WILLIAMSON
WATER & LAND ADVISORY

Unit 10 | 1 Putaki Drive | Kumeu
Auckland | New Zealand
s 9(2)(a)
s 9(2)(a)
W www.wwla.kiwi

Unispot Great South Ltd
435 Khyber Pass Road
Newmarket

Attention: Bob Zhou
By email: s 9(2)(a)

28 June 2022 WWLA0642

470 Great South Road, Papakura – Ground Contamination Review

Williamson Water & Land Advisory Ltd (WWLA) is pleased to present this letter summarising the findings of our previous investigation at the above site in the context of the updated development plans as prepared by Unispot Great South Ltd (Unispot) (**Appendix A**).

1. Introduction

Unispot proposes to develop the above site (**Figure 1**) into a residential development. The development will include a park in the centre of the site and will retain an existing stormwater pond in the south of the site. Proposed development plans are included in **Appendix A**.

Figure 1: Site location, outlined in red (Image Source: Auckland Council GeoMaps)

WWLA has previously investigated the site for a similar development in 2021. The Preliminary and Detailed Site Investigation report (PSI/ DSI)[1] prepared at that time also included a Site Management Plan (SMP) to support resource consent applications. The 2021 PSI/ DSI is attached as **Appendix B**. This letter summarises the findings of the 2021 PSI/ DSI in the context

[1] 3 November 2021. *470 Great South Road Papakura, Preliminary and Detailed Site Investigation*. Prepared for Greg Hayhow, WWLA Ref WWLA0472rev1.

of the new Unispot development proposal, with updated considerations for soil management where low level contamination is present.

1.1 Scope of work

Preparation of this letter has involved:

- Review of the new development plans prepared for Unispot Ltd.
- Review of the 2021 PSI/ DSI and SMP to confirm they are relevant to the Unispot development plans.
- Consideration of soil management requirements in the context of the Unispot development plans.
- Consideration of consenting requirements in the context of the Unispot development plans.

1.2 Legislative requirements

This letter has been prepared, reviewed and certified by Suitably Qualified Environmental Practitioners (SQEP) as described in the NESCS Users Guide. CVs confirming the SQEP status of our contaminated land specialists are available on request.

The attached supporting documents were prepared in general accordance with published industry best practice guidance, as stated in Section 1.2 of the PSI/ DSI report.

This letter, in combination with the attached PSI/ DSI and SMP, are sufficient to support resource consent applications under the NESCS[2] and Section E30 of the AUP[3].

2. Proposed Development

The development plans provided to us show the site will be subdivided into eleven (11) super-lots for high-density residential development, a central park, and a stormwater management area (positioned in the existing stormwater pond location). The development will be serviced by a central road system with an entrance off Gatland Road in the west and Great South Road in the north. Earthworks plans are not yet available but may be in the order of the 2021 development plans, which proposed 38,000 m^3 of cut and 34,500 m^3 of fill, leaving approximately 3,500 m^3 requiring offsite disposal.

The previous (2021) development plans varied only in that a portion of the current super lot A (corner of Gatland and Great South Roads) was proposed for commercial land use in 2021 (now proposed for residential), and a larger recreational/ park area is proposed in the Unispot development plans relative to the 2021 plans.

3. PSI/ DSI Summary

The PSI/ DSI report comprised a HAIL[4] assessment (review of historical aerial photographs, the property files for the site and a site walkover inspection), followed by soil sampling that both targeted potential HAIL activities, and characterised general soil conditions across the site. The key findings of the PSI/ DSI were (PSI/ DSI section numbers in brackets, refer to the PSI/ DSI report for further information):

Site description	The site walkover confirmed the site to be occupied by rural and rural residential properties:

[2] National Environmental Standards for Assessing and Managing Contaminants in Soil to Protect Human Health (NESCS) Regulations (2011).
[3] Auckland Unitary Plan: Operative in Part
[4] Ministry for the Environment's (MfE's) Hazardous Activities and Industries List (HAIL)

(Section 2.3)	• The property at 470 Great South Road contains a modern brick home with a concrete pad at the rear from a former sleepout. • 476 Great South Road is used for grazing (paddocks) with a stormwater pond at the southern boundary. Ground surrounding the stormwater pond was raised; fill from the excavation of the pond has been used to contour the pond margins. • 2 Gatland Road is a residential property with a house, swimming pool and associated garages and sheds. Suspected asbestos soffits and roofing tiles were in very good, condition. • 8 Gatland Road comprises a large modern home and associated garages and sheds. A hay shed, chicken coops and small garden sheds were present north of the house with very small quantities of drench chemicals present. Cattle yards are located on the Gatland Road frontage.
HAIL Activities (Section 3.2)	The following HAIL activities were identified in the HAIL assessment: • Pesticide use for cattle drenching (*A8: Livestock dip or sprayrace operations*). • Lead paint and/or leaching from treated timber structures or zinc roofing (*potentially I: Intentional or accidental release of a contaminant in sufficient quantity to present a risk to human health or the environment*) While Activity A8 was confirmed to have occurred, Activity I was dependant on soil sampling to determine if contaminants from building structures were present in sufficient quantity to present a risk to human health or the environment. Asbestos use on former and current buildings was determined to not be a HAIL due to their being no evidence of the former sheds (or knowledge of their construction materials) and because asbestos cladding on a current building at 2 Gatland Road is in good condition with no deterioration. Placement of fill around the stormwater pond was also not a HAIL activity due to it being site won material with very low potential for contamination.
Soil sampling (Section 4)	The objective of soil sampling was to identify contamination associated with the above HAIL activities, and also to characterise general site soils for offsite disposal. A combination of targeted and grid-based sampling was undertaken. A sampling plan is reproduced in **Figure 2**. Investigations encountered topsoil to 0.4 to 0.5 m BGL, underlain by silty weathered volcanic ash. Fill materials near the pond comprised reworked Puketoka Formation sediments with trace gravel and ash.
Sampling results (Section 4.6)	Results were compared to the relevant NESCS criteria for high-density residential use, and also to environmental discharge criteria as per the AUP. Volcanic values were used for background comparison. The results showed: • No asbestos, polycyclic aromatic hydrocarbons (PAHs) or organochlorine pesticides (OCPs) were detected in any of the samples tested. • Fill and general site soils were at background concentrations for all contaminants tested. • Two areas showed concentrations of one or more metals above background concentrations: - Sample S5 (from the former sleepout at 470 Great South Road) has elevated levels of arsenic, cadmium and lead. Lead concentrations slightly exceed environmental discharge criteria (322 mg/kg c.f. 250 mg/kg). Lead levels of this magnitude are commonly attributed to lead paint. While no flakes of lead paint were observed in the soil, it is possible that 'dust' remains from the original building. Elevated arsenic and cadmium are suggestive of storage of farm drench and fertiliser. It may be that the former 'sleepout' was actually a former storage shed for chemicals and farm equipment (or served both purposes at different times). - Sample S6 (the existing cattle yards) contains elevated concentrations of arsenic (slightly exceeding human health criteria for high-density residential use; 51.6 mg/kg c.f. 45 mg/kg), with cadmium also above background levels. This is typical where drenches are applied and is highly likely to be confined to topsoil.

Conceptual site model (CSM) (Section 5)	Overall, very little contamination is present at the site. Two 'hot spots' are present, within the current cattle sheds and immediately surrounding the concrete floor from the former sleepout/shed. These areas should be remediated in isolation prior to bulk earthworks commencing so that soil can be appropriately managed without cross contamination. The CSM shows that there is a potential risk to ecological receptors from lead, and to future site workers from arsenic. However, these pathways will be incomplete if appropriate earthworks controls are in place, and if arsenic contamination is removed from site prior to bulk earthworks commencing.

Figure 2: PSI/ DSI sampling plan. Site features shown with blue dots, samples with red and orange dots.

4. Development Implications

4.1 Hot spot remediation options

The two hot spots (former sleepout and cattle yards) require remediation to ensure that the pathways for contamination to reach ecological and future residential receptors is incomplete. Two options were proposed in Section 6.1 of the PSI/ DSI report and remain unchanged for the Unispot development as the proposed land use is unchanged:

1. Excavation and removal offsite (with disposal to a managed or licensed landfill); or
2. Soil mixing onsite as part of enabling works.

For both areas, soil mixing (Option 2) is likely to be a viable option, given the low levels of contamination (and low volumes of contaminated material) and the physical properties of the soils. However, soil mixing does have some risk in that it can spread contamination if not undertaken properly. If soil mixing is selected as the preferred remedial method, then it is

recommended that the mixed soil is placed within the park area where a higher threshold of contamination is allowed from a human health perspective (environmental thresholds are the same regardless of the land use). This is also practical from the perspective that the material will be topsoil which is not geotechnically suitable for construction.

Given the small quantities of soil expected to require remediation (16 m^3 for the former sleepout and 26 m^3 for the cattle yards; approximately 3 truck and trailer loads), disposal offsite (Option 1) may be the more practical option. While this has a higher upfront cost (managed fill/ licensed landfill disposal fees), the contamination is completely removed from site and earthworks are able to proceed under standard earthworks controls and procedures. Given that there is also expected to be a surplus of topsoil during earthworks, this would be a pragmatic approach.

4.2 General development implications

Section 6.3.2 of the PSI/DSI sets out the soil disturbance requirements for the site. These are unchanged for the proposed Unispot development. The key points are:

- Remediation of the two hot spots should occur prior to bulk earthworks commencing. Specific controls will be required around each hot spot to prevent cross-contamination of clean soils.
- Validation sampling will be required by the contaminated land specialist (SQEP) on completion of remediation (regardless of the method chosen) to confirm that the remediation objectives have been met.
- An asbestos survey should be completed prior to demolition at 2 Gatland Ave. A SQEP should then undertake a visual inspection of the ground surface following demolition to confirm that demolition has not resulted in contamination of surrounding soils.
- Following satisfactory remediation and asbestos clearance, bulk earthworks can proceed under standard controls and procedures (Auckland Council's GD05). Soil disposal for the remainder of the site can be to cleanfill, with the approval of the receiving fill (retention on site is also possible from a contamination perspective).
- Any unexpected contamination can be managed through the procedures in the SMP, included in Appendix C of the PSI/ DSI report. This SMP is still relevant to the proposed works.

5. Consenting Implications

Consenting implications for the original development are set out in Section 6.2 of the PSI/ DSI report. Given that the proposed land use and remediation requirements are unchanged, the recommendations for the Unispot development are also unchanged. This assumes a similar level of soil disturbance works. In summary:

- The NESCS applies to the proposed works on the site – for both soil disturbance and land use change/ subdivision.
- Soil disturbance is a Permitted Activity under the NESCS (Rule 8(3)) because the volumes of earthworks required for hot spot remediation are well below the permitted activity thresholds.
- Subdivision and land use change are also a Permitted Activity (Rule 8(4)) because it is highly unlikely there will be a risk to human health if the activity is done to the piece of land, as low levels of contamination will be removed/ remediated during enabling works.
- For the AUP, works will also be a Permitted Activity as the volume of earthworks required to remediate the former sleepout hot spot is 16 m^3, well below the 200 m^3 allowed by permitted activity Rule E30.6.1.2. To meet the other permitted activity provisions, Council must be notified of works commencing, works must be less than 2 months in duration and discharges must not contain separate phase hydrocarbons. We expect all these provisions can be met.

- The SMP provided in the appendix to the PSI/ DSI report sets out requirements for contractors undertaking remediation works, and in the event of unexpected contamination being encountered. This is also required to satisfy the Permitted Activity rules under the NESCS.

6. Closure

To summarise, the PSI/ DSI report prepared for the original development in 2021 is relevant to the works proposed by Unispot at the site.

We recommend that hot spots are remediated under the permitted activity framework of the NESCS and the AUP prior to bulk earthworks commencing. This will mean that sources of contamination that may impact future residents and the environment are removed and that bulk earthworks can proceed under standard controls.

The PSI/ DSI report, with attached SMP, should be provided to Auckland Council to support permitted activity provisions. Prior to works commencing, the SQEP shall be engaged to undertake validation sampling for remediation activities, and to provide advice to the contractor on contaminated land management.

We wish you the best for lodgement and granting of consents for your proposed development.

