dry wt	< 0.012	< 0.012	< 0.011	< 0.011	< 0.011
Endosulfan I	mg/kg dry wt	< 0.012	< 0.012	< 0.011	< 0.011	< 0.011
Endosulfan II	mg/kg dry wt	< 0.012	< 0.012	< 0.011	< 0.011	< 0.011
Endosulfan sulphate	mg/kg dry wt	< 0.012	< 0.012	< 0.011	< 0.011	< 0.011
Endrin	mg/kg dry wt	< 0.012	< 0.012	< 0.011	< 0.011	< 0.011
Endrin aldehyde	mg/kg dry wt	< 0.012	< 0.012	< 0.011	< 0.011	< 0.011
Endrin ketone	mg/kg dry wt	< 0.012	< 0.012	< 0.011	< 0.011	< 0.011
Heptachlor	mg/kg dry wt	< 0.012	< 0.012	< 0.011	< 0.011	< 0.011
Heptachlor epoxide	mg/kg dry wt	< 0.012	< 0.012	< 0.011	< 0.011	< 0.011
Hexachlorobenzene	mg/kg dry wt	< 0.012	< 0.012	< 0.011	< 0.011	< 0.011
Methoxychlor	mg/kg dry wt	< 0.012	< 0.012	< 0.011	< 0.011	< 0.011
Sample Name:		MG-16 16-Mar-2022	SPA-01 16-Mar-2022	SPA-02 16-Mar-2022	SPA-03 16-Mar-2022	POND 03 0-0.12 16-Mar-2022
Lab Number:		2918895.16	2918895.17	2918895.19	2918895.21	2918895.23
Individual Tests						
Dry Matter	g/100g as rcvd	94	-	-	-	-
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	6	6	5	5	3
Total Recoverable Cadmium	mg/kg dry wt	0.14	0.11	< 0.10	0.11	< 0.10
Total Recoverable Chromium	mg/kg dry wt	17	15	14	15	14
Total Recoverable Copper	mg/kg dry wt	14	10	10	9	8
Total Recoverable Lead	mg/kg dry wt	95	22	21	19.7	15.5
Total Recoverable Nickel	mg/kg dry wt	11	14	12	13	12
Total Recoverable Zinc	mg/kg dry wt	103	59	52	57	50
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	< 0.011	-	-	-	-
alpha-BHC	mg/kg dry wt	< 0.011	-	-	-	-
beta-BHC	mg/kg dry wt	< 0.011	-	-	-	-
delta-BHC	mg/kg dry wt	< 0.011	-	-	-	-
gamma-BHC (Lindane)	mg/kg dry wt	< 0.011	-	-	-	-
cis-Chlordane	mg/kg dry wt	< 0.011	-	-	-	-
trans-Chlordane	mg/kg dry wt	< 0.011	-	-	-	-
2,4'-DDD	mg/kg dry wt	< 0.011	-	-	-	-
4,4'-DDD	mg/kg dry wt	< 0.011	-	-	-	-
2,4'-DDE	mg/kg dry wt	< 0.011	-	-	-	-
4,4'-DDE	mg/kg dry wt	< 0.011	-	-	-	-
2,4'-DDT	mg/kg dry wt	< 0.011	-	-	-	-
4,4'-DDT	mg/kg dry wt	< 0.011	-	-	-	-
Total DDT Isomers	mg/kg dry wt	< 0.07	-	-	-	-
Dieldrin	mg/kg dry wt	< 0.011	-	-	-	-
Endosulfan I	mg/kg dry wt	< 0.011	-	-	-	-
Endosulfan II	mg/kg dry wt	< 0.011	-	-	-	-
Endosulfan sulphate	mg/kg dry wt	< 0.011	-	-	-	-
Endrin	mg/kg dry wt	< 0.011	-	-	-	-
Endrin aldehyde	mg/kg dry wt	< 0.011	-	-	-	-
Endrin ketone	mg/kg dry wt	< 0.011	-	-	-	-
Heptachlor	mg/kg dry wt	< 0.011	-	-	-	-

