Appendix D – Preliminary Site Investigation

ENVIRONMENTAL REPORT

Preliminary Site Investigation (PSI) at 2025 Ohaupo, Te Awamutu

for Ultimate Global Group

Rev A - 22/12/2021

BTW COMPANY

SURVEYING | ENGINEERING | PLANNING & ENVIRONMENT

Preliminary Site Investigation (PSI) at 2025 Ohaupo, Te Awamutu

for Ultimate Global Group

Reviewed

Report Author

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22/12/2021
Date

Reviewed by

Dean Sandwell, Environment Team Leader (Waikato). BSc, MSc (HONS)

22/12/2021
Date

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SUMMARY

BTW Company (BTW) was engaged by Ultimate Global Group (the client) to complete a Preliminary Site Investigation (PSI) at 2025 Ohaupo Road, Te Awamutu (Part Lot 1 DP 356454 and Lot 1 DPS 36696; the site) to support the proposed residential development at the site.

The broad objective of this PSI was to establish the likelihood of activities identified on the Ministry for the Environment (MfE) Hazardous Activities and Industries List (HAIL) occurring at the site based on current and/or historical land use. Following, the risk to human health is evaluated using available desktop information and supplemented with site visit and quantifiable soil data.

Overall, the potential for soil contamination across the majority of the site is highly unlikely to present a risk to human health based on the proposed subdivision and change of land use from pastoral agriculture to standard residential (10% produce scenario). However, if the development lot sizes were to increase to rural residential/lifestyle (25% produce scenario) then further assessment of cadmium is required. Specifically, quantification of 'natural' soil pH to develop a Site-Specific Soil Guideline Value reflective of site pH and subsequent cadmium bioavailability.

Kiwifruit orchard land use was noted on the northern and southern site boundaries. The desktop assessment, site visit, and quantifiable soil data were used to evaluate the risk of contamination from this adjacent land use. The information and data suggest that the bordering orchard activities are highly unlikely to present a risk to human health at the site.

A number of isolated potential and confirmed HAIL activities were identified and evaluated at the site (i.e., livestock dipping, offal pit, asbestos and lead-based paint use, storage of chemicals and treated wood, motor vehicle workshop, burn pit). Overall, the risk assessment highlighted that these HAIL areas were isolated and small scale, and subsequently determined as low to moderate risk to human health. However, in the absence of quantitative soil data, the risk of these areas to human health could not be concluded as highly unlikely. Therefore, these areas are identified as 'pieces of land' until quantitative soil data at these locations is collected and assessed. It is recommended that the sampling plan for additional sampling is designed following the development of the site concept plan for the development. The additional information and data is recommended to be presented as a Detailed Site Investigation (DSI).

Suitably Qualified and Experienced Person Statement

Primary Report Author

Nakeysha Lammers holds a Diploma in Business (2018) from the Western Institute of Technology, Taranaki and is currently studying towards a Bachelor of Applied Science (Environment) through the Open Polytechnic. Nakeysha has two years of experience in environmental compliance management and contaminated land investigation, sampling and reporting. Nakeysha is an Environmental Advisor at BTW Company and has worked across a wide range of consenting and contaminated land projects.

Report Reviewer Statement

Dean Sandwell holds a Bachelor of Science (2004) and a Master of Science (2006) from Waikato University, focussing on experimental design, environmental and analytical chemistry, physical oceanography, marine ecology and soil science. Dean has over 14 years of environmental research experience in New Zealand and overseas and is the Environment Team Leader for BTW Company in the Waikato. Dean has a diverse background in environmental research and monitoring. Working across multi-disciplinary fields, specifically, marine, freshwater, climate, soils, geo-chemistry, and eco-hydrology. Dean has a proven track record in environmental research, experimental design, instrumentation, and statistical data analysis. In addition to using a wide range of instrumentation (e.g., dataloggers, ADVs, ADCPs, pressure sensors, water quality sensors, CTD profilers, meteorological sensors, greenhouse gas sensors and flux systems, GPS / GNSS, 3D scanning, echosounders) Dean has developed a number of novel environmental monitoring solutions. These solutions range from soil climate and water quality logging in Antarctica, to CO2 and climate monitoring in Niue cave systems. Dean has worked on a variety of contaminated land investigations and provides contaminated land technical reviews for several Councils.

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1 INTRODUCTION

1.1 Background

BTW Company (BTW) was engaged by Ultimate Global Group (the client) to undertake a Preliminary Site Investigation (PSI) to support the proposed residential development at 2025 Ohaupo Road, Te Awamutu (Part Lot 1 DP 356454 and Lot 1 DPS 36696; hereafter referred to as the site). The site is 257,824 m² (25.78 ha) and is further described in Section 2 of this report.

This PSI is a desktop assessment supplemented with a site visit and limited soil sampling to complete a risk assessment appropriate for the proposed residential development. The risk assessment determines if any activities on the Ministry for the Environment (MfE) Hazardous Activities and Industries List (HAIL) are being, or have been, or are more likely than not being or to have been, undertaken on the site. Following, the location and significance of potential contaminant sources and potential pathways are evaluated to determine the likelihood that any HAIL sites may affect human and environmental health should the residential development occur.

This investigation was undertaken in general accordance with the current edition of Contaminated Land Management Guidelines No. 1–Reporting on Contaminated Sites in New Zealand, Wellington, Ministry for the Environment (MfE 2021a).

1.2 Objectives and Scope

The purpose of this PSI is to assess whether the site presents a risk to human health in accordance with the MfE Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (NESCS) should the residential development be undertaken.

The objectives and scope are as follows:

1.2.1 Objectives

- To evaluate the probability whether it is more likely than not those activities or industries described in the HAIL are being, or have been, undertaken on the site (regulation 6(3)).
- To assess the likelihood of any identified HAIL land use to present a risk to human health should the residential development and change of land use occur (regulation 8(4)).
- To identify any ‘pieces of land’ within the site area in accordance with the NESCS.
- To determine the requirement for any further investigation or reporting at the site (e.g., intrusive soil sampling, a Detailed Site Investigation (DSI) and/or a Site Management Plan).
- To determine the activity status under the NESCS.

1.2.2 Scope

The scope of work is limited to the site defined as Part Lot 1 DP 35654 and Lot 1 DPS 36696 (see Figure 2.1 and Figure 2.2). The residential dwelling and surrounding area (i.e., curtilage) is excluded from the scope. The scope of this report is as follows:

- Review of Waipa District Council (WDC) records.
- Review of Waikato Regional Council (WRC) records.
- Review of aerial imagery from Retrolens (1943 – 1995) and Google Earth Pro (2008 – 2021).
- A site visit and supplementary soil sampling.

- An interview with current landowner.
- The development of a Conceptual Site Model (CSM).
- Complete a risk assessment to determine any potential linkage between contamination sources, pathways, and likely receptors.
- Provide a conclusion regarding the likely risk to human health from soil contamination.
- Conclude the appropriate activity status and requirement for any further investigation or reporting applicable to the site under the NESCS.

2 SITE IDENTIFICATION AND ENVIRONMENT

The site is located at 2025 Ohaupo Road, Te Awamutu (see Figure 2.1 for a locality map; and Figure 2.2 for a site overview map). The site is split across two lots (Part Lot 1 DP 35654 and Lot 1 DPS 36696) with a total area of 257,824 m² (25.78 ha). The site is located in the Rural Zone according to the Waipa District Plan, see Table 2.1 and Table 2.2 for further details.

The majority of Part Lot 1 DP 35654 is currently, and was historically, used for pastoral agriculture activities with the exclusion of the dwelling and the surrounding curtilage[1] area. The current and historic land use across Lot 1 DPS 36696 is pastoral agriculture. The surrounding land uses appear to be residential, pastoral agriculture, and orchard activities.

The WDC IntraMaps and WRC LocalMaps portals were reviewed and found the following notable features within the vicinity of the site:

- Significant Area
  - The WDC IntraMaps shows a ~22,387,694 m² significant area (Hingakaka Battle Area) approximately 276 m west (at its closest point) from the subject site. The Hingakaka Battle area is the location of a significant battle that took place between the Waikato-Maniapoto tribes of the Tainui Waka Tribal region, and other tribes from the lower and middle north island between 1798 and 1808. (Maniapoto et. al., 2006).
- Biodiversity Vegetation
  - WRC LocalMaps shows a biodiversity layer of 4,820 m² (0.482 ha) related to a kahikatea stand[2].

The site geology, hydrology, and topography is outlined in Section 2.1, and the historical aerial imagery is outlined in Section 3 of this report.

[1] The area of land directly surrounding the residential dwelling. The area is defined in Appendix A as 'Farm Residence – Not Investigated' and is colour coded green.
[2] https://data.waikatoregion.govt.nz:8443/ords/f?p=140:12:0::NO::P12_METADATA_ID:2382

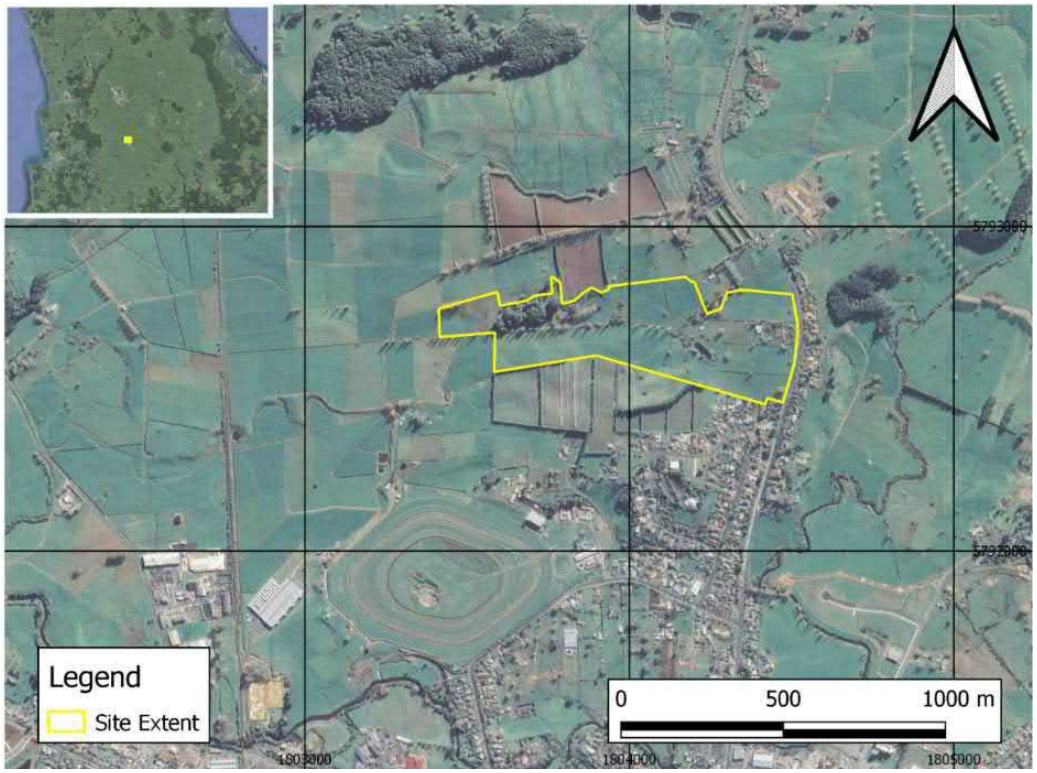

Figure 2.1: Site location.

