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THE CONTAMINATED SITE CONSULTANCY

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Your Report

Preliminary site investigation and Detailed site investigation

Te Awamutu Country Club

Te Awamutu

Sanderson Group Limited

THE CONTAMINATED SITE CONSULTANCY

Record of review

Roles	***Person responsible***	***Position***	***Relevant experience***	***Signature***
Report preparation	Brendon Love	Contaminated Site Specialist	30 years	
Report review	William Lines	Contaminated Site Specialist	26 years	 

Report checklist

Summary contaminated sites report checklist					
Report contained in this document	☑	☑	☐	☐	☐
Report sections and information to be presented	**PSI**	**SIR**	RAP	SVR	MMP
Executive summary	**R**☑	**R**☑	R☐	R☐	R☐
Scope of work	**R**☑	**R**☑	R☐	R☐	R☐
Site identification	**R**☑	**R**☑	R☐	R☐	R☐
Site history	**R**☑	**S**	S	S	S
Site condition and surrounding environment	**R**☑	**S**	S	S	S
Geology and hydrology	**A**	**R**☑	S	S	S
Sampling and analysis plan and sampling methodology	**A**	**R**☑	X	R☐	R☐
Field quality assurance and quality control (QA/QC)	**N**	**R**☑	X	R☐	S
Laboratory QA/QC	**N**	**R**☑	X	R☐	X
QA/QC data evaluation	**N**	**R**☑	X	R☐	X
Basis for guideline values	**R**☑	**R**☑	R☐	R☐	R☐
Results	**A**	**R**☑	R☐	R☐	S
Site characterisation	**R**☑	**R**☑	R☐	R☐	R☐
Remedial actions	**X**	**X**	R☐	S	S
Validation	**X**	**X**	X	R☐	S
Site management plan	**X**	**X**	R☐	S	S
Ongoing site monitoring	**X**	**X**	X	N	R☐
Conclusions and recommendations	**R**☑	**R**☑	R☐	R☐	R☐

Key:

R - the corresponding heading and details are required

A - readily available information should be included

S - a summary of this section's details will be adequate if detailed information has been included in an available referenced report

N - include only if no further site investigation is to be undertaken

X - not applicable and may be omitted.

Ref: MfE2

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Summary

Sanderson Group Limited proposes to develop an 18-hectare retirement village / residential subdivision adjoining Frontier Road, Te Awamutu, Waikato. The site is to be known as the Te Awamutu Country Club and currently encompasses roughly 18 ha of rural land located to the north of 10 Frontier Road, Te Awamutu ("the site").

The site comprises two properties. Since at least 1944 the northern property has been used as a rural residential dwelling and associated buildings while the southern property adjoining Frontier Road has been used for pastoral grazing purposes. The site is not listed on the Waikato Regional Council's selected land use registry of hazardous activity and industry list (MfE 1).

HAIL Environmental Limited (HAIL Environmental) was commissioned by Sanderson Group Limited (proposal dated 12 March 2020) to complete a combined preliminary and detailed site investigation (PSI-DSI) for the properties. The purpose of the investigation was to:

- Confirm whether the land has been used for activities or industries that have the potential to result in contamination.
- Determine whether soil disturbance and change of use associated with the redevelopment could result in a risk to human health and/or the environment.
- Identify potential consenting requirements under the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011, regional and district plans.

Based on information reviewed, field observations, soil sampling and analysis, mean concentrations of heavy elements in surface soils are at concentrations below applicable standards across both properties. Asbestos fibres are not present, in surface soils within the northern portion of the site. Accordingly, during and following development, no complete source-pathway-receptor contaminant linkages will be present.

Based on the revised conceptual site model, soil contaminants at the proposed Te Awamutu Country Club development does not require any specific management or remediation to mitigate risks to human health.

Anecdotal information indicates that offal pits may be present near the former diary milking shed which adjoined the south eastern boundary. While organic wastes within these pits is likely to have biodegraded potential co-disposal of non-organic wastes may pose a hazard if present.

Elevated lead and zinc are present within the northern property. Samples collected within this portion of the site targeted the locations of former sheds and structures however the presence of buried demolition wastes with higher heavy element concentrations cannot be ruled out.

Due to the potential for waste disposal pits to be encountered during bulk earthworks it is recommended that contingency measures are adopted into earthworks management plans to manage any risks associated with these wastes if encountered.

The development will require a controlled activity consent from Waipa District Council under the NES-CS.

1. Introduction

1.1 Purpose

Sanderson Group Limited proposes to develop 18-hectare retirement village/ residential subdivision adjoining Frontier Road, Te Awamutu, Waikato. The site is to be known as the Te Awamutu Country Club. The site currently encompasses roughly 18 ha of rural land located to the north of Frontier Road, Te Awamutu ("the site").

The site comprises two properties. Since at least 1944 the northern property has been used as a rural residential dwelling and associated buildings while the southern property adjoining Frontier Road has been used for pastoral grazing purposes. The site is not listed on the Waikato Regional Council's selected land use registry of hazardous activity and industry list (MfE 1).

HAIL Environmental Limited (HAIL Environmental) was commissioned by Sanderson Group Limited (proposal dated 12 March 2020) to complete a preliminary site and detailed site investigation (PSI-DSI) for the property. The purpose of the investigation was to:

- Confirm whether the land has been used for activities or industries that have the potential to result in contamination.
- Determine whether soil disturbance and change of use associated with the redevelopment could result in a risk to human health and/or the environment.
- Identify potential consenting requirements under the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011, regional and district plans.

1.2 Scope of work

The scope of work comprised:

- Review of the Waipa District Council (WDC) property files for the site.
- Review of Waikato Regional Council (WRC) supplied contamination enquiry information.
- Review of available historic aerial photographs.
- Review of historic certificates of title.
- Review of geological and hydrogeological information.
- Site walkover inspection and interviews with landowners.
- Conducting sampling and analysis in potential areas of concern based on the site history information.

This report has been prepared in general accordance with *Reporting on Contaminated Sites in New Zealand* (Ref: MfE2), *Site Investigation and Analysis of Soils* (Ref: MfE3) and the NES:CS. In accordance with the requirements of Regulation 3 of the NES:CS, this PSI-DSI is prepared and certified by suitably qualified and experienced practitioners (see the record of review above).

2. Site Identification

2.1 Site details

Table 1: Site details

Site name:	Te Awamutu Country Club
Address:	10 & 52 Frontier Road Te Awamutu, Waikato 3876
Relevant authorities	Waipa District Council Waikato Regional Council
Legal description and area	Lot 1 DP 487281 - 15.683 ha, 52 Frontier Road Lot 2 DP 487281 – 2.530 ha, 10 Frontier Road
Zoning	Rural - Waipa District Council
Elevation	Approximately 80 m above mean sea level (amsl) on the eastern site boundary falling to 50 m amsl on the western boundary
General description	Irregular shaped, 18 ha site sloping west and located approximately 3 km west of Te Awamutu. Northern parts of the site have long been occupied by a residential dwelling, while the southern part (>80%) have had pastoral grazing use.

The location and layout of the site is depicted in Figures 1 and 2 respectively. The proposed redevelopment is provided in Appendix A.

2.2 Proposed development

According to scheme plans supplied by the Sanderson Group the proposed development will consist of:

- 98 retirement units
- Care facility, club house, health spa, pond bowls lawn, croquet green, camper van parking, hobby shed, golf putting green
- 105 residential lots ranging from 500 – 700 m^2

A copy of the proposed scheme plan for development is provided in Appendix A.

2.3 Site layout

A site walkover was completed by HAIL Environmental on 30 April 2020. The layout was generally consistent with Figure 2. The following observations were noted during the inspection. Site photographs are provided in Appendix B.

2.3.1 10 Frontier Road (Lot 2 DP 487281)

- This site is accessed off Frontier Road via a long gravel driveway (approximately 300 m). A residential dwelling is located near the southern boundary of this property. The dwelling is surrounded by ornamental gardens and mature trees.

- The remainder of this property comprises pastoral grazing, with some mature macrocarpa and oak trees.
- Some old bricks were noted to the west of the residential dwelling in the location of the former residential dwelling evident in historical aerials, circa 1940-70. Several hand excavated test pits were advanced in this area. No ACM or other anthropogenic waste was observed with the exception of ash and charcoal.
- Several depressions were noted in the topography where former sheds were located circa 1940-1980. Several hand excavated test pits were advanced in these areas. No ACM or other anthropogenic waste was observed with the exception of ash and charcoal. A small mound of sub angular fine to medium gravel was located near the northern boundary of the property.
- With the exception of a mound of gravel located near the northern boundary the test pits advanced on the property revealed a dark brown silty loam with some charcoal fragments extending to around 0.3 m below ground level.
- The topography slopes slightly to the north away from the residential dwelling.

2.3.2 52 Frontier Road (Lot 1 DP 487281)

- This site is accessed off Frontier Road via a gravel driveway which leads to a stock loading yard and iron shed. The stockyard is concrete lined. The shed is a modern three bay colour steel shed. The shed was locked.
- A disused 500 L above ground fuel storage tank (AST) was located near the northern side of the shed. The tank was lying on the ground. Further inspection revealed the AST was empty. No spilled fuel, staining or odour was noted around the tank or the shed.
- Several logs of native timber were noted near the northern end of the shed. Sawdust was noted near the logs and to the south of the shed indicating that some firewood was processed recently. No spills or stained ground was observed near the shed or the stockyard.
- A recently harvested maize crop was evident in the paddock to the west of the stockyard adjoining Frontier Road.
- The remainder of this property comprised pastoral grazing paddocks and farm vehicle and stock access tracks.
- The topography had a moderate slope towards a pond located in the centre of the property bordering the western boundary. The pond was almost dry and surrounded by mature trees.