Sample Type: Soil						
Sample Name:		MG-16 16-Mar-2022	SPA-01 16-Mar-2022	SPA-02 16-Mar-2022	SPA-03 16-Mar-2022	POND 03 0-0.12 16-Mar-2022
Lab Number:		2918895.16	2918895.17	2918895.19	2918895.21	2918895.23
Organochlorine Pesticides Screening in Soil						
Heptachlor epoxide	mg/kg dry wt	< 0.011	-	-	-	-
Hexachlorobenzene	mg/kg dry wt	< 0.011	-	-	-	-
Methoxychlor	mg/kg dry wt	< 0.011	-	-	-	-
Sample Name:		POND 04 0-0.7m 16-Mar-2022				
Lab Number:		2918895.24				
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	3	-	-	-	-
Total Recoverable Cadmium	mg/kg dry wt	0.11	-	-	-	-
Total Recoverable Chromium	mg/kg dry wt	15	-	-	-	-
Total Recoverable Copper	mg/kg dry wt	10	-	-	-	-
Total Recoverable Lead	mg/kg dry wt	18.9	-	-	-	-
Total Recoverable Nickel	mg/kg dry wt	13	-	-	-	-
Total Recoverable Zinc	mg/kg dry wt	63	-	-	-	-

Summary of Methods

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

Sample Type: Soil			
Test	Method Description	Default Detection Limit	Sample No
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%.	-	1-17, 19, 21, 23-24
Heavy Metals, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1-17, 19, 21, 23-24
Organochlorine Pesticides Screening in Soil	Sonication extraction, GC-ECD analysis. Tested on as received sample. In-house based on US EPA 8081.	0.010 - 0.06 mg/kg dry wt	1-16
Dry Matter (Env)	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	1-16

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

Testing was completed between 21-Mar-2022 and 24-Mar-2022. 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

