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Future Primary School, Hobsonville Point, Auckland

Ground Contamination, Flood Risk and Infrastructure Capacity Review

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Future Primary School, Hobsonville Point

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Williamson Water & Land Advisory

PO Box 314,
Kumeu 0841,
Auckland
T +64 21 613 408

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Review Summary

Williamson Water & Land Advisory (WWLA) has prepared this Ground Contamination, Flood Risk, and Infrastructure Capacity Review report to assist the due diligence process for the possible acquisition of land at 279 Hobsonville Point Road (formerly referred to as Site 5) for use as a primary school.

The objective of this investigation was to establish implications of any ground contamination, flood risk and services capacity constraints on development of the land as an educational facility. The key findings and implications of this report are:

Ground contamination [Section 3]	Site history and intrusive investigation	• The site was part of the grassed airfield and no structures or specific activities have occurred on the site except for earthworks in around 2010 and 2017, after airbase activities had ceased and the Hobsonville Point area began to be subdivided for residential development. Two sediment retention ponds were located in the northern part of the site during the 2017 works and were subsequently filled. Former airbase operations are considered a HAIL activity (i.e., potentially contaminating). • Soil contamination testing found that contaminants are below background except in the northern part of the site where former sediment ponds associated with wider mastergrading activities occurred. Low levels of PAH were detected in fill up to 1.9 m deep where settlement ponds had been filled and the site relevelled. No exceedances of NESCS or AUP criteria were reported. • There are no complete pathways between the source of contamination and potential receptors in both a construction or future use scenario because contaminant concentrations are not at levels that pose a risk to human health or the environment.
	Design	No ground contamination risk to future site users or the environment was identified. Soils can be reused on site where required.
	Earthworks	Standard earthworks controls and procedures that limit discharges to the environment will be applicable to future site works. No additional specific health and safety controls are required.
	Soil disposal	• Contaminants detected above background in Type B fill, present in former sediment ponds in the north of the site from the surface to around 2 m BGL, will not be considered cleanfill. Spoil from this area will need to go to managed fill if offsite disposal is required. • All remaining soil types were below background levels and thus can be disposed as cleanfill.
	Consenting	• Consent for soil disturbance as a controlled activity is expected to be required under the NESCS since it is unlikely that earthworks volumes and duration will comply with permitted activity limits. • No consent is required under Section E.30 of the AUP as contamination concentrations are below permitted activity discharge criteria.
Flood risk [Section 4]	Local topography, proposed site development plan contours and AC flood hazard data were reviewed. While overland flow paths cross the property, the small size of the upgradient catchment and the absence of flood-prone areas (i.e., topographical depressions) on the site indicate the risk of flood hazard for the proposed primary school site is low. No flood risk implications for future development are envisaged.	
Infrastructure capacity [Section 5]	Stormwater	• Connection to the stormwater network to the north-west of the site would be preferred to avoid pumping requirements. This could potentially be either through the existing private gravity main (of unknown capacity) that connects to the 750 mm stormwater main on the northern side of Hobsonville Road, or through construction of a new connection. • Under the AUP, the site is subject to the provisions of the Stormwater Management Area Controls (Flow 1) set out in Chapter E10, where on or offsite retention or detention of stormwater must be provided (subject to conditions). Confirmation from Watercare on the design capacity and current utilisation of the existing detention pond to the north on Buckley Avenue/ Frances Bryers Road would be required to confirm whether this connection and retention pond could be used or if onsite detention measures are needed.

	Wastewater	• In accordance with the Auckland Code of Practice for wastewater network design, the minimum wastewater discharge from the school and early childhood centre is estimated at 1.51 L/s. This volume, based on a role of 1,000 students is expected to come online in 2043 over staged role increases. • The current wastewater infrastructure (pump station WWPS3) currently has capacity for discharges from the school as the role increases to 1,000 in 2043. However, during this time adjacent development is expected and we understand from review of Kainga Ora's consultants (H&G) report that once the future planned surrounding development (including the school itself) is completed the pump station will be over capacity. Thus, while discharges from the school can be accommodated by the existing pump station, in the long term WWPS3 is expected to be at capacity. • Planned discussions with Kainga Ora and Watercare may resolve issues around the school development timing and ability to utilise any current underutilisation.
	Potable water	Potable water pipes are present on Hobsonville Point Road, Wallace Road and Waka Moana Drive. This allows for connections along any side of the site. Additional assessment will be required to confirm that the minimum flow rates and pressure required for potable water can be met, achieved through actual hydrant tests.
	Fire hydrant supply	More than ten fire hydrants are located in the streets surrounding the school (Hobsonville Point Road, Waka Moana Drive, and Wallace Road). Hydrant flow testing will be required to determine if the flow rates and minimum pressure stipulated under the firefighting standard SNZPAS 4509:2008 can be achieved for the site.
	Electricity	6,600 – 11,000-volt transmission lines are located along Hobsonville Point Road, and a section of Waka Moana Drive. Wallace Road contains a 400-volt line. To connect into the 6,600 – 11,000-volt transmission line a mini-substation and stepdown transformer would be required on site to convert to 400-volt municipal supply. Alternatively, it may be possible to connect directly to the existing 400-volt cable on Wallace Road.
	Gas	There are no gas supply lines in the area. If gas is required at the school this will need to be tanked.
	Tele-communications	Chorus plans show that telecommunication cables are located along Hobsonville Point Road, Waka Moana Road and Wallace Road, and fibre broadband is available. The network in this area is capable of delivering hyperfibre speeds of up to 2,000 mbps.

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Appendix A – Development Plans

Appendix B – Laboratory Summary and Transcripts

1. Introduction

Williamson Water & Land Advisory (WWLA) has been commissioned by the Ministry of Education (MoE) to provide a ground contamination, flood risk and infrastructure capacity review to assist the due diligence process for the possible acquisition of land at 279 Hobsonville Point Road (Site 5), for use as a primary school (refer **Figure 1**).

1.1 Background and proposed development

MoE intend to construct a new primary school (Years 1-8) at Hobsonville Point on land that was formerly part of the Royal New Zealand Air Force's (RNZAF) Hobsonville Airbase. The school will be the second primary school in the suburb and has a masterplan roll of 650 students, with future expansion capacity of up to 1,000 students required. An early childhood education (ECE) centre with up to 50 students will also be included in the development. Future expansion of the ECE centre is not required.

During the initial stage of the site selection process, 12 sites at Hobsonville Point were selected by MoE for investigation. From these 12 sites, the four sites that had been considered most suitable for the proposed primary school were further assessed by Incite Ltd[1], with the site known as Site 5 at 279 Hobsonville Road deemed as the most appropriate for development of the school.

Draft development plans have been produced by Jasmax Ltd (issued 23 December 2020) and are attached in **Appendix A**. The masterplan schedule and calculations made under MoE's School Property Guide indicate 28 classrooms, a hall, library and administration buildings are required. Hardcourts, sports fields and outdoor learning areas are also included in the proposed development, and a total of 73 carparks will be required.

Figure 1. Location of the site, with current proposed site boundary outlined in red (Image source: Google Earth Pro).

[1] Incite Ltd, 2020. *Hobsonville Point Primary School 2 Site Selection Options Assessment*. Report prepared for Ministry of Education

1.2 Objective and scope

This assessment combines a site walkover with review of available information to establish implications of any ground contamination, flood risk and services capacity constraints on development of the site as an educational facility. This report:

1. Confirms the site's environmental setting from published and available information, utilising our own experience of the area where relevant.
2. Provides the findings of a site walkover assessment to establish existing activities and any features that may impact on potential for soil or groundwater contamination, flood risk or services availability.
3. Reviews Auckland Council property files, historical aerial imagery and other readily available information to determine the site history from a contaminated land perspective and establish whether potentially contaminating (HAIL[2]) activities have occurred.
4. Reviews Auckland Council held information on flooding potential and determine implications (if any) on minimum floor level requirements for the new buildings.
5. Assesses the school's demand on civil infrastructure against the existing capacity information for the three waters (potable water, stormwater and waste water), fire water supply, natural gas, communications and electricity.
6. Evaluates the implications on design, consenting and construction from ground contamination, flood risk, and infrastructure capacity limitations.

1.3 Information reviewed

In preparing this report we have reviewed the following:

1. The property file held by Auckland Council for 279 Hobsonville Point Road.
2. Prior investigation reports as listed in **Table 4**, provided by MoE and contained in the property file.
3. Auckland Council GIS viewer[3] (Geomaps) and Auckland Unitary Plan[4] online maps.
4. The New Zealand Geotechnical Database[5].
5. Underground service plans provided by BeforeUdig[6]
6. The Auckland Code of Practice for Land Development and Subdivision (December 2016).

1.4 Legislative requirements

WWLA has prepared this report in general accordance with requirements of published industry best practice guidance for reporting on contamination investigations, including:

- Ministry for the Environment (MfE) Contaminated Land Management Guideline (CLMG) No. 1: Reporting on Contaminated Sites in New Zealand;
- National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health (NESCS) Users' Guide (2012).

This report meets the requirements of a preliminary site investigation (PSI) and detailed site investigation (DSI) for ground contamination. The specialists preparing this report meet the qualifications for a suitably qualified environmental practitioners set out in the NESCS[7] in relation to ground contamination.

[2] Ministry for the Environment Hazardous Activities and Industries List (HAIL).
[3] https://geomapspublic.aucklandcouncil.govt.nz/viewer/index.html
[4] https://unitaryplanmaps.aucklandcouncil.govt.nz/upviewer/
[5] https://nzgd.org.nz/
[6] https://www.beforeudig.co.nz/
[7] National Environmental Standards for Assessing and Managing Contaminants in Soil to Protect Human Health Regulations (NESCS)

2. Site Description

2.1 Site identification

The area under investigation is known in the due diligence process as Site 5 but referred to herein as "the site", which is located within a wider block of land as described in **Table 10.** It is bounded by Hobsonville Point Road to the north, Wallace Road to the east and Waka Moana Drive to the south.

Table 1. Site identification

Address	279 Hobsonville Point Road, Auckland 0616
Legal Description	Lot 1005 DP 528384
Area (hectares)	The site covers approximately 1.52 ha of the of 2.48 ha lot
Zoning: Auckland Unitary Plan – Operative in Part (AUP)	Zoning is Residential – Mixed Housing Urban Zone

Land in the surrounding area and is used for medium-density residential purposes or is in a pre-development state (vacant and grassed) but zoned for residential use. The majority of developments in the area are recently constructed, although some former airbase structures remain including the heritage-listed Wasp hangar 150 m east of the site, and 1930s-era dwellings northwest of the site.

2.2 Site condition

An inspection of the site was undertaken on 13 January 2020 by a specialist from WWLA. Site features observed during the inspection are described below and are as shown in **Photographs 1-2**.

- The site is vacant (**Photograph 1**) and secured with chain link fencing.
- The site is in a fairly unkempt state. Ground cover is long grass with weeds. Minor amounts of demolition waste (gravel, concrete, ceramic pipe fragments) were visible across the surface (**Photograph 2**).
- The site slopes down gently to the northwest and the ground surface is uneven. There are deep ruts across the entire site where large vehicles or machinery have been driven through when ground conditions were wet. The site surface at the time (high summer) was dry.

Photograph 1 (left): Overall condition of the vacant site. Photograph 2 (right): Ceramic pipe fragments and gravel visible on the site surface.

2.3 Environmental setting

The environmental setting is described in **Table 2.**

Table 2. Environmental setting.

Topography	The site slopes down gently to the northwest, with the ground elevation ranging from approximately 18 m RL down to 16 m RL.
Historic features and landforms	The history of the site is illustrated in aerial imagery in **Table 10.** In summary, the site was part of the grassed airfield at the Hobsonville Airbase, which was in operation by the RNZAF from the 1920s until the early 2000s. No structures or specific activities have occurred on the site except for earthworks observed in historic aerial photographs around 2010 and 2017 as subdivision and development of the Hobsonville Point area occurred.
Surrounding land use	Where developed, surrounding land is used for residential purposes, with predominantly medium density housing present. The remainder of surrounding land is unoccupied but zoned for further residential use.
Geology	The published geology (GNS 1:250,000 Geological Map) (**Figure 2**) describes the site and surrounding land as being underlain by Puketoka Formation sediments, comprising pumiceous mud, sand and gravel with muddy peat and lignite. Intrusive investigations undertaken for this investigation (refer **Section 3.2**) encountered around 1 m of fill and a thin layer of volcanic ash overlying the Pukotoka sediments.
Hydrogeology	Groundwater was not encountered during hand augering up to 1.9 m below ground level (mBGL) during this investigation (**Section** 3.2) but review of the New Zealand Geotechnical Database indicates that perched groundwater (0.5-1.5 m depth) occurs in the area. Perched groundwater layers fluctuate with rainfall and can be transient. The regional groundwater table is expected to be shallow (<6 mBGL) given the site's elevation and proximity to the coast.
Surface water bodies	None on the site. A man-made wetland with pond is located approximately 200 m to the northwest.
Significant ecosystems	Aquatic and terrestrial ecosystems of the Waitemata Harbour, 280 m north of the site.

Figure 2. Geology of the site and surrounds: pale yellow indicates Puketoka Formation; orange indicates East Coast Bays Formation. (Source: GNS Webmap).

3. Ground Contamination Investigation

This section details the desk and intrusive investigations undertaken to determine whether or not ground contamination is expected to constrain use of the site as a primary school. The desk and intrusive investigation subsections broadly cover the information required in preparation of a PSI and DSI as defined by the NESCS and as indicated in **Section 1.4**. In future should the site be acquired by MoE this section of the report can be developed into a PSI/ DSI report to support resource consenting.

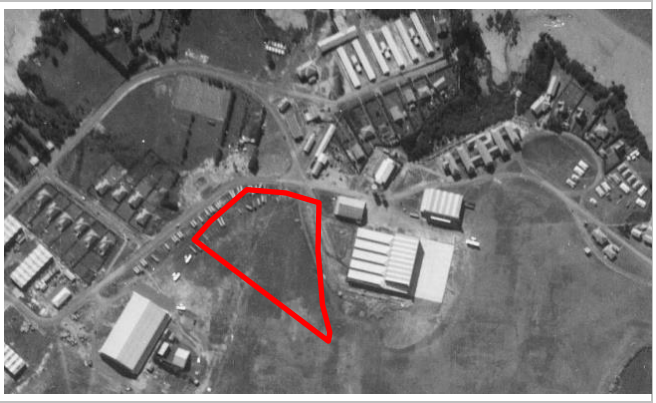
3.1 Site history

The history of the site has been established through review of historical aerial photographs, the Auckland Council property file, and documents supplied by MoE.

3.1.1 Historical aerial photograph review

Table 3 provides an overview of the history of the site through review of historical aerial photographs sourced from Retrolens[8] (1940-1988), Auckland Council GeoMaps (1996-2017) and Google Earth Pro (2017-2019).