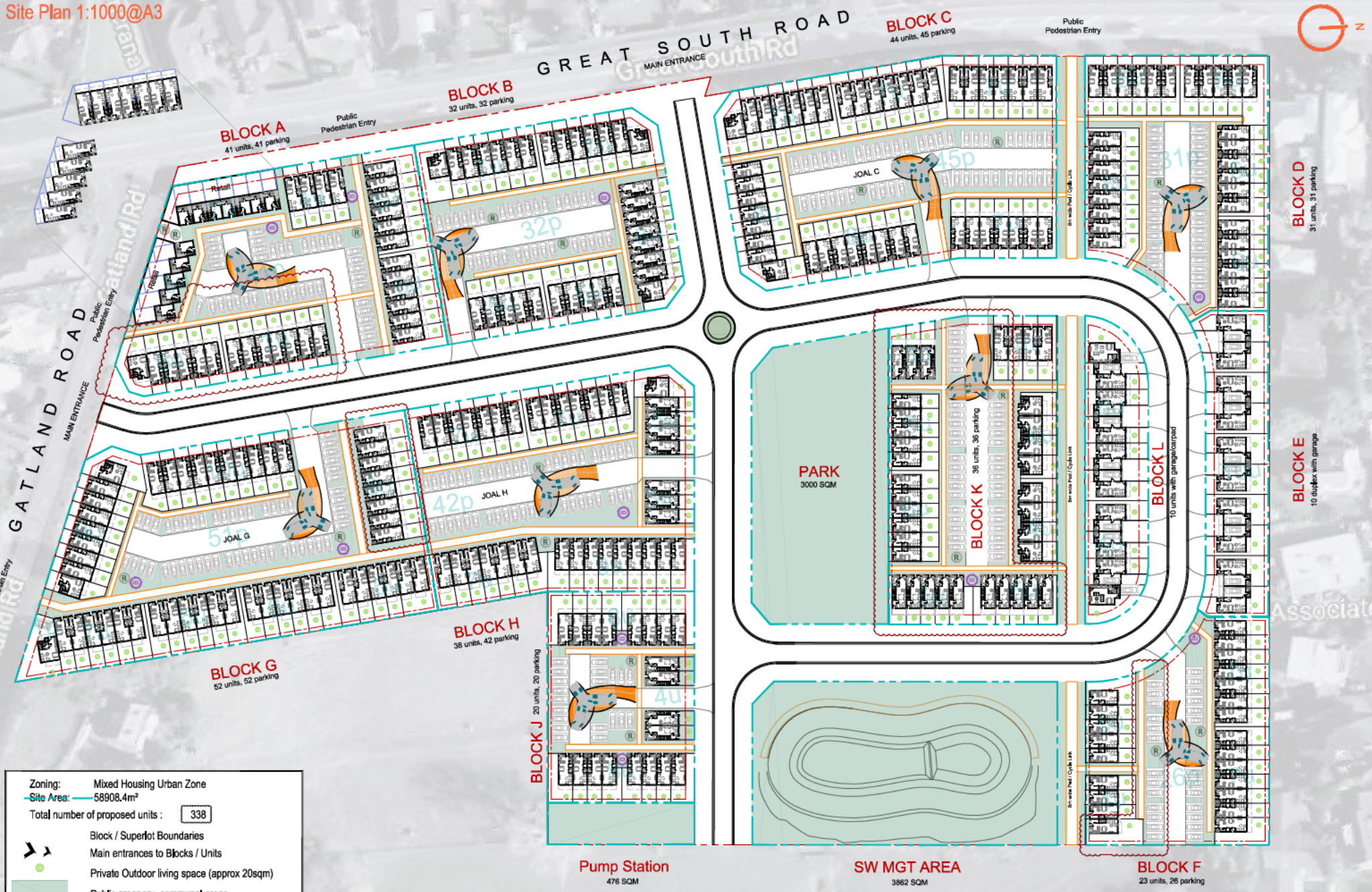
Yours sincerely,

Wendi Williamson
Principal Contaminated Land and Environmental Specialist | s 9(2)(a)
s 9(2)(a) | www.wwla.kiwi

Attached:

Unispot development plan
WWLA Preliminary and Detailed Site Investigation report

Site Plan 1:1000@A3

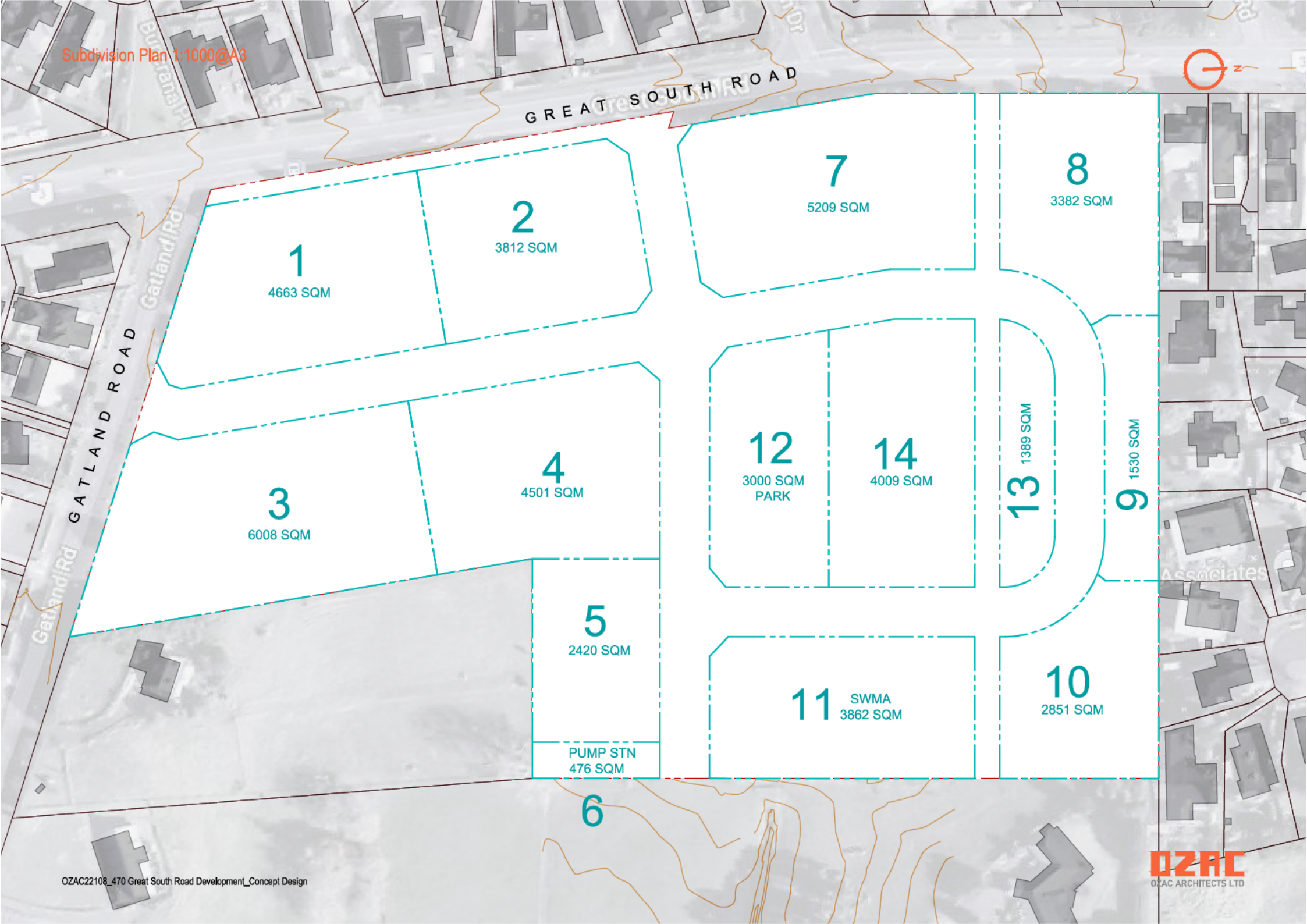


Zoning: Mixed Housing Urban Zone
Site Area: 58908.4m²
Total number of proposed units : 338

- Block / Superlot Boundaries
- Main entrances to Blocks / Units
- Private Outdoor living space (approx 20sqm)
- Public greenery, communal areas
- Communal Rubbish Enclosure
- Communal Bike Parking

OZAC22108_470 Great South Road Development_Concept Design

OZAC
OZAC ARCHITECTS LTD


Subdivision Plan 1:1000@A3
GREAT SOUTH ROAD
GATLAND ROAD
Gatland Rd
1
4663 SQM
2
3812 SQM
3
6008 SQM
4
4501 SQM
5
2420 SQM
PUMP STN
476 SQM
6
7
5209 SQM
8
3382 SQM
9
1530 SQM
10
2851 SQM
11
SWMA
3862 SQM
12
3000 SQM
PARK
13
1389 SQM
14
4009 SQM
OZAC22108_470 Great South Road Development_Concept Design
OZAC
OZAC ARCHITECTS LTD

WILLIAMSON
WATER & LAND ADVISORY

470 Great South Road, Papakura

Preliminary and Detailed Site Investigation (Ground Contamination)

GREG HAYHOW

WWLA0472 | Rev. 1

3 November 2021

WWLA

470 Great South Road, Papakura

Project no:	WWLA0472
Document title:	Preliminary and Detailed Site Investigation (Ground Contamination)
Revision:	1
Date:	3 November 2021
Client name:	Greg Hayhow
Project manager:	Wendi Williamson
Author(s):	Lauren Windross
File name:	s 9(2)(a)

Williamson Water & Land Advisory

PO Box 314,
Kumeu 0841,
Auckland
s 9(2)(a)

Document history and status

Rev	Date	Description	Prepared	Reviewed
1	3 November 2021	Ground contamination investigation	Lauren Windross	Wendi Williamson

Distribution of copies

Rev	Date issued	Issued to	Comments
1	3 November 2021	Greg Hayhow, Campbell Brown Planning	Issue for Consent Application

Investigation Summary

Williamson Water & Land Advisory (WWLA) has prepared this Preliminary and Detailed Site Investigation into ground contamination for Mr Greg Hayhow to inform consenting and earthworks management for the proposed residential subdivision at 470-476 Great South Road and 2-8 Gatland Road, Papakura (the site). The objective of this investigation was to determine the potential for contamination, the actual contamination present and implications for consenting, design and construction. The key findings of this report are:

History and potential for contamination [Section 3]	**HAIL activities (those included on the Ministry for the Environment's Hazardous Activities and Industries List) are confirmed on the site.** The site has been pastoral for its known history, with more recent construction of dwellings. Activities with potential to cause ground contamination (HAIL's) identified relate largely to: • Placement of fill from the pond excavation (Activity I). • Use of asbestos in buildings (if degraded: Activity E1). • Livestock spray race/ drenching (Activity A8). • Leaching of metals from building products e.g. lead paint (Activity I) If present, contamination is likely to be localised and confined to surface soils, with minimal potential for deeper or widespread contamination.
Sampling observations and laboratory results and discussion [Section 4]	**Testing confirms contaminant levels in soil within the proposed upgrade areas are low, generally below published background. Where contaminants are present, they are in very localised positions:** • Lead in the immediate vicinity of the former shed/ sleepout is elevated above discharge criteria. This is likely due to lead-based paint. While Mr Hayhow understands the building was a sleepout, it may have also been used as a shed for farm-related storage. • Arsenic in topsoil in the cattle yards exceeds human health criteria for high-density residential use. Arsenic is common as a result of historic pest control on animals.
Conceptual site model (CSM) [Section 5]	A CSM is a process used to assess ground contamination risks in the context of the site development. For this site, medium to high-density residential use if expected in the future. The two hot spots described above will need to be remediated with the appropriate controls in place to prevent a effects on future residents or the environment. Provided this is undertaken, the risk will be mitigated/ removed. Controls for this activity are set out in the Site Management Plan (SMP) attached to this report.
Consenting implications [Section 6.1]	**Ground contamination related rules are triggered but the remedial soil disturbance and future land use change/ subdivision meet permitted activity provisions.** • The NESCS applies to the site as HAIL activities have occurred and several contaminants exceed published background values. However, due to the isolated nature of contamination, the volumes of contaminated soil to be removed are very small and soil disturbance can be undertaken as a permitted activity. Land use change/ subdivision is also permitted as there will be no risk to human health following remediation. • Earthworks are also permitted under AUP Section E30, again because of the limited volume and duration of contaminated soil disturbance proposed. A site management plan (SMP) has been prepared to support permitted activity provisions. The SMP informs Councils and contractors how bulk earthworks will be managed and how potential discharges will be mitigated. If the SMP is adhered to during the works, the ground contamination-related effects will be less than minor.
Construction implications [Section 6.2]	**The key requirements during soil disturbance are ensuring earthworks controls are in place, the appropriate reuse and disposal of soils, and management of unexpected contamination.** Key actions (as set out in the attached SMP) during the works include: • Appropriate controls during the remediation of two hot spots. This includes appropriate offsite disposal (managed/ licensed landfill or bulk mixing to combine and reduce contaminant levels with those cleaner surrounding soils) and control of discharges from the two areas. • Asbestos survey before demolition of 2 Gatland Road, and soil clearance by a SQEP. • Standard best practice earthworks controls and procedures are applicable following remediation, with surplus soils suitable for cleanfill disposal.