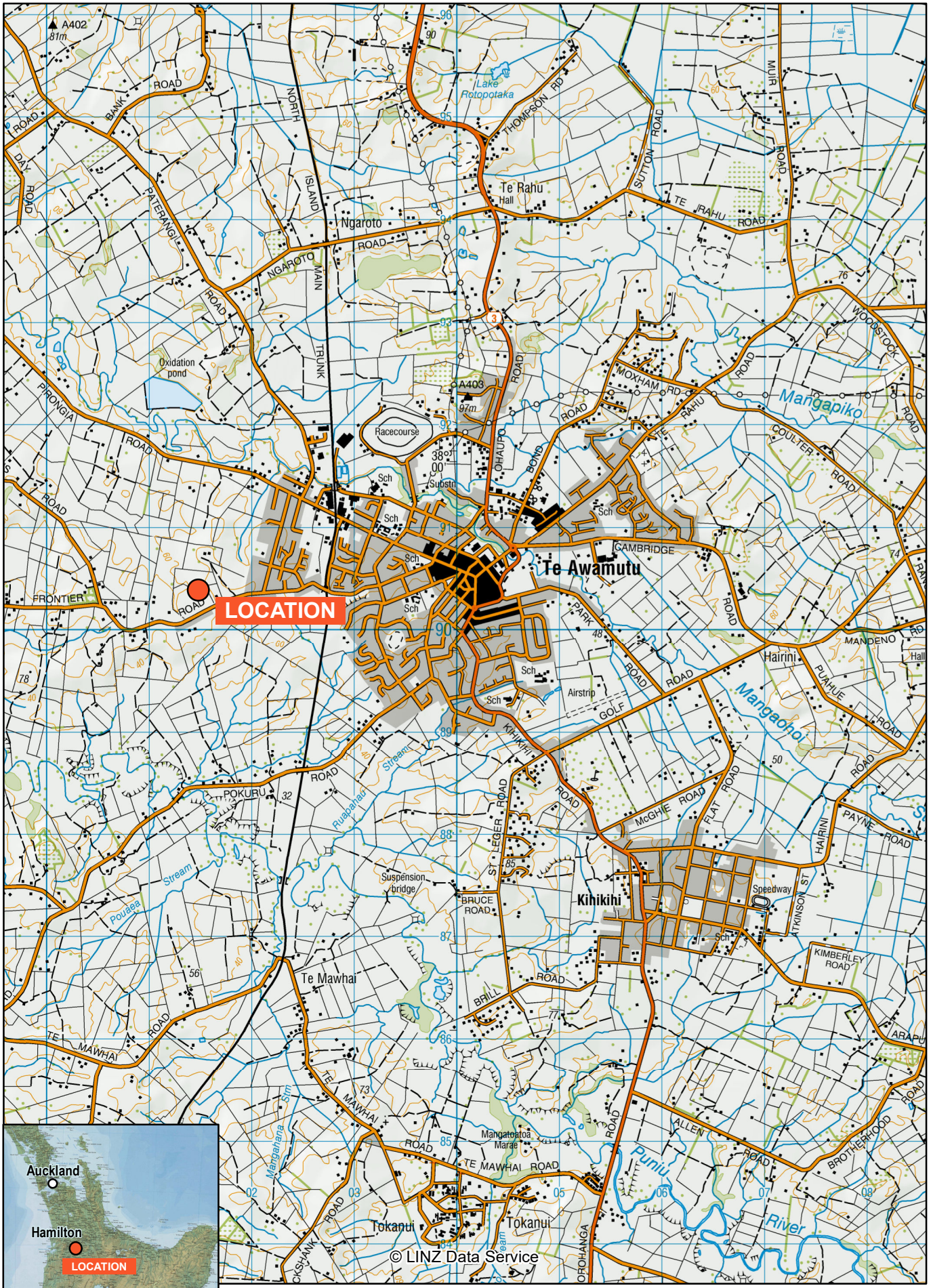

Figure 1 - Site Location Plan

56 Frontier Road, Te Awamutu

Scale = 1:50000 (A4)

0 1 2 3

Kilometres

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Figure 2 - Site Layout Plan

56 Frontier Road, Te Awamutu

Scale = 1:4000 (A4)

0 100 200

Metres

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2.4 Anecdotal information

2.4.1 Site contact

During the site inspection on 30 April anecdotal information was obtained from discussions with the current site owner, Rodney Spiers. Rodney provided the following information:

- Rodney purchased the property in the late 1980s.
- Part of the site including the former cow milking shed and farm implement shed was sub-divided off the property around 2015 and sold to the Waipa District Council (WDC) for construction of the current water storage reservoir.
- When questioned about former buildings and sheds that may have asbestos containing materials Rodney stated that he thought that the old milking shed may have had some ACM, and WDC had to manage it during construction of the reservoir.
- When questioned about possible sheep dips, he stated that the farm had never been used for sheep and was always dairy cows and dry stock to his knowledge. He stated that there may have been some offal pits near the former cowshed.
- When asked about the disused AST located near the shed he indicated that it was formerly located near the cowshed but he had some fuel thefts in the past and when the cowshed was subdivided and sold from the farm they decided not to use it again.
- When asked about fertiliser application rates he was not sure but stated that a portion of the original farm which adjoined the eastern boundary and was now being developed into a residential subdivision was tested and contained high cadmium levels. He said that prior to being developed they had stopped applying superphosphate and had applied lime to the land.
- When asked about agrichemical use on the maize crops he wasn't aware of what sprays and fertilisers might have been used. He said that any agrichemicals would have been stored in the former implement shed which was located off-site near the former cowshed. He said that maize had been grown in the southern portion of the site for around 5 years.

2.4.2 Internet search

An internet search using Google® associated with the address Frontier Road, Te Awamutu resulted in a Harcourts Real Estate listing for a consented 300 residential lot subdivision at 8 Frontier Road being identified as being sold in May 2016. This property adjoins the eastern boundary of the site.

2.5 Surrounding areas

Land uses adjacent to the site predominantly comprise:

North The site is bounded by rural grazing land.

East The site is largely bounded by former pastoral grazing land currently undergoing land use change into a residential subdivision. A water storage reservoir and pump station are located adjacent to the south eastern boundary of the site near Frontier Road.

South The southern boundary adjoins Frontier Road beyond which lies residential land use.

West The site is largely bounded by pastoral grazing land.

2.6 Local geology and hydrology

2.6.1 Soils

Site soils are mapped as Mairoa (high confidence) over most of the site, and Porchester (medium confidence) in the gully near the western site boundary. Mairoa soils are classified as orthic allophanic soils; deep, well drained, tephric, with high topsoil phosphate retention. Porchester soils are classified as mottled orthic brown soils; deep, imperfectly drained, stoneless, with medium topsoil phosphate retention (Ref: Landcare1).

2.6.2 Geology

The site is mapped as underlain by Walton Subgroup which are part of the Tauranga Group deposits containing pumiceous silt, sand and gravel with interbedded peat and rhyolitic pumice, including non-welded ignimbrite, tephra and alluvium pumice deposits. (Ref: GNS1).

WRC online mapping shows several cold-water wells near the site with geological logs:

- **72_9783**, shown in the north east of the site very close to the site boundary, is recorded as silt from 0-7.94 m bgl, gravels 7.94-11.24 m, silt 11.24-11.74 m, gravels 11.74-21.74 m, followed by layers of silt, gravel, pumice and sand to a depth of 145 m. The well is screened from 129 m.
- **72_9765**, shown to be located on 28 Frontier Road adjoining the south eastern site boundary, is recorded as 150 m deep; with clay from 0-12 m bgl, silt 12-30 m, gravels 30-42 m, sands 42-81 m, silts 81-100. The well is screened from 100 m.
- There are several other wells on 28 Frontier Road that were all installed in 2015 by Barham United Well Drillers presumably to establish the WDC municipal water supply. This includes well 72_8208, 72_8871, and 72_9767. Of these wells 72_8871 appears to be the deepest well at 191 m bgl, with ignimbrite being the predominant geological unit between 34-191 m.

2.6.3 Hydrogeology

The Waikato Regional Plan assigns the site to the Waipa Catchment management zone. Groundwater resource investigations commissioned by Waikato Regional Council show the site in the Waipa Zone of the Healthy River Project (GNS2).

The Walton Subgroup, which underlies the site is considered the most important groundwater resource of the Tauranga Group sediments for groundwater resources. The Walton Subgroup typically provides large volumes of good quality water with bores in this group yielding greater than 28 L/s. Many bores are shown on WRC online mapping, including at least 4 within 500 m of the site; where well depth or screen level is shown, this is typically 100-190 m bgl, suggesting that the high-yield aquifer is deep.

In this aquifer zone, nitrate-nitrogen from agriculture commonly exceed community drinking-water standards. Iron and manganese are also greater than drinking water maximum acceptable values in some wells (Ref: GNS2). Perhaps for this reason, the casing depth for onsite well 72_8871 is recorded as 100 m bgl indicating that it is installed in a deep aquifer. This aquifer may be semi-confined, given the log shows a 30 m thickness of clay above the casing depth. This well is currently listed as a consented groundwater take (consent authority ID: 136401.01.02) and named the Frontier Road, Te Awamutu Supplementary Water Supply.

Regionally, groundwater flow is north toward the Waikato River (GNS2).

2.6.4 Hydrology

The site drains west through several gullies to a pond located near the western site boundary. WRC online mapping shows the site is approximately 1 km east of a minor unnamed tributary of the Puniu River which is part of the upper catchment of the Waikato River. The site is not listed as being within a Waikato Regional council land drainage scheme. The Waikato Regional Plan assigns the site to the Waipa Catchment management zone.

3. Site History

3.1 Historic image review

Available aerial photographs and satellite imagery were reviewed to help determine past and current site layout and usage, as well as changes in surrounding properties. Selected aerial photographs are contained in Appendix C. The current and historic certificates of land title are included in Appendix D.

Review of the images revealed that:

1944 – The site is pastoral farmland. There is what appears to be a residential dwelling on the northern end of the site. Another structure is visible within trees to the west of the residential dwelling. The dwelling is accessed from Frontier Road by a track located on property to the east. A small shed or structure is visible midway along the northern border and an unknown object or structure is evident in the north eastern corner.

Frontier Road is in its present-day alignment. Several buildings are located on the property adjoining the south-western site boundary. Otherwise the site is surrounded by pastoral farmland.

- **1958** – The site remains pastoral farmland and largely unchanged from the 1944 image. The unknown object or structure in the north eastern corner is no longer evident.

  The surrounding land use is pastoral farmland. Two residential dwellings have been constructed on the southern side of Frontier Road. It appears that a milking shed with milk tanker truck turn-circle has been constructed on property to the south-east of the site bounding Frontier Road.

  1961 – The site and surrounding land use remain pastoral farmland. An additional shed has been constructed to the north of the residential dwelling on the northern site boundary. An unknown object or structure is visible to the west of the residence.

  The surrounding land still appears to be farmland. Several new residential dwellings are visible on the southern side of Frontier Road.

- **1966** – The site and surrounding land use remain pastoral farmland and largely unchanged from the 1961 image with exception of several new residential dwellings being constructed on the southern side of Frontier Road. An additional small shed or structure is evident in the north eastern corner of the site.

- **1971** – The site and surrounding land use remain pastoral farmland and largely unchanged from the 1966 image. Two small buildings are now present to the north east of the residential dwelling onsite. The sheds that were present on property adjoining the south-western boundary have been removed. Property located on the southern side of the site adjoining Frontier Road is now dominated by residential dwellings.

- **1995** – The residential dwelling onsite appears to be located further west and may have had an extension added or possibly be a new building. Some of the mature trees that were present around the residential dwelling have now been removed. The small shed located midway along the northern boundary is no longer evident. Additional buildings are now evident immediately to the north and north east of the residence.

  The surrounding land use appears the same.

- **2012** –Trees have been removed around the residential dwelling and stock are grazing on land directly west of the dwelling. The pastoral grazing portion of the site and property adjoining the eastern boundary appears to have been recently had recent fertiliser application.