Table 3. Historical aerial photograph review

Photograph date	Activities	Aerial image
1940 (shown), 1950, 1959 and 1963	The site is grassed and part of wider airbase land, with unidentified items stored in the northern part of the site in the 1940 photo removed by 1950. Roads in the vicinity are unpaved until 1950. Surrounding airbase land uses include hangars to the southwest (Hangar 3) and east (the Wasp helicopter hangar). Land to the north is predominantly vacant but dwellings are present to the northwest.	
1972	No significant changes observed on the site relative to the previous photographs. Further development on surrounding land includes removal of ancillary structures and paving of the apron area at Hangar 3, and construction of several additional structures at the Wasp hangar to from a complex. Recreational facilities have been developed on the land to the north (pool and tennis courts evident).	

[8] Sourced from https://retrolens.nz and licensed by LINZ CC-BY 3.0

Photograph date	Activities	Aerial image
1978, 1980, 1988, and 1996 (shown)	No changes observed on the site relative to the previous photographs. Only minor changes observed in the surrounding area, with land continuing to be used for airbase purposes.	
2000, 2001, 2003/2004, 2006, and 2008 (shown)	No signficant changes observed on the site or immediate surrounding area relative to the previous photographs.	
2010/2011 (shown) and 2012	The majority of the site has been earthworked. Earthworks extend to the southwest of the site although the hangars remain intact. The 2012 photograph shows no changes to the site or surrounds but grass has re-established.	
2015	The site remains vacant but earthworks in the surrounding area are widespread. Hangar 3 has been demolished.	

Photograph date	Activities	Aerial image
2017	The site and surrounds are undergoing earthworks. Two sediment retention ponds have been established and soil is being stockpiled on the site. Part of the Wasp hangar complex to the east has been removed.	
2019	Earthworks appear largely complete. Sediment ponds have been filled and grass has re-established in the north of the site. Additional roads have been constructed surrounding the site. The Wasp hangar remains but all other structures of the complex have been removed.	

3.1.2 Property file

The Auckland Council property file for 279 Hobsonville Point Road was provided to WWLA by MoE for this report in December 2020. There were no legacy documents within the file, with the oldest record dating from 2010 and relating to consent applications for redevelopment of former airbase land surrounding the site. Consent records included applications and supporting documentation for subdivision of land, construction of roads, infrastructure upgrades and earthworks and discharge consents for residential development.

The file included several contamination investigation reports, those which pertain to the site are summarised separately in **Section 3.1.3**.

3.1.3 Previous contamination investigations

A summary of the contamination information contained in the property file is presented in **Table** 10 **4.** All investigations were conducted on airbase land within the vicinity of the site but there is no soil sampling data for the site itself. Reports are listed in chronological order.

Table 4. Summary of previous contamination investigations

1. Tonkin and Taylor (T&T), 2000. Hobsonville Base Environmental Audit Stage One, Phase I Report. Report prepared for New Zealand Defence Force (NZDF).	A report assessing existing and former uses on air force land to the east of the site, and the potential and actual environmental effects of those uses. This report pre-dates the recent residential development in this part of Hobsonville Point. • The potential contamination risks generally related to activities undertaken in specific areas, e.g. underground fuel storage tanks (USTs) and fuel distribution, maintenance workshops, hazardous goods stores etc. None of the identified activities are expected to have resulted in contamination of the site due to the expected localised nature of any contamination and their distance from the site. • Two surface soil samples collected from the airfield approximately 450 m east of the site were tested for organochlorine pesticides with trace amounts of dieldrin found to be present. Testing of fill in the airfield was consistent with published background levels for Auckland.
2. T&T, May 2009. Hobsonville Marine Precinct Soil Contamination Assessment. Report prepared for Waitakere Properties Ltd.	A desk study review of previous contamination investigations undertaken on and around the former airbase. The report includes a summary of testing undertaken around Hangar 3, which is the hangar immediately southwest of the subject site, and the dangerous goods store in the SAS compound near the WASP hangar, east of the subject site. Individual sample results were not included in the report but the summary for these areas indicated: • Near-surface soil in unpaved areas around the Hangar 3 Building contained elevated metals and PAH, with most samples above background and isolated exceedances of the Auckland Regional Council (ARC) discharge criteria applicable at the time for benzo(a)pyrene equivalence (BaP eq.) which was 2.15 mg/kg. BaP eq. concentrations were found to decrease with depth and distance away from the building. • Volatile odours were encountered in a sample 1 m below the ground surface west of Hangar 3, but test results showed volatile organic compound concentrations were below human health guidelines, and groundwater testing in the area complied with ARC discharge criteria. • Samples tested for hydrocarbons around the dangerous goods store at the SAS hangar (east of the site) showed concentrations were below human health and ARC discharge criteria.
3. Pattle Delamore Partners (PDP), 2009. Hobsonville Land Company – Park and Ride Soil Sampling Investigation. [Results table only, report not included].	Fourteen (14) surface soil samples from the grassed area east of the Wasp hangar (~200 m east of the site) were tested for metals, with all results reported below background for Auckland soils. Additional samples collected from a soil stockpile in the same area also reported metals below background but had trace amounts of polycyclic aromatic hydrocarbons (PAH). There is no further information available as only the results tables and a sampling plan were provided.
4. T&T, 2 September 2010. Testing of Proposed Clay Capping Material. Letter report prepared for NZDF.	Letter report summarising the results of testing of near-surface (0.4 m depth) clay samples collected from four locations in the airfield approximately 350 m south of the site. • Samples were tested for metals and PAH, with all results consistent with background levels for volcanic soil.
5. PDP, 15 September 2010. Former Hobsonville Airbase – Surface Soil Sampling Investigation. Letter report prepared for Hobsonville Land Company Ltd (HLC).	Extensive surface soil sampling along the southern part of the airfield edges and near buildings prior to proposed residential development. • Ninety five (95) samples collected from “Area 2” (grassed area approximately 500-600 m south of the site) were tested for metals, PAH, and organochlorine pesticides (OCP). Several of the samples contained elevated metals and PAH, with PAH concentration generally below 1 mg/kg but samples containing up to 14 mg/kg BAP eq. were reported. No OCPs were detected.

6. PDP, 14 November 2012. Former Hobsonville Airbase – North Buckley Avenue and Isitt Road – Surface Soil Sampling Investigation. Letter report prepared for HLC.	Soil sampling on former airbase land 500 m west of the site. • Prior uses of the land include a hazardous goods store and other storage sheds, and residential buildings, some of which were still present. • Testing of 32 soil samples for metals, and PAH, and four samples for OCP and TPH indicated no exceedances of NESCS residential land use criteria. 29 of the 32 samples contained detectable levels of PAH, with a maximum concentration detected of 5.8 mg/kg. The 95% upper confidence limit of the mean for BAP eq for all samples was 1.43 mg/kg.
7. PDP, 26 November 2012. Former Hobsonville Airbase – Northern Area Surface Soil Sampling Investigation. Letter report prepared for HLC.	Contamination investigation conducted in land to the north of the site (beyond Hobsonville Point Road), prior to proposed residential development. • This part of the airbase contained several HAIL activities including USTs, hazardous goods storage, and vehicle workshops. Surface soil sampling identified metals and PAH above NESCS criteria.
8. T&T, 20 March 2015 (email to Shanon Tapp of RCP Ltd)	Testing of topsoil and underlying "fill" or natural soils prior to construction of "Roads D and E", now known as Bomb Point Drive and Glidepath Road, located 400 m east and 300 m south of the site, respectively. • Testing for metals and PAH indicated the fill/natural soil samples were consistent with background levels for Auckland, but PAH were detected in 11 of the 16 topsoil samples. • The results table appended to the email is a poor-quality facsimile and concentrations are illegible, however three samples are indicated as having BAP eq. above Auckland Council's permitted activity guideline in place at the time of 2.15 mg/kg.
9. Jacobs New Zealand Ltd, October 2020. Hobsonville Point Primary School and Early Childhood Education Centre Site Evaluation, Stage 2 Assessment Report. Report prepared for Incite Auckland Ltd.	Contamination desk study assessment of the site (Site 5) as part of the Stage 2 due diligence process for the proposed new primary school. Involved a review of historic aerial photographs and reports provided by the client. • No HAIL activities were identified for the specific site area. • Weed control in the airfield was indicated to be a potential source of contamination following the detection of dieldrin in airfield samples east of the site in the T&T 2000 report (item 1 of this table), however subsequent earthworks over the site area are likely to have reduced concentrations.

3.1.4 Potential for contamination

A review of the site's history indicates it was part of the grassed airfield and no structures or specific activities have occurred in the past except for earthworks around 2010 and 2017, after airbase activities had ceased and the Hobsonville Point area began to be subdivided for residential development.

Investigations undertaken in the vicinity of the site indicate that specific airbase activities have resulted in localised ground contamination. The localised nature of these means they are unlikely to have affected soils on the site. An assessment of the potential sources of contamination and their reference on the HAIL is detailed in **Table 5,** which shows that, given past land uses and testing in the surrounding area, there is unlikely to be significant contamination of site soils. Groundwater testing at Hangar 3 has found that groundwater has not been impacted by airbase activities to a degree that poses a threat to human health or the environment.

Colour coding indicates red as identified HAIL activities, orange as those which would only be a HAIL if contaminants were found above land use standards and green which are no HAIL activities but may have potential for contamination.

Table 5. Potential for ground contamination.

Former Hobsonvillle Airbase activities		**HAIL?**	Yes
HAIL Activity reference:	Airports including fuel storage, workshops, washdown areas, or fire practice areas		
Years of activity:	1920s to early 2000s.		
Potential contaminants:	Metals and PAH		
Potential for contamination:	The site is located on the airfield within the former airbase, however, has always been vacant. Runoff/washwater from the nearby Hangar 3 has been shown to have contaminated soils immediately surrounding the hangar but is not expected to have significantly impacted site soils given the distance from the hangar and its location topographically cross-gradient. Prior testing at the airbase has generally found trace levels of PAH and metals above background in surface soils across the site, with some isolated exceedances of environmental protection criteria relating to specific activities. The potential for airbase activities to have impacted site soils is low since few contaminating activities appear to have occurred on or adjacent to the site itself.		
Possible extent and magnitude:	Soil contamination (if present) is most likely to be in surface and near-surface materials (~0.5 m) but is not expected to be at a level that poses a risk to human health or the environment, especially since earthworks carried out in 2010 have likely diluted any hotspots.		
Weed control on airfield		**HAIL?**	Only if contaminants are present at levels that pose a risk to human health or the environment.
HAIL Activity reference:	A10: Use of pesticides including on sports fields		
Years of activity:	Potentially the entire time the airbase was operational, i.e., from the 1920s to early 2000s, but the application period is more likely to be limited due to the absence of pesticide contamination detected elsewhere on the airfield.		
Potential contaminants:	Lead, copper, arsenic, OCP		
Potential for contamination:	Two surface soil samples collected east of the site contained trace amounts of dieldrin. There is potential for surface soil at the site to have had similar contamination, however, earthworks in 2010 are likely to have diluted concentrations. Overall, the potential for contamination from this source is low.		
Possible extent and magnitude:	Soil contamination (if present) is most likely to be in surface and near-surface materials (~0.5 m) but is not expected to be at a level that poses a risk to human health or the environment.		
Fill placement		**HAIL?**	Only if contaminants are present at levels that pose a risk to human health or the environment.
HAIL Activity reference:	I: Land that has been subject to the intentional or accidental release of a hazardous substance in sufficient quantity that it could be a risk to human health or the environment.		
Years of activity:	Unknown but most likely during site development in the 1920s and/or earthworks in 2010 and 2017.		
Potential contaminants:	Wide ranging depending on source, but often includes metals, PAH and asbestos.		
Potential for contamination:	Small areas of fill have been observed across the airfield during prior investigations. Prior testing indicated fill contains metals and PAH either below or slightly above background levels, i.e., not at concentrations that pose a risk to human health or the environment. There is moderate potential for fill encountered on the site to be contaminated.		
Possible extent and magnitude:	The magnitude of contamination (if any) is expected to be consistent with prior testing, so not in exceedance of human health or environmental discharge criteria and would likely be distributed throughout fill.		

3.2 Intrusive contamination investigation

3.2.1 Sampling rationale

Based on historical land use and findings from prior investigations in the surrounding area, soil sampling targeted:

1. Surface/near-surface soils to assess contamination from airbase activities and weed control on the airfield.

2. Deeper samples of fill including in the locations of the former sediment retention ponds present on site during redevelopment of the wider area.
3. Natural *in situ* soil below the fill layers.

Sampling was undertaken over the wider area of land bounded by Hobsonville Point Rd, Waka Moana Drive, and Wallace Road to account for any future changes in the proposed site boundary.

3.2.2 Sampling method

Soil sampling was undertaken using a hand auger at 13 locations (HA1-HA13), as shown in **Figure 3**. The sampling procedure was as follows:

- Soil samples were collected at regular depths from the recovered core and at changes in lithology, in general accordance with the MfE's "*Contaminated Land Management Guidelines No. 5, Site Investigation and Analysis of Soils* (Revised 2011)".
- Materials encountered were logged in general accordance with the NZ Geotechnical Society "Guidelines for the classification and field description of soils and rocks for engineering purposes".
- Samples for chemical analysis were collected with freshly gloved hands, directly from the recovered core, and placed into laboratory supplied glass jars. Samples for asbestos analysis were collected into 500 mL plastic bags.
- All sampling equipment was decontaminated between sample locations using Decon-90 (a phosphate-free detergent) and fresh water rinses; and
- All samples were couriered chilled, under chain of custody documentation, to IANZ accredited Analytica Laboratories (Hamilton) and Focus Analytics (Auckland).

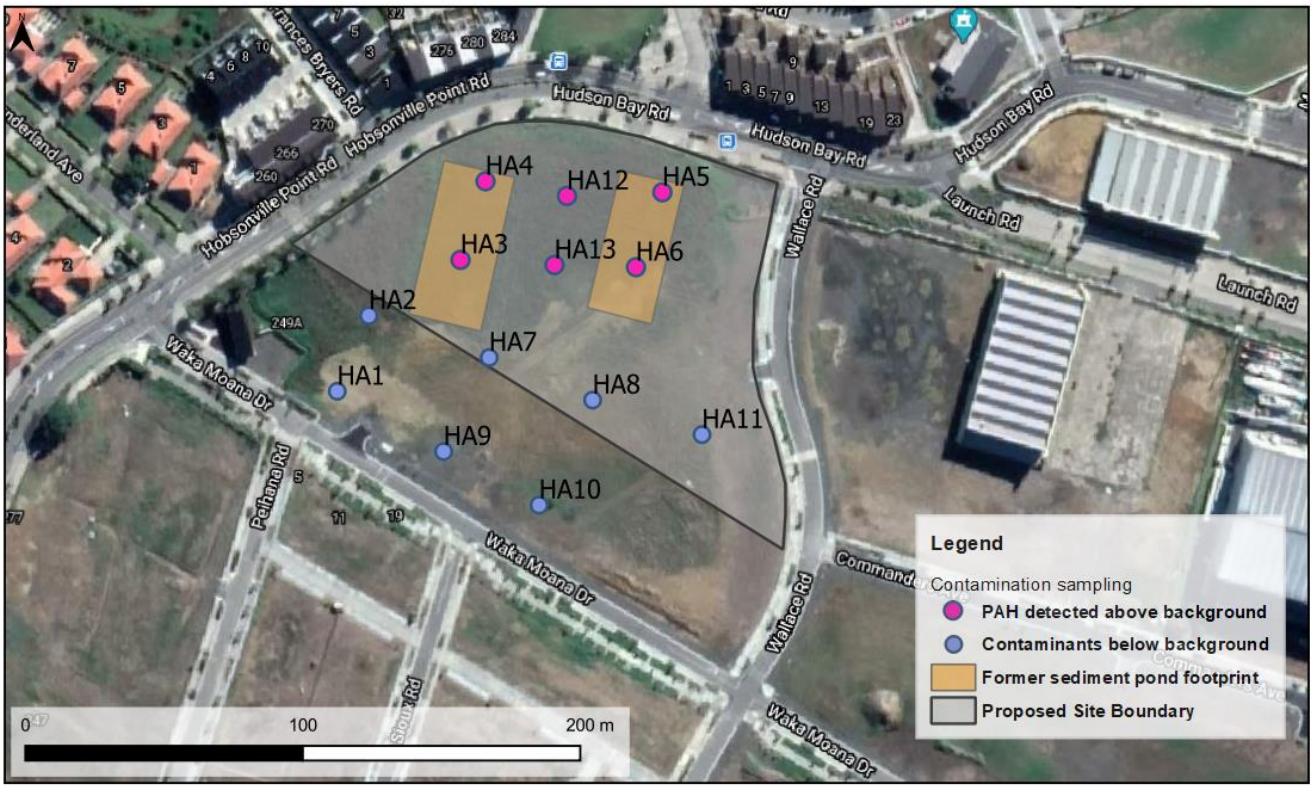


Figure 3. Contamination sampling points and results. Locations with trace PAH (above background) appear to be related to presence of Fill B.