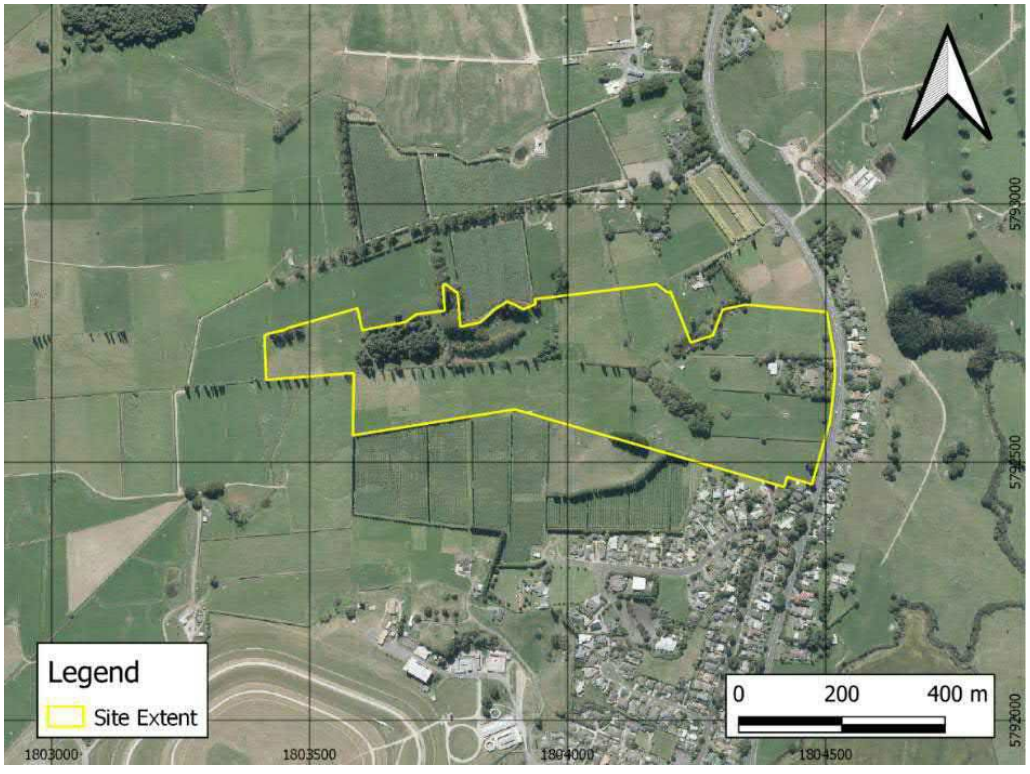

Figure 2.2: Site overview.

Table 2.1: Site Identification Details for Part Lot 1 DP 35654.

Item	Description
Location:	2025 Ohaupo Road, Te Awamutu
Legal Descriptions:	Part Lot 1 DP 35654
Certification of Title:	SA32D/155
Current Owners:	Christopher and Beverley Johnson
Subject Site Area:	166,614 m²; 16.66 ha
District Plan Zone:	Rural Zone
Territorial Authority:	Waipa District Council
Regional Authority:	Waikato Regional Council

Table 2.2: Site Identification Details for Lot 1 DPS 36696.

Item	Description
Location:	2025 Ohaupo Road, Te Awamutu
Legal Descriptions:	Lot 1 DPS 36696
Certification of Title:	SA32D/155
Current Owners:	Christopher and Beverley Johnson
Subject Site Area:	91,210 m²; 9.12 ha
District Plan Zone:	Rural Zone
Territorial Authority:	Waipa District Council
Regional Authority:	Waikato Regional Council

2.2 Site Geology, Hydrology and Topography

The Hamilton Basin is characterised by four main landforms, low rolling hills, alluvial plains, low terraces, and gullies (Lowe 2010; Hewitt et. al. 2021). The site is located in an area of low rolling hills (often referred to as the 'Hamilton Hills'). The rolling hills are described as ignimbrites overlaid with tephras and alluvial clays (Lowe 2010; Hewitt et. al. 2021). The soil series found within the rolling hills of the Hamilton Basin are Kainui/Ohaupo, Hamilton and Rotokauri (Lowe, 2010). The soil order found on the subject site are allophanic, brown, and gley (see Figure 2.3[3]). Waikato Maps describes the site soils as well drained. To the north of the site the peat soils of the drained Moanatuatua Bog dominate[4].

The site is situated in the Waipa catchment. All surface water from the site appears to drain into a central farm drain. The drain flows from east to west and discharges into an unnamed tributary of the Mangapiko Stream at the south-western end of the site, and eventually into the Waipa River (see Figure 2.4[3]). The peat lakes, Lake Ngaroto, Lake Ngarotoiti, and Lake Serpentine are within 3.5 km to 5.4 km from the site and fall within the same catchment (Waipa catchment).

Waikato Maps (2021) groundwater database records showed no groundwater bores located on the site, but several located within the wider area. The groundwater data provided by WRC was

[3] Data sourced and adapted from LRIS portal (lris.scinfo.org.nz/), LINZ data service (data.linz.govt.nz/), Ministry for the Environment (data.mfe.govt.nz/) under Creative Commons Attribution 3.0 and Creative Commons Attribution 4.0 International.

[4] The bog was formed 14,000 years ago (Clarkson et. al. 1999) and was formerly ~ 7500 - 8500 ha in size and now is 140 ha following widespread drainage and conversion to agriculture (Schipper and McLeod 2002; Clarkson, et. al. 2004).

reviewed, but no water quality was available. The author assumes that groundwater flows generally follow the topographic contours, see Figure 2.4[3] and Figure 2.5[3].

The New Zealand Land Use Capability (LUC) Classification system consists of eight LUC classes. The subject site is made up of three of these LUC classes. Those being 2s, 3e and 4e (refer to Figure 2.6[3]). For additional information on LUC classes see the LUC Handbook[5].

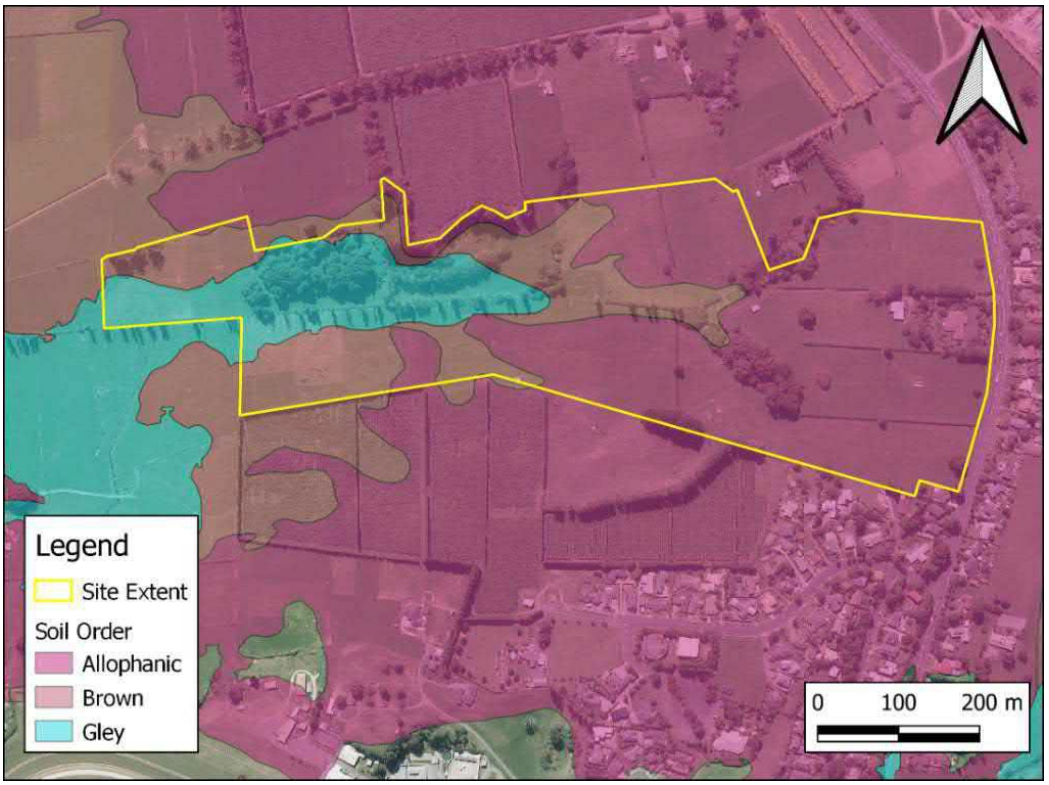

Figure 2.3: Site soils – allophanic (pink), brown (peach), gley (aqua).

[5] Lynn IH, Manderson AK, Page MJ, Harmsworth GR, Eyles GO, Douglas GB, Mackay AD, Newsome PJF 2009. Land Use Capability Survey Handbook – a New Zealand handbook for the classification of land 3rd ed. Hamilton, AgResearch; Lincoln, Landcare Research; Lower Hutt, GNS Science. 163p. ISBN 978-0-477-10091-5.