  The property adjoining the south-eastern boundary has an additional shed located on it.

- **2019** – The northern portion of the site is largely unchanged since 2012. A stockyard and shed are now located on the southern site boundary.

  The property adjoining the eastern boundary appears to have some earthworks being carried out on it. The cowshed and sheds visible on property to the south-east in 2012 have been removed and a large tank is now located on-site.

3.2 Waipa District Council

WDC property files for the two properties within the site were reviewed. Only two documents were supplied which are summarised below.

- 1988 – Applications for building a swimming pool with removable roof at 10 Frontier Road made by Mr R. J. Spiers.
- 2019 – Transfer of ownership related to 52 Frontier Road. This records a change of trustee for the Rochdale Trust.

3.3 Waikato Regional Council

3.3.1 Contaminated sites enquiry

Available site contamination information was requested from WRC.

The WRC site contamination files do not include any information in relation to the contamination status of the sites.

The response does include reference to common sources of contamination on rural properties such as sheep dipping, chemical storage, bulk petroleum storage, farm implement workshops, historical asbestos building materials or lead-based paint use on buildings, and long term, frequent use of superphosphate fertilisers as having the potential to impact soil quality on sites.

A copy of the response is included in Appendix E.

4. Initial Conceptual Site Model

4.1 Sources of contamination

Aerial photography, Council files, and anecdotal information agree that the northern part of the site has had a rural residential land use since the late 1940s. Anecdotal information indicates that a new dwelling was constructed during the 1990's slightly east of the original farm homestead. Other sheds located in this part of the site were associated with hay storage.

Chromium, copper and arsenic from treated timber, lead from paints, zinc from galvanised iron and steel, and asbestos containing material (ACM) are all probable contaminants associated with older building materials.

Across the remainder of the site, low to moderate levels of common persistent agricultural contaminants are possible. These are likely to include cadmium, a trace impurity in superphosphate fertiliser, and possibly organonitrogen or organophosphate pesticides (ONOPs) in maize cropping areas in the south of the site – although anecdotal evidence and historical aerial photographs suggests that the period of maize cropping occurred well after the period of potential ONOP usage.

4.2 Transport and exposure pathways

Most of the potential contaminants above have limited mobility in the subsurface and are hazardous to human health principally on direct contact, ingestion of soil and dust, and vegetable uptake. They are hazardous to the environment due to their toxicity to soil organisms, and when sediment and entrained contaminants are carried into surface water by overland flow and stormwater drainage.

Exceptions include:

- Comminuted or fibrous asbestos, which is hazardous solely by inhalation,
- Some heavy elements, notably zinc, are sparingly soluble and can leach into groundwater; they may be phytotoxic at higher concentrations.

Surface runoff from the site is shown as passing through a stormwater pond. This pond is to be retained in the proposed development plan.

Regionally, groundwater abstraction is from very deep aquifers with regional flow to the northwest toward the Waikato River.

4.3 Potentially sensitive receptors

In the context of the proposed retirement village / residential subdivision development (refer Section 2.2), key receptors on site are:

- Development workers in ground contact.
- Future residents.
- Gardening and maintenance staff.
- Management and advanced care staff.
- Groundwater, albeit potentially already impacted by nitrate and/or faecal coliforms from surrounding agriculture.

Potentially sensitive offsite receptors may include:

- Residents of adjacent properties to the south, or east following completion of residential development.

4.4 Initial conceptual site model

Based on the above assessment, potentially complete source-pathway-receptor contaminant linkages at the site during and following development include:

- During ground works, development worker and nearby resident exposure to inhaled asbestos fibres from former building or shed demolition and removal in the northern portion of the site.
- Direct exposure of development workers to a range of building materials and waste-derived contaminants including heavy elements.
- Exposure of future residents to building material and waste-derived contaminants via ingestion and inhalation. Produce consumption will not be a pathway as there is no allowance for growing produce at the site.
- Exposure of future garden and maintenance staff to building material and waste-derived contaminants via ingestion and inhalation. Management and advanced care staff will primarily work indoors and consequently are at considerably less risk.
- Impacts on soil quality and landscape planting from building material and waste-derived contaminants.
- Leaching of building material and waste-derived contaminants to groundwater, which may be used for agricultural or domestic purposes, and will eventually discharge into nearby waterways.

5. Soil sampling and analysis

5.1 Sampling plan

Given the initial conceptual site model, soil sampling had two main objectives:

- To assess surface soil quality, especially in and around the former residential dwelling and sheds in the north of the site.
- To assess surface soil quality in pastoral soils in the southern portion of the site.

Accordingly, the following approach was planned:

- In the northern portion of the site 4 surface soil samples for presence/absence of asbestos and for heavy elements (S1-S4).
- In the southern portion of the site 9 surface soil samples for heavy elements (S5-S13)
- In the southern portion of the site where maize cropping occurred 1 surface soil sample for organonitrogen and organophosphates (S11).

Two samples were to be collected and analysed in duplicate for quality assurance and quality control purposes. The data quality objective (DQO) was a mean relative percent difference (RPD) of less than 30 %, following MfE3.

Control samples were not collected since local natural background concentration ranges are available.

The sample locations are presented on Figure 3.

5.2 Sampling methodology

The soil sampling programme was completed on 30 April 2020. Sampling locations are shown on Figure 3.

Soil samples were collected using from shallow test pits excavated with a stainless-steel spade, which was decontaminated between sampling points by washing with Decon-90® detergent and rinsing with tap water. Each sample was handled with dedicated disposal gloves. Soil was placed directly into laboratory supplied containers. Samples were held chilled and couriered to the laboratory, Analytica Laboratories Limited (Analytica), under chain of custody documentation. Chain of custody documentation is included in Appendix F.

Two samples were also collected in duplicate, with the second of each pair submitted for blind analysis under a separate sample number: D1 for S7, D2 for S12. As no gross contamination was observed, rinsate blanks were not collected.

Figure 3 - Site Sampling Plan

56 Frontier Road, Te Awamutu

Scale = 1:4000 (A4)

0 100 200

Metres

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5.3 Field observations

General observations on site layout and condition are given in Section 2. In summary:

- Test pits at sample locations S1 and S2 encountered brown loam SILT, with minor ash and charcoal fragments to 0.2 m bgl overlying a yellow brown silt.
- Test pits at sample locations S3 and S4 encountered brown loam SILT, with minor charcoal fragments to 0.2 – 0.3 m bgl, overlying a yellow brown silt.
- Test pits at sample locations TP5 – TP13 encountered brown loam SILT to 0.2 – 0.3 m bgl overlying a yellow brown silt.

ACM or other evidence of former building materials (paint flakes, wood or steel fragments were not noted in the surface soils.

5.4 Basis for guideline values

Based on the initial site conceptual model, the applicable standards are soil contaminant standards (SCS) for a residential land use (Ref: MfE4). This is considered highly conservative as the proposed land use is unlikely to include vegetable gardens eliminating the consumption of home grown produce pathway.

For amenity purposes, the ecological soil guideline values (eco-SGV) promulgated by Landcare (Ref: Landcare) are of interest, specifically those for residential / recreational areas. Background concentrations for heavy elements in the Waikato have been determined (Ref: WRC), and 95th percentile values are used here for comparison purposes.

5.5 Results

Analytical results for the soil samples collected from the site are summarised in Table 2. Laboratory reports and block data analysis sheets are provided in Appendix G.

In summary the results show that:

- Mean concentrations of selected heavy metals in the topsoil samples were within applicable standards. Samples S3 and S4 in the north of the site were high outliers for arsenic, but at 15 and 14 mg/kg respectively, both results are within the residential SCS of 20 mg/kg, and are therefore considered unlikely to represent a significant 'hot spot'.
- Samples S1 and S4 contained concentrations of lead slightly above applicable standards. These samples were not identified as high outliers using Grubbs Test and a significance level of a = 0.05 and a sample set of n = 13. However, it is assumed that these elevated lead concentrations may be representative of isolated particles of lead paint and are considered unlikely to represent a significant 'hot spot'.
- Samples S1-S4 contained concentrations of zinc slightly above applicable standards. These samples were not identified a high outlier using Grubbs Test and a significance level of a = 0.05 and a sample set of n = 13. However, it is assumed that these elevated zinc concentrations may be representative of isolated particles of galvanised zinc roof coatings and are considered unlikely to represent a significant 'hot spot'.

- No organonitrogen or organophosphorus pesticides were reported in sample S11 from the south of the site, which was analysed in duplicate by the laboratory.
- Otherwise, samples typically contained elevated cadmium and zinc within assessment criteria, other contaminants of interest within background levels, and no reported asbestos.

5.6 Quality assurance and quality control

Analytica Laboratories is accredited by International Accreditation New Zealand (IANZ), which represents New Zealand in the International Laboratory Accreditation Cooperation (ILAC). Through the ILAC Mutual Recognition Arrangement (ILAC-MRA) this accreditation is internationally recognised. Analyses were performed in accordance with the terms of accreditation.

The mean relative percentage difference (RPD) between laboratory duplicate analyses of sample S1 was 3 % across the seven selected heavy metals, a highly satisfactory result. The mean RPD across two pairs of field duplicates analysed for selected heavy metals – S7/D1 and S12/D2 – was 14 %, within the investigation's data quality objective of 30 %.

Table 2: Summary of chemical analyses – surface soils

Sample	***Arsenic***	***Cadmium***	***Copper***	***Lead***	***Zinc***
S1	7.5	0.541	46.9	222	**297**
S2	9.5	0.666	38.7	195	**272**
S3	15.3	0.516	37.2	68.2	**264**
S4	13.7	0.791	68.6	222	**388**
S5	6.1	0.913	53.2	15.4	119
S6	5.6	1.15	55.9	13.5	142
S7	5.8	0.736	57.9	14	109
S8	6.8	0.778	45.2	13.4	95.3
S9	6.2	0.734	33.7	13.5	88.1
S10	6.9	0.43	54.6	14.4	108
S11	6	0.911	55.1	14	140
S12	5.7	0.782	50.5	14.5	107
S13	6.3	1.07	57.1	14	139
D1	5.4	0.631	54.1	12.7	97.1
D2	5.1	0.653	46.6	13.3	92.2
Guidelines					
SCS$_{res}$ (ref: MfE4)	20	3.0	>10,000	210	No SCS
Eco-SGV (ref: Landcare 2)	**60**	**12**	**300**	**900**	**200**
Background (ref: WRC)	*6.8*	*0.22*	*25*	*20*	*53*

Notes: Concentrations are total recoverable analyte, mg/kg dry weight. Red – exceeds SCS. **Bold** – exceeds eco-SGV. *Italics* – within background. Chromium, nickel, not shown, as all reported results within reported background.

6. Site characterisation

6.1 Revised conceptual site model

Based on information reviewed, field observations, soil sampling and analysis, mean concentrations of heavy elements are at concentrations below applicable standards across the site. In addition, asbestos fibres are not present, in surface soils within the northern portion of the site.