3.2.3 Field observations

Observations of the general condition of the site are in **Section 2.2**. The subsurface profile as encountered during the intrusive investigation is summarised in **Table 6** below.

3.2.4 Laboratory analysis

A total of 26 samples were submitted for analysis as summarised in **Table 6**.

Table 6. Subsurface profile encountered and summary of laboratory testing schedule

Geological unit	Depth to top of layer (m)	Unit thickness	Locations observed	Description	Tested for (and no. of tests)	No. of samples tested
Topsoil	0 m	0.05 m	HA3	Sandy silt with trace rootlets. Medium Brown. Dry.	Metals (1)	1
Fill A	0-0.05	0.15-1.0 m	All locations except HA4 and HA6	Clayey, gravelly SILT. Medium brown with orange and red inclusions. Moist. Gravel: Grey, angular greywacke.	Asbestos (3), Metals (9), PAH (2), OCP (3)	9
Fill B	0-0.2	>1.75 m (base not established)	HA3-HA6, HA12-HA13	Sandy, gravelly SILT. Grey-brown. Dry. Gravel: Grey, angular greywacke. Minor amounts of inert waste: ceramic pipe fragments, concrete at surface.	Asbestos (5), Metals (6), PAH (6), OCP (1)	9
Fill C	0.3-0.6	0.5 m to >0.6 m where base not established	HA7, HA8	Reworked Puketoka: Clayey SILT. Orange-brown to light grey.	Metals (3), PAH (3)	3
Volcanic ash	0.3	0.2 m	HA2	Sandy SILT. Light grey with orange inclusions. Dry.	Not tested	-
Puketoka Formation	0.5-1.0	>0.6 m	HA1, HA2, HA7, HA9, HA11	Clayey SILT. Orange-brown with light grey mottles or light grey with orange mottles. Moist, stiff.	Metals (4), PAH (3)	4

3.3 Analytical results

3.3.1 Soil evaluation criteria

Soil results were evaluated against the following:

Protection of human health	The NESCS does not specifically provide contaminant standards for primary school land use. To account for lower exposure frequency and body mass of children the contaminant standards for residential use (no produce) (i.e., residential exposure where there is no consumption of produce grown on site) are recommended as an initial screening tool[9]. Where there is potential for vegetables to be grown for consumption on site (i.e., garden to table programs), residential use (10% produce) can be used as screening criteria. We have included both sets of guideline values in our evaluation. Where NESCS/ MfE contaminant standards were not provided, guidance obtained from the following documents were used, as per MfE's "Contaminated Land Management Guideline No. 2, Hierarchy and Application in New Zealand of Environmental Guideline Values (Revised 2011)" including: • [Australian] National Environment Protection (Assessment of Site Contamination) Measure 1999, updated 2013 (standard residential use); and

[9] MfE Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health

	• Guidelines for Assessing and Managing Petroleum hydrocarbon Contaminated Sites in New Zealand (residential use).
Discharges to the environment	Auckland Unitary Plan – Operative in Part (AUP) Permitted Activity Soil Acceptance Criteria (Table E30.6.1.4.1) or where appropriate the criteria specified by Rule E30.6.1.4 of the AUP. Evaluation criteria for soils for protection of groundwater quality have been used in the absence of groundwater testing data.
Background levels	Background levels for Auckland soils listed in Table E30.6.1.4.2 of the AUP. Background levels are used as a basis for acceptance of soil to cleanfill sites in the region. The values for non-volcanic soils have been used to reflect the regional published geology for the area.

3.3.2 Results summary

Analytical results are presented in **Table B1, Appendix B** with full laboratory transcripts also attached in **Appendix B**.

In summary, all samples reported asbestos, metals and OCP below background levels. Trace amounts of PAH (benzo(a)pyrene equivalent <1 mg/kg) were detected in samples up to 0.6 mBGL from the northern part of the site, where sediment retention ponds were observed in the 2017 aerial photograph.

The results indicate:

1. Topsoil, Fill C and natural soils are consistent with background levels for Auckland.
2. Fill B (imported fill) contained PAH above background but well below NESCS and AUP environmental discharge criteria. All other contaminants were below background.
3. Fill A (site or locally source disturbed natural) is also considered to be below background. One sample collected from the surface at HA5 with trace PAH likely contained material from Fill B, since Fill A was encountered at all locations and all other results were below background.

3.3.3 Discussion of results and implications

It is assumed that Fill B has been used to fill the former sediment settlement ponds, thus is localised and present within the pond footprints from the surface up to 2m BGL (as the typical maximum depth for settlement ponds). Based on the extent of the ponds shown in historic aerial photographs, it is estimated that around 5,300 m^3 of Fill B material could be present in the pond locations shown on **Figure 3**. Fill B may also be present across the top 0.1 m of the remainder of the site where relevelling occurred (estimate 1,500 m^3).

As a HAIL activity has been identified and contaminants are above background, NESCS legislation will apply to future subdivision and soil disturbance activities. There are no human health, environmental or regulatory drivers to remove any types of fill or conduct other contamination remediation prior to site redevelopment.

These results have the following implications:

Additional investigations	No further contamination investigations are warranted unless further delineation and classification of fill types is required. No effects on groundwater quality were indicated by the site history assessment or soil testing so groundwater investigations are likewise unnecessary.	
Design	No ground contamination risk to future site users or the environment was identified. Soils can be reused on site if geotechnically suitable.	
Soil disposal	**Fill B**	Fill B contains contaminants above background so would not be considered cleanfill. Fill B spoil will need to go to managed fill if offsite disposal is required. Typical rates for managed fill disposal are around $35/tonne plus GST. Assuming 1.5 tonnes per m^3 of fill gives an estimated disposal cost for total removal of Fill B of around $11,000 (excluding excavation and transport).
	Other material	All remaining soil types can be classified as cleanfill. Cleanfill disposal rates are around $10/tonne. The disposal site operator may require additional contamination testing of soil before accepting any material.
Consenting	**NESCS**	• Consent for subdividing/change in use will <u>not</u> be required since soil testing indicates it is highly unlikely that there is a risk to human health from exposure to soils under the proposed development.

		• Consent for soil disturbance as a controlled activity is expected to be required under the NESCS since it is unlikely that the permitted activity thresholds of less than 760 m^3 of soil disturbance and 152 m^3 of soil removal will be met, or that the duration of earthworks will be less than two months. • A site management plan (SMP) for managing potential contamination issues during works may need to be submitted in support of the consent application. The SMP is expected to be relatively simple given the nature of contamination and an allowance in the order of $3,000 (excluding GST) would be appropriate.
	AUP	No short- or long-term discharge consents are required under Section E.30 of the AUP as contaminant concentrations are below permitted activity criteria.
Earthworks	Standard earthworks controls and procedures that limit discharges to the environment will be applicable to future site works. No additional specific health and safety controls are required.	

3.4 Conceptual site model

A conceptual site model (CSM) illustrates known and potential sources of contamination, routes of exposure (pathways), and the receptors that are affected by contaminants moving along those pathways. Receptors may be human or environmental**. Table 7** sets out an assessment of the CSM based on the desk study review and findings of intrusive investigations.

Table 7. CSM for future primary school development

Source	Receptor	Pathway	Assessment
Low level PAHs in localised fill materials (Fill B)	Site users and neighbouring site users.	Exposure via inhalation of dust, ingestion of contaminated soils or dermal contact with skin.	**Incomplete Pathway:** Contamination levels indicate soil does not present a risk to human health or the environment.
	Construction workers during redevelopment.		
	Ecological receptors at the Hobsonville Esplanade, Waitemata Harbour, and at the disposal site if soils are removed from site.	Leaching through groundwater or sediment-laden stormwater reaching the receiving environment.	

3.5 Summary

The contamination investigation findings are summarised as follows:

- A review of the history of the site indicates that the site was part of the grassed airfield and no structures or specific activities have occurred on the site except for earthworks in around 2010 and 2017, after airbase activities had ceased and the Hobsonville Point area began to be subdivided for residential development.
- Two sediment retention ponds were located in the northern part of the site during the 2017 works and were subsequently filled.
- Soil contamination testing found that contaminants are below background except in the vicinity of the filled sediment ponds where low levels of PAH were detected.
- No exceedances of NESCS or AUP criteria were reported.
- There are no complete pathways between the source of contamination and potential receptors because contaminant concentrations are not at levels that pose a risk to human health or the environment.

4. Flood Risk

4.1 Overview

The site is located on the side of a low elevation hill, on the northern extents of Hobsonville Point. Auckland Council's 2016 LiDAR Digital Elevation Model (DEM) shows the site generally lies at an elevation of approximately 14 to 18 m NZVD2016 (**Figure 4**).

The currently proposed development plan (Jasmax: Site 5 Option F.pdf), shows developed land surface contours gently sloping from 17.5 m RL in the south-western corner of the site to 15.5 m RL along the north-western edge of the site.

There are no major surface water courses (e.g., rivers, streams or drains) located in close proximity or upgradient of the site.

Figure 4. Overview elevation map.

4.2 Auckland Council GIS layers review

AC's Catchments & Hydrology GIS data on their GeoMaps webviewer indicates areas prone to flooding. Key overlays from this dataset are presented in **Figure 5**, and are defined as follows:

- Overland Flow Paths layer - The predicted path stormwater would take in a rain event, as it flows downhill over the lands surface.
- Flood Plains layer – "*Indicates areas predicted to be covered by flood water as result of a rainstorm event of a scale that occurs on average once every hundred years. These areas have been produced from hydraulic modelling. The floodplain contains the most up to date information for each of the 23 Stormwater Catchments in the Auckland region.*"
- Flood Prone Areas layer – Indicates topographical depressions prone to flooding and are defined as follows: *"The areas occur naturally or are created by dammed gullies created by man-made features such as roads*

and railway embankments. The flood prone extent is the area water will pond up to in a 1% AEP extreme rainfall event assuming the outlet to the topographical depression is blocked."

Figure 5. Auckland Council Catchments & Hydrology overlays.

An overland flow path cross from south to north, along the eastern side of the property. The flow path is generally consistent with contours shown on the developed site plan. The flow path will change to flow around buildings once the development is complete.

A flood plain area is shown adjacent to the eastern boundary of the site. This layer was developed based on a regional scale rapid flood hazard mapping assessment[10], using a direct rain-on-grid modelling approach. The assessment utilised a 10 x 10 m DEM developed prior to the assessment (i.e., prior to 2010). The site itself and surrounding areas have undergone earthworks and slight recontouring in recent years, and therefore the outputs (i.e., presence of a flood plain at this location) of the rapid flood hazard assessment at this location are no longer expected to be accurate. Given the small size of the upgradient catchment, the risk of flooding from the overland flow path is considered low.

There are no flood prone areas highlighted within the site (i.e., no topographical depressions). This is consistent with contours shown on the currently proposed site development plan. Therefore, the risk of flooding due to closed topographical depressions is considered low for the proposed development.

4.3 Concluding Statement

Based on a review of the local topography, proposed site development plan contours and AC flood hazard data, the risk of flood hazard the proposed primary school site is considered low.

[10] DHI (2010) Auckland Rapid Flood Hazard Mapping of the Auckland Region – Volume 1: Hydraulic Modelling. Consultancy report prepared for Auckland Regional Council

5. Infrastructure Capacity Review

This section expands on the infrastructure assessment produced by Jacobs NZ Ltd for the site (refer item 9 in **Table 4**). Plans for underground services sourced from the Auckland Council GIS viewer (Geomaps) and BeforeUdig were reviewed for this infrastructure capacity assessment. No physical inspection has been undertaken to confirm the accuracy of the plans.

5.1 Stormwater

GeoMaps data shows the site still contains a network of private 150 mm stormwater pipes installed under the airfield in 1940 which are not connected to the municipal stormwater network.

Stormwater infrastructure has been installed along Wallace Road, ranging from 300 mm diameter pipes at the northern end through to 450 mm pipes at the southern end (**Figure 9**). The stormwater network appears to be placed along the eastern side of Wallace Road, but two potential connection points for the site are located on the western side of Wallace Road.

Given the topography of the site gently slopes from south-east to north-west, connection to the stormwater network to the north-west of the site would be preferred to avoid pumping requirements. One option is the existing private gravity main that connects to the 750 mm stormwater main on the northern side of Hobsonville Road (**Figure 6**, red oval). The capacity of the private gravity main is unknown. Alternatively, a new connection under Hobsonville Point Road to the 750 mm stormwater main may be required.