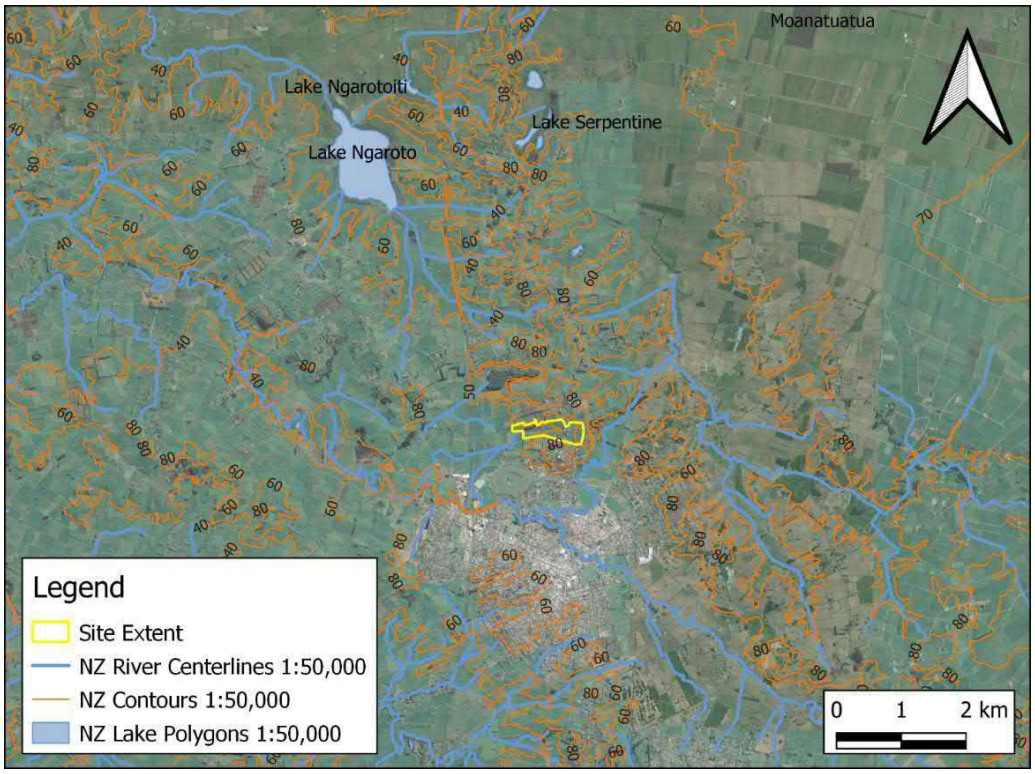

Figure 2.4: Topographic contours (orange) and hydrology surrounding the site (light blue).

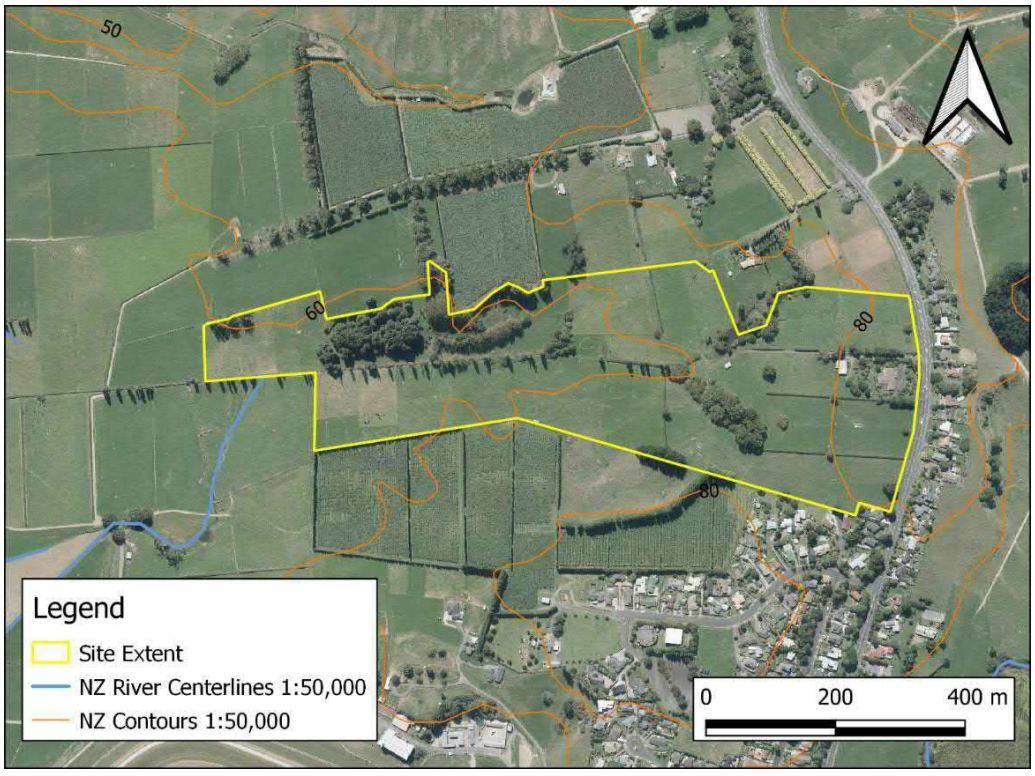

Figure 2.5: Site topography (orange) and hydrology (light blue).

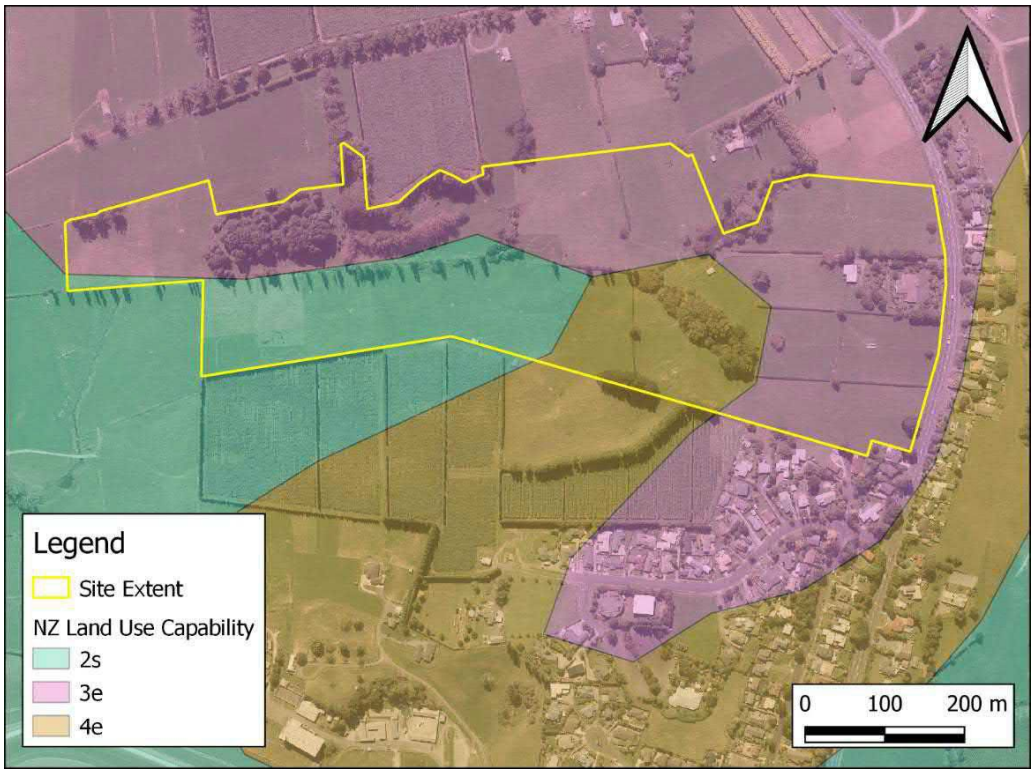

Figure 2.6: New Zealand Land Use Capability (LUC) Classification.

3 HISTORICAL SITE INFORMATION

3.1 Aerial Imagery

Historical aerial imagery sourced from Retrolens (1943 – 1995) and Google Earth Pro (2008 – 2021) was reviewed (see Appendix B). Aerial imagery commentary is provided in Table 3.1 below. The key points specific to the NESCS, from review of historical aerial imagery are as follows:

- The historic and current land use for the subject site appears to be pastoral agriculture. Excluding the residential dwelling and surrounding curtilage area (noted from 1995 imagery to 2021).
- A shed structure is observed on the subject site in 1943 aerial imagery. The shed is not visible in 1957 imagery (the next available aerial imagery date).
- The historic and current land uses for the surrounding area appears to be pastoral agriculture, residential, and orchard activities.
- Orchard activities on the neighbouring property to the north are present from 1979 to 2021.
- Orchard activities on the neighbouring property to the south are present from 1995 to 2021.
- The dwelling, hay barn and implement shed/workshop are observed in 1995 – 2021 imagery.
- A silage pit is observed from 1979 to 2021 imagery.

Table 3.1: Historical aerial imagery timeline.

Year	Source	Description
1943	Retrolens	The site and surrounding land uses appear to be pastoral agriculture. A single structure is observed on the site. Surface water drainage is observed through the centre of the site and surrounded by well-established vegetation.
1957	Retrolens	Structure observed in 1943 is no longer visible. A dwelling is observed just outside of the site boundary in the south-eastern corner.
1967	Retrolens	No discernible changes.
1974	Retrolens	No discernible changes.
1979	Retrolens	Two ponds appear on the site. A circular area of soil disturbance was noted (assumed to be the silage pit/burn pit). Potential orchard activities observed on the property to the north of the site (5022 Ohaupo Road).
1995	Retrolens	Orchard activities observed north and south (420 Greenhill Drive) of the subject site. Four structures are observed (assumed to be the hay barn, dwelling, workshop/woolshed and stockyard).
2008	Google Earth	No discernible changes.
2010	Google Earth	The workshop/woolshed is extended.
2013	Google Earth	No discernible changes.
2017	Google Earth	No discernible changes.
2021	Google Earth	No discernible changes.

Figure 3.1 and Figure 3.2 below show the site in 1943 and 2017. The remainder of the historical imagery can be viewed in Appendix B.

Figure 3.1: 1943 arial image of 2025 Ohaupo Road, Te Awamutu (the site – highlighted yellow). Image source: Retrolens, plotted by BTW.