Underlying soils generally comprise SILTs that are likely to have low permeability and retain any heavy elements above background levels.

Accordingly, during and following development, no complete source-pathway-receptor contaminant linkages will be present.

7. Conclusions

Based on the revised conceptual site model, soil contaminants at the proposed Te Awamutu Country Club development does not require any specific management or remediation to mitigate risks to human health.

Soil disturbance and change to residential use is likely to generate dust and stormwater with elevated contaminants above background levels however standard bulk earthworks control measures are adequate to manage these potential discharges.

The development will require a controlled activity consent under the NES-CS, and potentially under the Waikato Regional Plan and Waipa District Plan.

8. Recommendations

Anecdotal information indicates that offal pits may be present near the former dairy milking shed which adjoined the south eastern boundary. While organic wastes within these pits is likely to have biodegraded potential co-disposal of non-organic wastes may pose a hazard.

Some elevated lead and zinc are present within the northern property. Samples collected within this portion of the site targeted the locations of former sheds and structures however the presence of buried demolition wastes with higher heavy element concentrations cannot be ruled out.

Due to the potential for waste disposal pits to be encountered during bulk earthworks it is recommended that contingency measures are adopted into earthworks management plans to manage any risks associated with these wastes if encountered.

9. Limitations

Because of the limited scope of work performed and the errors and omissions inherent in available historical and anecdotal records, HAIL Environmental cannot reach unqualified conclusions about soil contamination at the site:

- HAIL Environmental cannot validate that all anecdotal information is accurate.
- Conclusions based on review of representative regional land uses and their impacts cannot ensure that impacts from a particular site agree with these regional norms.
- The locations of apparent current and historical HAIL activities were used to target soil sampling locations. Sampling was not undertaken underneath buildings currently on site. Unreported activities may also have occurred, and if so, might not have been detected by the sampling and analysis performed.
- Some site conditions may be undetectable by the limited scope of work performed. Localised hotspots may exist between sampled locations. In particular, it is almost certain that sampling did not intercept all buried wastes.
- Groundwater was not sampled.

10. References

GNS1: Edbrooke, S.W. (compiler) 2005: Geology of the Waikato area: scale 1:250,000. Lower Hutt: Institute of Geological & Nuclear Sciences. Institute of Geological & Nuclear Sciences 1:250,000.

GNS2: Groundwater resource characterisation in the Waikato River catchment for Healthy Rivers Project. Draft for discussion purposes, commissioned by Technical Leaders Group for Healthy Rivers Wai Ora Project, Waikato Regional Council. Institute of Geological and Nuclear Sciences Limited. Lower Hutt. 2015.

Landcare1: S-map national soil mapping database. Landcare Research Limited, Lincoln. Accessed online at smap.landcare.co.nz during April 2020.

Landcare2: Development of soil guideline values for the protection of ecological receptors (Eco-SGVs): technical document. JE Cavanagh, K Munir. Landcare Research Limited, Lincoln. 2016.

MfE1: Hazardous activities and industries list (HAIL). Revised edition. Ministry for the Environment. Wellington. 2011.

MfE2: Contaminated land management guideline No. 1: Reporting on contaminated sites in New Zealand. Revised edition. Ministry for the Environment. Wellington. 2011.

MfE3: Contaminated land management guideline No. 5: Site investigation and analysis of soils. Revised edition. Ministry for the Environment. Wellington. 2011.

MfE4: Methodology for deriving standards for contaminants in soil to protect human health. Ministry for the Environment. Wellington. 2011.

NES:CS: Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations. 2011.

WRC: Natural background concentrations in the Waikato Region. Waikato Regional Council https://www.waikatoregion.govt.nz/services/regional-services/waste-hazardous-substances-and-contaminated-sites/contaminated-sites/natural-background-concentrations/ viewed on 8 May 2020

Appendix A: Proposed Scheme Plan

Te Awamutu Country Club

Frontier Drive, Te Awamutu

Proposed facilities

1. Care Facility
2. Club House
3. Health Spa
4. Pond
5. Bowls Lawn
6. Croquet Green
7. Campervan Parking
8. Hobby Shed
9. Golf Putting Green

98 Retirement Villas

105 Residential Lots

Appendix B: Site Photographs

Image from southern site boundary facing north

Image taken near southern site boundary facing east. Frontier Road is visible on the right with the water reservoir in the background

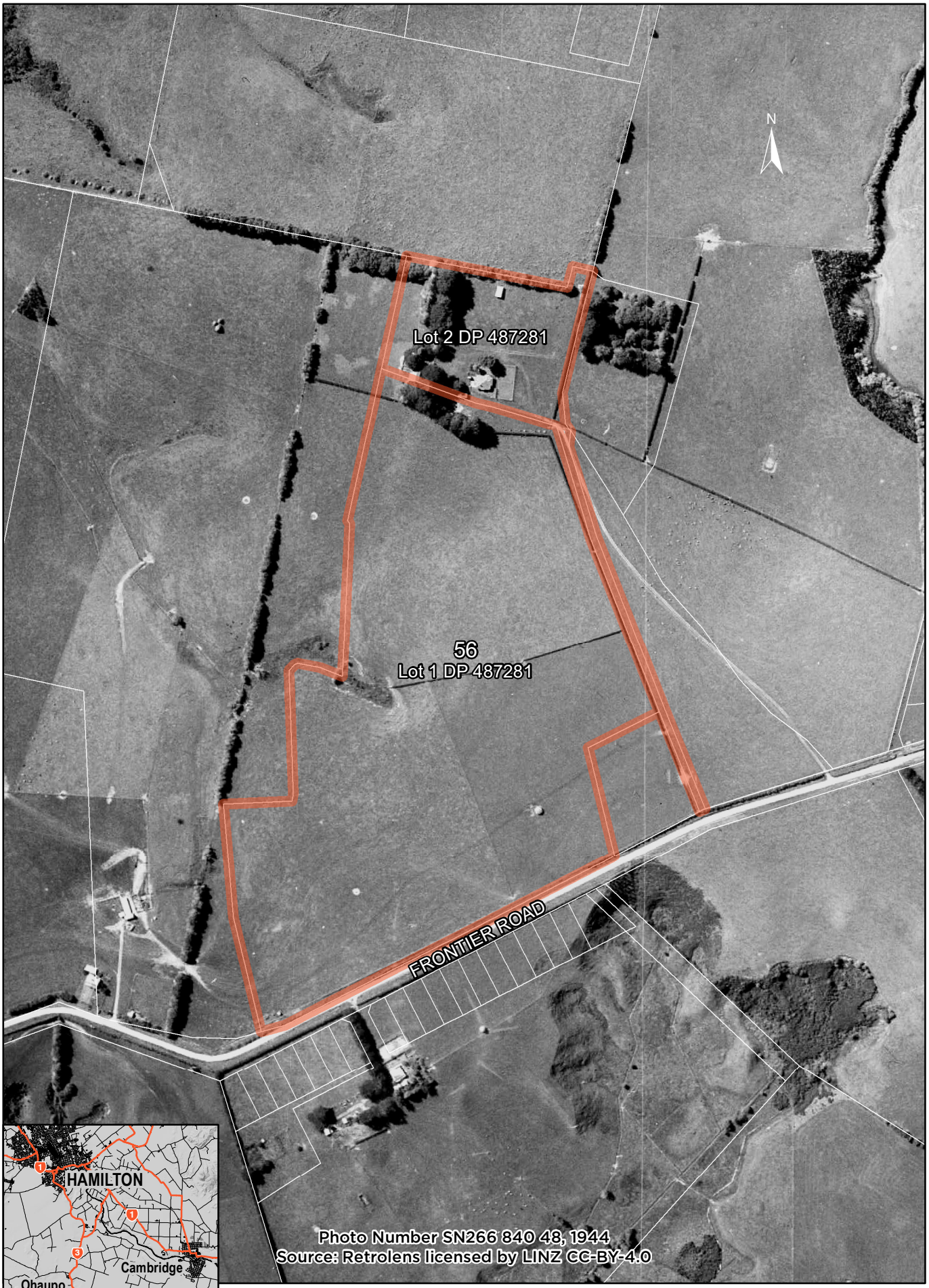
Building materials near the former residential dwelling

Shallow soil profile in sample location S2

Image taken near northern boundary facing south towards the existing residential dwelling

Image taken near locked implement shed located on southern boundary. Disused AST is visible in foreground.

Appendix C: Aerial Photographs



Historic Aerial Imagery - March 1944

56 Frontier Road, Te Awamutu

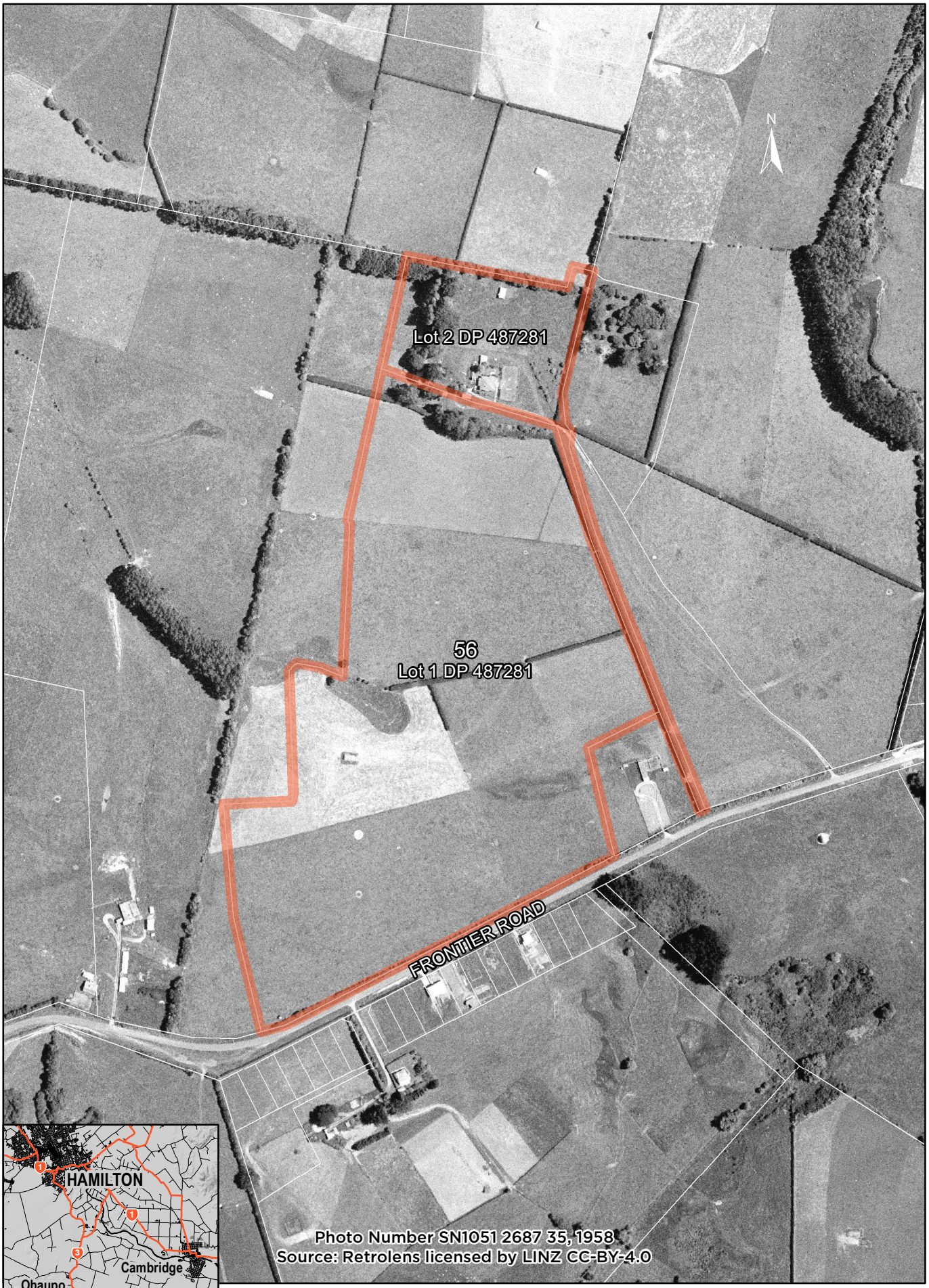
Scale = 1:5000 (A4)