Contents

Appendices:

1. Introduction

Williamson Water & Land Advisory (WWLA) has prepared this Preliminary and Detailed Site Investigation (combined PSI and DSI) report to assist Mr Greg Hayhow with the proposed high-density subdivision of 2-8 Gatland Road and 470-476 Great South Road, Papakura (referred to as 'the site'), location provided in **Figure 1**). The site has recently been through the Private Plan Change process as Plan Change 58.

Figure 1. Site location, outlined in red (Image source: Auckland Council GeoMaps).

1.1 Background

Mr Hayhow proposes to subdivide the existing four rural/ rural residential properties to develop a multi-lot high-density residential subdivision with associated roading, services and recreational areas. The development will be accessed off both Gatland Road on the southern boundary and Great South Road on the western boundary. The existing stormwater pond will be expanded to meet the stormwater capacity and treatment requirements of the new development, with a recreational area developed around the enlarged pond. Approximately 38,000 m^3 of cut is proposed with 34,500 m^3 of fill, leaving approximately 3,500 m^3 requiring offsite disposal. This is expected to be primarily topsoil. The maximum cut depth proposed is -5.5 m to expand the stormwater pond. A cut-fill plan is provided in **Appendix A** and also shows the approximate development outline.

Horticulture was common in the surrounding area in the past. Horticulture, or specifically the use of persistent pesticides, is an activity included on the MfE's Hazardous Activities and Industries List (HAIL). Activities on the HAIL have the potential to cause ground contamination and can trigger the contamination rules of the Auckland Unitary Plan: Operative in Part (AUP) and NESCS[1]. There may also be earthworks implications to identify, with

[1] National Environmental Standards for Assessing and Managing Contaminants in Soil to Protect Human Health (NESCS) Regulations (2011).

opportunities and constraints on materials management, consenting and staging to be considered by the optioneering and design team.

This investigation has been prepared in accordance with requirements for a PSI and DSI, as set out in the NESCS and NESCS User's Guide[2] and other national guidance set out in **Section 1.3**. Adherence to these industry standards ensures industry best practice is achieved and enables this report to support resource consent applications.

1.2 Scope of work

The scope of this investigation comprised:

1. Review of the site's history including:
    - Historical aerial photographs sourced from Auckland Council, Retrolens (www.retrolens.nz), and Google Earth;
    - Property files obtained from Auckland Council.
2. Site walkover inspection by a Senior Contaminated Land Specialist, accompanied by Mr Hayhow.
3. Assessment of the potential for contamination, based on historical land use and evaluation of that against the HAIL.
4. Inspection of ground conditions and collection of soil samples to investigate potential impacts of identified HAIL activities within the site.
5. Laboratory testing for potential contaminants identified by the HAIL Assessment (Task 3 above).
6. Development of a conceptual site model (CSM) to assess contaminant risks and mitigation requirements during the works and post construction.
7. Evaluation of consenting requirements and earthworks/construction implications for subdivision and development for residential use.

1.3 Legislative requirements

WWLA has undertaken this investigation and prepared the report in general accordance with published industry best practice guidance, including:

- MfE (revised 2021). Contaminated Land Management Guideline No. 1: Reporting on Contaminated Sites in New Zealand (CLMG 1).
- MfE (revised 2021). CLMG No. 5: Site Investigation and Analysis of Soils.
- BRANZ (2017). New Zealand Guidelines for Assessing and Managing Asbestos in Soils (NZ Asbestos Guidelines).
- NESCS Users Guide (2012).

This report has been prepared, reviewed and certified by Suitably Qualified Environmental Practitioners (SQEP) as described in the NESCS Users Guide. CVs confirming the SQEP status of our contaminated land specialists are available on request.

[2] NESCS Users Guide (April 2012).

2. Site Description

2.1 Site identification

The site comprises four land parcels as described in **Table 1** and shown on **Figure 1**. The site is located south of Papakura town centre/ neighbourhood and is bound by Great South Road to the west, Gatland Road along the south, residential properties to the north and west of Great South Road, and rural properties to the east.

Note: 2 Gatland Road was part of the Plan Change but is not currently part of the resource consent application (subdivision). However, it has been assessed as part of this report so that when it is able to be incorporated into the development at a later date, no further contamination reporting is required.

Table 1. Site identification

Address	Legal description	Certificate of title	Area
470 Great South Road	Lot 1 DP 190539	NA120B/968	4406 m²
476 Great South Road	Lot 2 DP 398232	392063	25,092 m²
2 Gatland Road	Pt Allot 15 Parish of Opaheke	NA1005/239	1,808 m²
8 Gatland Road	Lot 1 DP 398232	392062	29,419 m²

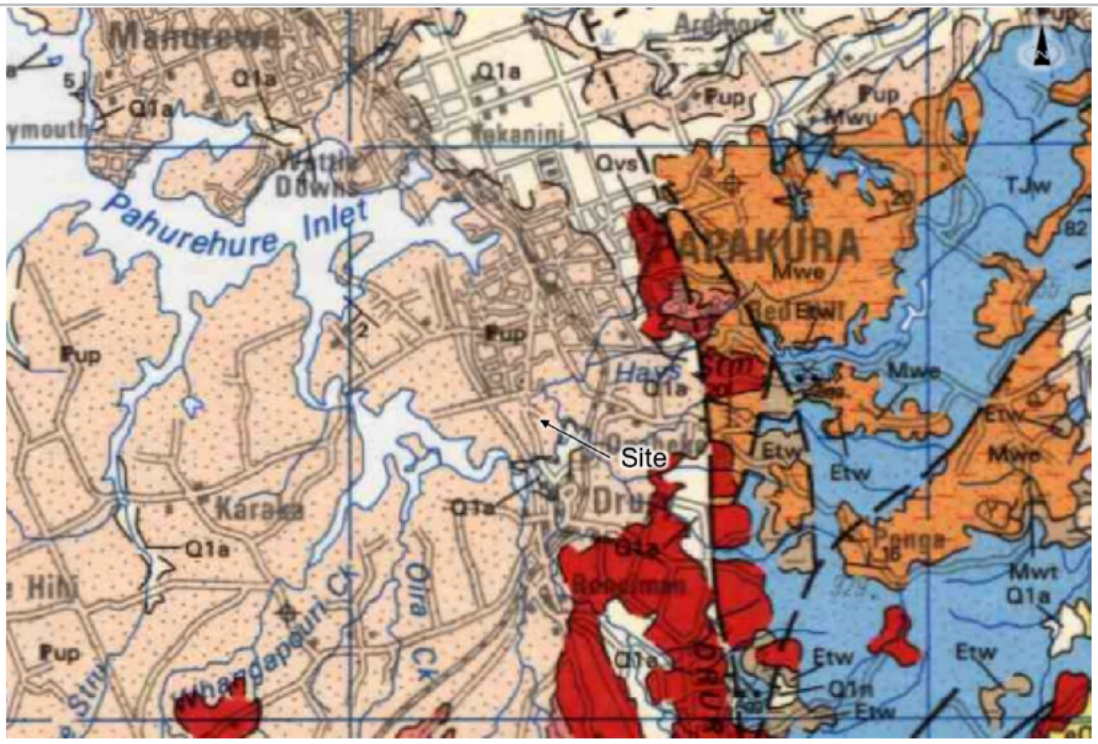
2.2 Environmental setting

The environmental setting is described in **Table 2**. The features of the environmental setting are considered in the context of their potential to affect the distribution, mobility and form of contaminants (if present). These variables set the scene and inform the conceptual site model (CSM) evaluation (**Section 5**) if it is established that activities with potential to cause ground contamination have occurred.

Table 2: Environmental setting.

Topography	*The topographical nature of the site impacts where contaminants might migrate to if present.* The site is gently undulating with a gradual fall from approximately 24 mRL in the west to 11 mRL at the pond in the east. There is a central east-west aligned shallow gully feature and the Gatland Road frontage is on a relatively elevated plateau.
Geology	*Geological conditions are considered in the context of describing the conceptual site model (CSM; **Section 5**) should a potential for contamination be identified by the desk study. For example, more porous soils can enable contaminants (if present) to move more quickly and potentially further than clay-rich soils that retain/ bind or prevent penetration of contaminants.* Published geology[3] (**Figure 2**) shows the site is underlain by Puketoka Formation silts, sands and muds. Peat units are also common within the Puketoka Formation. Puketoka Formation sediments are typically highly weathered and clay-rich near the surface. A Geotechnical Investigation Report prepared by CMW Geosciences[4] included assessment of 29 hand augers and six (6) test pits across the site. Investigations encountered topsoil overlying a layer (up to approximately 1 m thick) of volcanic ash then Puketoka Formation sediments.

[3] GNS, QMap3: Geological map of the Auckland area, 1:250,000.
[4] CMW Geosciences, 31 August 2021. Great South Road/ Gatland Road, Papakura. Geotechnical Investigation Report. Prepared for Greg Hayhow, Ref AKS2021-0005AB Rev 0

	 **Figure 2. Published geology: Pup refers to Puketoka Formation.**
Hydrogeology	*Hydrogeological conditions affect potential risk of contaminant (if present) entering and being transported in groundwater.* CMW Geosciences installed piezometers in several hand auger boreholes during their investigation. Measured depths to groundwater in the months following their investigation were generally 2 to 3 m below ground (including both summer and winter conditions). Shallow groundwater is expected to flow east to Slippery Creek, but regional/deep groundwater is l kely to flow west toward the Manukau Harbour.
Surface water bodies	*Surface water features are potential receiving environments should contaminants be present on a site.* A stormwater pond sits on the eastern boundary of the site and flows out to Slippery Creek approximately 270 m to the east.
Sensitive receptors	*Sensitive environmental receptors could include aquatic or terrestrial ecosystems. This is not an ecological assessment but is instead an initial review of the surrounding environment to assess where contaminants (if present) on the site could migrate to and affect.* There are no sensitive ecosystems in the vicinity of the site with the exception of Slippery Creek which receives stormwater from the site.
	Sensitive human receptors could for example be children at a school or kindergarten on or adjacent to a site. Workers on industrial land (including or adjacent to a site) would be considered less sensitive. This people receptor interpretation informs the CSM and also future guideline value selection for evaluation of soil data. The site is located on the edge of a residential area, with farmland on remaining sides. Neighbouring residents can be considered sensitive receptors.

2.3 Site layout

A Senior Contaminated Land Specialist from WWLA conducted a site walkover inspection on 15 October 2021. Greg Hayhow, property owner for all properties except 2 Gatland Ave, accompanied the site walkover. The owner of 2 Gatland Ave was also spoken to during the walkover. Site features observed during the inspection are described below and are as shown on **Figure 3** and in **Photographs 1 – 11**.

Overall, the site is gently undulating and dominated by pasture with isolated mature trees and dwellings.

470 Great South Road

- The property is occupied by a modern brick home (**Photograph 1**) near the road frontage with a similarily modern garage (aluminium construction) on the northern boundary. A strip of land between the garage and the road is used for temporary storage of scaffolding by the neighbour.
- A small concrete platform, previously occupied by a sleepout, is located immedaitely south of the garage (**Photograph 2**).
- The eastern half of the property is overgrown garden and trees. Cattle from 476 Great South Road and 8 Gatland Road are able to graze within this area.