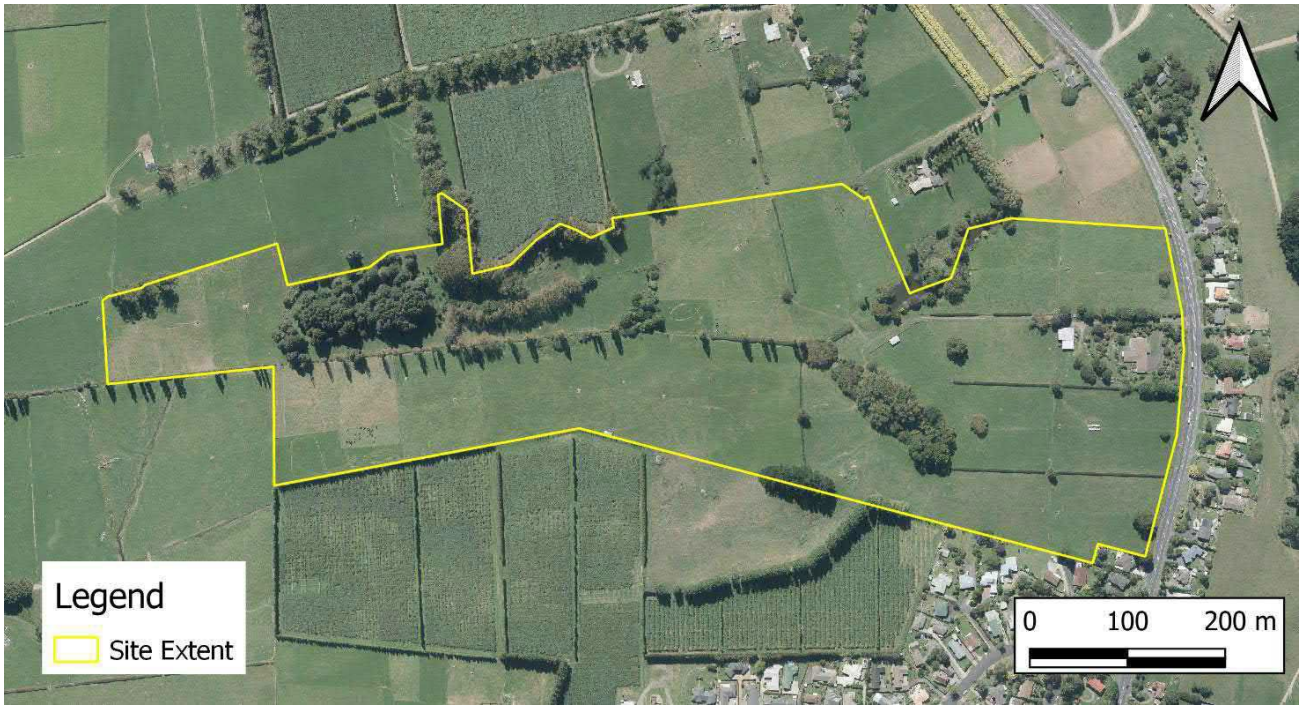

Figure 3.2: 2017 aerial image of 2025 Ohaupo Road, Te Awamutu (the site – highlighted yellow). Image source: Waipa District Council, plotted by BTW.

3.2 Waikato Regional Council (WRC) Records

BTW requested information from Waikato Regional Council (WRC) relating to potential contamination at the site and surrounding lots. WRC confirmed[6] that the site is not listed on the WRC Land Use Information Register (LUIR)[7]. No further information was provided by the WRC.

3.3 Waipa District Council (WDC) Records

BTW requested the site property file from WDC and any available contaminated land investigations from the surrounding area. The property file documents provided consisted of code of compliance certificates, Certificate of Title, building plans and designs, and building applications and consents dated from 1979 to 2012[8]. These documents provided no supplementary information relevant to the PSI. Therefore, these documents are not addressed further or summarised within this report.

The WDC IntraMaps database was searched for potential HAIL at the site and surrounds. Figure 3.3 highlights orchard HAIL activity (A.10[9]) boundaries occurring at the property north of the subject site (Part Lot 2 DPS 36696 and Lot 2 DPS 82004) and the property south of the subject site (Lot 2 DP 405546).

WDC provided a PSI report prepared for an adjacent property, 5022 Ohaupo Road, Te Awamutu (see Section 3.3.1 for summary of report).

[6] Email received on the 30th of November 2021 from Sarah Ladegourdie (WRC Student – Geothermal and Air, Land Ecology and Contamination, Science, Policy).

[7] 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 under development and should not be regarded as comprehensive. The 'potentially contaminated' category is gradually being compiled with reference to past and 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).

[8] File named: ECM_1280533_v1_ Application to erect a new rural outbuilding. Dated: 03/04/2008
File named: ECM_1280537_v1_P12501 – Compliance Code Compliance Certificate. Dated: 08/03/2012
File named: ECM_1280541_v1_P12501 – Building Plans Site Plan. Dated: 08/03/2012
File named: ECM_1280545_v1_P12501 – Specification. Dated: 08/03/2012
File named: ECM_1280553_v1_P12501 – Building PIM. Dated: 08/03/2012
File named: ECM_1280557_v1_P12501 – Building Consent. Dated: 08/03/2012
File named: ECM_1280565_v1_Application for code compliance certificate. Dated: 08/03/2012
File named: ECM_1280581_v1_Certificate of Title. Dated: 12/12/1984
File named: ECM_1280589_v1_Historic Building Permit Application Alter haybarn. Dated: 28/03/1990
File named: ECM_1280593_v1_Historic Building Permit Application Implement Shed. Dated: 13/02/1990
File named: ECM_1280597_v1_Historic Building Application Plumbing and Drainage for Dwelling. Dated: 10/07/1984
File named: ECM_1280613_v1_Historic Building Plans Additions alterations or extensions. Dated: 07/1987
File named: ECM_5414619_v1_Historical Building Microfiche – Ohaupo Road 2025. Dated: 1979 – 2008
File named: ECM_8378585_v2_P12501 – PIM 0411 08 – Project Information Memorandum. Dated: 01/05/2008
File named: ECM_8392874_v2_P12501 – BC 0435 08 – Building Consent. Dated: 19/05/2008
File named: ECM_8427009_v2_P12501 – CCC 1000 08 – Code of Compliance Certificate. Dated: 23/07/2008

[9] A.10 – Persistent pesticide bulk storage or use including sport turfs, market gardens, orchards, glass houses or spray sheds.

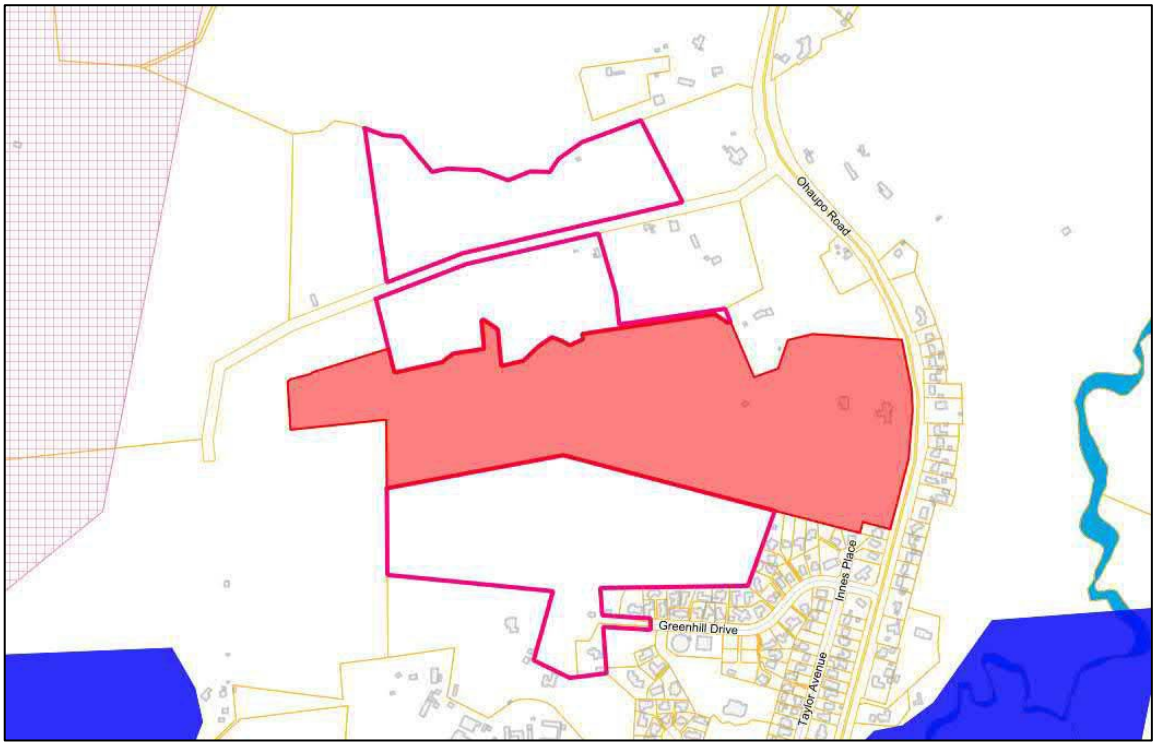

Figure 3.3: Outline of orchard (HAIL) boundaries on adjacent properties. Source: WDC IntraMaps.

3.3.1 Preliminary Site Investigation – Guy Sowry - Contaminated Site Investigation (CSI) - 5022 Ohaupo Road, Te Awamutu (2011)

PSI report for 5022 Ohaupo Road, Te Awamutu (Lot 2 DPS 82004) (dated February 2011) was provided by WDC. Figure 3.4 illustrates the property investigated in the PSI. The PSI identified that a section of Lot 2 DPS 82004 was planted in kiwifruit prior to 2000 and was completely planted in kiwifruit in 2009. The report notes that by 1997 all kiwifruit orchards in New Zealand were required to be members of KiwiGreen. Being a part of KiwiGreen meant that only 'soft' chemicals ('*basically organic chemicals'*) could be applied to the orchards to control pests. The report states that the site was certified by Bio-Gro as organic in 2007.

The PSI included the analysis of three soil samples which were collected from beneath the proposed building platform location on the 9th of February 2011 during the site investigation undertaken by Guy Sowry (CSI) (see Figure 3.5 below). The samples were delivered to Hill Laboratories and analysed for arsenic, copper, and cadmium. The report concluded that from the three samples collected and analysed, no concentrations were found to exceed the recommended values. The risk to the environment and human health was considered to be low. It was recommended that no further contaminated land investigations were required as part of the building permit. However, the soil sampling was limited to the area described as the 'bare block' and therefore the potential for contamination in other areas of the property could not be completely ruled out.

Figure 3.4: Investigated area in the 2011 PSI report completed by Guy Sowry (CSI).