0 100 200 300

Metres

HAIL Environmental

THE CONTAMINATED SITE CONSULTANCY



Historic Aerial Imagery - November 1958

56 Frontier Road, Te Awamutu

Scale = 1:5000 (A4)

0 100 200 300

Metres

HAIL Environmental

THE CONTAMINATED SITE CONSULTANCY

Historic Aerial Imagery - September 1961

56 Frontier Road, Te Awamutu

Scale = 1:5000 (A4)

0 100 200 300

Metres

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Historic Aerial Imagery - February 1966

56 Frontier Road, Te Awamutu

Scale = 1:5000 (A4)

0 100 200 300

Metres

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Historic Aerial Imagery - August 1971

56 Frontier Road, Te Awamutu

Scale = 1:5000 (A4)

0 100 200 300

Metres

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Historic Aerial Imagery - February 1995

56 Frontier Road, Te Awamutu

Scale = 1:5000 (A4)

0 100 200 300

Metres

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Historic Aerial Imagery - 2012/13

56 Frontier Road, Te Awamutu

Scale = 1:5000 (A4)

0 100 200 300

Metres

HAIL Environmental

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Historic Aerial Imagery - June 2019

56 Frontier Road, Te Awamutu

Scale = 1:5000 (A4)

0 100 200 300

Metres

HAIL Environmental

THE CONTAMINATED SITE CONSULTANCY

Appendix D: Certificates of Title

RECORD OF TITLE
UNDER LAND TRANSFER ACT 2017
FREEHOLD
Search Copy

R.W. Muir
Registrar-General
of Land

Identifier **696841**
Land Registration District **South Auckland**
Date Issued 07 April 2016

Prior References
580866 630860

Estate Fee Simple
Area 2.5307 hectares more or less
Legal Description Lot 2 Deposited Plan 487281

Registered Owners
Rodney James Spiers as to a 1/2 share
Raewyn Dale Spiers as to a 1/2 share

Interests

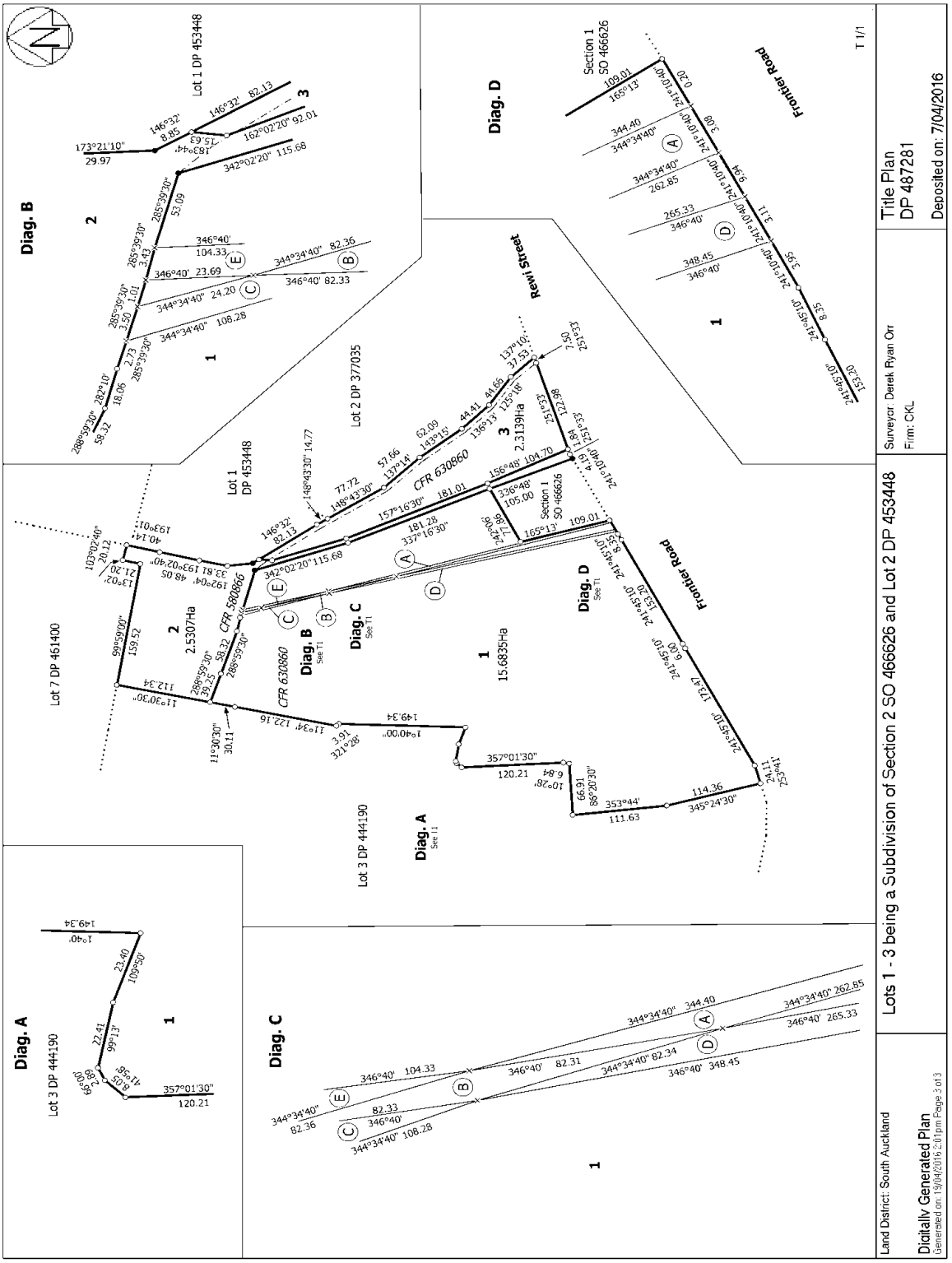
8852276.2 Consent Notice pursuant to Section 221 Resource Management Act 1991 - 18.10.2011 at 11:04 am (Affects parts formerly Lot 2 DP 444190 and Lot 3 DPS 85145)

Appurtenant to part formerly Lot 2 DP 453448 is a right to convey electricity and water created by Easement Instrument 9161449.6 - 11.9.2012 at 10:32 am

The easements created by Easement Instrument 9161449.6 are subject to Section 243 (a) Resource Management Act 1991

9433009.1 Compensation Certificate pursuant to Section 19 Public Works Act 1981 by Waipa District Council - 19.6.2013 at 7:00 am (affects part formerly Section 2 SO 466626)

Identifier **696841**



RECORD OF TITLE
UNDER LAND TRANSFER ACT 2017
FREEHOLD
Search Copy

R.W. Muir
Registrar-General
of Land

Identifier **696840**
Land Registration District **South Auckland**
Date Issued 07 April 2016

Prior References
630860

Estate	Fee Simple
Area	15.6835 hectares more or less
Legal Description	Lot 1 Deposited Plan 487281

Registered Owners
Rodney James Spiers as to a 7/20 share
Raewyn Dale Spiers as to a 7/20 share
Rodney James Spiers, Raewyn Dale Spiers and Aubrey Mark Irwin as to a 3/10 share

Interests

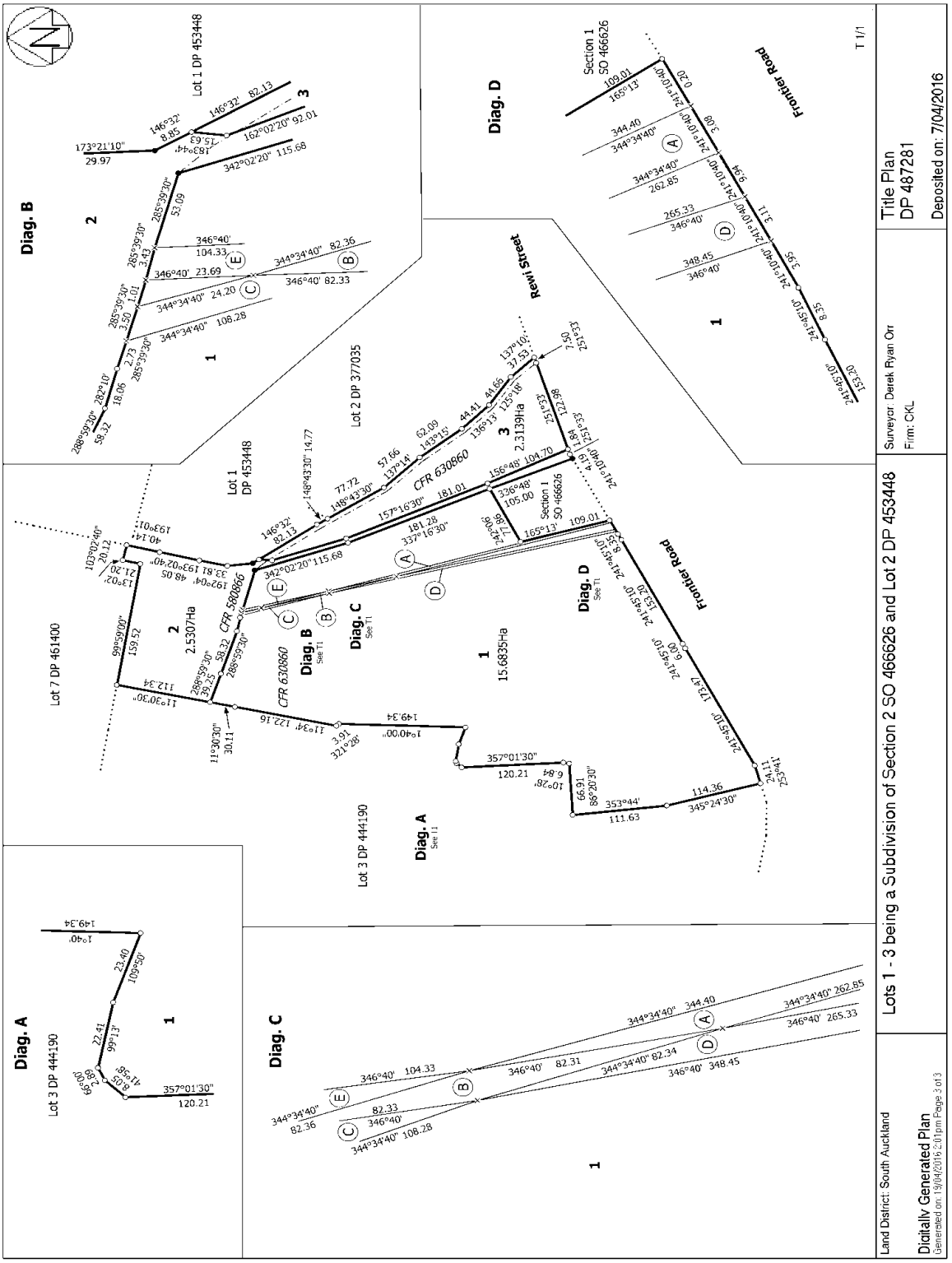
8852276.2 Consent Notice pursuant to Section 221 Resource Management Act 1991 - 18.10.2011 at 11:04 am (Affects part formerly Lot 3 DPS 85145)