Photograph 1: House at 470 Great South Rd

Photograph 2: Concrete pad from former sleepout

476 Great South Road

- This property is predominantly grazing land, accessed via a long driveway from Great South Road (**Photograph 3**).
- At the eastern boundary is a stormwater pond (**Photograph 4**). A small dinghy is stored in the lake and small wooden structures including a playhouse are located on its margins.
- The ground surrounding the pond is raised, suggestive of placement of excess spoil from the original pond excavation (**Photograph 5**).
- At the time of our walkover a septic tank leak had recently been discovered and fixed, immediately northeast of the pond on the neighbouring property (outside of the site). The overflow from the leak had drained onto 476 Great South Road and was ponding near the stormwater pond. Affected soil in the ponding area had begun to dry out. The source of wastewater in the septic tank is domestic and therefore not a ground contamination concern.
- The location of the former sheds in the centre of the site could not be identified (refer aerial review in **Section 3.1.1**). However a fragment of a concrete footing indicates the location of the former cattle shed and yards (also **Section 3.1.1** and **Figure 3**)

Photograph 3: General site view at 476 Great South Rd

Photograph 4: Stormwater pond

Photograph 5: Potential site-won fill north of the stormwater pond, location of sample S2

2 Gatland Road

- 2 Gatland Road is a residential property occupied by a house with attached carport, separate office and a swimming pool with changing rooms (**Photograph 6 and 7**).
- The house has potential asbestos soffits and roofing tiles, both being well maintained and the soffits painted.
- Surrounding the house are landscaped gardens, concrete paths/ pool surrounds, and decking.

Photograph 6: Dwelling at 2 Gatland Road

Photograph 7: Rear of the dwelling at 2 Gatland Road, location of sample 2G-A2

8 Gatland Road

- A large modern house and associated garages/ sheds occupies much of the south eastern portion of this property. The house is of timber construction with a colourseel roof and aluminium joinery. Landscaping surrounding the house suggests that minor cut-to-fill activities have occurred.
- Northwest of the house is a hay shed (timber with a metal roof; **Photograph 8**) and a small aluminium shed with aluminium floor containing small volumes of drench (<5 L) and chicken feed (**Photograph 9, 10**). Within the hay shed area are two chicken coops.
- Cattle graze both this property and the Great South Road properties at a low density.
- Cattle yards are located in the southwest corner of 8 Gatland Ave (**Photograph 11**).

Photograph 8: Hay shed

Photograph 9: Aluminium shed with aluminium floor

Photograph 10: Drench inside aluminium shed

Photograph 11 Cattle yards and loading ramp

Map Title

Site Features and Sample Locations

Proiect

470 Great South Road, Papakura

Client

Greg Hayhow

Legend

- Samp e ocat ons:asbestos
- Samp e ocat ons: genera
- S te Features
- Property boundary
- S te boundary

Data Provenance

Image from LINZ

Layout & Project File

Site Featurs

WWLA

Figure 3.

3. HAIL Assessment

A HAIL assessment is a review of historical activities and evaluation of these against the MfE HAIL list, a document detailing land use activities with potential to cause contamination. The HAIL list is not exhaustive and other activities may be present.

The HAIL assessment for this site has included a historical review of information including aerials available online and Auckland Council's property file. The findings of the HAIL review informed the site investigation sampling positions (**Section 4**) and laboratory testing programme.

3.1 Site history

3.1.1 Aerial photograph review

Historical aerial imagery available from Auckland Council's GeoMaps and Retrolens.co.nz were reviewed and are summarised in **Table 3** below.

Table 3. Historical aerial photograph review

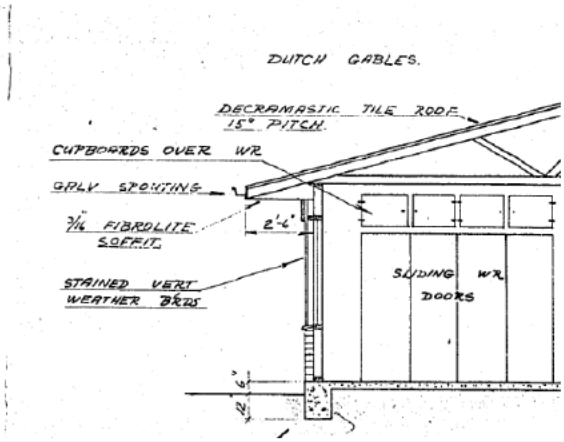
Photograph date (source)	Activities	Aerial image
1942 (Retrolens; SN192, Run 273, Photo 17)	The site is pastoral with a dwelling and garden at 470 Great South Road, and a farm shed located immediately east of the garden area. Small structures, possibly sheds, are located in the northeast corner of the site. Another shed is located immediately east of what is now 2 Gatland Road, within the 8 Gatland Road property. All sheds are circled in orange on the adjacent image. A depression appears to run east-west through the centre of the property. Surrounding land is also pastoral with isolated dwellings.	
1959 (GeoMaps)	The better photo resolution means that along with the dwelling at 470 Great South Road, two sheds can also be seen. The farm shed (with yards) east of it remains, but the small buildings in the northwest of the site have been removed, as has the shed in the south of the site in what is now 8 Gatland Road. A dwelling and garden have been established at 2 Gatland Road (circled in orange). A farm drain has been formed in the centre of the east-west depression. Surrounding land remains pastoral, with possible cropping to the west across Great South Road.	

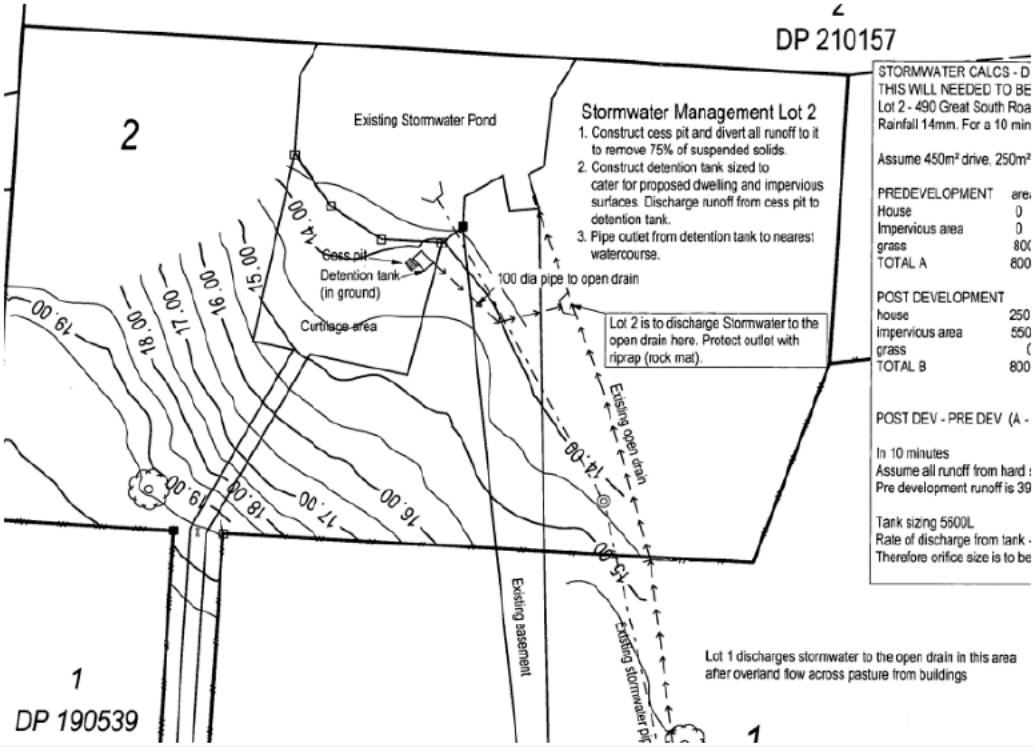
Photograph date (source)	Activities	Aerial image
1960 (Retrolens, SN583, Run 1929A, Photo 18)	The site is relatively unchanged compared to the previous photograph. Surrounding land remains predominantly pastoral.	
1981 (Retrolens, SN5783B, Run U, Photo 14)	Only the house and one shed/ garage at 470 Great South Road and the house at 2 Gatland Road remain. The farm shed and yards at 476 Great South Road have been removed. Residential housing now extends to the northern and southern site boundaries, with land to the east and west remaining pastoral.	
1996 (GeoMaps)	A shed (red painted) has been constructed on the southeast boundary of the site within the 476 Great South Road property (orange outline). No other significant changes either to the site or surrounding land relative to the previous aerial photograph.	
2001 (GeoMaps)	At 470 Great South Road the original house and shed have been demolished and a new house constructed near the road frontage with a garage on the northern boundary. There is now a house and dwelling in the place of the former red shed at 476 Great South Road. A farm shed is located to the north of these buildings, apprxoimately in the centre of the site. The house at 2 Gatland Road has been extended and now has a swimming pool. A large stormwater pond (circled in orange) has been constructed on the eastern boundary of the site. Soil from the excavation of the pond appears to have been placed around the pond as landscaped bunds. Residential development continues surrounding the site.	

Photograph date (source)	Activities	Aerial image
2006-2017 (GeoMaps)	Over this time period the only changes have been minor additions/ extensions to houses, landscaping, and the temporary occurrence of another shed at 470 Great South Road. Residential development has continued on surrounding land. Aerial photo from 2017 shown.	

3.1.2 Property file

Property files for all four individual properties were requested from Auckland Council. Only files for 2 Gatland Road and 476 Great South Road are available in digital form at this time and due to Covid-19 restrictions at the time of reporting, hard copy files for the other two properties were not able to be viewed. Documents relevant to the history of the site are summarised below.

2 Gatland Road	
1999	Building consent plans for alterations to a residential house that also includes an external office and a swimming pool (both already existing) with a septic tank wastewater disposal system. The plans show that the original house has fibrolite soffits and a metal (decramastic) tiled roof. Both of these products are likely to contain asbestos given that they pre-date the 1990s (as evidenced by the aerial photograph review above). The garage cladding was also f brolite. 

476 Great South Road	
2008	Plans show the intention to create a new stormwater system (cesspit and detention tank) to discharge to the existing stormwater pond on the eastern boundary of the site as stormwater mitigation for an impending subdivision and creation of a new dwelling. 
2003-2009	Several documents, including an AEE, detail the subdivision of this property from 8 Gatland Road. A geotechnical report (Moss Engineering Ltd, 2003) was prepared to support the subdivision application(s). Two hand augers were completed in the north of the site, to depths of 1.5 m and 2.0 m below ground. Both hand augers encountered approximately 0.2 m of topsoil overlying Tauranga Group alluvium/ weathered Waitemata Group sediments.

3.2 Potential for contamination

Our site walkover inspection and historical review confirm the pastoral history of the site, with minor supporting activities such as cattle yards, and more recent residential houses. There was no evidence during the site walkover of the former sheds in the centre of the site. The location of the largest cattle shed and yards was indicated by a fragment of concrete footing remaining in the ground.

Potentially contaminating activities are described in **Table 4**, along with an assessment of the likelihood and magnitude of any contamination resulting from the activity, and whether the activity constitutes a HAIL (refer to **Figure 6**). While the purpose of this evaluation was to inform the sampling and laboratory testing programme (**Section 4**), our HAIL assessment covers the entire site so that the requirements of a PSI are addressed for future projects elsewhere on the site. Those pertinent to the proposed upgrade were investigated during the data collection process.

Colours in **Table 4** relate to the potential significance of contamination as follows:

- Negligible – contamination unlikely or if possible, highly unlikely to be at levels that would present a risk to the people or the environment in the context of the proposed development.
- Minor – if present, contamination is likely to be above background levels, but highly unlikely to be at levels that would present a risk to people or the environment in a high-density residential setting, or if so, confined to a small area.