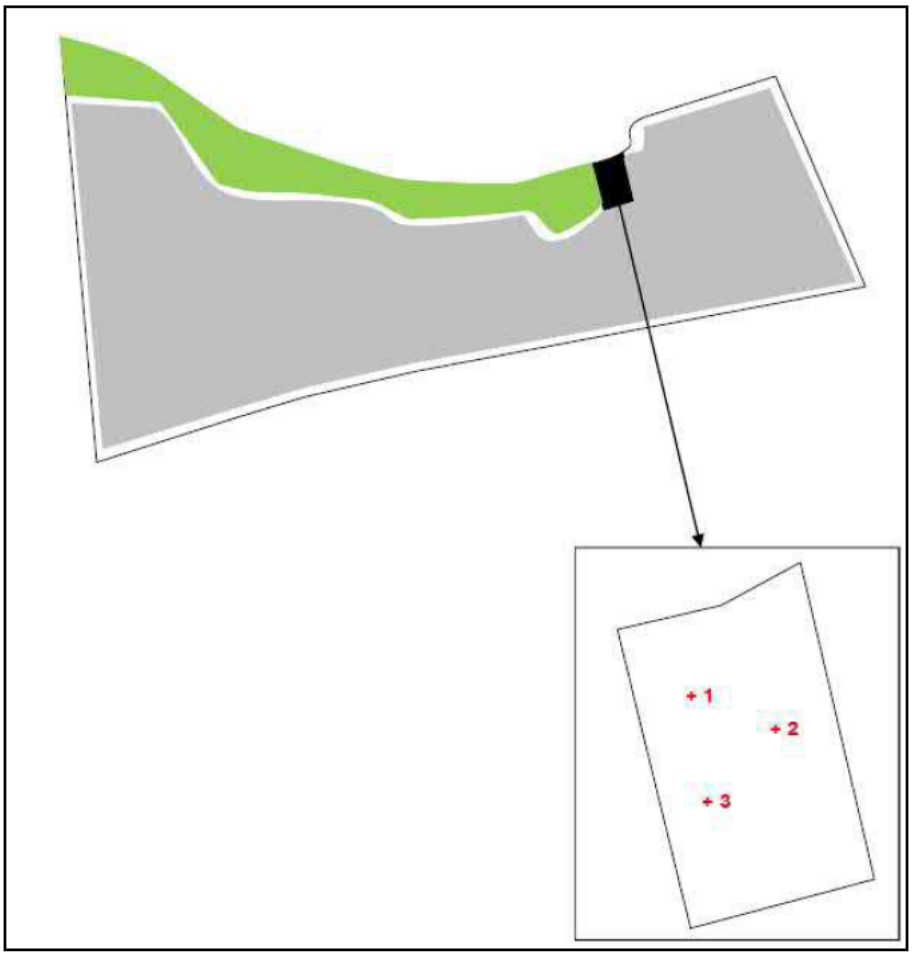

Figure 3.5: Sampling plan for PSI report at 5022 Ohaupo Road, Te Awamutu, February 2011.

3.4 Client Supplied Information

No preliminary development design information was supplied by the client.

3.5 Interview with Current Landowner

The landowner, Christopher Johnson, was interviewed on the phone on the 7th of December 2021. The information provided is as follows:

- Christopher and Beverley have owned the property for 20 years. Chris' dad owned the property for 12 years prior to Chris taking over the property. Chris' dad purchased the property in 1989.
- As far as Christopher is aware, the farm has been used to graze dry stock (cattle) and only a handful of sheep at any one time. The third owners back used the property for dairy farming, which was prior to the property being subdivided in 1982.
- Christopher is not aware of any sheep or cattle dipping occurring on the property. Fly sprays have been applied to the sheep on the property via spray-on and pour-on (dates not provided).
- Christopher is not aware of any structures being removed from the site (specifically referring to the structure observed in 1943 imagery).
- Not aware of any asbestos materials or lead-based paints being used on any of the structures on the site.
- Bricks observed during the site visit were from an old garage on a previous farm of Christopher's. The bricks were originally going to be used for an overflow in the drain, but this has not happened.
- There are three offal pits on the site. Two are disused and have been filled in. The third offal pit is currently in use. The offal pits are/were used to dispose of animal carcasses.
- The burn pile is used to burn green waste from the site (mainly pruning's). It is a disused silage pit. It was used as a silage pit pre-1980s.
- Soil was imported from a driveway on Greenhill Drive and placed around the trough edges. No other soil has been imported to the site. There is no landfill on the site.
- 10 tonne of superphosphate is applied to the property most years. This year (2021) 10 tonne of superphosphate and two tonne of ammonium sulfate was applied to the site.
- The orchard on the town side of the site (south of the subject site [420 Greenhill Drive]) is an organic kiwifruit orchard. Christopher was unsure if the orchard north (5022 Ohaupo Road) is an organic orchard.
- All fuel stored on the site is stored within the workshop on a concrete floor. The most fuel ever stored on the site at any one time is 40 litres of diesel and 40 litres of petrol for farm machinery.
- Not aware of any spills occurring on the site.

4 SITE VISIT AND SOIL SAMPLING

4.1 Sampling Plan

A preliminary CSM was developed from the desktop assessment and potential activities that could cause soil contamination from agricultural farming and horticulture. Developing the CSM involved evaluating the source-pathway-linkage probability which in turn was used to inform whether soil sampling was required. The preliminary CSM indicated that soil arsenic, cadmium, and organochlorines were the most likely contaminants of concern at the site. The CSM is presented (in a revised format following analysis of quantitative soil data) in Section 6.2.

The produce consumption pathway is the key exposure route to human health from soil cadmium. In general, cadmium is regarded as relatively immobile in soils and concentrations are commonly reported to be higher in surface soils. The controlling pathway for arsenic is soil ingestion. Produce consumption has a significant influence for residential scenarios at high home-grown produce proportions but only a moderate influence at the standard residential proportion of 10 per cent. The controlling pathways for organochlorines (OCP) include produce consumption, soil ingestion and dermal absorption. Produce consumption has a dominant influence in the SCSs for dieldrin for the residential with produce scenarios.

The 0 – 150 mm depth covers the significant root zone and therefore best represents the home produce exposure pathway and soil ingestion pathway. It is assumed that any potential soil cadmium accumulation would be relatively homogenous across the site (due to site wide application of fertiliser). It is assumed that any potential soil arsenic and organochlorine accumulation would occur in locations such as the stockyard, woolshed, and along the site's boundaries adjacent to the neighbouring kiwifruit orchards.

A random sampling design of 10 samples (see Figure 4.1) was determined to be the most appropriate method to provide a good representation of the overall site. The key reason for using a random sampling design over a judgemental sampling design is that the random sampling dataset could be supplemented and analysed statistically if further sampling was required (i.e., judgemental samples cannot be analysed statistically). In addition, three judgemental samples were collected and analysed for organochlorines and heavy metals at the woolshed, stockyard and boundary of the site adjacent to orchard activities.

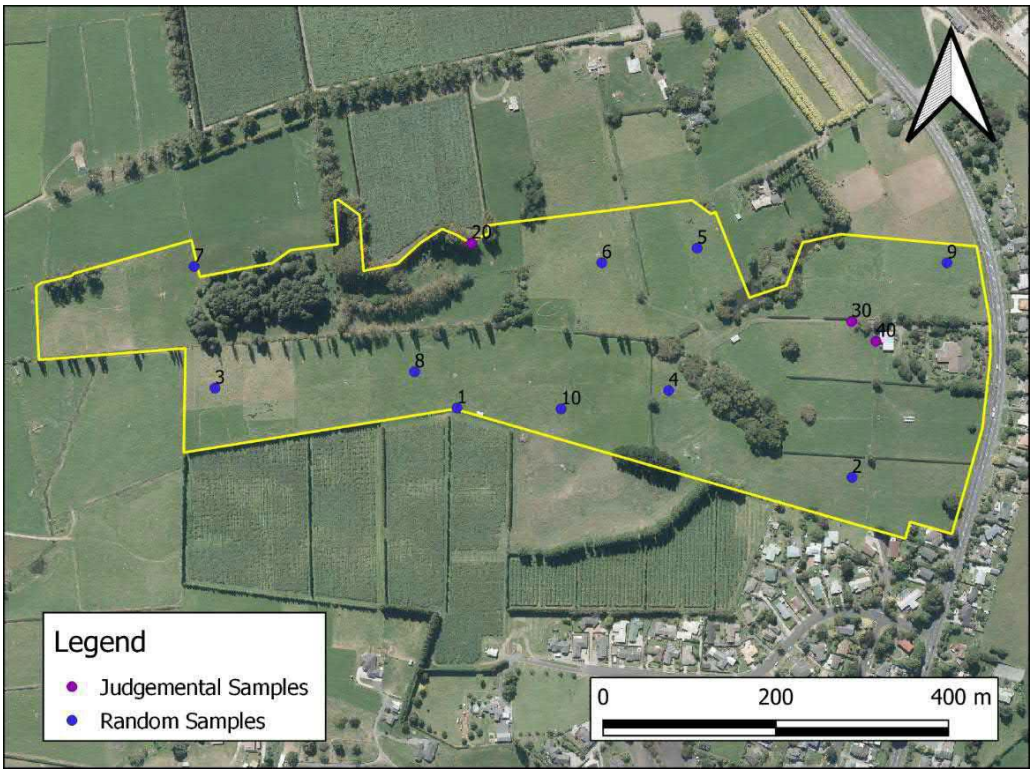

Figure 4.1: Sampling location plan.

4.2 BTW Site Visit

The site was visited on the 18th of November 2021. The key observations from the site visit are as follows:

- Adjacent land uses were pastoral agricultural, rural residential and horticultural.
- The land use of the subject site appeared to be pastoral agriculture and rural residential (the single main residential dwelling).
- A herd of dry stock grazing onsite.
- Three offal pits were pointed out by the landowner during the site visit. Two of these offal pits had been filled in. The third offal pit was still in use.
- A silage pit was being used as a burn pit. Tree cuttings and a small amount of fence wire and unknown debris observed.
- Piles of treated timber and metal observed in area of main farm shed.
- Structures noted on the site included:
  - main residential dwelling (not investigated);
  - workshop/implement shed (main farm shed);
  - woodshed;
  - woolshed (no structures suggestive of livestock dip or spray race);
  - stockyard (no structures suggestive of livestock dip or spray race);
  - hay shed;
  - water tanks;

- No suspect of asbestos or lead-based paint materials observed (main residential dwelling and surrounding area was not inspected);
- Small area with building brick debris observed;
- No stained or discoloured soils, or odours;
- A central farm drain that flows from east to west;
- Two ponds located on the site;
- Kahikatea stand;
- Horticultural (kiwifruit orchards) sites observed on adjacent properties (north and south).

4.3 Field and Laboratory Quality Assurance and Quality Control

Soil samples were collected on the 18th of November 2021 in clean laboratory supplied (Hill Laboratories; IANZ accredited laboratory) containers. Soil sampling equipment was decontaminated prior to work and between each sample. Samples were individually labelled and stored and transported in a chilled polystyrene bin. Samples were stored in BTW cool storage prior to delivery to Hill Laboratories for analysis on the 19th of November 2021. Chain of Custody forms are available in Appendix D.

5 SOIL SAMPLING RESULTS

A total of 13 samples were analysed for heavy metals (10 randomly collected and three judgementally collected). A total of four samples were analysed for organochlorine pesticides (one random and three judgementally collected). The organochlorine pesticide screening results were all below analytical detection (see Appendix C), and therefore the results are not presented further.

The raw analytical results are presented in Table 5.1 and Table 5.2 (and Appendix C) and compared to predicted background concentrations (Upper 95% predicted background concentrations from WRC and Landcare Research[10]). The summary results are presented in Table 5.3 for comparison to the NESCS and the NEPM[11] Residential A land use scenarios (NEPM 2011).

All samples were below the applicable guideline values. Notably, 12 cadmium concentrations were above the WRC 95% upper background concentration and eight were above the Landcare Research 95% upper background concentration.

The soil sample results for arsenic and cadmium are plotted on Figure 5.1 and Figure 5.2 below. Plots of measured soil data overlaid with predicted background concentration and soil order layers are presented in Appendix E and Appendix F.