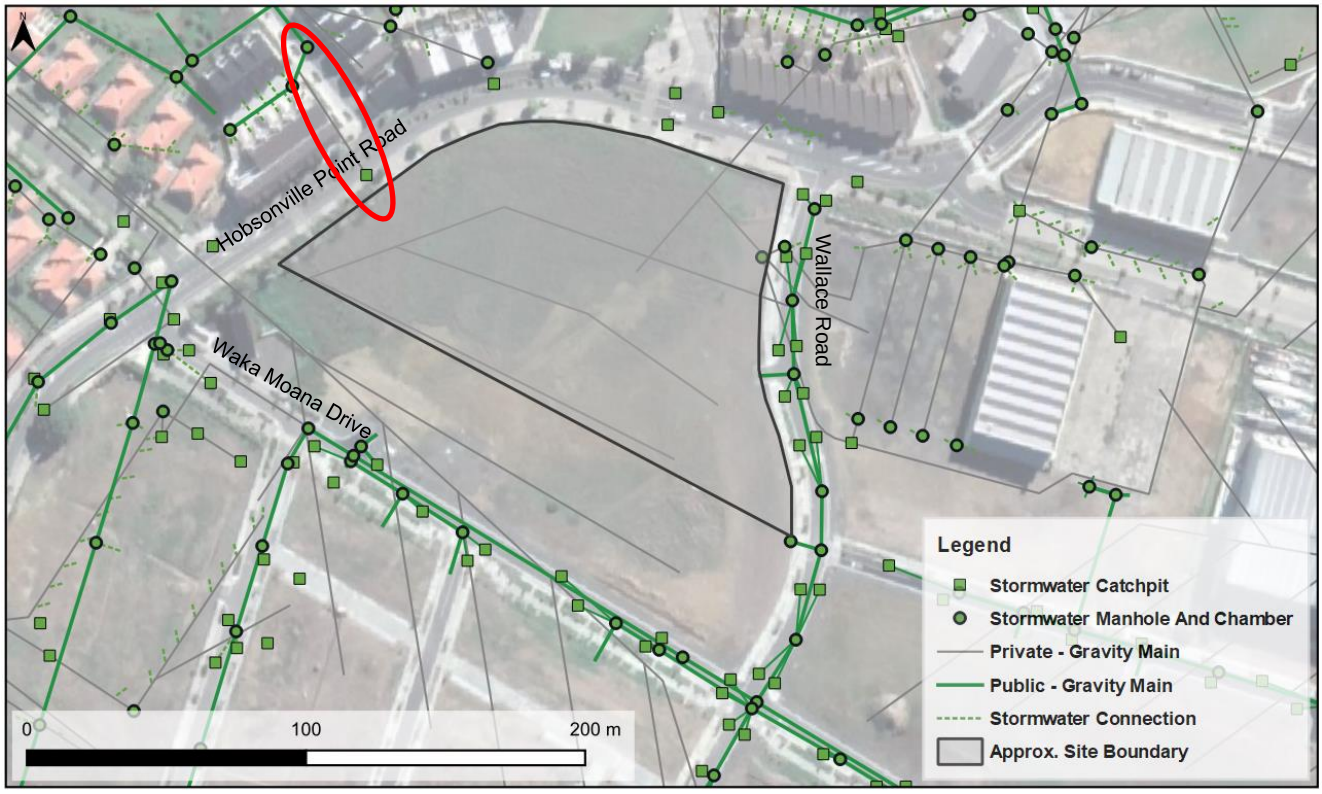


Figure 6. Local stormwater infrastructure. (Stormwater infrastructure data downloaded from AC GeoMaps).

A preliminary estimate on the increase in the volume of surface water runoff resulting from the school development (i.e., due to the creation of impervious surfaces such as buildings, sealed play areas and cark parks) was calculated following the Auckland Council Guidelines for Stormwater Runoff Modelling in Auckland (TP108). The results are presented in **Table 8**, and represent runoff from the site only. Based on the proposed draft development plans (**Appendix A**), it was estimated 44% of the site will be converted to impervious surfaces.

Table 8. High-level estimate of peak runoff rate and 24-hour volume from Site 5.

Flood Event	Pre-Development		Post Development	
	Peak Flow (L/s)	24-Hour Volume (m^3)	Peak Flow (L/s)	24-Hour Volume (m^3)
2-year ARI	70	380	100	590
10-year ARI	140	760	210	1,060
100-year ARI	270	1,400	320	1,820

Stormwater Runoff Calculation Assumptions:

(i) Initial abstraction = 5mm

(ii) Time on concentration = 13 minutes

(iii) Pervious curve number =

(iv) Impervious curve number = 98

(v) Channelisation factor = 0.8

(vi) Slope = 0.01

(vii) Slope length = 200 m

(viii) 24-hour Rainfall depth (from HIRDS): 2-year = 72.8 mm, 10-year = 110 mm, 100-year = 166 mm

Under the AUP, the site is subject to the provisions of the Stormwater Management Area Controls (Flow 1) set out in Chapter E10. Under Rule E.10.6.1, retention or detention of stormwater must be provided, and this can be located on or offsite, subject to conditions.

Confirmation from Watercare on the design capacity and current utilisation of the existing detention pond to the north on Buckley Avenue/ Frances Bryers Road would be required to confirm whether this connection and retention pond could be used or if onsite detention measures are needed.

5.2 Wastewater

Geomaps indicate 150 mm diameter wastewater pipes on the eastern side of Wallace Road, and a 225 mm diameter line on the south side of Waka Moana Drive. A number of manholes are located along the Wallace Road line which are potential connection points for the school, along with pipe stubs which extend through to the land immediately south of the site from Waka Moana Drive (**Figure 9**). As with the stormwater, preference would be for a connection into the existing network to the north-west of the property along Hobsonville Point Road in order to avoid pumping requirements to reach the Wallace Road connections.

The current wastewater infrastructure may not have capacity for discharges from the school and potential future development surrounding the site combined. Investigations have been made for Kainga Ora[11] into development of a second wastewater pump station (known as WWPS6) at Hobsonville Point to augment the existing WWPS3 at Buckley Avenue, in preparation for proposed mixed use development (including the primary school) across former airfield land, which is currently undeveloped. Wastewater yield calculations by Harrison Grierson[11] found that the new pump station would be required to accommodate peak wet weather flows of 54 L/s. The capacity of the existing WWPS3 was not described although it was assumed in a prior report[11] that the station would be unable to process additional flow of 30 L/s without upgrades being made.

Following the same calculation method as Harrison Grierson[11] and in accordance with the Auckland Code of Practice for wastewater network design, the peak wet weather flow (PWWF) wastewater discharge from the school and early childhood centre only (i.e., not including the residential and commercial development as included in the Harrison Grierson assessment), is presented in **Table 9**Error! Reference source not found., for three stages of school development (i.e. increasing school roll).

[11] Harrison Grierson Consultants Ltd, 7 December 2020. Technical Memo: *Hobsonville Point wastewater yield review for WWPS6. Impacts of Airfields yield changes on WWPS6.* Report prepared for Kainga Ora.

This means that on its own, the school's wastewater discharges may be accommodated by the current pump station, depending on when it is connected relative to surrounding developments. However, in the long-term, based on Harrison Grierson's calculations for adjacent developments, combined (surrounding development and the school) wastewater discharges will render WWPS3 over capacity.

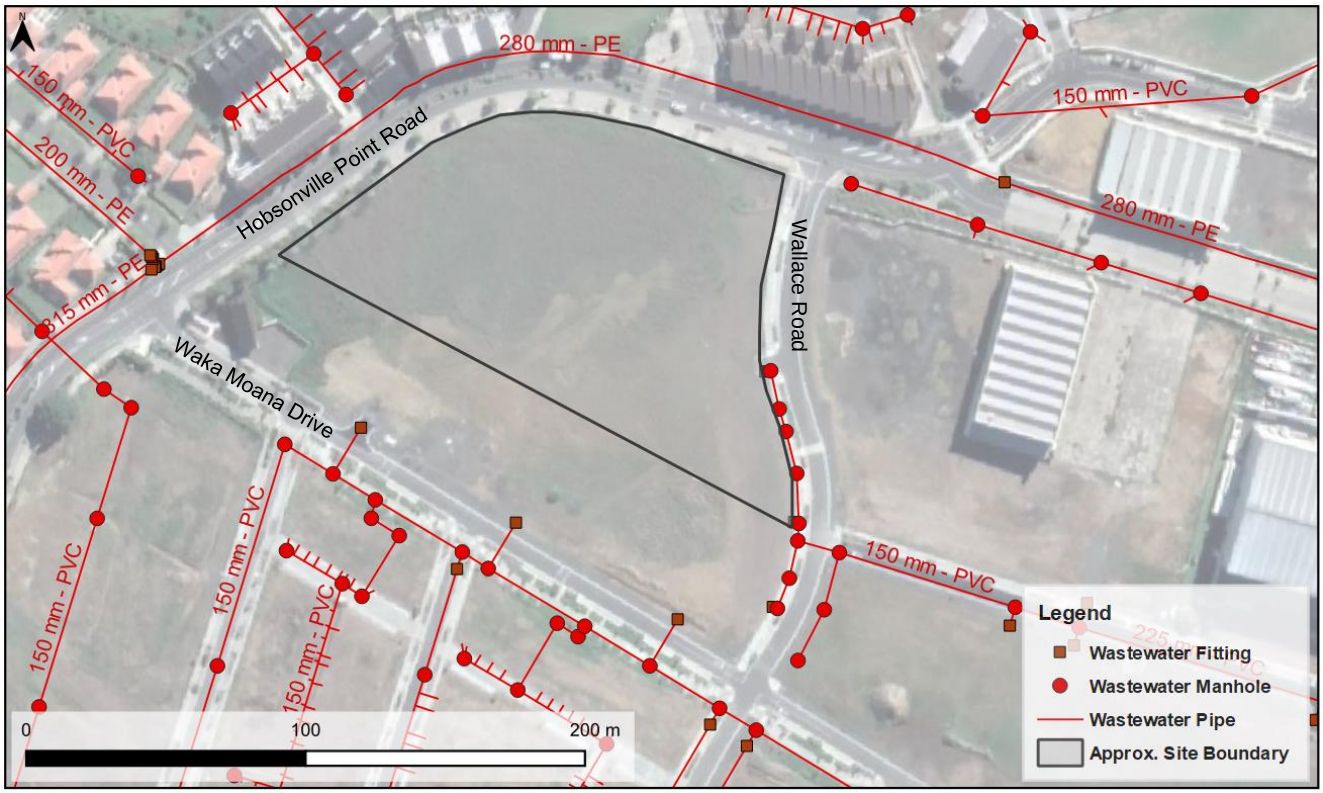


Figure 7. Local wastewater infrastructure. Wastewater infrastructure data downloaded from AC GeoMaps.

Table 9. Estimated peak wet weather wastewater flows[12]

Year	Students	Staff	Early Childhood Centre	Total PWWF (L/s)
2023	350	18	50	0.47
2030	650	33	50	0.87
2043	1,000	50	50	1.51

Options to manage wastewater once surrounding development progresses and as the school role increases include either:

1. Assessing the capacity of WWPS3 to confirm whether flows from the school could be accommodated without upgrades, prior to additional development across former airfield land by Kainga Ora, or
2. Developing the new wastewater pump (WWPS6) in conjunction with Kainga Ora.

5.3 Potable water

Geomaps shows 315 mm diameter potable water pipes along Hobsonville Point Road, and 180 mm pipes along Wallace Road and Waka Moana Drive (**Figure 8**). This allows for connections along any side of the site. Preference would be a connection from the 315 mm as this will have the largest capacity.

[12] Based on a daily wastewater estimate of 15 L/day per student and 45 L/day per staff member and early childhood centre attendee. A peaking factor of 6.7 was assumed, as per Harrison Grierson assessment.

The Auckland Council Code of Practice for water supply design specification assumes water consumption for site users as set out in **Table 10**. The total minimum daily demand of potable water for the school and early childhood centre is estimated at 24,750 L per day.

Table 10. Estimated daily potable water requirements.

User	Count	Consumption (L/day)	Total (L/day)
School student	1,000	20	20,000
Staff	50	50	2,500
Early childhood centre	50	45	2,250
Total			24,750

Confirmation from Watercare is required to confirm whether the existing 315 mm or 180 mm diameter pipes surrounding Site 5 could support the existing demand of approximately 24,750 L/day.

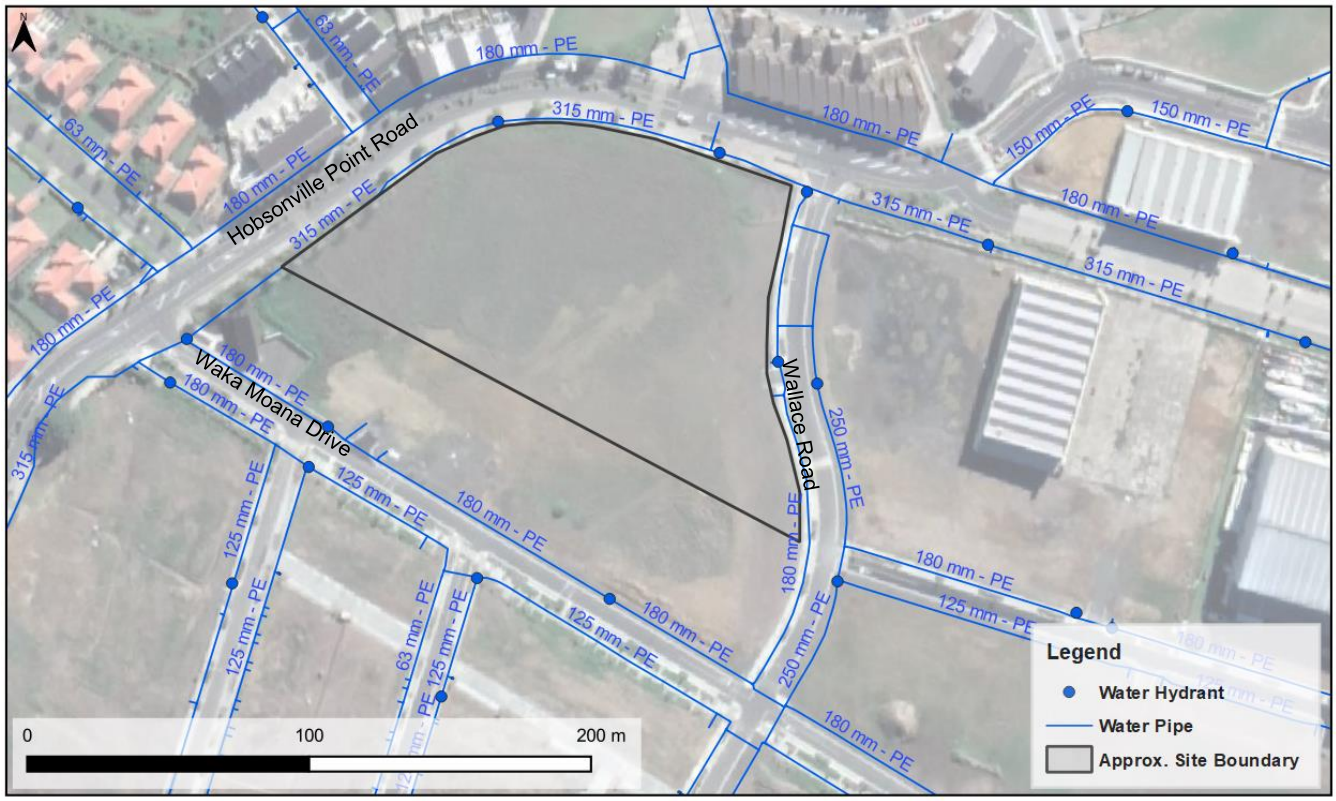


Figure 8. Local clean water infrastructure. Water infrastructure data downloaded from AC GeoMaps.

5.4 Firefighting water supply

More than ten fire hydrants are located in the streets surrounding the school (Hobsonville Point Road, Waka Moana Drive, and Wallace Road) and are illustrated in **Figure 8**.