- Significant – contamination likely to be present, with increased risk of concentrations exceeding applicable human health or environmental criteria and extending over a relatively large area *(no significant activities are identified for this site).*

Table 4: Potential for Contamination

Feature *HAIL Activity*	Potential contaminants	Potential magnitude and extent	Does the HAIL apply?	Sample locations
Pesticide use for cattle drenching *A8: Livestock dip or sprayrace operations*	Arsenic, copper, zinc, organochlorine pesticides (OCPs)	Contamination may be present around former cattle shed/ yards and in current yards and loading ramp area. L kely to be limited in magnitude and confined to topsoil in the immediate vicinity of the yards. Note: current storage of very small volumes of drench in a modern aluminium shed is not considered a HAIL due to the very limited quantities and good condition of the shed, preventing any contamination of underlying ground in the event of a spill.	**Yes**, Activity A8 applies to the site.	S1, S6
Asbestos use on former and current buildings *E1: Asbestos in a deteriorated condition*	Asbestos	Potential for asbestos around demolished sheds is low as there is no evidence that they were constructed with ACM (corrugated iron was also common at the time) and no evidence of the sheds remaining on site. At the dwelling at 2 Gatland Road, ACM is in good condition, so potential is also low.	**No**, Activity E1 ACM was not identified in a deteriorated condition	S1, S5, G2-A1, G2-A2
Placement of Fill *I: Intentional or accidental release of a contaminant in sufficient quantity to present a risk to human health or the environment.*	Variable depending on source; typically metals and polycyclic aromatic hydrocarbons (PAH).	The fill around the pond is likely site won from the pond excavation. Potential for contamination to be present is therefore very low.	**Unlikely**, only if contamination present in sufficient quantity to present a risk.	S2, S3, S4
Lead paint and/or leaching from treated timber structures or zinc roofing. *I: Intentional or accidental release of a contaminant in sufficient quantity to present a risk to human health or the environment.*	Arsenic, copper, chromium, zinc	Older structures can leach their protective metal components, particularly if unpainted or exposed to the weather for several decades. As little is known about the demolished structures, it is possible that some leaching has occurred. Unlikely from current structures as they are all well maintained and painted.	**Maybe**, only if contamination present in sufficient quantity to present a risk.	S1, S5

4. Data Collection and Review

4.1 Sampling and testing rationale

Field investigations were undertaken by WWLA on 15 October 2021.

The historical review confirms that activities that can cause ground contamination (HAIL activities) have occurred on the site. Soil investigations (sampling and laboratory testing) were conducted to assess the following:

- The magnitude of contamination, if present, with respect to criteria for assessing the effects on people and the environment.
- Remedial actions required prior to bulk earthworks to minimise effects on workers carrying out ground disturbance activities (if any).
- Soil quality for offsite disposal should surplus soils be generated during earthworks.
- Resource consenting requirements.

The sampling and testing rationale were informed by the site history and site walkover observations as follows.

Table 5: Sampling and laboratory analysis

Feature (refer Figure 3)	Sampling and laboratory testing rationale	Sample locations (refer Figure 3)
Pesticide use for cattle drenching	• Surface soil (topsoil) samples collected in areas of current and former yards • Laboratory testing for metals and OCPs.	S1, S6
Asbestos use on former and current buildings	• Sampling across a 1 m square area in the vicinity of the former cattle shed, the former sleepout, and the existing dwelling with confirmed ACM. Topsoil sampled. • Laboratory testing for presence/ absence of asbestos.	S1, S5, G2-A1, G2-A2
Placement of Fill	• Surface and near-surface sampling of fill material surrounding pond. • Laboratory testing for metals and PAH.	S2, S3, S4
Lead paint and leaching from treated timber structures or zinc roofing.	• Composite samples of topsoil around former sleepout and cattle shed. • Laboratory testing for metals.	S1, S5
Soil disposal information	• All samples, including some in the center of the paddocks, to provide sufficient data to support offsite disposal. • Laboratory testing for metals, some additional testing for PAHs, as these are typically required by the receiving fill sites.	All

4.2 Sampling methodology

Soil sampling was undertaken using a spade and trowel. The sampling procedure was as follows:

- 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*".
- Soil sampling was in general accordance with the MfE's "Contaminated Land Management Guidelines No. 5, Site Investigation and Analysis of Soils (Revised 2021)" (CLMG No. 5). This involved:
  - Collection of samples using freshly gloved hands, directly from the spade or trowel and placed into laboratory supplied glass jars to avoid cross contamination between sample positions. Samples for asbestos analysis were placed into laboratory prepared plastic 500 ml pots for quantitative analysis of asbestos in soils. Composites were comprised of four sub-samples (S1 and S5 only).

- Decontamination of equipment (hand auger) between sample locations using Decon-90 (a phosphate-free detergent) and freshwater rinses.
- Couriering samples chilled, under chain of custody documentation, the same day they were collected.

- All samples were sent to IANZ accredited Laboratories, with analysis completed at Analytica Laboratory (Hamilton).

4.3 Field observations

Soils encountered were generally topsoil (brown, silty clay) to approximately 0.4 to 0.5 m depth BGL, underlain by silty, weathered, volcanic ash. Within the fill material near the pond (S2 – S4), soils at surface were re-worked Puketoka Formation sediments with trace gravel and ash.

No visible asbestos was identified and there were no visual or olfactory suggestions of contamination.

4.4 Evaluation criteria

The analytical data for soils was compared to the criteria set out in **Table 6**.

Table 6. Soil evaluation criteria.

Protection of Human Health	NESCS contaminant standards (SCS) for a high-density residential use. Where NESCS SCS values 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, for residential 'B'. • Ministry for the Environment's "Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand". • For asbestos, the New Zealand Guidelines for Assessing and Managing Asbestos in Soil (BRANZ, 2017), "all users" criteria to assess both effects on people and health and safety requirements during soil disturbance. Note: when it is included in the development, the property at 2 Gatland Road may be used for commercial purposes rather than high-density residential. However, we have applied the more stringent residential thresholds to the two asbestos samples as this will provide flexibility if future plans change.
Discharges to the Environment	For discharges to the environment the Auckland Unitary Plan (AUP) Permitted Activity (PA) Soil Acceptance Criteria or where appropriate the criteria specified by Rule E30.6.1.4 of the AUP.
Soil Disposal	For soil disposal, published non-volcanic background concentrations for Auckland described in TP153[5], are used as a basis for acceptance of soil to cleanfill sites. Volcanic background values are considered when assessing the activity status of the NESCS for soil disturbance and removal.

4.5 Data quality

A quality assurance and quality control (QA/QC) program was implemented as part of field procedures to confirm data is representative of the materials present within the site. Field procedures to ensure the samples were representative included:

- Using appropriately experienced staff to collect the samples;
- Decontaminating sampling equipment and wearing fresh gloves for collection and placement of each sample into laboratory supplied containers or bags;
- Clearly labelling samples as they are collected and recording sample positions on the geological log;

[5] Auckland Reginal Council, Technical Publication 153 (TP153): Background concentrations of inorganic elements in soil from the Auckland Urban Region.

- Transporting samples under chilled conditions and accompanied by Chain of Custody (CoC) to the laboratory;
- Ensuring samples were tested by an accredited laboratory.

4.6 Soil results and discussion

Results are presented in **Table 7** and laboratory transcripts are provided in **Appendix B**.

A summary of the samples tested for each material type and the data findings is as follows:

- No asbestos, PAHs or OCPs were detected in any of the samples tested.
- Fill and general site soils contained background concentrations for all contaminants tested.
- Two areas showed concentrations of one or more metals above background concentrations:
  - Sample S5 (from the former sleepout) has elevated levels of arsenic, cadmium and lead. Lead concentrations slightly exceed environmental discharge criteria (322 mg/kg *c.f.* 250 mg/kg). Lead levels of this magnitude are commonly attributed to lead paint. While no flakes of lead paint were observed in the soil, it is possible that 'dust' remains from the original building. Elevated arsenic and cadmium are suggestive of storage of farm drench and fertiliser. It may be that the former 'sleepout' was actually a former storage shed for chemicals and farm equipment (or served both purposes at different times).
  - Sample S6 (the existing cattle yards) contains elevated concentrations of arsenic (slightly exceeding human health criteria for high-density residential use; 51.6 mg/kg *c.f.* 45 mg/kg), with cadmium also above background levels. This is typical where drenches are applied and is highly likely to be confined to topsoil.

Overall, very little contamination is present at the site. Two 'hot spots' are present, within the current cattle sheds and immediately surrounding the concrete floor from the former sleepout/shed. These areas should be remediated in isolation prior to bulk earthworks commencing so that soil can be appropriately managed without cross contamination.

Table 7. Laboratory Data Summary

Feature		Former cattle shed/ yard	Fill placement			Former sleepout	Cattle yards	General site		2 Gatland Rd dwelling		Human Health NES Soil (Commercial/ Outdoor worker)[1]	Human Health NES Soil (High Density Residential) [2]	Environmental AUP Discharge Criteria[3]	Background (non-volcanic)[4]	Background (volcanic)[4]
Sample information	Sample ID	S1	S2	S3	S4	S5	S6	S7	S8	G2-A1	G2-A2					
	Depth (m bgl)															
	Date	15/10/21	15/10/21	15/10/21	15/10/21	15/10/21	15/10/21	15/10/21	15/10/21	15/10/21	15/10/21					
	Material type	Topsoil	Reworked natural	Reworked natural	Reworked natural	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil					
Asbestos	>10 mm	Not detected	-	-	-	Not detected	-	-	-	Not detected	Not detected	0.05 [7]	0.04 [7]	-	<LD	<LD
	2-10 mm											0.001 [7]		-	<LD	<LD
	<2 mm											0.001 [7]		-	<LD	<LD
Metals	Arsenic	10	4.1	5.3	5 5	26.0	51.6	6.1	4 8	-	-	70	45	100	12	12
	Cadmium	0.642	0.11	0.28	0 640	0.737	0.806	0.14	0.19	-	-	1,300	230	7.5	0.65	0.65
	Chromium	21.5	11	19.7	15 5	31.0	48.2	20 2	16 9	-	-	6,300	1,500	400	55	125
	Copper	24.6	9 28	19.4	12.7	39.9	50.3	15 3	10.4	-	-	NL	NL	325	45	90
	Lead	41.4	26.0	21 6	31.1	322	35.4	19.7	25.7	-	-	3,300	500	250	65	65
	Nickel	9.03	6 21	13.1	8.40	12.3	10.4	8 28	10 8	-	-	6,000 [5]	1200 [5]	105	35	320
	Zinc	124	26.5	80 3	47 6	288	134	27 9	30.1	-	-	400,000 [5]	60,000 [5]	400	180	1,160
PAH	All	-	<LD	<LD	<LD	-	-	<LD	<LD	-	-	Various [6]	Various [6]	Various [6]	<LD	<LD
OCPs	All	<LD	-	-	-	-	<LD	-	-	-	-	1,000	240	20	<LD	<LD

Notes

Grey values at background levels, Black values exceed published background for volcanic soil, Bold values exceed AUP discharge criteria,
Underlined values exceed NES (High density), green shaded values exceed NES (Commercial/outdoor workers)
Values in mg/kg except asbestos in %weight/weight
<LD = below laboratory detection level

1. National Environmental Standard - Soil Contamination Standard - Commercial/ outdoor worker land use
2. National Environmental Standard - Soil Contamination Standard - High-density residential land use
3. Auckland Unitary Plan permitted activity discharge criteria (Table E30.6.1.4.1).
4. Background concentrations of trace elements in volcanic and non-volcanic soils in Auckland (TP135)
5. NEPM National Environmental Standard (Australia) - Soil Contamination Standard - Commercial/ industrial land use and high-density residential land use (Residential B) as specified.
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 and commercial criteria used as appropriate for human health, protection of groundwater quality for environmental discharge (surface contamination, groundwater at 4m)
7. BRANZ New Zealand Guidelines for Assessing and Managing Asbestos in Soil, commercial and high-density residential values used.

5. Conceptual Site Model

A conceptual site model (CSM) indicates known and potential sources of contamination, routes of exposure (pathways), and the receptors that are affected by contaminants moving along those pathways (**Table 8**). Receptors may be people or environmental. The purpose of the CSM in the context of this site is to determine if, where and how people and the environment may be affected by disturbance of soils during the upgrade works, both on the site and off.

The HAIL assessment followed by soil sampling indicates contaminant levels are low and do not pose a risk people (workers and those on adjacent industrial sites) during soil disturbance, with the exception of two localised hot spots. The detailed investigation findings are illustrated in the source – pathway – receptor analysis (CSM) in **Table 8** below. The CSM shows that there is potential for effects on the environment if contaminant management procedures are not in place. Following development of the site all pathways would be incomplete (i.e., no potential risk and the site will be suitable for high-density residential use).