Table 5.1: Randomly collected soil surface (0 – 150 mm) samples analysed for heavy metals. Grey shading indicates result is greater than the WRC 95% upper limit for background concentration. Italicised values indicate result is greater than the highest Landcare Research predicted 95% concentration for the site.

Sample Name:	Arsenic (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Nickel (mg/kg)	Zinc (mg/kg)
M-1-150	6	*0.61*	11	*45*	17.4	5	*107*
M-2-150	7	*0.99*	10	36	15.3	5	93
M-3-150	3	0.13	7	11	16.2	2	40
M-4-150	8	0.41	11	39	*25*	6	100
M-5-150	6	*0.96*	10	39	15.2	5	*106*
M-6-150	6	*0.95*	11	29	15	5	*145*
M-7-150	7	0.25	14	30	20	6	58
M-8-150	4	0.27	9	20	18.2	4	60
M-9-150	7	*0.87*	11	*48*	16.6	6	*115*
M-10-150	6	*1.02*	11	*45*	15.5	5	*112*
Minimum	3	0.13	7	11	15	2	40
Maximum	8	1.02	14	48	25	6	145
Mean	6	0.646	10.5	34.2	17.44	4.9	93.6
SD	1.49	0.353	1.78	11.82	3.088	1.197	31.77
Skewness	-1.006	-0.324	-0.0739	-0.857	1.904	-1.709	-0.349
CV	0.248	0.546	0.169	0.346	0.177	0.244	0.339
95% Percentile	7.55	1.01	12.65	46.65	22.75	6	131.5
95% UCL	6.86	0.851	11.53	41.05	19.23	6.55	112

[10] Cavanagh, J., McNeill, S., Arienti, C., Rattenbury, M. 2015. Background soil concentrations of selected trace elements and organic contaminants in New Zealand. Landcare Research Report 2440 for Envirolink Tools Grant C09X1402.
[11] National Environment Protection (Assessment of Site Contamination) Measure. Australian Government.

Table 5.2: Judgementally collected soil surface (0 – 150 mm) samples analysed for heavy metals. Grey shading indicates result is greater than the WRC 95% upper limit for background concentration. Italicised values indicate result is greater than the highest Landcare Research predicted 95% concentration for the site

Sample Name:	Arsenic (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Nickel (mg/kg)	Zinc (mg/kg)
O-20-150	16	0.36	10	28	20	5	*112*
O-30-150	9	0.92	13	*45*	15.7	6	*104*
O-40-150	11	0.65	11	*54*	17.5	6	*126*

Table 5.3: Summary of soil heavy metal data (both randomly and judgementally collected) from soil samples at surface (0 – 150 mm) compared with NESCS, NEPM, and 95% upper predicted background concentrations.

Analyte	NESCS Soil Contaminant Standards for Rural residential / lifestyle block 25% produce (mg/kg)	NESCS Soil Contaminant Standards for Residential 10% produce (mg/kg)	NEPM Investigation Levels for Soil and Groundwater (Residential A) (mg/kg)	Landcare Upper 95% Predicted Background (mg/kg)	Waikato Regional Council Upper 95% Predicted Background (mg/kg)	Reported Range (mg/kg)	Average reported (mg/kg)
Arsenic	17	20	100	12.67-16.38	6.8	3-16	7.38
Cadmium	0.8	3	20	0.28-0.49	0.22	0.13-1.02	0.65
Chromium	290	460	100	60.5-0-67.35	30	7-14	10.69
Copper	>10,000	>10,000	6000	40.17-42.16	25	11-54	36.08
Lead	160	210	300	24.79-30.08	20	15-25	17.51
Nickel	N/A	N/A	400	32.88-33.75	7.6	2-6	5.08
Zinc	N/A	N/A	7400	101.80-129.70	53	40-145	98.31

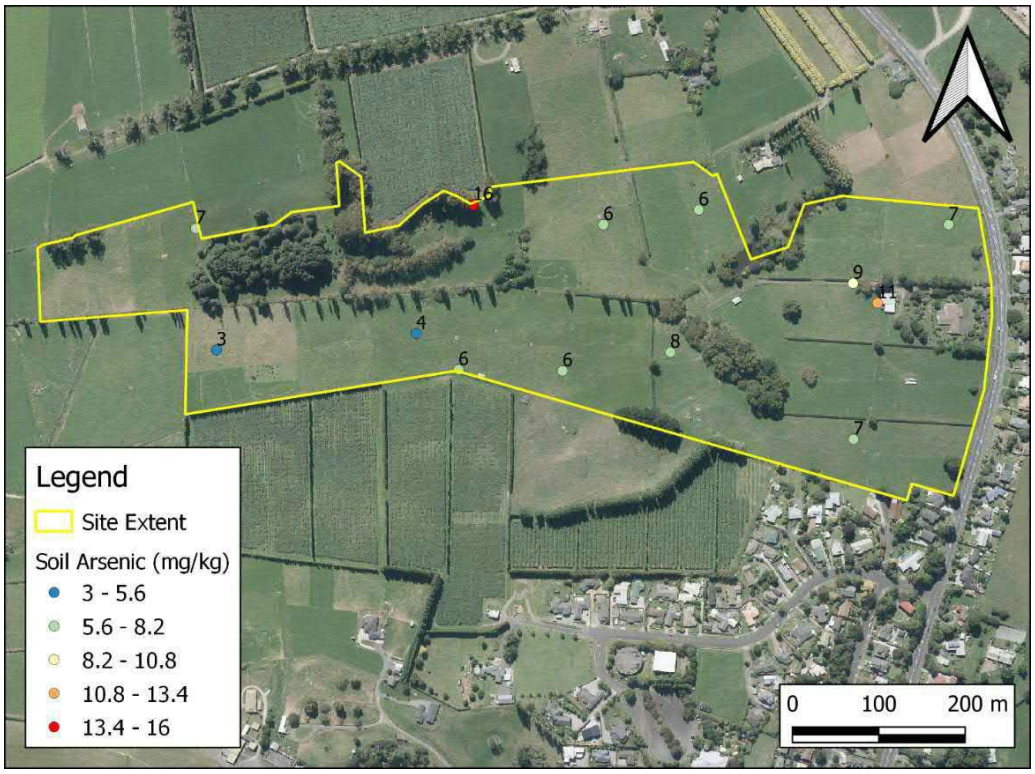

Figure 5.1: Aerial image of the site with sample locations and soil sample results for arsenic (labels indicate concentration in mg/kg).

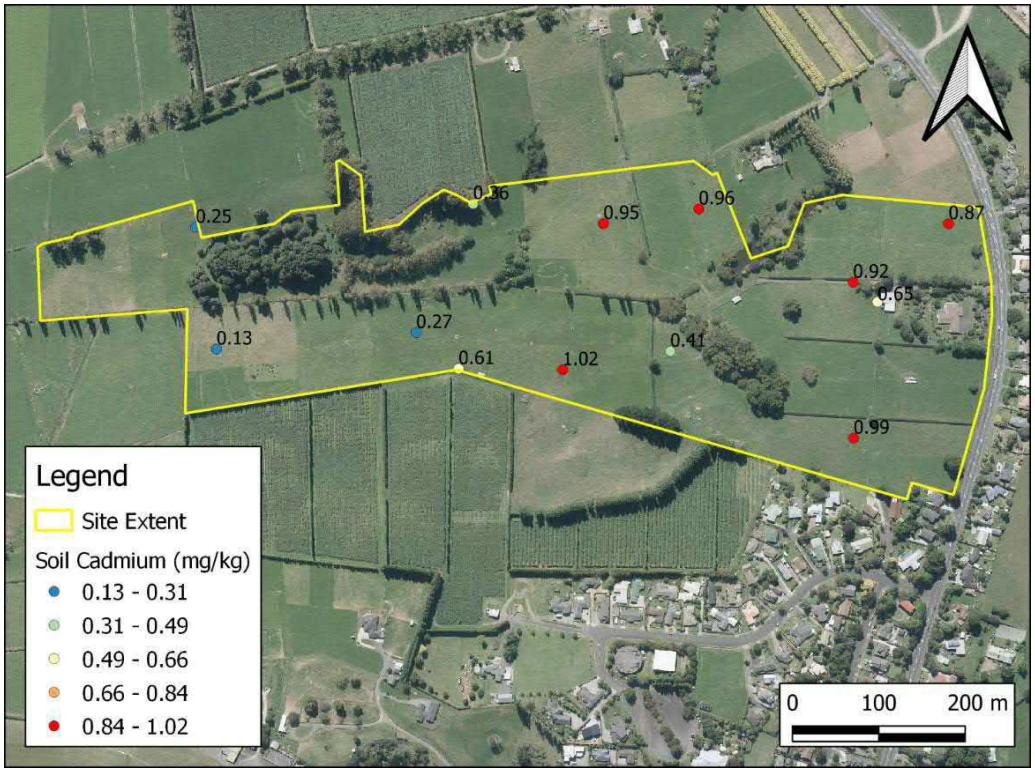

Figure 5.2: Aerial image of the site with sample locations and soil sample results for cadmium (labels indicate concentration in mg/kg).

6 SITE RISK CHARACTERISATION AND EVALUATION

To evaluate the magnitude of the risk pursuant to the NESCS (i.e., determine that it is highly unlikely that there will be a risk to human health if the activity is done to the 'piece of land') the investigation must complete a site risk assessment. Central to the requirements of the risk assessment is the development of a CSM. A CSM is an evaluation of the probability of contaminate sources in an environmental system and identification and characterisation of the pathways (e.g., biological, physical, chemical vectors) to human health and environmental receptors (see Figure 6.1 and MfE 2012 for further details). Ultimately the goal is to evaluate the source-pathway-receptor linkage. Instances where the linkage is complete presents a risk to human health that requires robust assessment and/or management.