Subject to a right to convey electricity over parts marked A, B & C and a right to convey water over parts marked B, D & E all on DP 487281 created by Easement Instrument 9161449.6 - 11.9.2012 at 10:32 am

The easements created by Easement Instrument 9161449.6 are subject to Section 243 (a) Resource Management Act 1991

9433009.1 Compensation Certificate pursuant to Section 19 Public Works Act 1981 by Waipa District Council - 19.6.2013 at 7:00 am

Identifier **696840**



Appendix E: Contaminated Sites Enquiry

From: Caitlin Holm
To: Brendon Love
Subject: RE Land Use Information Register enquiry 0 & 52 Frontier Road, Te Awamutu (REQ160646) No SLUS
Date: Wednesday, 22 April 2020 12:31:27 PM
Attachments: image325273.png

Dear Brendon,

Thank you for your enquiry regarding information the Waikato Regional Council may hold relating to potential contamination at the property indicated below:

- **0 Frontier Road, Te Awamutu**: LOT 2 DP 487281 (VRN 04611/032/22)
- **52 Frontier Road, Te Awamutu**: LOT 1 DP 487281 (VRN 04611/032/21)

Background: The Waikato Regional Council maintains a register of properties known to be contaminated on the basis of chemical measurements, or potentially contaminated on the basis of past land use. This register (called the Land Use Information Register) is still under development and should not be regarded as comprehensive. The 'potentially contaminated' category is gradually being compiled with reference to past or present land uses that have a greater than average chance of causing contamination, as outlined in the Ministry for the Environment's Hazardous Activities and Industries List (HAIL):

http://www.mfe.govt.nz/sites/default/files/hazards/contaminated-land/is-land-contaminated/hazardous-activities-industries-list.pdf

These properties:

- I can confirm that these properties **do not** currently appear on the Land Use Information Register.

District Councils: Our records are not integrated with those of territorial authorities, so it would also be worth contacting the Waipa District Council to complete your audit of Council records if you have not already done so. In general, information about known contaminated land will be included on a property LIM produced by the territorial authority.

-

Rural Land Considerations: Examples of sites that are "more likely than not" to have soil contamination (HAIL sites) include timber treatment activities, service stations and/or petroleum storage, panel beaters, spray painters, etc. Whilst pastoral farming is not included on this list, typical farming activities of horticulture, sheep dipping, chemical storage, petroleum storage and workshops are; but are more difficult to identify and may not be as well represented on the Land Use Information Register. Therefore, individuals interested in pastoral land may be interested in completing further investigations in accordance with Ministry for the Environment Guidelines prior to land purchase and/or development.

Additional Information: Please note that:

- Significant use of lead-based paint on buildings can, in some cases, pose a contamination risk; the use of lead-based paint is not recorded on the Land Use Information Register.
- Buildings in deteriorated or derelict condition which contain asbestos can result in asbestos fibres in soil; the use of asbestos in building materials is not recorded on the Land Use Information Register.
- The long term, frequent use of superphosphate fertilisers can potentially result in elevated levels of cadmium in soil; the use of superphosphate fertiliser is not recorded on the Land Use Information Register.
- We are not currently resourced to fully incorporate historic aerial photographs in our region-wide assessment of HAIL activities. A significant proportion of the Crown historical aerial image archive for the Waikato region is available to view free of charge at http://retrolens.nz/. We recommend this resource is consulted for any HAIL assessment.
- Due to the large volume of enquiries being received, we may not be able to respond to your enquiry as quickly as previously. We are resourced to meet 20 day response times as per LGOIMA, but endeavour to respond more quickly when workload permits. If your enquiry is urgent, please note this first in your enquiry and we will do our best to assist.

Please feel free to contact me if you have any further queries on this matter. For any new enquiries or requests for information please continue to use the Request for Service form for 'Contaminated Land/HAIL.'

Regards,

Caitlin Holm | SCIENTIST | Geothermal & Air, Land Ecology & Contamination, Science and Stra
WAIKATO REGIONAL COUNCIL | Te Kaunihera ā Rohe o Waikato

Take a look at the work we do
P: +6479497129
F: facebook.com/waikatoregion
Private Bag 3038, Waikato Mail Centre, Hamilton, 3240

To ensure we are doing everything we can to slow down the impact of COVID-19, our offices are currently closed and our staff are working remotely. If you need health advice or information, call Healthline on 0800 358 5453 or head to covid19.govt.nz.

Appendix F: Chain of Custody

ENVIRONMENTAL TESTING:

CHAIN OF CUSTODY

20-15656

ANALYTICA LABORATORIES

CLIENT INFORMATION		Lab ID (Lab use only)	20-15656	Registered By	AV	Date Registered	04/05/20
Client	HAIL Environmental	Customer Comments/Instructions					
Address	18 Waikare Place, Welcome Bay, Tauranga	Brendon Confirmed he would like to test for PIA Asbestos. He would also like to add ONOPs to Sample S11. AV 04/05/20.					
Project Leader	Brendon Love						
Project ID	176						
Site	Frontier Road, Te Awamutu						
Sampler	Brendon Love						
Phone	Brendon Love - 0296339577						
Email	blove@hailenvironmental.co.nz						
Invoice Email	blove@hailenvironmental.co.nz						

CLIENT REQUESTS (Please Tick)											
Routine	x	Priority		Urgent		ESDAT		QC Report	x	Drinking Water	

TESTS REQUESTED											
					Analysis Requests/Suites [Enter Test Code Below]						
Sample ID	Depth	Sampling Date	Time	Matrix (Please Circle)		P/A				Sample Comments (ie: extra test requests,high odour, bulk material)	
1	S1	0.01-0.2	30/04/2020	11.30AM	S	MH7_TR_S	ASB_S	PH_S			
2	S2	0.01-0.2	30/04/2020	11.30AM	S	MH7_TR_S	ASB_S	PH_S			
3	S3	0.01-0.2	30/04/2020	11.30AM	S	MH7_TR_S	ASB_S	PH_S			
4	S4	0.01-0.2	30/04/2020	11.30AM	S	MH7_TR_S	ASB_S	PH_S			
5	S5	0.01-0.2	30/04/2020	11.30AM	S	MH7_TR_S		PH_S			
6	S6	0.01-0.2	30/04/2020	11.30AM	S	MH7_TR_S		PH_S			
7	S7	0.01-0.2	30/04/2020	11.30AM	S	MH7_TR_S		PH_S			
8	S8	0.01-0.2	30/04/2020	11.30AM	S	MH7_TR_S		PH_S			
9	S9	0.01-0.2	30/04/2020	11.30AM	S	MH7_TR_S		PH_S			
10	S10	0.01-0.2	30/04/2020	11.30AM	S	MH7_TR_S		PH_S			
11	S11	0.01-0.2	30/04/2020	11.30AM	S	MH7_TR_S		PH_S	ONOPs		
12	S12	0.01-0.2	30/04/2020	11.30AM	S	MH7_TR_S		PH_S			
13	S13	0.01-0.2	30/04/2020	11.30AM	S	MH7_TR_S		PH_S			
14	D1	0.01-0.2	30/04/2020	11.30AM	S	MH7_TR_S		PH_S			
15	D2	0.01-0.2	30/04/2020	11.30AM	S	MH7_TR_S		PH_S			

Matrix Key	S (Solids)	CW (Clean Water)	SW (Saline Water)	WW (Waste Water)
	All soils, sediment, sludge	Potable, Ground, Bore, Surface, Fresh	Sea Water, Geothermal	Effluent, Trade Waste, Leachate

Sender Name	Brendon Love	Received by (Lab Staff)	AV	Courier company	NZC	Courier #	JDQ000006125		
Date Sent	30-Apr	Time sent	3.30	Date Received	04/02/20	Time Received	548 pm	Seal Status	✓	Sample Chilled	X

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Hamilton 3240, New Zealand
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Email enviro.reception@analytica.co.nz
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ENVIRONMENTAL TESTING

CHAIN OF CUSTODY

20-15661

ANALYTICA LABORATORIES

CLIENT INFORMATION		Lab ID (Lab use only)	20-15661	Registered By	AV	Date Registered	04/05/20
Client	HAIL Environmental	Customer Comments/Instructions					
Address	18 Waikare Place, Welcome Bay, Tauranga	Brendon Confirmed he would like to test for PIA Asbestos. He would also like to add ONOPs to Sample S11. AV 04/05/20.					
Project Leader	Brendon Love						
Project ID	176						
Site	Frontier Road, Te Awamutu						
Sampler	Brendon Love						
Phone	Brendon Love - 0296339577						
Email	[redacted]						
Invoice Email	[redacted]						

ASBESTOS

CLIENT REQUESTS (Please Tick)											
Routine	X	Priority		Urgent		ESDAT		QC Report	X	Drinking Water	