It is assumed that the school will have a sprinkler system installed to the approved standard, in which case the fire water supply classification is FW2 under the New Zealand Fire Service Firefighting Water Supplies Code of Practice (SNZPAS 4509:2008). The requirements under FW2 are in addition to the potable water and sprinkler system demands and require a minimum reticulation pressure of 100 kPa. The FW2 water supply requirements are:

1. Water flow of 12.5 L/s within 135 m of the site.
2. Additional water flow of 12.5 L/s within 270 m of the site.

3. No more than 2 hydrants operating to provide the required flow.

Hydrant flow testing will be required to determine if the stipulated flow rates and minimum pressure can be achieved.

5.5 Electricity

Vector plans from BeforeUdig show that 6,600 – 11,000-volt transmission lines are located along Hobsonville Point Road, and a section of Waka Moana Drive. Wallace Road contains a 400-volt line (**Figure 9**).

To connect into the 6,600 – 11,000-volt transmission line a mini-substation and stepdown transformer would be required on site to convert to 400-volt municipal supply. Alternatively, it may be possible to connect directly to the existing 400-volt cable on Wallace Road.

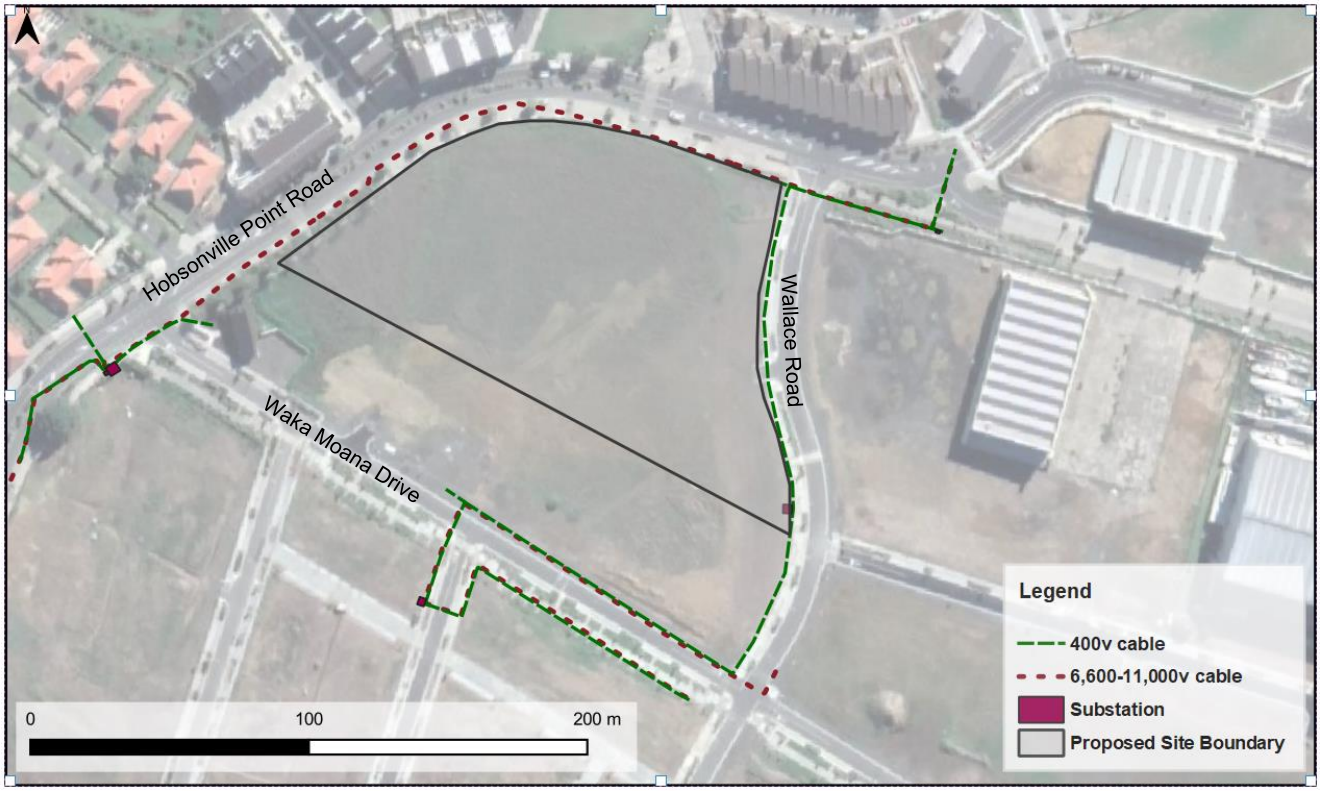


Figure 9. Electricity lines. Infrastructure digitised from Vector plans. Infrastructure outside of the area of interest (e.g., side streets) were not digitised, and therefore the infrastructure map is incomplete in these areas.

5.6 Gas and Telecommunications

As stated in the Jacobs assessment, there are no natural gas supply lines in the area. Tanked gas will be necessary if gas is required at the school.

Chorus plans show that telecommunication cables are located along Hobsonville Point Road, Waka Moana Road and Wallace Road, and fibre broadband is available. The network in this area is capable of delivering hyperfibre speeds of up to 2,000 mbps.

6. Summary of Future Development Implications

The implications of the findings of this report are summarised below.

Ground contamination implications	Design	No ground contamination risk to future site users or the environment was identified. Soils can be reused on site where required.
	Earthworks	Standard earthworks controls and procedures that limit discharges to the environment will be applicable to future site works. No additional specific health and safety controls are required.
	Soil disposal	• Contaminants detected above background in Type B fill, present in former sediment ponds in the north of the site from the surface to around 2 m BGL, will not be considered cleanfill. Spoil from this area will need to go to managed fill if offsite disposal is required. • All remaining soil types were below background levels and thus can be disposed as cleanfill.
	Consenting	• Consent as a controlled activity is expected to be required under the NESCS since it is unlikely that earthworks volumes and duration will comply with permitted activity limits. • No consent is required under Section E.30 of the AUP as contamination concentrations are below permitted activity discharge criteria.
Flood risk implications	Based on a review of the local topography, proposed site development plan contours and AC flood hazard data, the risk of flood hazard at the property is considered low. No implications for future development are envisaged.	
Infrastructure capacity implications	Stormwater	• Connection to the stormwater network to the north-west of the site would be preferred to avoid pumping requirements. This could be either through the existing private gravity main (of unknown capacity) that connects to the 750 mm stormwater main on the northern side of Hobsonville Road, or through construction of a new connection. • Under the AUP, the site is subject to the provisions of the Stormwater Management Area Controls (Flow 1) set out in Chapter E10, where on or offsite retention or detention of stormwater must be provided (subject to conditions). Confirmation from Watercare on the design capacity and current utilisation of the existing detention pond to the north on Buckley Avenue/ Frances Bryers Road would be required to confirm whether this connection and retention pond could be used or if onsite detention measures are needed.
	Wastewater	• The current wastewater infrastructure (pump station WWPS3) may not have capacity for discharges from the school and potential future development surrounding the site. • Options to manage wastewater include either assessing the capacity of WWPS3 to confirm whether flows from the school could be accommodated without upgrades prior to additional development occurring in the surrounding area by Kainga Ora or developing a new proposed wastewater pumpstation (WWPS6) in conjunction with Kainga Ora.
	Potable water	Potable water pipes are present on Hobsonville Point Road, Wallace Road and Waka Moana Drive. This allows for connections along any side of the site.
	Fire hydrant supply	More than ten fire hydrants are located in the streets surrounding the school (Hobsonville Point Road, Waka Moana Drive, and Wallace Road). Hydrant flow testing will be required to determine if the flow rates and minimum pressure stipulated under the firefighting standard SNZPAS 4509:2008 can be achieved for the site.
	Electricity	6,600 – 11,000-volt transmission lines are located along Hobsonville Point Road, and a section of Waka Moana Drive. Wallace Road contains a 400-volt line. In order to connect into the 6,600 – 11,000-volt transmission line, a mini-substation and stepdown transformer would be required on site to convert to 400-volt municipal supply. Alternatively, it may be possible to connect directly to the existing 400-volt cable on Wallace Road.
	Gas	There are no gas supply lines in the area. If gas is required at the school this will need to be tanked.
	Tele-communications	Chorus plans show that telecommunication cables are located along Hobsonville Point Road, Waka Moana Road and Wallace Road, and fibre broadband is available. The network in this area is capable of delivering hyperfibre speeds of up to 2,000 mbps.

7. Conclusions

This ground contamination, flood risk and infrastructure capacity investigation was undertaken to support MoE's due diligence process for potential acquisition of 279 Hobsonville Point Road in order to develop an educational facility. Investigations were made into potential and actual ground contamination, flood risk, and the capacity of stormwater, wastewater, potable water, firefighting water, electricity, natural gas, and telecommunications infrastructure surrounding the site.

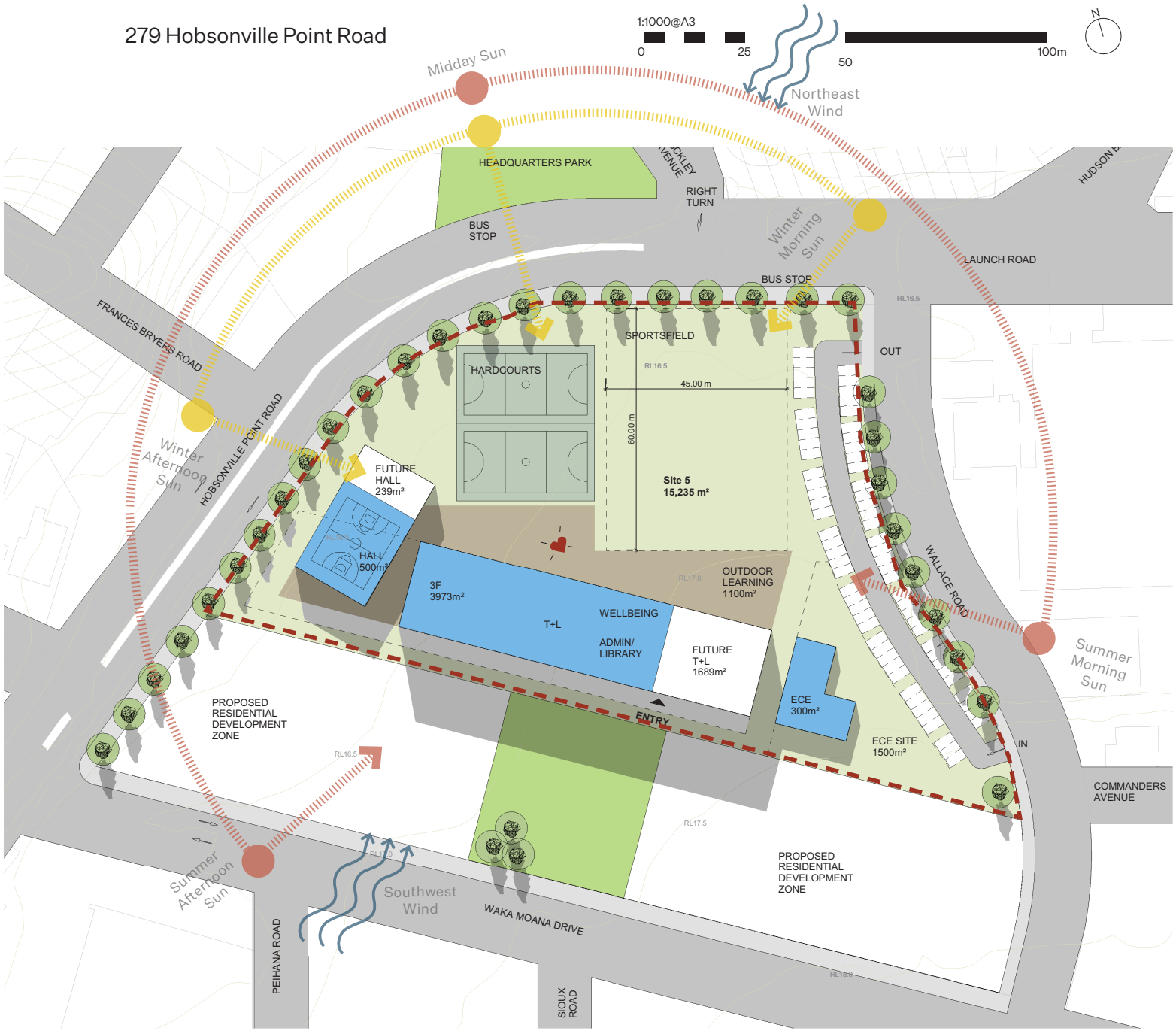
This investigation has not identified any issues that would immediately preclude the site from being developed for primary school and early childhood education purposes. However, we note the following:

1. HAIL activities have occurred on the site, associated with the land formerly being part of the airfield of the Hobsonville Airbase and placement of fill. Contamination testing of soil confirms that the NESCS legislation will apply to proposed soil disturbance, and consent will be required.
2. Low levels of contamination detected (PAH elevated above background) has implications for soil requiring offsite disposal, since some soils on site will need to be disposed to a managed fill at around $35/tonne.
3. No ground contamination or flood risk-related constraints on building design, earthworks or health and safety during or post-development were identified.
4. Additional infrastructure assessment will be required during the design process to confirm:
    a) The capacity of private stormwater drainage lines underlying the site or whether construction of a new stormwater line connecting to the municipal system to the northwest will be necessary;
    b) The capacity of the stormwater detention pond located to the north of the site and whether this facility can be utilised for discharges from the site, otherwise onsite detention measures will be required;
    c) The capacity of the current wastewater pumpstation at Hobsonville Point and whether the minimum estimated flow of 1.51L/s from the school can be accommodated or a new pumpstation will need to be constructed. It is expected these discussions will occur alongside those planned by Kainga Ora.
    d) That the minimum flow rates and pressure required for potable water and firefighting supply can be met, achieved through actual hydrant tests.