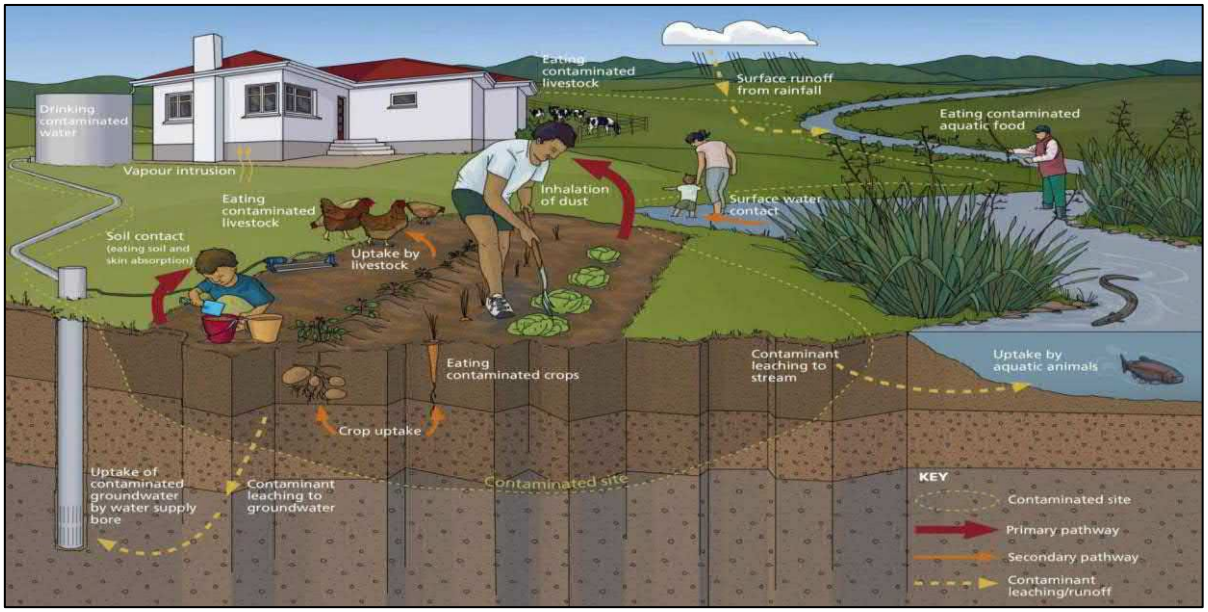

Figure 6.1: Conceptual Site Model (CSM) of contaminate sources and pathway vectors for human health risk. Source: MfE (2012).

6.1 Land Use and Exposure Scenarios for Proposed Development

To evaluate the risk of soil contaminants to human health the MfE has developed soil contaminant standards (SCSs) and soil guideline values (SGVs) for common land uses ranging from rural residential to commercial/outdoor worker, referred to as exposure scenarios (MfE 2011; MfE 2012). The SCSs and SGVs provide guidance around the concentrations of specific priority contaminants that are considered to present a risk to human health. The standards applicable at this site are considered to be the 10% produce residential exposure scenarios outlined by MfE (2011, 2012).

6.2 Conceptual Site Model (CSM)

MfE (2021b) states that a CSM can be presented in written, pictorial or graphical format, or as a table or flow diagram, or a combination of these. This investigation presents a simplified flow diagram and a written evaluation of potential source-pathway-linkage likelihood.

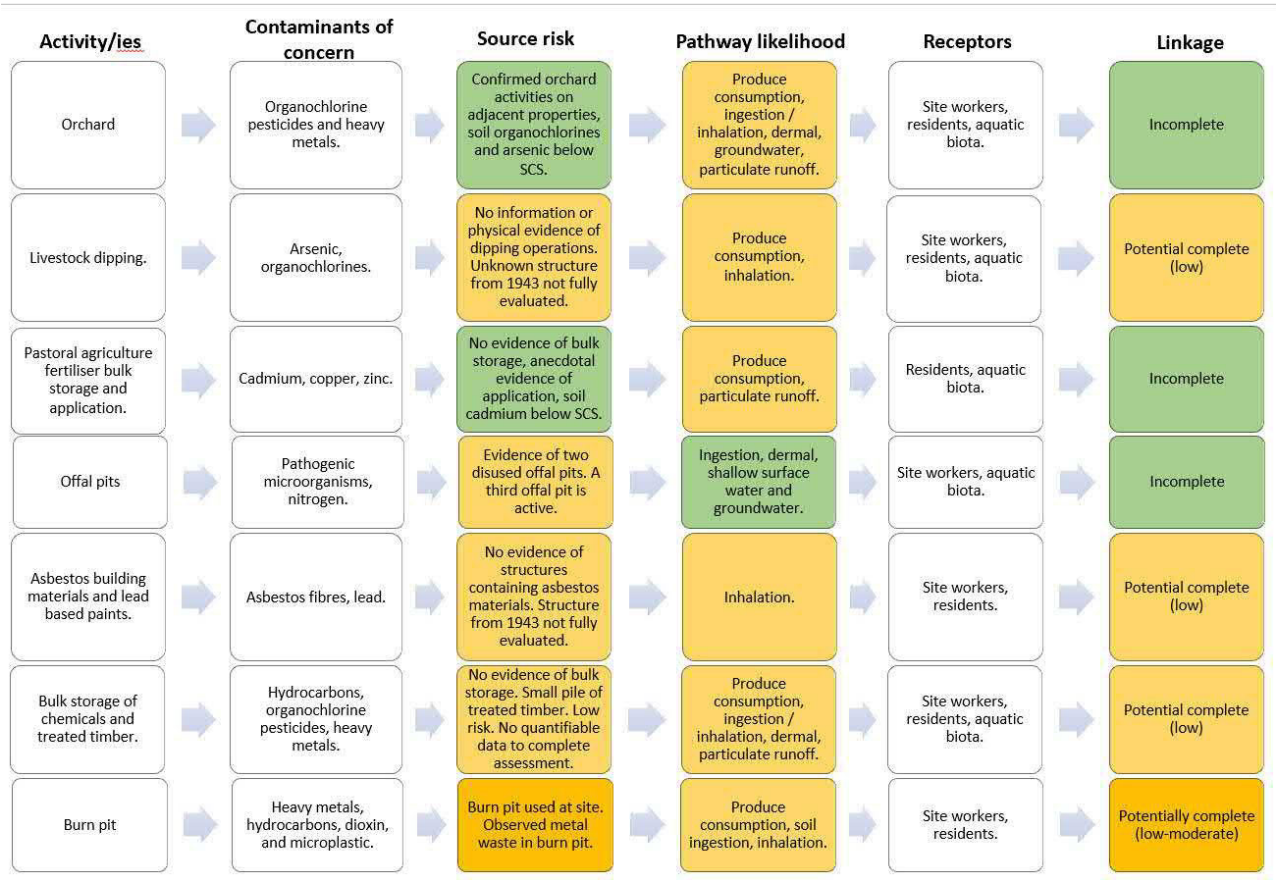

Figure 6.2: Simple flow diagram Conceptual Site Model (CSM) for the site. Where risk and probability is coded, low (green), low to moderate (yellow), moderate to high (orange), and high (red).

6.2.1 Detailed Source-Pathway-Receptor Evaluation

The site at 2025 Ohaupo Road is not identified on the WRC LUIR[7] or WDC HAIL database. The current investigation has identified several potential or confirmed HAIL activities at the site. The activity specific risk to human health from potential soil contamination is evaluated below.

Adjacent Orchard Activities

The aerial imagery shows orchard land use at the adjacent properties to the north and south, from 1979 and 1995 respectively (see Figure 3.3 and Appendix B). With the orchard activities to the north evident pre-1989[12], there is a possibility that pesticides containing arsenic, lead, copper, mercury and organochlorines were used and could subsequently present a risk to human health at the site from spray drift and transport across site boundaries. In comparison, the orchard to the south is unlikely to present a risk from persistent pesticide based on establishment post-1989.

The lot to the north of the site was investigated for potential soil contamination in 2011 by CSI (see Section 3.3.1). The 2011 report outlined that the lot to the north was certified organic in 2007 and stated: "*All kiwifruit orchards in New Zealand were required to be members of 'KiwiGreen' by 1997. 'KiwiGreen' is an industry initiative to ensure exports do not contain traces of hazardous chemicals.* A total of three soil samples were collected and analysed for arsenic, copper, and cadmium as part

[12] Agricultural and horticultural activities pre-1989 in New Zealand are more likely than not to have used pesticide sprays containing arsenic, lead, copper, mercury and organochlorines (Buckland et. al. 1998; Osborne, 1976; Matthews, 1975).

of the CSI report risk assessment. All sample concentrations were below SGVs. However, the 2011 CSI report did not examine the potential for historical pesticide use across the lot from pre-1989.

A judgemental sample was collected at the site at the boundary with the orchard to the north, to represent the 'worst-case' scenario. This sample was analysed for heavy metals and organochlorines. Arsenic concentration at this sampling location exceeded WRC background concentration and was substantially elevated in comparison to concentrations measured across the site. This observation could indicate that soil arsenic has become elevated from the adjacent orchard land use activities. However, the measured arsenic does not exceed the upper predicted concentration based on local geology (Appendix E). In comparison to the applicable SGV, the concentration of arsenic was 0.8 times lower than the applicable SGV. While organochlorine analysis results were all below analytical detection.

Overall, the information and data indicate that the orchard activities at the adjacent lots are highly unlikely to present a risk to human health at the subject site.

Livestock Dipping and Spray Race Operations

The desktop assessment suggests that the land use timeline at the site was pastoral agriculture from 1943 through to present day. Anecdotal information suggests that the site was used for grazing dry stock (mainly cattle and a handful of sheep) for the past 32 years and was used as part of a dairy farm before it was subdivided in 1982.

Historical livestock land use can be associated with livestock dip or spray race operations. It is estimated that there are 50,000 historic sheep dip sites across New Zealand, with over 10,000 in the Waikato Region. Although livestock dips were predominately used for sheep, a small number of cattle dips are confirmed in New Zealand. The contaminants of concern associated with dip and spray sites are, arsenic and organochlorines (e.g., aldrin, dieldrin, DDT, lindane), organophosphates, carbamates, and synthetic pyrethroids. Arsenic and the organochlorines (aldrin, dieldrin, DDT, and lindane) are the chemicals of greatest concern due to toxicity and persistence in the environment (MfE 2012). The historical timeline of arsenic and organochlorines use with dipping and spray race operations is from 1840s to 1980 and from 1945 to 1961 respectively[13].

A woolshed (Figure 6.3) and stockyard (Figure 6.4) were examined during the site visit for features suggestive of former dip or spray race operations. In addition, judgemental samples for heavy metals and organochlorines were collected to represent 'worst-case' concentrations. There was no evidence of structures potentially used for dipping and spray race treatments. Furthermore, judgemental sample results were below analytical detection for organochlorines and below the applicable SCS. Moreover, the desktop information suggests that the stockyard and woolshed were constructed in the 1990s (outside of the timeline of persistent chemical use for dipping and spray race animal treatments). Therefore, sheep dip and spray race activities are highly unlikely to present a risk to human health at the subject site. However, 1943 imagery identified a single structure at the site. The purpose and history of the structure is unknown, and the timeline corresponds with the historical timeline of arsenic and organochlorine use for animal treatments. This area was not investigated further or sampled to quantify potential risk. In the absence of additional qualitative information and quantitative data the structure footprint is regarded as a 'piece of land' (see Appendix A). If soil disturbance or a change of land use is to occur at this location, further

[13] Up until the mid-1970s, a range of persistent organochlorine (e.g., DDT) and metal-based pesticides (e.g., lead arsenate) were extensively used to control insect pests in New Zealand (Matthews, 1975). The persistent organochlorines were progressively restricted for use in New Zealand from the 1960s and eventually deregistered in 1989 (Buckland et al. 1998). Arsenic based pesticides were withdrawn from use in New Zealand from the 1970s (Matthews, 1975).

investigation is required to evaluate the potential risk of soil contamination from dipping and spray operations.