Table 8. CSM evaluation

Source	Receptor	Pathway	Assessment
Elevated lead concentrations around the former sleepout/ shed.	Site workers, future site and neighbouring property occupants.	Exposure via inhalation of dust, or ingestion and skin contact due to poor hygiene practices.	**Incomplete Pathway:** No risk is posed to workers during development or in a future high-density residential land use scenario as concentrations of contaminants are below values applicable for assessing effects on people.
	Ecological receptors at the nearest surface water bodies and receiving soils site.	Leaching to groundwater, runoff at the receiving site.	**Potentially Complete Pathway:** The pathway will be incomplete if appropriate earthworks controls are in place. This will include a focus on minimising discharges from the site by working only in dry conditions, loading trucks within the erosion and sediment control area, and preventing cross-contamination. If excavated, soils in the immediate vicinity of the shed would need to be disposed of to an appropriately licensed facility. Alternatively, if onsite remedial actions are proposed appropriate controls as per the SMP will mitigate effects (refer **Section 6**). With the controls outlined in the SMP, it is highly unlikely that discharges will cause a significant adverse effect on the environment.
Elevated arsenic in the cattle yards	Site workers, future site and neighbouring property occupants.	Exposure via inhalation of dust, or ingestion and skin contact due to poor hygiene practices.	**Potentially Complete Pathway:** The pathway for site workers is incomplete as contaminant levels are below site worker thresholds. The pathway for future site residents will be incomplete if the soil is removed from the site or subject to onsite mixing as part of enabling works, prior to bu k earthworks commencing. Potential effects on neighbours during works can be mitigated by standard earthworks controls and procedures, including preventing dust.
	Ecological receptors at the nearest surface water bodies and receiving soils site.	Leaching to groundwater, runoff at the receiving site.	**Incomplete Pathway:** No risk is posed to the environment so long as surplus soil is disposed of to an appropriately licensed facility or in the event of onsite remedial actions, validation data confirms appropriate levels have been achieved.

The following sections set out the development and consenting implications for the proposed development.

6. Development Implications

6.1 Hot spot remediation options

There are two potential hot spot remediation options:

1. Excavation and removal offsite (with disposal to a licensed landfill); or
2. Onsite as part of enabling works.

Option 1 is the simpler option but requires a higher upfront cost. Option 2 involves mixing contaminated topsoil with clean soils in the right conditions (dry but not dusty) and at the right ratios (approximately 6 parts clean to 1 part contaminated in this case) to reduce hot spot contamination down to background levels. This involves being able to stockpile and work the excess soil onsite and, in some cases, can be risky as it may result in larger volumes of soil becoming contaminated. However, in this situation it is likely to be successful due to the high volume of clean topsoil relative to the very small volume of contaminated soil. Note that if paint flakes are found in soil around the former sleepout/shed, Option 2 won't be a viable option for this area.

Both options require post-remediation validation by a contaminated land specialist. Practical detail on the techniques are set out in **Section 6.3.2**.

6.2 Consenting

6.2.1 NESCS

The NESCS sets out nationally consistent planning controls appropriate to district and city councils for assessing potential human health effects related to contaminants in soil. The regulation applies to specific activities on land (soil disturbance and removal, subdivision, bulk soil sampling and land use change) where an activity included on the HAIL has occurred.

We have assessed the permitted activity requirements of the NESCS in **Table 9** below. For this assessment, the "piece of land" as defined in the NESCS is defined as the entire site excluding 2 Gatland Road, as excluding 2 Gatland Road, all properties have been largely managed as a single farm for most of their history (2 Gatland Road appears to have been subdivided in the 1950s and is also not part of this resource consent application). The area of the "piece of land" is therefore 58,917 m^2. Based on site observations and the results of soil sampling, the following remediation is required:

- Former sleepout/ shed: Assuming 1 m around the concrete floor (and conservatively including the concrete floor area), an area of 40 m^2 requires remediation to a depth of 0.4 m, resulting in a volume of **16m^3** to be either removed offsite or subject to onsite mixing.
- Cattle yards: Assuming the entire cattle yard area and a 1 m buffer requires removal to a depth of 0.4 m, and area of 65 m^2 requires disturbance and **26 m^3** to be either removed offsite or subject to onsite mixing.

Therefore, a total of 42 m^3 requires offsite disposal or onsite treatment. Our assessment shows:

- The NESCS does apply to the site because HAIL activities have occurred, and contaminant concentrations in soil are above background levels in isolated areas.
- The minimal volumes of earthworks required to remediate the site are well within the permitted activity thresholds for the site and we consider that all other permitted activity thresholds can easily be met (refer **Table 9**). Therefore, soil disturbance is a Permitted Activity under the NESCS Clause 8(3).
- Subdivision and change of land use are also a Permitted Activity under the NESCS (Clause 8(4)) because it is highly unlikely there will be a risk to human health if the activity is done to the piece of land, as low levels of contamination will be removed/ remediated during enabling works.

Table 9: Permitted activity provisions for soil disturbance under the NESCS Rule 8(3).

Rule 8(3)	Permitted activity requirement.	Evaluation
(a)	Implementation of controls to minimise exposure of humans to mobilised contaminants.	Can be met. The WWLA SMP[6] satisfies this requirement.
(b)	The soil must be reinstated to an erosion free state within one month of completing the land disturbance	Can be met.
(c)	The volume of the disturbance of the piece of land must be no more than 25 m^3 per 500 m^2. *For the site this equates to 2,946 m^3.*	Can be met.
(d)	Soil must not be taken away unless it is for laboratory testing or, for all other purposes combined, a maximum of 5 m^3 per 500 m^2 of soil may be taken away per year. *For the site this equates to a permitted volume for soil removal of 589 m^3.*	Can be met.
(e)	Soil taken away must be disposed of at an appropriately licensed facility.	Can be met.
(f)	The duration of land disturbance must be no longer than two months.	Can be met.
(g)	The integrity of a structure designed to contain contaminated soil or other contaminated materials must not be compromised (not applicable to this site).	Not applicable.

To fulfil the requirements for a permitted activity under Rule 8(3), a site management plan (SMP) for ground contamination is required setting out how earthworks will be managed. The WWLA SMP provides this detail and is included in **Appendix C**. This report needs to be provided to Auckland Council to fulfill the permitted activity requirements of NESCS Clause 8(4).

6.2.2 Auckland Unitary Plan

Section E30 of the AUP contains rules that address discharges to the environment, both during works and in the long term. The contaminated land rules of the AUP apply to soils that contain 'elevated levels of contaminants' which is defined as contaminants exceeding the permitted activity discharge criteria in Table E30.6.1.4.1. Consent is required when contamination levels exceed the permitted activity criteria and earthworks exceed 200 m^3.

While contaminant concentrations in one sample (S5) exceed the permitted activity discharge criteria, the earthworks in this area will be 16 m^3 and therefore comply with the permitted activity rule E30.6.1.2 which allows for 200 m^3 to be disturbed. To meet the other permitted activity provisions, Council must be notified of works commencing, works must be less than 2 months in duration and discharges must not contain separate phase hydrocarbons. We expect all these provisions can be met. Soil disposal or mixing will be managed via the SMP.

A long-term discharge consent will not be required as contaminated soil will be remediated prior to bulk earthworks.

6.3 Construction implications

6.3.1 Site management plan (SMP)

As noted in **Section 6.1.1** a SMP is required to confirm how potential ground contamination effects will be managed during the works, with an emphasis on managing discharges and handling unexpected contamination. WWLA has prepare a SMP to demonstrate to Council the measures that will be in place and provide specific procedures for contractors to implement when undertaking the works.

[6] Site Management Plan, appended as **Appendix C**.

The WWLA SMP informs the contractor of procedures for disposal or treatment of surplus soil and managing any unexpected contamination. If complied with during the works, the effects of ground contamination will be less than minor.

6.3.2 Soil disturbance requirements

Hot spot remediation	The two hot spots should be remediated during enabling works, prior to bu k earthworks commencing, either by removal offsite or onsite mixing. For excavation and removal off site, separate erosion and sediment control may be required around each one to prevent cross-contamination of surrounding soils, depending on weather conditions at the time of work. Following removal of the concrete slab at the former sleepout/ shed, and timber structures at the cattle yards, a 400 mm scrape (or all of the topsoil) shall be removed via excavator and placed directly onto a truck for disposal to managed fill (for the cattle yards) and licensed landfill (for the sleepout/ shed). A 1 m buffer around each structure should also be removed. Care should be taken to ensure there are no spills of contaminated soil onto surrounding ground. Following removal, the contaminated land specialist will undertake validation soil sampling to confirm that contamination has been removed and that bulk earthworks can commence under standard earthworks controls. For onsite mixing, topsoil in both areas can be stripped with other topsoil from the remainder of the site. The process of stripping the topsoil, loading it into a Moxy or similar vehicle, and stockpiling it on site, would l kely be sufficient to enable it to become well mixed with clean topsoil, thereby reducing the contaminant concentrations to acceptable levels. Given the small volumes of contaminated soil in the context of the wider proposed works, this option is likely to be easy to achieve (a 6 parts clean to 1 part contaminated ratio is expected to be sufficient to reduce concentrations to background levels). The stockpiled soil would need to be validated by a CLS before it is able to be reused on site or disposed offsite as cleanfill. Mixing must be done in dry (but not dusty) conditions to ensure mixing is able to occur successfully.
Asbestos management	We anticipate that the demolition of buildings will occur prior to earthworks. Asbestos is l kely to be present at 2 Gatland Road. An asbestos survey should be completed prior to demolition so that all sources of asbestos are identified. It is likely that demolition works will be required to be undertaken as Class B works. Asbestos clearance of soils will likely be required following demolition. This can be undertaken by a SQEP (WWLA).
Bulk earthworks and soil disposal	Once hot spots have been remediated, standard earthworks controls will be applicable for the balance of the works as contamination levels on the remainder of the site's footprint are at background levels. Standard earthwork controls and responsibilities of the various parties involved will be defined in the SMP. Soil disposal for the remainder of the site can be to cleanfill, with the approval of the receiving fill operator.

6.3.3 Post works reporting

Although not required as part of permitted activity provisions, post-works closure reporting is worthwhile to document that remediation has been safely and adequately completed. The post-works report will be completed by the contaminated land specialist and will need to include:

- Validation sample results for the two remediated areas;
- Copies of soil disposal dockets/ summaries for landfill and managed fill disposal (if disposed offsite);
- Confirmation from the contaminated land specialist that remediation was undertaken in accordance with the SMP (**Appendix C**).

The post-works closure report can be provided to Auckland Council to be kept on the property file or relevant properties.

Post-works soil clearance reporting is also likely to be required following demolition of the house at 2 Gatland Road. This will be confirmed when an asbestos survey has been completed.

7. Conclusions

This report has been prepared to comply with the requirements of a PSI and DSI and has been undertaken to support redevelopment of the site for high-density residential use.

The site has a history of pastoral/ farming use, with associated cattle sheds, yards, and farm buildings. More recently, three dwellings have been constructed and a large pond excavated for stormwater treatment purposes. The HAIL assessment determined that there was potential for low to moderate levels of contamination from cattle drenching, historic and current asbestos use, and leaching of metals from older building structures. Potential for contamination from fill placement was considered low due to the likely site-won nature of the fill.

Laboratory testing confirmed metals as the key contaminants of concern at the site, with no asbestos, OCPs or PAHs detected. The metals that were elevated were very localised – being immediately around a former sleepout/ shed, and in topsoil in the current cattle yards. All other soils were at background concentrations for the contaminants tested.