TESTS REQUESTED

	Sample ID	Depth	Sampling Date	Time	Matrix (Please Circle)	Analysis Requests/Suites [Enter Test Code Below]					Sample Comments (ie: extra test requests, high odour, bulk material)
							P/A				
1	S1	0.01-0.2	30/04/2020	11.30AM	S	MH7_TR_S	ASB_S	PH_S			
2	S2	0.01-0.2	30/04/2020	11.30AM	S	MH7_TR_S	ASB_S	PH_S			
3	S3	0.01-0.2	30/04/2020	11.30AM	S	MH7_TR_S	ASB_S	PH_S			
4	S4	0.01-0.2	30/04/2020	11.30AM	S	MH7_TR_S	ASB_S	PH_S			
5	S5	0.01-0.2	30/04/2020	11.30AM	S	MH7_TR_S		PH_S			
6	S6	0.01-0.2	30/04/2020	11.30AM	S	MH7_TR_S		PH_S			
7	S7	0.01-0.2	30/04/2020	11.30AM	S	MH7_TR_S		PH_S			
8	S8	0.01-0.2	30/04/2020	11.30AM	S	MH7_TR_S		PH_S			
9	S9	0.01-0.2	30/04/2020	11.30AM	S	MH7_TR_S		PH_S			
10	S10	0.01-0.2	30/04/2020	11.30AM	S	MH7_TR_S		PH_S			
11	S11	0.01-0.2	30/04/2020	11.30AM	S	MH7_TR_S		PH_S	ONOPS		
12	S12	0.01-0.2	30/04/2020	11.30AM	S	MH7_TR_S		PH_S			
13	S13	0.01-0.2	30/04/2020	11.30AM	S	MH7_TR_S		PH_S			
14	D1	0.01-0.2	30/04/2020	11.30AM	S	MH7_TR_S		PH_S			
15	D2	0.01-0.2	30/04/2020	11.30AM	S	MH7_TR_S		PH_S			

Matrix Key	S (Solids)	CW (Clean Water)	SW (Saline Water)	WW (Waste Water)
	All soils, sediment, sludge	Potable, Ground, Bore, Surface, Fresh	Sea Water, Geothermal	Effluent, Trade Waste, Leachate

Sender Name	Brendon Love	Received by (Lab Staff)	AV	Courier company	NZC	Courier #	JDQ00006125		
Date Sent	30-Apr	Time sent	3.30	Date Received	04/02/20	Time Received	548 pm	Seal Status	✓	Sample Chilled	X

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Ruakura Research Centre
10 Bisley Road Private Bag 3123
Hamilton 3240, New Zealand
Phone +64 7 974 4740
Email enviroreception@analytica.co.nz
analytica.co.nz

Samples transferred to:		
Date:	Auckland	✓
Initials:	Hamilton	
	Wellington	
	Christchurch	
	Dunedin	

Appendix G: Laboratory Certificates and Block Data

Statistical tests for contaminated land data, taken from CIEH (2008) to meet the requirements of MfE (2011)

									Shapiro-Wilk Test for normality							
									W_{crit}	0.866	0.866	0.866	0.866			
				Assumed distribution:	Normal				W	0.695	0.969	0.614	0.801			
Te Awamutu Country Club - Topsoil									< LOD =		1	×LOD				
All units	mg/kg		Guideline value:		20	3	210	200	CLR5 tests for excessive LODs: >25%?					Grubbs Test to identify high outliers			
Location	Description	Easting	Northing	Depth	Arsenic	Cadmium	Lead	Zinc		Pass	Pass	Pass	Pass	2.285	2.285	2.285	2.285
S1				0.01-0.1	7.5	0.541	**222**	**297**		7.5	0.541	222	297	-0.09	-1.10	1.83	1.27
S2				0.01-0.1	9.5	0.666	195	**272**		9.5	0.666	195	272	0.54	-0.50	1.51	1.01
S3				0.01-0.1	15.3	0.516	68.2	**264**		15.3	0.516	68.2	264	2.37	-1.22	0.05	0.93
S4				0.01-0.1	13.7	0.791	**222**	**388**		13.7	0.791	222	388	1.87	0.10	1.83	2.21
S5				0.01-0.1	6.1	0.913	15.4	119		6.1	0.913	15.4	119	-0.54	0.68	-0.56	-0.58
S6				0.01-0.1	5.6	1.15	13.5	142		5.6	1.15	13.5	142	-0.70	1.82	-0.59	-0.34
S7				0.01-0.1	5.8	0.736	14	109		5.8	0.736	14	109	-0.63	-0.17	-0.58	-0.68
S8				0.01-0.1	6.8	0.778	13.4	95.3		6.8	0.778	13.4	95.3	-0.32	0.04	-0.59	-0.82
S9				0.01-0.1	6.2	0.734	13.5	88.1		6.2	0.734	13.5	88.1	-0.51	-0.18	-0.59	-0.90
S10				0.01-0.1	6.9	0.43	14.4	108		6.9	0.43	14.4	108	-0.28	-1.63	-0.58	-0.69
S11				0.01-0.1	6	0.911	14	140		6	0.911	14	140	-0.57	0.67	-0.58	-0.36
S12				0.01-0.1	5.7	0.782	14.5	107		5.7	0.782	14.5	107	-0.66	0.05	-0.57	-0.70
S13				0.01-0.1	6.3	1.07	14	139		6.3	1.07	14	139	-0.47	1.44	-0.58	-0.37
D1	Field duplicate of S7 above			0.01-0.1						Lower values th							
D1d	Lab duplicate of D1			0.01-0.1	Lower values than first sample - not used												
D2	Field duplicate of S12 above			0.01-0.1													
					Minimum	5.6	0.43	13	88								
					Maximum	15	1.2	**222**	388								
					Arithmetic mean	7.8	0.77	64	174								
					95%ile upper confidence limit (UCL95)	9.4	0.87	107	**222**								

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Certificate of Analysis

Hail Environmental Ltd
18 Waikare Place , Welcome Bay
Tauranga 3141

Attention: Brendon Love
Phone: 0296339577
Email: blove@hailenvironmental.co.nz

Lab Reference: 20-15656
Submitted by: Brendon Love
Date Received: 4/05/2020
Testing Initiated: 4/05/2020
Date Completed: 8/05/2020
Order Number: N/A
Reference: 176

Sampling Site: Frontier Road, Te Awamutu

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 0.01-0.2	S2 0.01-0.2	S3 0.01-0.2	S4 0.01-0.2	S5 0.01-0.2
	Date Sampled		30/04/2020	30/04/2020	30/04/2020	30/04/2020	30/04/2020
Analyte	Unit	*Reporting Limit*	20-15656-1	20-15656-2	20-15656-3	20-15656-4	20-15656-5
Arsenic	mg/kg dry wt	*0.125*	7.5	9.5	15.3	13.7	6.1
Cadmium	mg/kg dry wt	*0.005*	0.541	0.666	0.516	0.791	0.913
Chromium	mg/kg dry wt	*0.125*	9.0	11	12	15.7	12.6
Copper	mg/kg dry wt	*0.075*	46.9	38.7	37.2	68.6	53.2
Lead	mg/kg dry wt	*0.25*	222	195	68.2	222	15.4
Nickel	mg/kg dry wt	*0.05*	5.25	7.69	7.55	9.37	11.9
Zinc	mg/kg dry wt	*0.05*	297	272	264	388	119

Heavy Metals in Soil

	Client Sample ID		S6 0.01-0.2	S7 0.01-0.2	S8 0.01-0.2	S9 0.01-0.2	S10 0.01-0.2
	Date Sampled		30/04/2020	30/04/2020	30/04/2020	30/04/2020	30/04/2020
Analyte	Unit	*Reporting Limit*	20-15656-6	20-15656-7	20-15656-8	20-15656-9	20-15656-10
Arsenic	mg/kg dry wt	*0.125*	5.6	5.8	6.8	6.2	6.9
Cadmium	mg/kg dry wt	*0.005*	1.15	0.736	0.778	0.734	0.43
Chromium	mg/kg dry wt	*0.125*	13.0	11	10	11	11
Copper	mg/kg dry wt	*0.075*	55.9	57.9	45.2	33.7	54.6
Lead	mg/kg dry wt	*0.25*	13.5	14.0	13.4	13.5	14.4
Nickel	mg/kg dry wt	*0.05*	8.31	6.28	6.06	7.15	6.25
Zinc	mg/kg dry wt	*0.05*	142	109	95.3	88.1	108

IANZ ACCREDITED LABORATORY

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation, with the exception of tests marked *, which are not accredited.

Heavy Metals in Soil

		Client Sample ID	S11 0.01-0.2	S12 0.01-0.2	S13 0.01-0.2	D1 0.01-0.2	D2 0.01-0.2
		Date Sampled	30/04/2020	30/04/2020	30/04/2020	30/04/2020	30/04/2020
Analyte	Unit	*Reporting Limit*	20-15656-11	20-15656-12	20-15656-13	20-15656-14	20-15656-15
Arsenic	mg/kg dry wt	*0.125*	6.0	5.7	6.3	5.4	5.1
Cadmium	mg/kg dry wt	*0.005*	0.911	0.782	1.07	0.631	0.653
Chromium	mg/kg dry wt	*0.125*	12	12	11	9.7	9.7
Copper	mg/kg dry wt	*0.075*	55.1	50.5	57.1	54.1	46.6
Lead	mg/kg dry wt	*0.25*	14.0	14.5	14.0	12.7	13.3
Nickel	mg/kg dry wt	*0.05*	7.72	8.86	8.52	5.77	5.85
Zinc	mg/kg dry wt	*0.05*	140	107	139	97.1	92.2

Soil Aggregate Properties and Nutrients

		Client Sample ID	S1 0.01-0.2	S2 0.01-0.2	S3 0.01-0.2	S4 0.01-0.2	S5 0.01-0.2
		Date Sampled	30/04/2020	30/04/2020	30/04/2020	30/04/2020	30/04/2020
Analyte	Unit	*Reporting Limit*	20-15656-1	20-15656-2	20-15656-3	20-15656-4	20-15656-5
pH*	pH	*1*	5.3	5.4	5.2	5.3	5.1

Soil Aggregate Properties and Nutrients

		Client Sample ID	S6 0.01-0.2	S7 0.01-0.2	S8 0.01-0.2	S9 0.01-0.2	S10 0.01-0.2
		Date Sampled	30/04/2020	30/04/2020	30/04/2020	30/04/2020	30/04/2020
Analyte	Unit	*Reporting Limit*	20-15656-6	20-15656-7	20-15656-8	20-15656-9	20-15656-10
pH*	pH	*1*	5.3	5.3	5.3	5.4	5.2

Soil Aggregate Properties and Nutrients

		Client Sample ID	S11 0.01-0.2	S12 0.01-0.2	S13 0.01-0.2	D1 0.01-0.2	D2 0.01-0.2
		Date Sampled	30/04/2020	30/04/2020	30/04/2020	30/04/2020	30/04/2020
Analyte	Unit	*Reporting Limit*	20-15656-11	20-15656-12	20-15656-13	20-15656-14	20-15656-15
pH*	pH	*1*	5.3	5.3	5.3	5.2	5.2