Appendix A. Development plans

Site 5 - Option F

279 Hobsonville Point Road



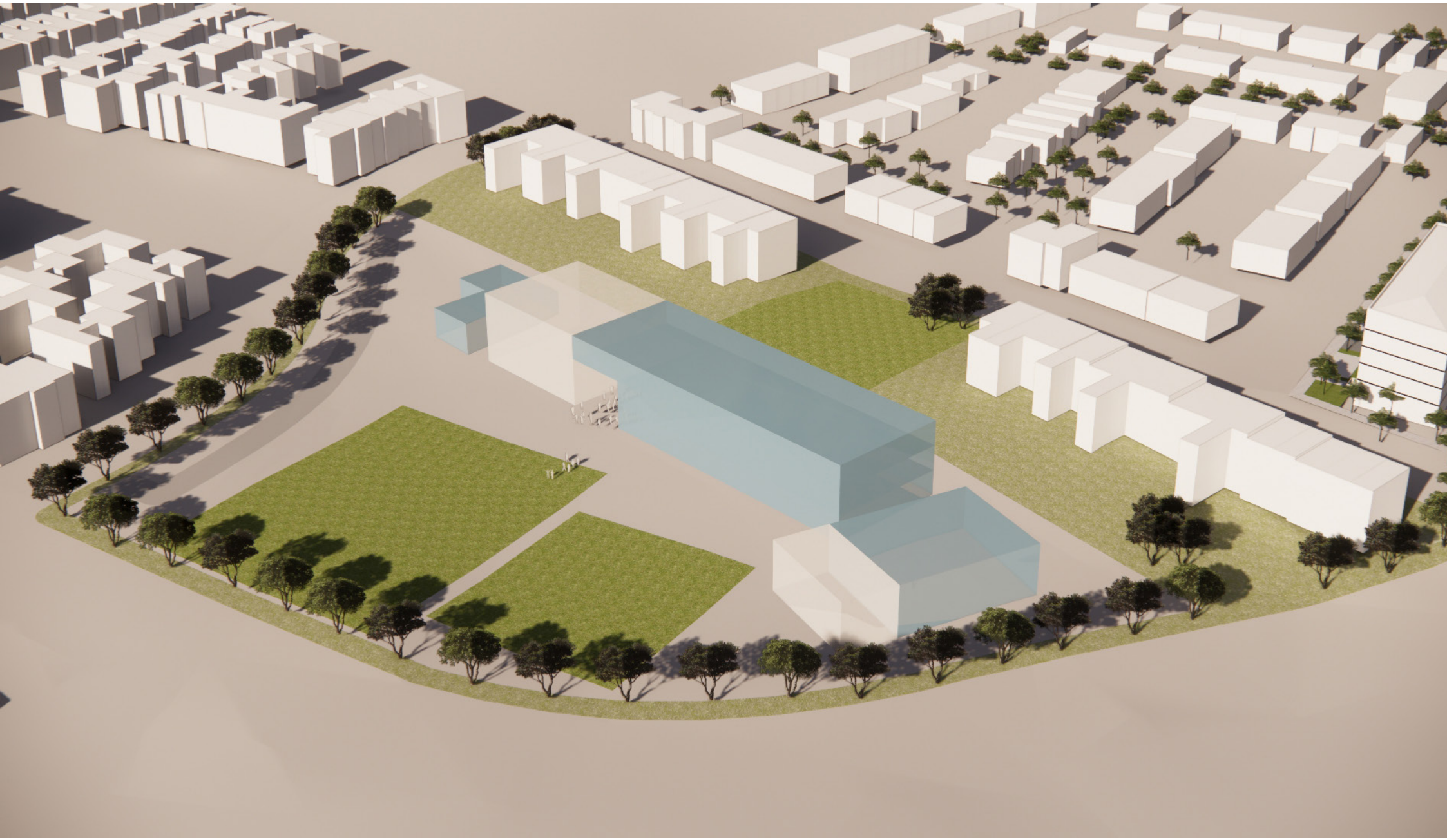
Site 5 - Option F - Sunstudies

279 Hobsonville Point Road

1 | 1 : 1000 Section
Site 5 Sunstudy Opt F 9AM

2 | 1 : 1000 Section
Site 5 Sunstudy Opt F 12PM

3 | 1 : 1000 Section
Site 5 Sunstudy Opt F 3PM



Appendix B. Laboratory Data

B.1 Summary table

B.2 Transcripts

Table B1: Laboratory data summary 279 Hobsonville Point Road, Hobsonville.

Feature															Maximum detected	Human Health: NESCS (High Density Residential) [1]	Environmental: AUP Discharge Criteria [2]	Background (non-volcanic) [3]
Sample information	Sample Location	HA1	HA1	HA2	HA2	HA3	HA3	HA4	HA4	HA5	HA5	HA5	HA6	HA6				
	Depth (m bgl)	0-0.1	0.5-0.6	0-0.1	0.7-0.8	0-0.1	0.4-0.5	0-0.1	0.2-0.4	0-0.1	0.2-0.4	0.5-0.6	0-0.1	0.3-0.5				
	Date	13/01/2021	13/01/2021	13/01/2021	13/01/2021	13/01/2021	13/01/2021	13/01/2021	13/01/2021	13/01/2021	13/01/2021	13/01/2021	13/01/2021	13/01/2021				
	Material type	Fill A	Puketoka	Fill A	Puketoka	Topsoil	Fill B	Fill B	Fill B	Fill A	Fill B	Fill B	Fill B	Fill B				
Asbestos	ACM (>10 mm)	-	-	-	-	-	-	-	ND	-	ND	-	-	ND	<LD	0.04% [4]	-	<LD
	AF/FA (2-10 mm)	-	-	-	-	-	-	-	ND	-	ND	-	-	ND	<LD	0.001% [4]	-	<LD
	AF/FA (<2 mm)	-	-	-	-	-	-	-	ND	-	ND	-	-	ND	<LD			
Metals	Arsenic	1.7	2.2	4.7	0.86	4.7	4.2	3.4	-	5.2	-	3.2	3.9	-	5.2	45	100	12
	Cadmium	0.023	0.018	0.07	<0.005	0.12	0.085	0.11	-	0.11	-	0.078	0.058	-	0.12	230	7.5	0.65
	Chromium	8.2	7.1	14.4	5.4	14	15.6	14	-	16.7	-	13.5	14.4	-	16.7	1,500	400	55
	Copper	5.2	2.4	10.6	1.5	12.5	11.7	9.3	-	12.8	-	8.57	11.4	-	13.5	NL	325	45
	Lead	8.77	8.33	27.9	4.2	38.2	19.7	14.8	-	35.7	-	13.5	15.5	-	38.2	500	250	65
	Nickel	4.7	3.4	12.6	1.8	13.5	16.6	11.1	-	14.6	-	12.1	13.9	-	17.2	1200 [5]	105	35
	Zinc	10.4	5.3	17.5	2.7	23.9	27.6	15.5	-	23.1	-	13.6	15.8	-	34.4	60,000 [5]	400	180
PAH	1-Methylnaphthalene	-	-	-	<0.01	-	<0.01	<0.01	-	<0.01	-	<0.01	<0.01	-	<LD	-	-	<LD
	2-Methylnaphthalene	-	-	-	<0.01	-	<0.01	<0.01	-	<0.01	-	<0.01	<0.01	-	<LD	-	-	<LD
	Acenaphthene	-	-	-	<0.01	-	0.04	<0.01	-	<0.01	-	<0.01	<0.01	-	0.04	-	-	<LD
	Acenaphthylene	-	-	-	<0.01	-	0.03	0.02	-	0.01	-	0.06	0.01	-	0.06	-	-	<LD
	Anthracene	-	-	-	<0.01	-	0.17	0.04	-	0.07	-	0.05	0.05	-	0.17	-	-	<LD
	Benz[a]anthracene	-	-	-	<0.02	-	0.48	0.14	-	0.18	-	0.3	0.13	-	0.48	-	-	<LD
	Benzo[a]pyrene	-	-	-	<0.01	-	0.64	0.19	-	0.2	-	0.51	0.2	-	0.64	-	-	<LD
	Benzo[b]&[j] fluoranthene	-	-	-	<0.02	-	0.61	0.19	-	0.19	-	0.45	0.22	-	0.61	-	-	<LD
	Benzo[g,h,i]perylene	-	-	-	<0.02	-	0.32	0.09	-	0.09	-	0.25	0.11	-	0.32	-	-	<LD
	Benzo[k] fluoranthene	-	-	-	<0.01	-	0.24	0.07	-	0.07	-	0.22	0.08	-	0.24	-	-	<LD
	Chrysene	-	-	-	<0.01	-	0.47	0.15	-	0.17	-	0.34	0.15	-	0.47	-	-	<LD
	Dibenz(a,h) anthracene	-	-	-	<0.01	-	0.06	0.02	-	0.02	-	0.05	0.02	-	0.06	-	-	<LD
	Fluoranthene	-	-	-	<0.02	-	1.15	0.33	-	0.46	-	0.25	0.33	-	1.15	-	-	<LD
	Fluorene	-	-	-	<0.01	-	0.02	<0.01	-	<0.01	-	<0.01	<0.01	-	0.02	-	-	<LD
	Indeno(1,2,3-cd)pyrene	-	-	-	<0.01	-	0.34	0.09	-	0.09	-	0.26	0.11	-	0.34	-	-	<LD
	Naphthalene	-	-	-	<0.01	-	<0.01	<0.01	-	<0.01	-	<0.01	<0.01	-	<LD	63 [6]	16 [6]	<LD
	Phenanthrene	-	-	-	<0.01	-	0.48	0.13	-	0.22	-	0.07	0.13	-	0.48	-	-	<LD
	Pyrene	-	-	-	<0.02	-	1.3	0.36	-	0.46	-	0.36	0.36	-	1.3	1,600 [6]	NL [6]	<LD
	Benzo[a]pyrene TEQ (Zero)	-	-	-	<0.01	-	0.88	0.26	-	0.28	-	0.69	0.28	-	0.88	24	20	<LD
Organochlorine pesticides (OCP)		-	-	ND	-	-	-	-	-	-	-	-	-	-	<LD	-	-	<LD

Dash (-) indicates no value provided or analyte not tested.

Grey values at background levels, black values exceed published background for non-volcanic soil. There were no exceedances of NESCS or AUP criteria reported.

<LD = below laboratory detection level

1. National Environmental Standards - Soil Contamination Standard - High-density residential land use.
2. Auckland Unitary Plan permitted activity discharge criteria (Table E30.6.1.4.1).
3. Background concentrations of trace elements in non-volcanic soils in Auckland (TP135)
4. BRANZ, New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.
5. NEPM National Environmental Standard (Australia) - Soil Contamination Standard - high-density residential land use (Residential B).
6. Guidelines for Assessing and Managing Petroleum hydrocarbon Contaminated Sites in New Zealand, Tier 1 Soil acceptance criteria, sand silt, surface contamination, all pathways, residential criteria used a for human health, protection of groundwater quality for environmental discharge (surface contamination, groundwater at 4m)

Table 4.5: Laboratory data summary 279 Hobsonville Point Road, Hobsonville.

Feature															Maximum detected	Human Health: NESCS (High Density Residential) [1]	Environmental: AUP Discharge Criteria [2]	Background (non-volcanic) [3]
Sample information	Sample Location	HA7	HA7	HA7	HA8	HA8	HA9	HA10	HA10	HA10	HA11	HA11	HA12	HA13				
	Depth (m bgl)	0-0.1	0.5-0.6	1-1.1	0-0.1	1.1-1.2	0-0.1	0-0.1	0.7-0.8	1-1.1	0-0.1	0.3-0.4	0-0.1	0-0.1				
	Date	13/01/2021	13/01/2021	13/01/2021	13/01/2021	13/01/2021	13/01/2021	13/01/2021	13/01/2021	13/01/2021	13/01/2021	13/01/2021	13/01/2021	13/01/2021				
	Material type	Fill A	Fill C	Puketoka	Fill A	Fill C	Fill A	Fill A	Fill A	Puketoka	Fill A	Fill C	Fill B	Fill B				
Asbestos	ACM (>10 mm)	ND	-	-	ND	-	-	-	-	-	ND	-	ND	ND	<LD	0.04% [4]	-	<LD
	AF/FA (2-10 mm)	ND	-	-	ND	-	-	-	-	-	ND	-	ND	ND	<LD	0.001% [4]	-	<LD
	AF/FA (<2 mm)	ND	-	-	ND	-	-	-	-	-	ND	-	ND	ND	<LD			
Metals	Arsenic	1.9	2.1	0.57	3.5	2.4	2.9	3.7	0.67	4.9	2.5	2	4.6	4.3	5.2	45	100	12
	Cadmium	0.026	0.024	0.01	0.033	0.011	0.074	0.066	0.0073	0.11	0.019	0.03	0.037	0.046	0.12	230	7.5	0.65
	Chromium	8.8	11	12	12	8.2	13.2	10	7.6	12	8.6	8.9	16.3	15.3	16.7	1,500	400	55
	Copper	4.1	10	6.4	12.5	4	13.3	8.53	3	9.73	5.7	3.9	13.4	13.5	13.5	NL	325	45
	Lead	9.99	12.2	9.93	16.9	15.1	10.2	14.5	6.04	34.3	9.67	12.9	20.1	21.9	38.2	500	250	65
	Nickel	4.5	3.7	3.1	11.9	6.88	10.4	7.12	3	9.68	6.52	5.7	17.2	15.1	17.2	1200 [5]	105	35
	Zinc	9.04	5.4	5.52	10.3	8.49	34.4	17.9	5.61	24.5	7.69	9.14	15.8	15.8	34.4	60,000 [5]	400	180
PAH	1-Methylnaphthalene	-	<0.01	<0.011	-	<0.01	-	-	<0.01	<0.01	-	<0.01	<0.01	<0.01	<LD	-	-	<LD
	2-Methylnaphthalene	-	<0.01	<0.011	-	<0.01	-	-	<0.01	<0.01	-	<0.01	<0.01	<0.01	<LD	-	-	<LD
	Acenaphthene	-	<0.01	<0.011	-	<0.01	-	-	<0.01	<0.01	-	<0.01	<0.01	<0.01	0.04	-	-	<LD
	Acenaphthylene	-	<0.01	<0.011	-	<0.01	-	-	<0.01	<0.01	-	<0.01	<0.01	<0.01	0.06	-	-	<LD
	Anthracene	-	<0.01	<0.011	-	<0.01	-	-	<0.01	<0.01	-	<0.01	<0.01	<0.01	0.17	-	-	<LD
	Benz[a]anthracene	-	<0.02	<0.02	-	<0.02	-	-	<0.02	<0.02	-	<0.02	<0.02	0.02	0.48	-	-	<LD
	Benzo[a]pyrene	-	<0.01	<0.011	-	<0.01	-	-	<0.01	<0.01	-	<0.01	0.02	0.05	0.64	-	-	<LD
	Benzo[b]&[j] fluoranthene	-	<0.02	<0.02	-	<0.02	-	-	<0.02	<0.02	-	<0.02	0.03	0.05	0.61	-	-	<LD
	Benzo[g,h,i]perylene	-	<0.02	<0.02	-	<0.02	-	-	<0.02	<0.02	-	<0.02	<0.02	0.03	0.32	-	-	<LD
	Benzo[k] fluoranthene	-	<0.01	<0.011	-	<0.01	-	-	<0.01	<0.01	-	<0.01	0.01	0.02	0.24	-	-	<LD
	Chrysene	-	<0.01	<0.011	-	<0.01	-	-	<0.01	<0.01	-	<0.01	0.02	0.04	0.47	-	-	<LD
	Dibenz(a,h) anthracene	-	<0.01	<0.011	-	<0.01	-	-	<0.01	<0.01	-	<0.01	<0.01	<0.01	0.06	-	-	<LD
	Fluoranthene	-	<0.02	<0.02	-	<0.02	-	-	<0.02	<0.02	-	<0.02	0.05	0.08	1.15	-	-	<LD
	Fluorene	-	<0.01	<0.011	-	<0.01	-	-	<0.01	<0.01	-	<0.01	<0.01	<0.01	0.02	-	-	<LD
	Indeno(1,2,3-cd)pyrene	-	<0.01	<0.011	-	<0.01	-	-	<0.01	<0.01	-	<0.01	0.01	0.02	0.34	-	-	<LD
	Naphthalene	-	<0.01	<0.011	-	<0.01	-	-	<0.01	<0.01	-	<0.01	<0.01	<0.01	<LD	63 [6]	16 [6]	<LD
	Phenanthrene	-	<0.01	<0.011	-	<0.01	-	-	<0.01	<0.01	-	<0.01	0.02	0.02	0.48	-	-	<LD
	Pyrene	-	<0.02	<0.02	-	<0.02	-	-	<0.02	<0.02	-	<0.02	0.06	0.09	1.3	1,600 [6]	NL [6]	<LD
	Benzo[a]pyrene TEQ (Zero)	-	<0.01	<0.01	-	<0.01	-	-	<0.01	<0.01	-	<0.01	0.03	0.06	0.88	24	20	<LD
Organochlorine pesticides (OCP)		ND	-	-	-	-	-	-	-	-	ND	-	ND	-	<LD	-	-	<LD

Dash (-) indicates no value provided or analyte not tested.