These hotspots should be remediated prior to bulk earthworks commencing, and could be remediated using either of two methods:

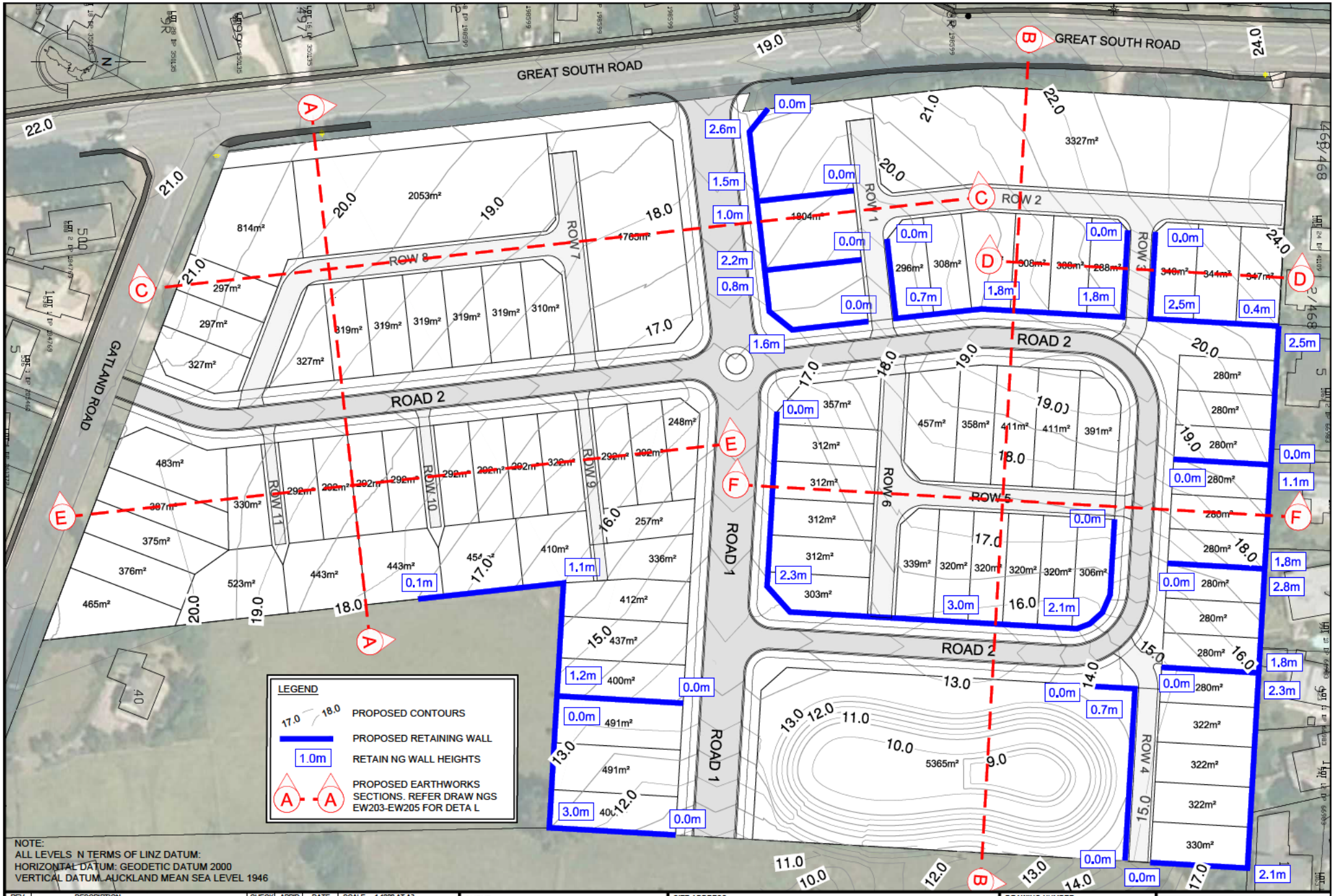
- Removal and disposal to landfill; or
- Onsite mixing.

Under either remedial option, our regulatory assessment found:

- The NESCS applies to the site because HAIL activities have occurred, and contaminant concentrations in isolated areas exceed background concentrations. However, works can be undertaken as a Permitted Activity with the support of a SMP.
- Works are also permitted under the AUP contamination rules due to the very small volumes of contaminated soil proposed to be excavated.

During earthworks procedures in the attached SMP (**Appendix C**) shall be followed. An asbestos survey of 2 Gatland Road should be undertaken before demolition to confirm if asbestos is present so if it is, it can be safely removed. Soil clearance may be required by a SQEP following demolition.

Appendix A. Development Plan



REV.	DESCRIPTION	CHECK	APP'D	DATE

SCALE 1:1000 AT A3

	NAME	DATE
DESIGN	JH	05/21
DRAWN	JH	05/21
DRAWING CHECK	EP	05/21
DESIGN CHECK	EP	05/21
APPROVED	EP	05/21

CLIENT
GREG HAYHOW

Conditions of Use;
These drawings shall only be used for the purpose for which they were supplied. Do not measure off this drawing. If doubt please contact Engineer.

SITE ADDRESS
470, 476 & 490 GREAT SOUTH ROAD
PAPAKURA

DRAWING TITLE
PROPOSED CONTOUR PLAN

DRAWING NUMBER
1554-RC-EW201

DATE
MAY 2021

REVISION
-

ASPIRE CONSULTING ENGINEERS
Ph: 09 426 6552
Web: www.aspeng.co nz

Appendix B. Investigation Data

B.1 Laboratory Transcripts

ANALYTICA LABORATORIES

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: Lauren Windross
Phone: s 9(2)(a)
Email: s 9(2)(a)

Lab Reference: 21-43648
Submitted by: Lauren
Date Received: 16/10/2021
Testing Initiated: 16/10/2021
Date Completed: 20/10/2021
Order Number:
Reference: WWLA0473

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	S1 0m	S2 0.1m	S3 0.1m	S4 0m	S5 0m
		Date Sampled	15/10/2021	15/10/2021	15/10/2021	15/10/2021	15/10/2021
Analyte	Unit	*Reporting Limit*	21-43648-1	21-43648-2	21-43648-3	21-43648-4	21-43648-5
Arsenic	mg/kg dry wt	*0.125*	10	4.1	5.3	5.5	26.0
Cadmium	mg/kg dry wt	*0.005*	0.642	0.11	0.28	0.640	0.737
Chromium	mg/kg dry wt	*0.125*	21.5	11	19.7	15.5	31.0
Copper	mg/kg dry wt	*0.075*	24.6	9.28	19.4	12.7	39.9
Lead	mg/kg dry wt	*0.25*	41.4	26.0	21.6	31.1	322
Nickel	mg/kg dry wt	*0.05*	9.03	6.21	13.1	8.40	12.3
Zinc	mg/kg dry wt	*0.05*	124	26.5	80.3	47.6	288

Heavy Metals in Soil

		Client Sample ID	S6 0m	S7 0.4m	S8 0.5m
		Date Sampled	15/10/2021	15/10/2021	15/10/2021
Analyte	Unit	*Reporting Limit*	21-43648-6	21-43648-7	21-43648-8
Arsenic	mg/kg dry wt	*0.125*	51.6	6.1	4.8
Cadmium	mg/kg dry wt	*0.005*	0.806	0.14	0.19
Chromium	mg/kg dry wt	*0.125*	48.2	20.2	16.9
Copper	mg/kg dry wt	*0.075*	50.3	15.3	10.4
Lead	mg/kg dry wt	*0.25*	35.4	19.7	25.7
Nickel	mg/kg dry wt	*0.05*	10.4	8.28	10.8
Zinc	mg/kg dry wt	*0.05*	134	27.9	30.1

Organochlorine Pesticides - Soil

			Client Sample ID	S1 0m	S6 0m
			Date Sampled	15/10/2021	15/10/2021
Analyte		Unit	*Reporting Limit*	21-43648-1	21-43648-6
2,4'-DDD		mg/kg dry wt	*0.005*	<0.0050	<0.0050
2,4'-DDE		mg/kg dry wt	*0.005*	<0.0050	<0.0050
2,4'-DDT		mg/kg dry wt	*0.005*	<0.0050	<0.0050
4,4'-DDD		mg/kg dry wt	*0.003*	<0.0030	<0.0030
4,4'-DDE		mg/kg dry wt	*0.005*	<0.0050	<0.0050
4,4'-DDT		mg/kg dry wt	*0.005*	<0.0050	<0.0050
Total DDT		mg/kg dry wt	*0.02*	<0.020	<0.020
alpha-BHC		mg/kg dry wt	*0.005*	<0.0050	<0.0050
Aldrin		mg/kg dry wt	*0.005*	<0.0050	<0.0050
beta-BHC		mg/kg dry wt	*0.005*	<0.0050	<0.0050
cis-Chlordane		mg/kg dry wt	*0.005*	<0.0050	<0.0050
cis-Nonachlor		mg/kg dry wt	*0.01*	<0.010	<0.010
delta-BHC		mg/kg dry wt	*0.005*	<0.0050	<0.0050
Dieldrin		mg/kg dry wt	*0.05*	<0.050	<0.050
Endosulfan I		mg/kg dry wt	*0.005*	<0.0050	<0.0050
Endosulfan II		mg/kg dry wt	*0.01*	<0.010	<0.010
Endosulfan sulfate		mg/kg dry wt	*0.005*	<0.0050	<0.0050
Endrin		mg/kg dry wt	*0.05*	<0.050	<0.050
Endrin aldehyde		mg/kg dry wt	*0.01*	<0.010	<0.010
Endrin ketone		mg/kg dry wt	*0.005*	<0.0050	<0.0050
gamma-BHC		mg/kg dry wt	*0.005*	<0.0050	<0.0050
Heptachlor		mg/kg dry wt	*0.005*	<0.0050	<0.0050
Heptachlor epoxide		mg/kg dry wt	*0.005*	<0.0050	<0.0050
Hexachlorobenzene		mg/kg dry wt	*0.005*	<0.0050	<0.0050
Methoxychlor		mg/kg dry wt	*0.01*	<0.010	<0.010
trans-nonachlor		mg/kg dry wt	*0.01*	<0.010	<0.010
trans-Chlordane		mg/kg dry wt	*0.01*	<0.010	<0.010
Chlordane (sum)		mg/kg dry wt	*0.02*	<0.020	<0.020
TCMX (Surrogate)		%	*1*	84	80

Polycyclic Aromatic Hydrocarbons - Soil

		Client Sample ID	S2 0.1m	S3 0.1m	S4 0m	S7 0.4m	S8 0.5m
		Date Sampled	15/10/2021	15/10/2021	15/10/2021	15/10/2021	15/10/2021
Analyte	Unit	*Reporting Limit*	21-43648-2	21-43648-3	21-43648-4	21-43648-7	21-43648-8
1-Methylnaphthalene	mg/kg dry wt	*0.01*	<0.010	<0.010	<0.010	<0.010	<0.010
2-Methylnaphthalene	mg/kg dry wt	*0.01*	<0.010	<0.010	<0.010	<0.010	<0.010
Acenaphthene	mg/kg dry wt	*0.01*	<0.010	<0.010	<0.010	<0.010	<0.010
Acenaphthylene	mg/kg dry wt	*0.01*	<0.010	<0.010	<0.010	<0.010	<0.010
Anthracene	mg/kg dry wt	*0.01*	<0.010	<0.010	<0.010	<0.010	<0.010
Benz[a]anthracene	mg/kg dry wt	*0.02*	<0.020	<0.020	<0.020	<0.020	<0.020
Benzo[a]pyrene	mg/kg dry wt	*0.01*	<0.010	<0.010	<0.010	<0.010	<0.010
Benzo[b]&[j] fluoranthene	mg/kg dry wt	*0.02*	<0.020	<0.020	<0.020	<0.020	<0.020
Benzo[g,h,]perylene	mg/kg dry wt	*0.02*	<0.020	<0.020	<0.020	<0.020	<0.020
Benzo[k]fluoranthene	mg/kg dry wt	*0.01*	<0.010	<0.010	<0.010	<0.010	<0.010
Chrysene	mg/kg dry wt	*0.01*	<0.010	<0.010	<0.010	<0.010	<0.010
Dibenz(a,h)anthracene	mg/kg dry wt	*0.01*	<0.010	<0.010	<0.010	<0.010	<0.010
Fluoranthene	mg/kg dry wt	*0.02*	<0.020	<0.020	<0.020	<0.020	<0.020
Fluorene	mg/kg dry wt	*0.01*	<0.010	<0.010	<0.010	<0.010	<0.010
Indeno(1,2,3-cd)pyrene	mg/kg dry wt	*0.01*	<0.010	<0.010	<0.010	<0.010	<0.010

Polycyclic Aromatic Hydrocarbons - Soil

			Client Sample ID	S2 0.1m	S3 0.1m	S4 0m	S7 0.4m	S8 0.5m
			Date Sampled	15/10/2021	15/10/2021	15/10/2021	15/10/2021	15/10/2021
Naphthalene	mg/kg dry wt	*0.01*		<0.010	<0.010	<0.010	<0.010	<0.010
Phenanthrene	mg/kg dry wt	*0.01*		<0.010	<0.010	<0.010	<0.010	<0.010
Pyrene	mg/kg dry wt	*0.02*		<0.020	<0.020	<0.020	<0.020	<0.020
Benzo[a]pyrene TEQ (LOR)	mg/kg dry wt	*0.03*		0.030	0.030	0.030	0.030	0.030
Benzo[a]pyrene TEQ (Zero)	mg/kg dry wt	*0.01*		<0.010	<0.010	<0.010	<0.010	<0.010
Anthracene-d10 (Surrogate)	%	*1*		110	120	110	130	130

Moisture Content

			Client Sample ID	S2 0.1m	S3 0.1m	S4 0m	S7 0.4m	S8 0.5m
			Date Sampled	15/10/2021	15/10/2021	15/10/2021	15/10/2021	15/10/2021
Analyte	Unit	*Reporting Limit*		21-43648-2	21-43648-3	21-43648-4	21-43648-7	21-43648-8
Moisture Content	%	*1*		24	16	32	26	26

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.