Appendix H. 2018 HAIL Activities and Test Locations



Figure H3: Areas with identified HAIL activities



Figure H4: Historical gravel extraction pit at 475 Memorial Avenue



Figure H5: Historical filled pond area at 400 Russley Road



Figure H6: Asbestos containing roof material at 500 Avonhead Road



Figure H7: Burn pad/burn barrel at 520 Avonhead Road

Appendix I. 2022 ESP Soil Sample Plan

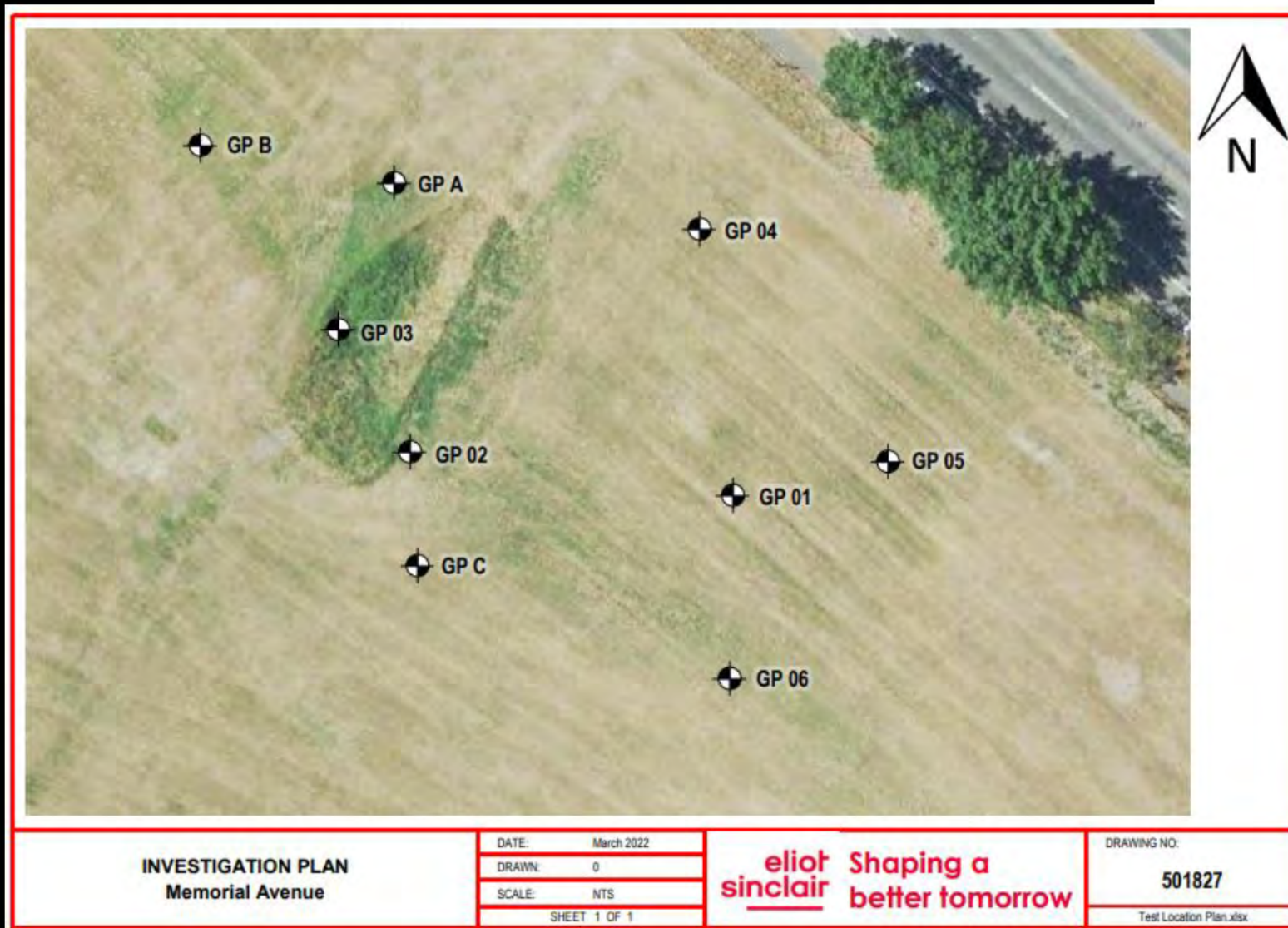


Figure I1: Test location plan for the historical gravel pit area

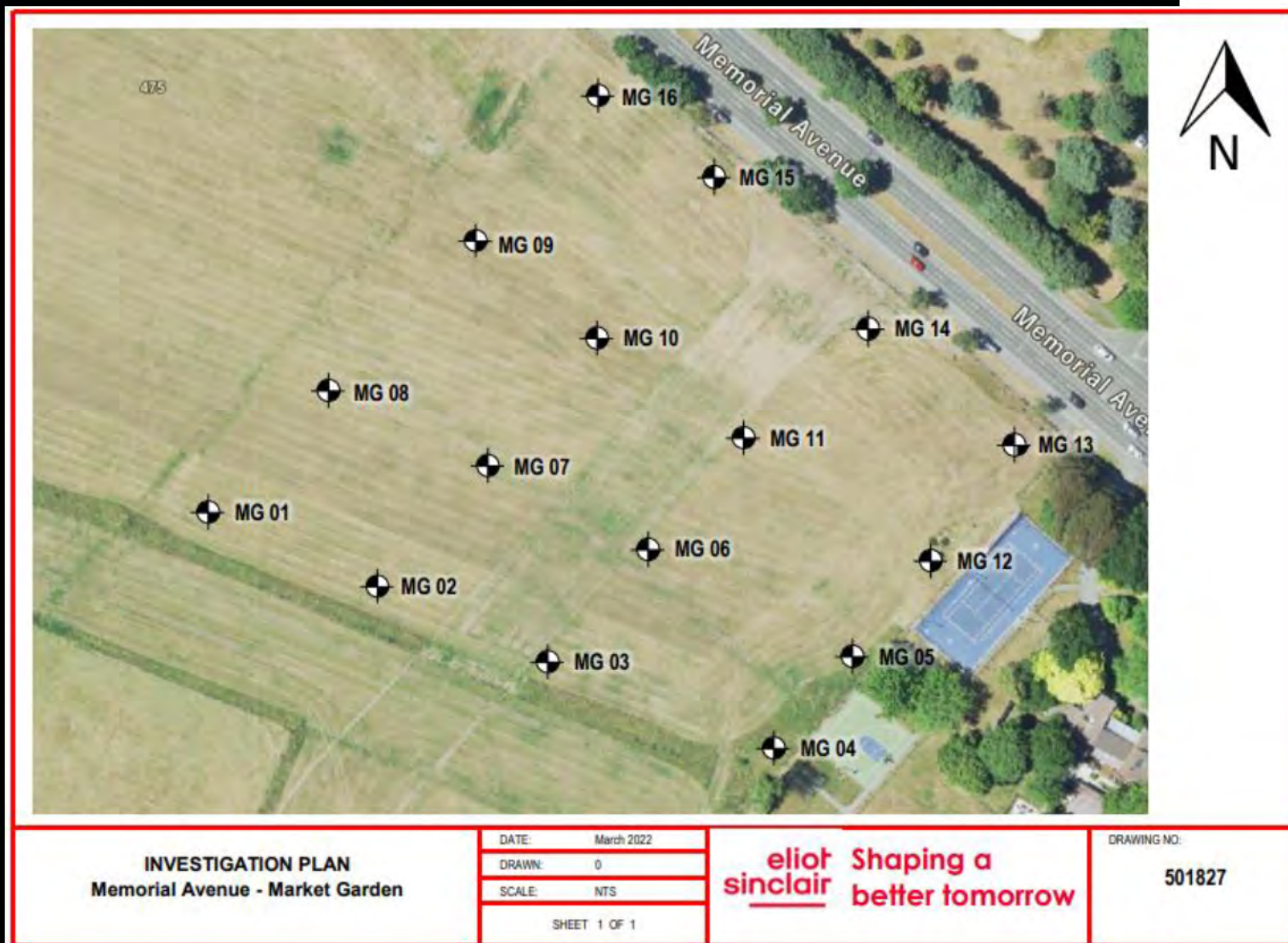


Figure I2: Test location plan for the historical market garden area

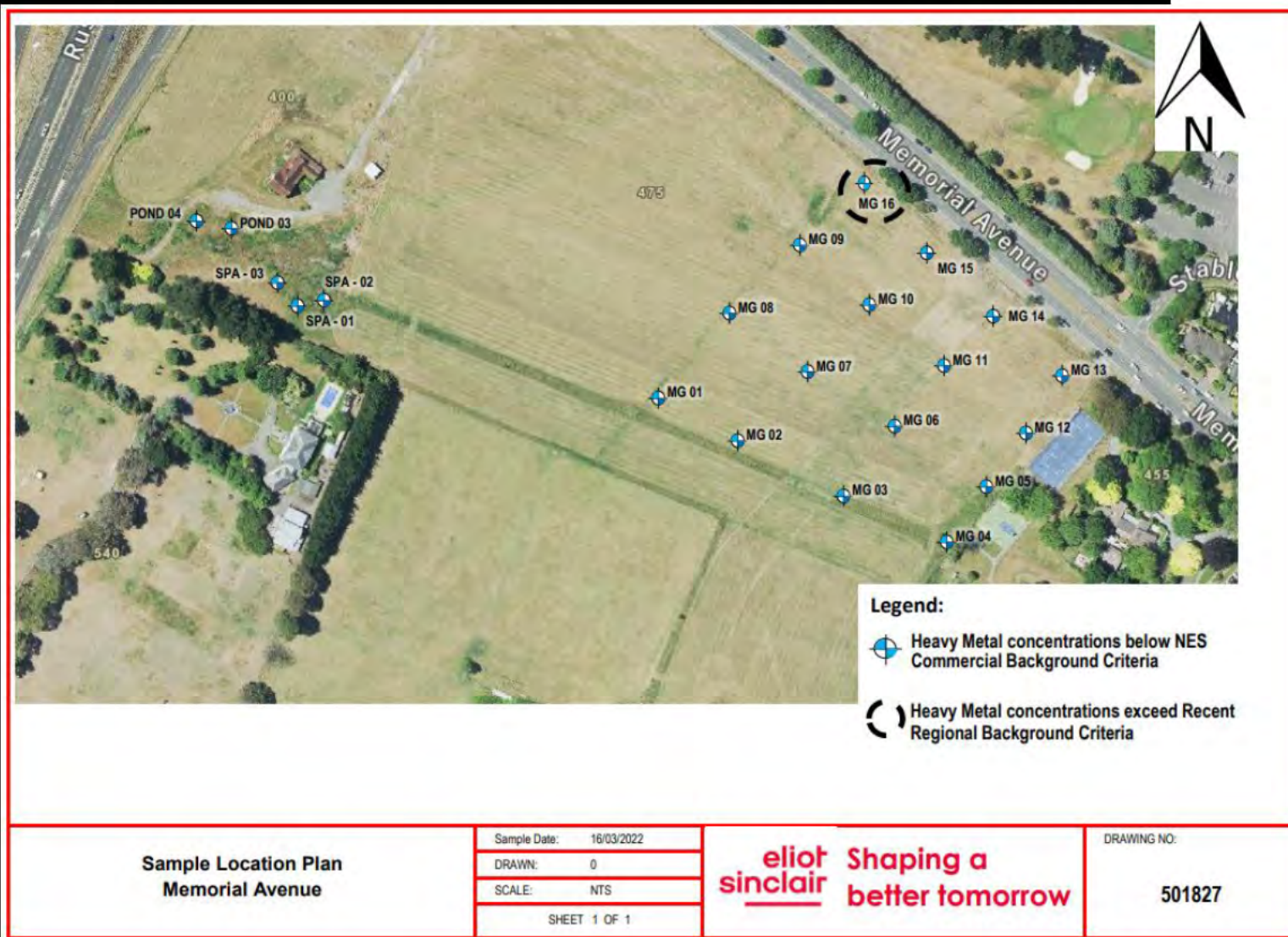


Figure I3: Overview plan of test locations at this site