Grey values at background levels, black values exceed published background for non-volcanic soil. There were no exceedances of NESCS or AUP criteria reported.

<LD = below laboratory detection level

1. National Environmental Standards - Soil Contamination Standard - High-density residential land use.
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Analytica Laboratories Limited
Ruakura Research Centre
10 Bisley Road
Hamilton 3214, New Zealand
Ph +64 (07) 974 4740
sales@analytica.co.nz
www.analytica.co.nz

Certificate of Analysis

WWLA
P O Box 314
Kumeu 0841

Attention: Wendi Williamson
Phone: 027 536 8751
Email: wendi.williamson@wwla.kiwi

Lab Reference: 21-01358
Submitted by: Cherise
Date Received: 15/01/2021
Testing Initiated: 15/01/2021
Date Completed: 20/01/2021
Order Number:
Reference: WWLA0313

Sampling Site:

Report Comments

Samples were collected by yourselves (or your agent) and analysed as received at Analytica Laboratories. Samples were in acceptable condition unless otherwise noted on this report.
Specific testing dates are available on request.

Heavy Metals in Soil

	Client Sample ID		HA1 0-0.1	HA1 0.5-0.6	HA2 0-0.1	HA2 0.7-0.8	HA3 0-0.1
	Date Sampled		13/01/2021	13/01/2021	13/01/2021	13/01/2021	13/01/2021
Analyte	Unit	*Reporting Limit*	21-01358-1	21-01358-2	21-01358-4	21-01358-7	21-01358-8
Arsenic	mg/kg dry wt	*0.125*	1.7	2.2	4.7	0.86	4.7
Cadmium	mg/kg dry wt	*0.005*	0.023	0.018	0.070	<0.0050	0.12
Chromium	mg/kg dry wt	*0.125*	8.2	7.1	14.4	5.4	14.0
Copper	mg/kg dry wt	*0.075*	5.2	2.4	10.6	1.5	12.5
Lead	mg/kg dry wt	*0.25*	8.77	8.33	27.9	4.2	38.2
Nickel	mg/kg dry wt	*0.05*	4.7	3.4	12.6	1.8	13.5
Zinc	mg/kg dry wt	*0.05*	10.4	5.30	17.5	2.7	23.9

Heavy Metals in Soil

	Client Sample ID		HA3 0.4-0.5	HA4 0-0.1	HA5 0-0.1	HA5 0.5-0.6	HA6 0-0.1
	Date Sampled		13/01/2021	13/01/2021	13/01/2021	13/01/2021	13/01/2021
Analyte	Unit	*Reporting Limit*	21-01358-9	21-01358-11	21-01358-13	21-01358-14	21-01358-17
Arsenic	mg/kg dry wt	*0.125*	4.2	3.4	5.2	3.2	3.9
Cadmium	mg/kg dry wt	*0.005*	0.085	0.11	0.11	0.078	0.058
Chromium	mg/kg dry wt	*0.125*	15.6	14.0	16.7	13.5	14.4
Copper	mg/kg dry wt	*0.075*	11.7	9.30	12.8	8.57	11.4
Lead	mg/kg dry wt	*0.25*	19.7	14.8	35.7	13.5	15.5
Nickel	mg/kg dry wt	*0.05*	16.6	11.1	14.6	12.1	13.9
Zinc	mg/kg dry wt	*0.05*	27.6	15.5	23.1	13.6	15.8

Heavy Metals in Soil

Client Sample ID			HA7 0-0.1	HA7 0.5-0.6	HA7 1-1.1	HA8 0-0.1	HA8 1.1-1.2
Date Sampled			13/01/2021	13/01/2021	13/01/2021	13/01/2021	13/01/2021
Analyte	Unit	*Reporting Limit*	21-01358-19	21-01358-20	21-01358-21	21-01358-22	21-01358-24
Arsenic	mg/kg dry wt	*0.125*	1.9	2.1	0.57	3.5	2.4
Cadmium	mg/kg dry wt	*0.005*	0.026	0.024	0.010	0.033	0.011
Chromium	mg/kg dry wt	*0.125*	8.8	11	12	12	8.2
Copper	mg/kg dry wt	*0.075*	4.1	10.0	6.4	12.5	4.0
Lead	mg/kg dry wt	*0.25*	9.99	12.2	9.93	16.9	15.1
Nickel	mg/kg dry wt	*0.05*	4.5	3.7	3.1	11.9	6.88
Zinc	mg/kg dry wt	*0.05*	9.04	5.40	5.52	10.3	8.49

Heavy Metals in Soil

Client Sample ID			HA9 0-0.1	HA10 0-0.1	HA10 0.7-0.8	HA10 1-1.1	HA11 0-0.1
Date Sampled			13/01/2021	13/01/2021	13/01/2021	13/01/2021	13/01/2021
Analyte	Unit	*Reporting Limit*	21-01358-25	21-01358-28	21-01358-29	21-01358-30	21-01358-31
Arsenic	mg/kg dry wt	*0.125*	2.9	3.7	0.67	4.9	2.5
Cadmium	mg/kg dry wt	*0.005*	0.074	0.066	0.0073	0.11	0.019
Chromium	mg/kg dry wt	*0.125*	13.2	10	7.6	12	8.6
Copper	mg/kg dry wt	*0.075*	13.3	8.53	3.0	9.73	5.7
Lead	mg/kg dry wt	*0.25*	10.2	14.5	6.04	34.3	9.67
Nickel	mg/kg dry wt	*0.05*	10.4	7.12	3.0	9.68	6.52
Zinc	mg/kg dry wt	*0.05*	34.4	17.9	5.61	24.5	7.69

Heavy Metals in Soil

Client Sample ID			HA11 0.3-0.4	HA12 0-0.1	HA13 0-0.1
Date Sampled			13/01/2021	13/01/2021	13/01/2021
Analyte	Unit	*Reporting Limit*	21-01358-32	21-01358-34	21-01358-35
Arsenic	mg/kg dry wt	*0.125*	2.0	4.6	4.3
Cadmium	mg/kg dry wt	*0.005*	0.030	0.037	0.046
Chromium	mg/kg dry wt	*0.125*	8.9	16.3	15.3
Copper	mg/kg dry wt	*0.075*	3.9	13.4	13.5
Lead	mg/kg dry wt	*0.25*	12.9	20.1	21.9
Nickel	mg/kg dry wt	*0.05*	5.70	17.2	15.1
Zinc	mg/kg dry wt	*0.05*	9.14	15.8	15.8

Moisture Content

Client Sample ID			HA2 0.7-0.8	HA3 0.4-0.5	HA4 0-0.1	HA5 0-0.1	HA5 0.5-0.6
Date Sampled			13/01/2021	13/01/2021	13/01/2021	13/01/2021	13/01/2021
Analyte	Unit	*Reporting Limit*	21-01358-7	21-01358-9	21-01358-11	21-01358-13	21-01358-14
Moisture Content	%	*1*	22	25	26	23	7

Moisture Content

	Client Sample ID		HA6 0-0.1	HA7 0.5-0.6	HA7 1-1.1	HA8 1.1-1.2	HA10 0.7-0.8
	Date Sampled		13/01/2021	13/01/2021	13/01/2021	13/01/2021	13/01/2021
Analyte	Unit	*Reporting Limit*	21-01358-17	21-01358-20	21-01358-21	21-01358-24	21-01358-29
Moisture Content	%	*1*	22	26	32	27	18

Moisture Content

	Client Sample ID		HA10 1-1.1	HA11 0.3-0.4	HA12 0-0.1	HA13 0-0.1
	Date Sampled		13/01/2021	13/01/2021	13/01/2021	13/01/2021
Analyte	Unit	*Reporting Limit*	21-01358-30	21-01358-32	21-01358-34	21-01358-35
Moisture Content	%	*1*	26	18	8	9

Polycyclic Aromatic Hydrocarbons - Soil

	Client Sample ID		HA2 0.7-0.8	HA3 0.4-0.5	HA4 0-0.1	HA5 0-0.1	HA5 0.5-0.6
	Date Sampled		13/01/2021	13/01/2021	13/01/2021	13/01/2021	13/01/2021
Analyte	Unit	*Reporting Limit*	21-01358-7	21-01358-9	21-01358-11	21-01358-13	21-01358-14
1-Methylnaphthalene	mg/kg dry wt	*0.01*	<0.01	<0.01	<0.01	<0.01	<0.01
2-Methylnaphthalene	mg/kg dry wt	*0.01*	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthene	mg/kg dry wt	*0.01*	<0.01	0.04	<0.01	<0.01	<0.01
Acenaphthylene	mg/kg dry wt	*0.01*	<0.01	0.03	0.02	0.01	0.06
Anthracene	mg/kg dry wt	*0.01*	<0.01	0.17	0.04	0.07	0.05
Benz[a]anthracene	mg/kg dry wt	*0.02*	<0.02	0.48	0.14	0.18	0.30
Benzo[a]pyrene	mg/kg dry wt	*0.01*	<0.01	0.64	0.19	0.20	0.51
Benzo[b]&[j] fluoranthene	mg/kg dry wt	*0.02*	<0.02	0.61	0.19	0.19	0.45
Benzo[g,h,i]perylene	mg/kg dry wt	*0.02*	<0.02	0.32	0.09	0.09	0.25
Benzo[k]fluoranthene	mg/kg dry wt	*0.01*	<0.01	0.24	0.07	0.07	0.22
Chrysene	mg/kg dry wt	*0.01*	<0.01	0.47	0.15	0.17	0.34
Dibenz(a,h)anthracene	mg/kg dry wt	*0.01*	<0.01	0.06	0.02	0.02	0.05
Fluoranthene	mg/kg dry wt	*0.02*	<0.02	1.15	0.33	0.46	0.25
Fluorene	mg/kg dry wt	*0.01*	<0.01	0.02	<0.01	<0.01	<0.01
Indeno(1,2,3-cd)pyrene	mg/kg dry wt	*0.01*	<0.01	0.34	0.09	0.09	0.26
Naphthalene	mg/kg dry wt	*0.01*	<0.01	<0.01	<0.01	<0.01	<0.01
Phenanthrene	mg/kg dry wt	*0.01*	<0.01	0.48	0.13	0.22	0.07
Pyrene	mg/kg dry wt	*0.02*	<0.02	1.30	0.36	0.46	0.36
Benzo[a]pyrene TEQ (LOR)	mg/kg dry wt	*0.03*	0.03	0.88	0.26	0.28	0.69
Benzo[a]pyrene TEQ (Zero)	mg/kg dry wt	*0.01*	<0.01	0.88	0.26	0.28	0.69
Anthracene-d10 (Surrogate)	%	*1*	120.0	110.5	108.9	109.4	107.1

Polycyclic Aromatic Hydrocarbons - Soil

	Client Sample ID		HA6 0-0.1	HA7 0.5-0.6	HA7 1-1.1	HA8 1.1-1.2	HA10 0.7-0.8
	Date Sampled		13/01/2021	13/01/2021	13/01/2021	13/01/2021	13/01/2021
Analyte	Unit	*Reporting Limit*	21-01358-17	21-01358-20	21-01358-21	21-01358-24	21-01358-29
1-Methylnaphthalene	mg/kg dry wt	*0.01*	<0.01	<0.01	<0.011	<0.01	<0.01
2-Methylnaphthalene	mg/kg dry wt	*0.01*	<0.01	<0.01	<0.011	<0.01	<0.01
Acenaphthene	mg/kg dry wt	*0.01*	<0.01	<0.01	<0.011	<0.01	<0.01
Acenaphthylene	mg/kg dry wt	*0.01*	0.01	<0.01	<0.011	<0.01	<0.01

Polycyclic Aromatic Hydrocarbons - Soil

			Client Sample ID	HA6 0-0.1	HA7 0.5-0.6	HA7 1-1.1	HA8 1.1-1.2	HA10 0.7-0.8
			Date Sampled	13/01/2021	13/01/2021	13/01/2021	13/01/2021	13/01/2021
Anthracene	mg/kg dry wt	*0.01*		0.05	<0.01	<0.011	<0.01	<0.01
Benz[a]anthracene	mg/kg dry wt	*0.02*		0.13	<0.02	<0.02	<0.02	<0.02
Benzo[a]pyrene	mg/kg dry wt	*0.01*		0.20	<0.01	<0.011	<0.01	<0.01
Benzo[b]&[j] fluoranthene	mg/kg dry wt	*0.02*		0.22	<0.02	<0.02	<0.02	<0.02
Benzo[g,h,i]perylene	mg/kg dry wt	*0.02*		0.11	<0.02	<0.02	<0.02	<0.02
Benzo[k]fluoranthene	mg/kg dry wt	*0.01*		0.08	<0.01	<0.011	<0.01	<0.01
Chrysene	mg/kg dry wt	*0.01*		0.15	<0.01	<0.011	<0.01	<0.01
Dibenz(a,h)anthracene	mg/kg dry wt	*0.01*		0.02	<0.01	<0.011	<0.01	<0.01
Fluoranthene	mg/kg dry wt	*0.02*		0.33	<0.02	<0.02	<0.02	<0.02
Fluorene	mg/kg dry wt	*0.01*		<0.01	<0.01	<0.011	<0.01	<0.01
Indeno(1,2,3-cd)pyrene	mg/kg dry wt	*0.01*		0.11	<0.01	<0.011	<0.01	<0.01
Naphthalene	mg/kg dry wt	*0.01*		<0.01	<0.01	<0.011	<0.01	<0.01
Phenanthrene	mg/kg dry wt	*0.01*		0.13	<0.01	<0.011	<0.01	<0.01
Pyrene	mg/kg dry wt	*0.02*		0.36	<0.02	<0.02	<0.02	<0.02
Benzo[a]pyrene TEQ (LOR)	mg/kg dry wt	*0.03*		0.28	0.03	0.03	0.03	0.03
Benzo[a]pyrene TEQ (Zero)	mg/kg dry wt	*0.01*		0.28	<0.01	<0.01	<0.01	<0.01
Anthracene-d10 (Surrogate)	%	*1*		109.7	113.2	108.6	111.0	111.9