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)

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).

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

Sharelle Frank, B.Sc. (Tech)
Technologist

Rong Zhang
Technician

Analytica Laboratories Limited
186 Macandrew Road
South Dunedin
sales@analytica.co.nz
www.analytica.co.nz

Certificate of Analysis

WWLA
P O Box 314
Kumeu 0841
Attention: Lauren Windross
Phone: s 9(2)(a)
Email: s 9(2)(a)

Lab Reference: 21-43745
Submitted by: Lauren Windross
Date Received: 18/10/2021
Testing Initiated: 18/10/2021
Date Completed: 19/10/2021
Order Number:
Reference:

Sampling Site: WWLA0473
Description of Work: Soil SQ - WWLA0473

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.

The <2 mm fraction for sample 2 weighed less than the recommended sample weight of 98 - 102 grams

Asbestos in Soil (Semi-Quantitative)

Sample Details

Laboratory ID	Client Sample ID	Sample Location	Sample Description	Date Sampled	Date Analysed
21-43745-1	2G - A1 0		Soil	15/10/2021	19/10/2021
21-43745-2	2G - A2 0		Soil	15/10/2021	19/10/2021
21-43745-3	S1 0		Soil	15/10/2021	19/10/2021
21-43745-4	S5 0		Soil	15/10/2021	19/10/2021

Information in the above table supplied by the client: Client Sample ID, Sample Location, Date Sampled

Analysis Results (Summary)

Laboratory ID	Client Sample ID	Asbestos	Sample Weight as Received	Moisture Content	Trace Asbestos (Presence / Absence)	Asbestos (Presence / Absence)
Units			g	%		
21-43745-1	2G - A1 0	Organic Fibres Asbestos NOT Detected.	471.0	14.3	Absent	Absent
21-43745-2	2G - A2 0	Organic Fibres Asbestos NOT Detected.	380.5	37.2	Absent	Absent
21-43745-3	S1 0	Organic Fibres Asbestos NOT Detected.	470.5	51.2	Absent	Absent
21-43745-4	S5 0	Synthetic Mineral Fibres Organic Fibres Asbestos NOT Detected.	544.0	41.4	Absent	Absent

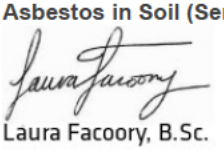
Information in the above table supplied by the client: Client Sample ID

Analysis Results (Size Fraction Breakdown)

Laboratory ID	Client Sample ID	Fraction Size	Fraction Weight*	AF/FA Weight*	ACM Weight*	ACM Content*	Asbestos Matrix	Asbestos Weight*	W/W% Asbestos*
	Units *Reporting Limit*		g 0	g 0	g 0	% 		g 0	
21-43745-1	2G - A1 0	>10mm	0.00	0.0000	0.0000	0	No Asbestos Detected	0.0000	<0.001 (ACM) <0.001 (AF/FA)
		2-10mm	171.50	0.0000	-	-	No Asbestos Detected	0.0000	
		<2mm	232.00	0.0000	-	-	No Asbestos Detected	0.0000	
21-43745-2	2G - A2 0	>10mm	38.00	0.0000	0.0000	0	No Asbestos Detected	0.0000	<0.001 (ACM) <0.001 (AF/FA)
		2-10mm	132.50	0.0000	-	-	No Asbestos Detected	0.0000	
		<2mm	68.50	0.0000	-	-	No Asbestos Detected	0.0000	
21-43745-3	S1 0	>10mm	0.00	0.0000	0.0000	0	No Asbestos Detected	0.0000	<0.001 (ACM) <0.001 (AF/FA)
		2-10mm	123.00	0.0000	-	-	No Asbestos Detected	0.0000	
		<2mm	106.50	0.0000	-	-	No Asbestos Detected	0.0000	
21-43745-4	S5 0	>10mm	24.00	0.0000	0.0000	0	No Asbestos Detected	0.0000	<0.001 (ACM) <0.001 (AF/FA)
		2-10mm	142.00	0.0000	-	-	No Asbestos Detected	0.0000	
		<2mm	153.00	0.0000	-	-	No Asbestos Detected	0.0000	

Information in the above table supplied by the client: Client Sample ID

Asbestos in Soil (Semi-Quantitative) Approver:



Laura Facoory, B.Sc.
Laboratory Technician

Method Summary

Asbestos Fibres in Soil (Semi-Quantitative)	Sample analysis was performed using polarised light microscopy with dispersion staining in accordance with AS4964-2004 Method for the qualitative identification of asbestos in soil samples. Note 1: The reporting limit for this analysis is 0.1g/kg (0.01%) by application of polarised light microscopy, dispersion staining and trace analysis techniques. Note 2: Trace asbestos is indicative that freely liberated respirable fibres are present and dust control measures should be implemented or increased on site. This is not the sole indicator for the friable nature of the asbestos present. Note 3: If mineral fibres of unknown type are detected, by PLM and dispersion staining, these may or may not be asbestos fibres. To confirm the identity of this fibre, another independent analytical technique such as XRD analysis is advised. Note 4: The laboratory does not take responsibility for the sampling procedure or accuracy of sample location description.

Appendix C. Site Management Plan (Ground Contamination)

WILLIAMSON
WATER & LAND ADVISORY

Unit 10 | 1 Putaki Drive | Kumeu
Auckland | New Zealand
s 9(2)(a)
s 9(2)(a)
W www.wwla.kiwi

Site Management Plan (Ground Contamination)

Site ID:	2-8 Gatland Road and 470-476 Great South Road, Papakura

Overview:

Greg Hayhow is redeveloping this rural site into a high-density residential subdivision. The proposed works will involve demolition of existing structures, soil disturbance and either onsite remediation or off-site disposal. WWLA has undertaken a combined HAIL assessment (PSI) and soil contamination testing (DSI) [1] confirming:

- HAIL activities have occurred, related to cattle drench application (Activity A8) and use of lead-based paint (Activity I).
- Soil testing has found that:
  - There is a single exceedance of high-density residential human health criteria in the cattle yards at 8 Gatland Road (for arsenic; sample S6).
  - The AUP (environmental) discharge criteria was only exceeded in one sample (former sleepout/ shed; sample S5) where lead exceeded the environmental values.
  - No asbestos was detected in soils, but ACM is present on the building at 2 Gatland Road.
  - All other soils, including fill around the stormwater pond, are at background concentrations for both volcanic and non-volcanic soils.

This SMP provides procedures to guide contractors in materials management, reuse, disposal, health and safety and response to unexpected contamination encounters. The contractor is responsible for following the requirements of the SMP and reporting on compliance to the contaminated land specialist (CLS). Where input is required by a CLS/ SQEP (i.e. WWLA), it is *highlighted* below).

Actioned by (Contractor's Site Manager): … …….……..	Date: ……
Checked by (SQEP/ Contaminated Land Specialist): ……..	Date: ……

Task	Description	Check
Site Establishment	• Establish earthworks controls according to Auckland Council's Guideline Document 2016/005, "*Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region*":	☐
	• Induct new workers/ subcontractors to requirements of this plan as works progress.	☐
Hot Spot Remediation	• Establish dedicated erosion and sediment control around two hot spots areas (refer Figure C1).	☐
	• *CLS (i.e. WWLA) shall be notified prior to commencement and completion of any remediation activities*.	☐
	<u>If offsite removal is chosen:</u> • Excavate soil to 0.4 m depth, or the base of topsoil, in both remediation areas. This includes a 1 m buffer on each side. • Load soil directly into a truck for offsite disposal. Trucks should be covered during transit to the fill facility. Disposal as follows: - Former sleep out: Licensed landfill disposal. - Cattle yards: Managed fill or licensed landfill disposal. • No remediation shall take place while it is raining or during windy conditions to prevent migration of contamination offsite. • The excavation shall be covered when not being worked until cleared by the CLS. • Any excess water that falls in the excavation shall be allowed to drain to ground.	☐
	<u>If onsite mixing is chosen:</u> • Strip hot spot areas along with remaining clean topsoil on site, placing it progressively into Moxy or other similar vehicles for onsite stockpiling.	☐

[1] WWLA, Preliminary and Detailed Site Investigation (Ground Contamination), 470 Great South Road, Papakura. 1 November 2021. Ref: WWLA0472.

	• Ensure stockpiling is undertaken with topsoil from contaminated areas being alternated with topsoil from clean areas. • A 6:1 ration of clean to contaminated soil should be achieved as a minimum. • Stockpiling must be within the area of erosion and sediment control. • If paint flakes are found in the sleepout/ shed, topsoil from this area shall not be mixed with clean soils. Soil with paint flakes requires offsite disposal to licensed landfill.	
	• *Contact the CLS for validation sampling when underlying ground is reached (and stockpiles formed, for onsite mixing).*	☐
	 **Figure C1: Remediation areas**	☐
General (Bulk) Earthworks Requirements (following remediation)	• Maintain erosion, sediment and surface water controls.	☐
	• Action mitigation for any new hazards identified during the course of the works.	☐
	• Arrange soil disposal permits <u>before any soil leaves site</u>. Disposal shall be as below (pending operator approval):	☐
	All soils following remediation — Cleanfill (or reuse on site)	
	Unexpected contamination — To be advised by CLS.	
	• Keep records of disposal volumes and destinations for submission to the CLS on completion of works.	☐
	• *Ensure any imported materials are clean*. These must be verified by the CLS as being either quarry sourced or from a non-HAIL (uncontaminated) site.	☐
	• Surface water shall be retained onsite and allowed to soak to ground or to the existing stormwater pond. <u>Water shall not be disposed to the public stormwater network without prior treatment</u>.	☐

Unexpected Contamination Response	• Liaise with the CLS *should any unexpected contamination be identified* and implement mitigation measures advised by the CLS. Typical unexpected materials can include: - odorous materials (i.e., hydrocarbons, solvent odour); - discoloured soil (green, black); - bulk asbestos; or - putrescible or demolition materials.	☐
	If unexpected contamination is encountered the following steps must be taken by the Contractor: 1. Cease works in the immediate vicinity of the suspected contamination and tape or cone off. 2. *Notify the project manager (client representative) and the CLS*. 3. Implement any contaminated land-related health and safety procedures and PPE if deemed necessary by the CLS. 4. Update the Hazard Board to direct site workers should continued exclusion of the area be required. 5. Implement and maintain any additional controls required by the CLS to manage contamination. 6. Notify Auckland Council via the *CLS within 24 hours of implementing any contamination mitigation measures* If additional asbestos is identified subsequent to the demolition and clearance, requirements of the Health and Safety at Work (Asbestos) Regulations must be adhered to. The *CLS shall provide direction* and if required, a Licensed Asbestos Removal Supervisor engaged.	☐
Post Works (*provide to CLS*)	• Weighbridge summary of materials disposed from site to managed fill/ landfill	☐
	• Details of any health and safety or environmental incidents during remediation.	☐
	• Details of mitigation measures implemented during remediation.	☐
	• Clearance certificates for asbestos removal from the buildings (for 2 Gatland Road).	☐