ONOPs in Soil

		Client Sample ID	S11 0.01-0.2
		Date Sampled	30/04/2020
Analyte	Unit	*Reporting Limit*	20-15656-11
3-Hydroxycarbofuran	mg/kg dry wt	*0.05*	<0.05
Acephate	mg/kg dry wt	*0.05*	<0.05
Acetochlor	mg/kg dry wt	*0.05*	<0.05
Alachlor	mg/kg dry wt	*0.05*	<0.05
Aldicarb	mg/kg dry wt	*0.05*	<0.05
Aldicarb sulfone	mg/kg dry wt	*0.05*	<0.05
Aldicarb sulfoxide	mg/kg dry wt	*0.05*	<0.05
Ametryn	mg/kg dry wt	*0.05*	<0.05
Atrazine	mg/kg dry wt	*0.05*	<0.05
Atrazine-desethyl	mg/kg dry wt	*0.05*	<0.05
Atrazine-desisopropyl	mg/kg dry wt	*0.05*	<0.05
Avermectin B1a	mg/kg dry wt	*0.05*	<0.05

ONOPs in Soil

			Client Sample ID	S11 0.01-0.2
			Date Sampled	30/04/2020
Azaconazole	mg/kg dry wt	*0.05*		<0.05
Azinphos-methyl	mg/kg dry wt	*0.05*		<0.05
Azoxystrobin	mg/kg dry wt	*0.05*		<0.05
Benalaxyl	mg/kg dry wt	*0.05*		<0.05
Bendiocarb	mg/kg dry wt	*0.05*		<0.05
Bitertanol	mg/kg dry wt	*0.05*		<0.05
Bromacil	mg/kg dry wt	*0.05*		<0.05
Bupirimate	mg/kg dry wt	*0.05*		<0.05
Buprofezin	mg/kg dry wt	*0.05*		<0.05
Butachlor	mg/kg dry wt	*0.05*		<0.05
Carbaryl	mg/kg dry wt	*0.05*		<0.05
Carbendazim	mg/kg dry wt	*0.05*		<0.05
Carbofuran	mg/kg dry wt	*0.05*		<0.05
Chlorfluazuron	mg/kg dry wt	*0.05*		<0.05
Chlorpyrifos	mg/kg dry wt	*0.05*		<0.05
Chlorpyriphos-methyl	mg/kg dry wt	*0.05*		<0.05
Chlortoluron	mg/kg dry wt	*0.05*		<0.05
Cyanazine	mg/kg dry wt	*0.05*		<0.05
Cyfluthrin	mg/kg dry wt	*0.05*		<0.05
Cyhalothrin (lambda)	mg/kg dry wt	*0.05*		<0.05
Cypermethrin	mg/kg dry wt	*0.05*		<0.05
Cyproconazole	mg/kg dry wt	*0.05*		<0.05
Cyprodinil	mg/kg dry wt	*0.05*		<0.05
Deltamethrin	mg/kg dry wt	*0.05*		<0.05
Diazinon	mg/kg dry wt	*0.05*		<0.05
Dichlofluanid	mg/kg dry wt	*0.05*		<0.05
Dichlorvos	mg/kg dry wt	*0.05*		<0.05
Difenoconazole	mg/kg dry wt	*0.05*		<0.05
Dimethoate	mg/kg dry wt	*0.05*		<0.05
Diuron	mg/kg dry wt	*0.05*		<0.05
Emamectin B1a	mg/kg dry wt	*0.05*		<0.05
Fenarimol	mg/kg dry wt	*0.05*		<0.05
Fenpropimorph	mg/kg dry wt	*0.05*		<0.05
Fenpyroximate	mg/kg dry wt	*0.05*		<0.05
Fenvalerate	mg/kg dry wt	*0.05*		<0.05
Fluazifop-butyl	mg/kg dry wt	*0.05*		<0.05
Fluometuron	mg/kg dry wt	*0.05*		<0.05
Flusilazole	mg/kg dry wt	*0.05*		<0.05
Fluvalinate (tau)	mg/kg dry wt	*0.05*		<0.05
Furalaxyl	mg/kg dry wt	*0.05*		<0.05
Haloxyfop-methyl	mg/kg dry wt	*0.05*		<0.05
Hexaconazole	mg/kg dry wt	*0.05*		<0.05
Hexazinone	mg/kg dry wt	*0.05*		<0.05
Imazalil	mg/kg dry wt	*0.05*		<0.05
Imidacloprid	mg/kg dry wt	*0.05*		<0.05
Indoxacarb	mg/kg dry wt	*0.05*		<0.05
IPBC	mg/kg dry wt	*0.05*		<0.05
Iprodione	mg/kg dry wt	*0.05*		<0.05
Kresoxim-methyl	mg/kg dry wt	*0.05*		<0.05
Linuron	mg/kg dry wt	*0.05*		<0.05
Lufenuron	mg/kg dry wt	*0.05*		<0.05
Malathion	mg/kg dry wt	*0.05*		<0.05
Metalaxyl	mg/kg dry wt	*0.05*		<0.05
Methamidophos	mg/kg dry wt	*0.05*		<0.05

ONOPs in Soil

			Client Sample ID	S11 0.01-0.2
			Date Sampled	30/04/2020
Methiocarb	mg/kg dry wt	*0.05*		<0.05
Methomyl	mg/kg dry wt	*0.05*		<0.05
Metolachlor	mg/kg dry wt	*0.05*		<0.05
Metribuzin	mg/kg dry wt	*0.05*		<0.05
Mevinphos	mg/kg dry wt	*0.05*		<0.05
Molinate	mg/kg dry wt	*0.05*		<0.05
Monocrotophos	mg/kg dry wt	*0.05*		<0.05
Myclobutanil	mg/kg dry wt	*0.05*		<0.05
Naled	mg/kg dry wt	*0.05*		<0.05
Norfluazuron	mg/kg dry wt	*0.05*		<0.05
Omethoate	mg/kg dry wt	*0.05*		<0.05
Oxyflurofen	mg/kg dry wt	*0.05*		<0.05
Paclobutrazol	mg/kg dry wt	*0.05*		<0.05
Parathion-ethyl	mg/kg dry wt	*0.05*		<0.05
Pendimethalin	mg/kg dry wt	*0.05*		<0.05
Permethrin	mg/kg dry wt	*0.05*		<0.05
Pirimicarb	mg/kg dry wt	*0.05*		<0.05
Pirimiphos-methyl	mg/kg dry wt	*0.05*		<0.05
Prochloraz	mg/kg dry wt	*0.05*		<0.05
Procymidone	mg/kg dry wt	*0.05*		<0.05
Prometryn	mg/kg dry wt	*0.05*		<0.05
Propachlor	mg/kg dry wt	*0.05*		<0.05
Propanil	mg/kg dry wt	*0.05*		<0.05
Propazine	mg/kg dry wt	*0.05*		<0.05
Propiconazole	mg/kg dry wt	*0.05*		<0.05
Pyrimethanil	mg/kg dry wt	*0.05*		<0.05
Pyriproxyfen	mg/kg dry wt	*0.05*		<0.05
Quizalofop-ethyl	mg/kg dry wt	*0.05*		<0.05
Simazine	mg/kg dry wt	*0.05*		<0.05
Simetryn	mg/kg dry wt	*0.05*		<0.05
Sulfentrazone	mg/kg dry wt	*0.05*		<0.05
TCMTB	mg/kg dry wt	*0.05*		<0.05
Tebuconazole	mg/kg dry wt	*0.05*		<0.05
Terbufos	mg/kg dry wt	*0.05*		<0.05
Terbumeton	mg/kg dry wt	*0.05*		<0.05
Terbuthylazine	mg/kg dry wt	*0.05*		<0.05
Terbuthylazine-desethyl	mg/kg dry wt	*0.05*		<0.05
Terbutryn	mg/kg dry wt	*0.05*		<0.05
Tetrachlorvinphos	mg/kg dry wt	*0.05*		<0.05
Tetraconazole	mg/kg dry wt	*0.05*		<0.05
Thiabendazole	mg/kg dry wt	*0.05*		<0.05
Thiacloprid	mg/kg dry wt	*0.05*		<0.05
Thiobencarb	mg/kg dry wt	*0.05*		<0.05
Tolylfluanid	mg/kg dry wt	*0.05*		<0.05
Triazophos	mg/kg dry wt	*0.05*		<0.05
Triflumuron	mg/kg dry wt	*0.05*		<0.05
Triphenylphosphate (Surrogate)	%	*1*		94.4

Moisture Content

		Client Sample ID	S11 0.01-0.2
		Date Sampled	30/04/2020
Analyte	Unit	*Reporting Limit*	20-15656-11
Moisture Content	%	*1*	36

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.
pH in Soil	1:2.5 extraction with 0.1M calcium chloride followed by pH probe determination.(Department of Sustainable Natural Resources).
ONOPs in Soil	Fresh soil is extracted in acetonitrile and analysed by GC-MS/MS and LC-MS/MS. (In accordance with in-house procedure).
Moisture	Moisture content is determined gravimetrically by drying at 103 °C.

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Certificate of Analysis

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Lab Reference: 20-15661
Submitted by: Brendon Love
Date Received: 4/05/2020
Testing Initiated: 6/05/2020
Date Completed: 6/05/2020
Order Number: N/A
Reference: 176

Sampling Site: Frontier Road, Te Awamutu
Description of Work: 176

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.

Asbestos in Soil (Qualitative)

Sample Details

Laboratory ID	Client Sample ID	Sample Location	Sample Description	Date Sampled	Date Analysed
	Units				
20-15661-1	S1 0.01-0.2		Soil	30/04/2020	6/05/2020
20-15661-2	S2 0.01-0.2		Soil	30/04/2020	6/05/2020
20-15661-3	S3 0.01-0.2		Soil	30/04/2020	6/05/2020
20-15661-4	S4 0.01-0.2		Soil	30/04/2020	6/05/2020

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

Analysis Results

Laboratory ID	Client Sample ID	ACM Weight*	ACM Types*	Fibre Types	Trace Asbestos (Presence / Absence)	Asbestos (Presence / Absence)
	Units	g				
20-15661-1	S1 0.01-0.2	0.0000	No Asbestos Detected	Asbestos NOT Detected. Organic Fibres	Absent	Absent
20-15661-2	S2 0.01-0.2	0.0000	No Asbestos Detected	Asbestos NOT Detected. Organic Fibres	Absent	Absent
20-15661-3	S3 0.01-0.2	0.0000	No Asbestos Detected	Asbestos NOT Detected. Organic Fibres	Absent	Absent
20-15661-4	S4 0.01-0.2	0.0000	No Asbestos Detected	Asbestos NOT Detected. Organic Fibres	Absent	Absent

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

Asbestos in Soil (Qualitative) Approver:

IANZ ACCREDITED LABORATORY

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation, with the exception of tests marked *, which are not accredited.

Georgina Jackson

Georgina Jackson, PGDipSci.
Technician

Method Summary

Asbestos Fibres in Soil (Qualitative)	Sample analysis was performed using polarised light microscopy with dispersion staining in accordance with AS4964-2004 Method for the qualitative identification of asbestos in bulk 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.