Polycyclic Aromatic Hydrocarbons - Soil

			Client Sample ID	HA10 1-1.1	HA11 0.3-0.4	HA12 0-0.1	HA13 0-0.1
			Date Sampled	13/01/2021	13/01/2021	13/01/2021	13/01/2021
Analyte	Unit	*Reporting Limit*		21-01358-30	21-01358-32	21-01358-34	21-01358-35
1-Methylnaphthalene	mg/kg dry wt	*0.01*		<0.01	<0.01	<0.01	<0.01
2-Methylnaphthalene	mg/kg dry wt	*0.01*		<0.01	<0.01	<0.01	<0.01
Acenaphthene	mg/kg dry wt	*0.01*		<0.01	<0.01	<0.01	<0.01
Acenaphthylene	mg/kg dry wt	*0.01*		<0.01	<0.01	<0.01	<0.01
Anthracene	mg/kg dry wt	*0.01*		<0.01	<0.01	<0.01	<0.01
Benz[a]anthracene	mg/kg dry wt	*0.02*		<0.02	<0.02	<0.02	0.02
Benzo[a]pyrene	mg/kg dry wt	*0.01*		<0.01	<0.01	0.02	0.05
Benzo[b]&[j] fluoranthene	mg/kg dry wt	*0.02*		<0.02	<0.02	0.03	0.05
Benzo[g,h,i]perylene	mg/kg dry wt	*0.02*		<0.02	<0.02	<0.02	0.03
Benzo[k]fluoranthene	mg/kg dry wt	*0.01*		<0.01	<0.01	0.01	0.02
Chrysene	mg/kg dry wt	*0.01*		<0.01	<0.01	0.02	0.04
Dibenz(a,h)anthracene	mg/kg dry wt	*0.01*		<0.01	<0.01	<0.01	<0.01
Fluoranthene	mg/kg dry wt	*0.02*		<0.02	<0.02	0.05	0.08
Fluorene	mg/kg dry wt	*0.01*		<0.01	<0.01	<0.01	<0.01
Indeno(1,2,3-cd)pyrene	mg/kg dry wt	*0.01*		<0.01	<0.01	0.01	0.02
Naphthalene	mg/kg dry wt	*0.01*		<0.01	<0.01	<0.01	<0.01
Phenanthrene	mg/kg dry wt	*0.01*		<0.01	<0.01	0.02	0.02
Pyrene	mg/kg dry wt	*0.02*		<0.02	<0.02	0.06	0.09
Benzo[a]pyrene TEQ (LOR)	mg/kg dry wt	*0.03*		0.03	0.03	0.04	0.07
Benzo[a]pyrene TEQ (Zero)	mg/kg dry wt	*0.01*		<0.01	<0.01	0.03	0.06
Anthracene-d10 (Surrogate)	%	*1*		112.0	109.9	109.7	107.7

Organochlorine Pesticides - Soil

Client Sample ID			HA2 0-0.1	HA7 0-0.1	HA11 0-0.1	HA12 0-0.1
Date Sampled			13/01/2021	13/01/2021	13/01/2021	13/01/2021
Analyte	Unit	*Reporting Limit*	21-01358-4	21-01358-19	21-01358-31	21-01358-34
2,4'-DDD	mg/kg dry wt	*0.005*	<0.005	<0.005	<0.005	<0.005
2,4'-DDE	mg/kg dry wt	*0.005*	<0.005	<0.005	<0.005	<0.005
2,4'-DDT	mg/kg dry wt	*0.005*	<0.005	<0.005	<0.005	<0.005
4,4'-DDD	mg/kg dry wt	*0.003*	<0.003	<0.003	<0.003	<0.003
4,4'-DDE	mg/kg dry wt	*0.005*	<0.005	<0.005	<0.005	<0.005
4,4'-DDT	mg/kg dry wt	*0.005*	<0.005	<0.005	<0.005	<0.005
Total DDT	mg/kg dry wt	*0.02*	<0.02	<0.02	<0.02	<0.02
alpha-BHC	mg/kg dry wt	*0.005*	<0.005	<0.005	<0.005	<0.005
Aldrin	mg/kg dry wt	*0.005*	<0.005	<0.005	<0.005	<0.005
beta-BHC	mg/kg dry wt	*0.005*	<0.005	<0.005	<0.005	<0.005
cis-Chlordane	mg/kg dry wt	*0.005*	<0.005	<0.005	<0.005	<0.005
cis-Nonachlor	mg/kg dry wt	*0.01*	<0.01	<0.01	<0.01	<0.01
delta-BHC	mg/kg dry wt	*0.005*	<0.005	<0.005	<0.005	<0.005
Dieldrin	mg/kg dry wt	*0.05*	<0.05	<0.05	<0.05	<0.05
Endosulfan I	mg/kg dry wt	*0.005*	<0.005	<0.005	<0.005	<0.005
Endosulfan II	mg/kg dry wt	*0.01*	<0.01	<0.01	<0.01	<0.01
Endosulfan sulfate	mg/kg dry wt	*0.005*	<0.005	<0.005	<0.005	<0.005
Endrin	mg/kg dry wt	*0.05*	<0.05	<0.05	<0.05	<0.05
Endrin aldehyde	mg/kg dry wt	*0.01*	<0.01	<0.01	<0.01	<0.01
Endrin ketone	mg/kg dry wt	*0.005*	<0.005	<0.005	<0.005	<0.005
gamma-BHC	mg/kg dry wt	*0.005*	<0.005	<0.005	<0.005	<0.005
Heptachlor	mg/kg dry wt	*0.005*	<0.005	<0.005	<0.005	<0.005
Heptachlor epoxide	mg/kg dry wt	*0.005*	<0.005	<0.005	<0.005	<0.005
Hexachlorobenzene	mg/kg dry wt	*0.005*	<0.005	<0.005	<0.005	<0.005
Methoxychlor	mg/kg dry wt	*0.01*	<0.01	<0.01	<0.01	<0.01
trans-nonachlor	mg/kg dry wt	*0.01*	<0.01	<0.01	<0.01	<0.01
trans-Chlordane	mg/kg dry wt	*0.01*	<0.01	<0.01	<0.01	<0.01
Chlordane (sum)	mg/kg dry wt	*0.02*	<0.020	<0.020	<0.020	<0.020
TCMX (Surrogate)	%	*1*	100.8	99.4	99.1	97.7

Method Summary

Elements in Soil
Samples dried and passed through a 2 mm sieve followed by acid digestion and analysis by ICP-MS. In accordance with in-house procedure based on US EPA method 200.8.

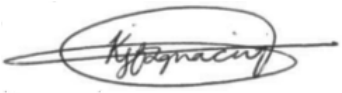
Moisture
Moisture content is determined gravimetrically by drying at 103 °C.

PAH in Soil
Solvent extraction, silica cleanup, followed by GC-MS analysis.
Benzo[a]pyrene TEQ (LOR): The most conservative TEQ estimate, where a result is reported as less than the limit of reporting (LOR) the LOR value is used to calculate the TEQ for that PAH.
Benzo[a]pyrene TEQ (Zero): The least conservative TEQ estimate, PAHs reported as less than the limit of reporting (LOR) are not included in the TEQ calculation.
Benzo[a]pyrene toxic equivalence (TEQ) is calculated according to *'Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health'*. Ministry for the Environment. 2011. (In accordance with in-house procedure).

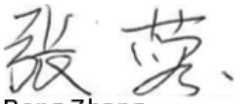
OCP in Soil
Samples are extracted with hexane, pre-concetrated then analysed by GC-MSMS.
(Chlordane (sum) is calculated from the main actives in technical Chlordane: Chlordane, Nonachlor and Heptachlor). (In accordance with in-house procedure).

Total DDT
Sum of DDT, DDD and DDE (4,4' and 2,4 isomers)

Sharelle Frank, B.Sc. (Tech)
Technologist



Kimmy Ignacio, B.Sc.
Technician



Rong Zhang
Technician

FocusAnalytics

IANZ ACCREDITED LABORATORY

Tests indicated as not accredited are outside the scope of the laboratory's accreditation

Certificate of Analysis – Asbestos in Soil

Client: Williamson Water and Land Advisory
Client Contact: Wendi Williamson
Tel: 027 5368 751
Email: wendi.williamson@wwla.kiwi

Focus Analytics Ltd
Unit 3
57 Walls Road
Penrose
Auckland 1061
Tel: +64 (0) 9 525 0568

Site: Hobsonville

Date sample(s) received: 14/01/2021

Date sample(s) analysed: 20/01/2021

Samples taken by: Cherise Martin

Certificate / Job Number: S-21-0005V2/ WWLA0313

This is an amended certificate to replace S-20-0005. Change has been made to Site Address at client's request.

Qualitative Analysis of Asbestos

Lab ID	Sample ID	Sample Details	Sample Weight (g) *(as received)*	Fibres Identified
1	HA4	0.2 – 0.4	515 g	**ORF, NAD**
2	HA5	0.2 – 0.4	475 g	**ORF, NAD**
3	HA6	0.3 – 0.5	649 g	**ORF, NAD**
4	HA7	0.1 – 0.3	441 g	**ORF, NAD**
5	HA8	0.1 – 0.3	548 g	**ORF, NAD**
6	HA11	0.0 – 0.1	582 g	**ORF, NAD**
7	HA12	0.0 – 0.1	577 g	**ORF, NAD**
8	HA13	0.0 – 0.1	579 g	**ORF, NAD**

Fibre Identification Key:

CHR – Chrysotile (White Asbestos)
AMO – Amosite (Brown / Grey Asbestos)
CRO – Crocidolite – (Blue Asbestos)
UMF – Unknown Mineral Fibre
ORF – Organic Fibre
SMF – Synthetic Mineral Fibre
NFD – No Fibres Detected
NAD – No Asbestos Detected

Scope of Accreditation:

1. The analytical comments marked (*) stated in the semi-quantitative analysis and the calculations in the semi-quantitative analysis of asbestos in soil are beyond Focus Analytics scope of accreditation.
2. The laboratory is not responsible for sampling errors when we have not taken the sample.
3. This certificate should be read in its entirety and shall not be reproduced except in full, without written approval of the laboratory.

FocusAnalytics

IANZ ACCREDITED LABORATORY

Tests indicated as not accredited are outside the scope of the laboratory's accreditation

*Semi Quantitative Analysis of Asbestos

***Semi Quantitative Analysis of Asbestos in Soil**

Date sample(s) received: 14/01/2021
Date sample(s) analysed: 20/01/2021

Lab ID	Sample ID	As received weight (g)	Dry weight (g)	Weight (g) (ashed)	Moisture (%)	Fraction size (mm)	Ashed Fraction weight (g)	Asbestos product weight (g)	Asbestos product type	Percentage of asbestos in product [a]	Total mass of Asbestos in sample [b]	Bonded Asbestos containing material in sample (% w/w) [c]	Asbestos as FA (% w/w) [d]	Asbestos as AF (% w/w) [e]	Total Fibrous Asbestos + Asbestos Fines (Friable) (% w/w) [f]
1	HA4	514.6	355.9	346.7	30.8	(>10mm) Fraction	89.4	-	NAD	-	-	-	<0.001	<0.001	<0.001
						(10-2mm) Fraction	117.5	-	NAD	-					
						(<2mm) Fraction	138.2	-	NAD	-					
2	HA5	474.9	359.4	354.3	24.3	(>10mm) Fraction	162.2	-	NAD	-	-	-	<0.001	<0.001	<0.001
						(10-2mm) Fraction	145.3	-	NAD	-					
						(<2mm) Fraction	46.5	-	NAD	-					
3	HA6	648.6	481.0	474.4	25.8	(>10mm) Fraction	185.8	-	NAD	-	-	-	<0.001	<0.001	<0.001
						(10-2mm) Fraction	205.0	-	NAD	-					
						(<2mm) Fraction	82.6	-	NAD	-					
4	HA7	441.0	336.7	332.2	23.6	(>10mm) Fraction	164.8	-	NAD	-	-	-	<0.001	<0.001	<0.001
						(10-2mm) Fraction	117.4	-	NAD	-					
						(<2mm) Fraction	48.9	-	NAD	-					

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Tests indicated as not accredited are outside the scope of the laboratory's accreditation

*Semi Quantitative Analysis of Asbestos

*Semi Quantitative Analysis of Asbestos in Soil															
Date sample(s) received: 14/01/2021 **Date sample(s) analysed**: 20/01/2021															
Lab ID	Sample ID	As received weight (g)	Dry weight (g)	Weight (g) (ashed)	Moisture (%)	Fraction size (mm)	Ashed Fraction weight (g)	Asbestos product weight (g)	Asbestos product type	Percentage of asbestos in product [a]	Total mass of Asbestos in sample [b]	Bonded Asbestos containing material in sample (% w/w) [c]	Asbestos as FA (% w/w) [d]	Asbestos as AF (% w/w) [e]	Total Fibrous Asbestos + Asbestos Fines (Friable) (% w/w) [f]
5	HA8	548.4	400.9	391.1	26.9	(>10mm) Fraction	186.5	-	NAD	-	-	-	<0.001	<0.001	<0.001
						(10-2mm) Fraction	145.1	-	NAD	-					
						(<2mm) Fraction	58.3	-	NAD	-					
6	HA11	581.9	514.3	501.3	11.6	(>10mm) Fraction	92.1	-	NAD	-	-	-	<0.001	<0.001	<0.001
						(10-2mm) Fraction	255.5	-	NAD	-					
						(<2mm) Fraction	153.7	-	NAD	-					
7	HA12	576.7	529.8	517.8	8.1	(>10mm) Fraction	207.5	-	NAD	-	-	-	<0.001	<0.001	<0.001
						(10-2mm) Fraction	241.3	-	NAD	-					
						(<2mm) Fraction	68.7	-	NAD	-					
8	HA13	579.4	532.8	525.8	8.0	(>10mm) Fraction	23.6	-	NAD	-	-	-	<0.001	<0.001	<0.001
						(10-2mm) Fraction	265.5	-	NAD	-					
						(<2mm) Fraction	235.3	-	NAD	-					

Analysis Method:
Samples submitted have been analysed to determine the mass fraction of asbestos in soil using low powered stereo microscopy followed by polarised light microscopy (PLM) including dispersion staining techniques as documented in (AS *4964*-2004*), Method for the qualitative identification of asbestos in bulk samples*, BRANZ, *New Zealand Guidelines for Assessing and Managing Asbestos in Soils*:2017 and (TP 04) our internal method *Technical Procedure for Qualitative and Semi Qualitative analysis of asbestos in soil.*

Interpretation of Key:
[a] Percentage of Asbestos in product is adopted from *HSG 264* - 2012, Asbestos the survey guide, Appendix 2, ACMS in buildings and categorized in our internal Technical Procedure (TP04) for Qualitative and Semi-Quantitative analysis of asbestos in soil. A dash (-) denotes that there was no asbestos found in that fraction.

[b] Total Mass of Asbestos is the sum mass of asbestos by asbestos type in product type([a]) plus the mass of free fibre asbestos. A dash (-) denotes that there was no total mass of asbestos calculated in that fraction.

[c] Bonded Asbestos Containing Material in the greater than 10mm fraction as percentage of the total sample (% w/w). A dash (-) denotes that there was no bonded asbestos containing materials found in that fraction.

[d] Asbestos as Fibrous Asbestos (FA) in greater than 10mm fraction as percentage of total sample (% w/w).

[e] Asbestos as Asbestos Fines (AF) in less than 10mm fraction as a percentage of total sample (% w/w).

[f] Total Friable Asbestos combining Fibrous Asbestos and Asbestos Fines as the percentage weight for weight of the total sample (% w/w).

Analyst Name: Ricky Singh **Analyst Signature:** 

Reviewed By KTP: Rosavina Palmer **Reviewer Signature:**