Figure 6.3: Photo of the woolshed at the site.

Figure 6.4: Photo of the stockyard at the site.

Fertiliser Application and other Animal Treatments

Accumulation of heavy metals can occur in agricultural soils from the application of fertilisers (e.g., superphosphate, manure) and animal remedies (e.g., facial eczema treatment). For example, Zhou et. al. (2020) found increased soil cadmium, copper, and zinc in maize fields derived from manure application. In New Zealand, Longhurst, et. al. (2004) conducted a national survey of heavy metal concentrations in agricultural soils and found cadmium enrichment and no enrichment of arsenic, copper, lead, or zinc in the 0 − 7.5 cm depth.

Cadmium derived from fertiliser use and subsequent accumulation in New Zealand agricultural soils is well documented (Kim, 2005). Cadmium is a natural, non-essential, toxic heavy metal, and is listed as a NESCS priority contaminant (MfE 2012). When superphosphate fertiliser comes into contact with moisture, cadmium is released and is rapidly sequestered by soil particles. The adsorption of cadmium to soil varies due to differences in soil particle size, pH, organic matter content, and abundance of metal cations (Gray et al., 1999).

Superphosphate is applied to the site. In 2021, approximately 10 tonne of superphosphate and two tonne of ammonium sulfate was applied. The site visit and anecdotal information suggests that there is no bulk storage of fertiliser at the site. Therefore, potential accumulation of cadmium at the site from agricultural fertiliser application is expected to be 'homogenous' across the site (i.e., no areas of bulk storage and homogenous application of fertiliser across the site).

To supplement the risk assessment, soil samples were collected across the site to quantify potential soil cadmium accumulation. The concentration of cadmium ranged from 0.13 to 1.02 mg/kg. These concentrations are elevated in comparison to predicted upper background concentrations but lower than the applicable residential soil guideline concentrations (residential 10% produce scenario) for cadmium. However, cadmium concentration (and 95% UCL of the mean) exceeds the SCS for rural residential (25% produce scenario). The indicative development plan is for standard residential lot sizes. Therefore, cadmium is highly unlikely to present a risk to human health based on the proposed development. However, if rural lot sizes are included in the development, further assessment of cadmium is required. This additional assessment should involve an evaluation of 'natural' soil pH to apply a site-specific SGV.

Offal Pits

The disposal of dead animals is a standard practise associated with agricultural land use and can present a source of soil and water contamination. Three offal pits are located at the site adjacent to the stockyard. Two offal pits are not in use and have been filled in. While the third offal pit is still in use. The primary contaminants of concern associated with these activities are pathogenic microorganisms[14] in soil and water, and nitrogen[15] inputs to receiving water bodies.

In general, there is very little information available regarding the environmental impacts of livestock burial. NABCC (2004) reviewed carcass disposal processes and environmental impacts. In brief, the review highlights that the pollutant load is likely to be released during the early stages of decomposition with nitrogen impacts to groundwater being more problematic than microbial contamination. For example, it was reported that 50% of total volume from a carcass occurs in the first two months. However, the rate of decomposition is dependent on depth, soil type, species and

[14] Pathogen is a bacteria, virus or other microorganism that can cause disease.

[15] In soils ammoniacal nitrogen (ammonia [NH3] and ammonium [NH4+]), exhibits low toxicity (ammonium sorbs to the cation exchanges complexes of soils and sediments and anions in solution reducing bioavailability and toxicity) and transforms into less toxic forms (nitrate [NO3-]). In comparison, in aquatic environments ammoniacal nitrogen can be toxic to aquatic organisms. High concentrations of nitrogen can cause methaemoglobinaemia or "blue baby" syndrome, gastric cancer, hypertension, leukaemia and non-Hodgkins lymphoma.

size, and hydrology. Therefore, there is insufficient information and data to determine the potential or likelihood of potential nitrogen impacts to downstream water bodies. However, it is expected that impacts are probably lesser in comparison to fertiliser inputs.

The duration of survival times for pathogenic microorganisms in soil are generally <100 days (Feachem et al. 1983) and therefore it is expected that potential pathogenic risk to future site residents will be highly unlikely. However, the offal pit does present a risk to site workers. It is recommended that offal pits are addressed with any health and safety or Site Management Plan (SMP) documentation for commercial workers to ensure safe procedures are in place to minimise pathogenic health effects. Moreover, there is potential that the offal pits could have been used to discard other farm waste materials although anecdotal evidence suggests that this did not occur.

Asbestos and Lead-based Paints

Farming related structures and residences have the potential of being a source of soil asbestos and lead contamination from building materials containing asbestos and use of lead-based paints[16]. Asbestos importation and manufacture in New Zealand started from around 1939 (Graham, B. 2014) and peaked around 1975. From the 1940's to 1960's asbestos cladding and roofing was prevalent in buildings. Asbestos products were manufactured in New Zealand until 1987 and banned in New Zealand in 2000. Therefore, buildings that were constructed between the 1940's – 1980's correlates to the peak timing of asbestos use and therefore could potentially be comprised of asbestos. While the use of lead-based paints in New Zealand was common until the 1980's.

The uncontrolled demolition of buildings containing asbestos and/or asbestos material in poor condition is a potential vector for asbestos soil contamination and subsequent soil disturbance of asbestos contaminated soils is the pathway for human exposure. While mechanical breakdown or removal of lead-based paints is the vector for soil lead contamination with dust and produce consumption pathways for exposure. Both asbestos and lead are environmentally persistent and therefore elevated sources present a significant human health risk.

There was one structure on the site that corresponded with asbestos building material and lead-based paint use. All remaining structures at the site were constructed outside of the timeline of peak asbestos and lead-based paint use. Furthermore, the site visit and property file review provided no evidence suggestive of asbestos or lead-based paints. Therefore, excluding the 1943 structure, uncontrolled demolition of asbestos building materials and lead-based paint breakdown and removal are unlikely to be a source of soil contamination and the probability of a complete pathway at the site is low.

As there is insufficient information and data regarding the structure observed in 1943 (to fully evaluate the source-pathway receptor linkage), the footprint of this structure is marked as a 'piece of land' (Appendix A). This area will require further evaluation to determine potential asbestos and lead contamination. It is recommended that any further investigation is completed once the site development plan is established.

Workshop/Implement Shed (Main Farm Shed) and Surrounds

A workshop/implement shed is located on the subject site. The shed was first identified in aerial imagery from 1995 to 2021. The shed is used as a maintenance, hobby restoration, and storage shed for machinery (e.g., tractors, quad bikes, hay mower, lawn mower), see Figure 6.5 and Figure 6.6. No bulk storage of chemicals or fuel was observed during the site visit and anecdotal

[16] The use of lead-based paints, while not specifically included in the MfE HAIL register, is considered a potential source of soil contamination (i.e., HAIL I).

information suggests that fuel storage is small scale. The shed has a concrete surface in the workshop area and exposed soil in the implement storage area. Surrounding the implement shed and workshop, a pile of treated timber (Figure 6.7) and a pile of scrap metal was observed on bare soil during the site visit.

Overall, the activities associated with the main farm shed and surrounding area are small scale and present a low risk to human health. However, in the absence of quantifiable data (e.g., bulk storage of copper-chromium-arsenic (CCA) treated timber is likely to create an elevation in concentrations of copper, chromium, and arsenic in the soil beneath and the workshop activities could result in hydrocarbon contamination of soils) there is insufficient evidence to conclude that the source-pathway-receptor linkage is incomplete. Therefore, the main farm area is identified as a 'piece of land' (Appendix A). It is recommended that any further investigation into the potential soil contamination risk at this area is completed once the site development plan is established.

Figure 6.5: Photo of the implement shed storage area.

Figure 6.6: Photo of the workshop.

Figure 6.7: Photo of treated timber fence posts.

Burn Pit

A burn pit was observed during the site visit, see Figure 6.8. The burn pit was also identified in historical imagery from 1979 to 2021 imagery. Anecdotal information suggests the burn pit was originally an old silage pit, however it is now used as a burn pit to dispose of tree cuttings from around the site. Although tree cuttings were the predominant material observed a small amount of rubbish was noted (e.g., fencing wire). Contaminants associated with burn pits are dependent on the original waste that is disposed of into the pit. This activity could result in metal, hydrocarbon, dioxin, and microplastic contamination at the site. In the absence of quantifiable data, there is a potential risk to human health at this location. Therefore, the burn pit is identified as a 'piece of land' (Appendix A). It is recommended that any further investigation into the potential soil contamination risk at this area is completed once the site development plan is established.

Figure 6.8: Photo of burn pit.

7 CONCLUSIONS AND RECOMMENDATIONS

7.1 Conclusions

- Overall, the potential for soil contamination across the majority of the site is highly unlikely to present a risk to human health based on the proposed subdivision and change of land use from pastoral agriculture to standard residential (10% produce scenario).
- The proposed development is standard residential (10% produce). At the rural residential 25% produce scenario soil cadmium exceeds SGV. If the development plan is to include rural residential lots where 25% produce scenario is applicable quantification of soil pH will be required to develop a Site-Specific Soil Guideline Value for the site to reflect the bioavailability of cadmium.
- Orchard activities (A.10) at adjacent lots were evaluated and determined to be highly unlikely to present a risk to human health at the site.
- Isolated areas across the site are highlighted as 'pieces of land' (Appendix A). These areas are based on HAIL activities that are either confirmed or more likely than not to have occurred on the site[17]. In general, the risk to human health from 'pieces of land' was determined to be low. However, in the absence of quantifiable data the source-pathway-receptor risk cannot be fully evaluated to determine that risk is highly unlikely.
- Providing that no soil disturbance or change of land use occurs in areas identified as 'pieces of land', the proposed residential development is regarded as a permitted activity. Areas of identified as 'pieces of land' require further evaluation in conjunction with a developed site plan and additional quantitative soil data.

7.2 Recommendations

- The findings of this investigation are considered in the development of the subdivision plans.
- If development plan includes rural residential lots where 25% produce scenario is applicable (current plan is for standard residential) then quantification of soil pH is required to develop a Site-Specific Soil Guideline Value for cadmium at the site.
- Following development of subdivision plans and resource consent for the development, the risk assessment at locations identified as low risk 'pieces of land' (Appendix A) is updated based on development plan information and/or quantitative soil data where applicable.
- The updated risk assessment is to be compiled and presented as Detailed Site Investigation (DSI).
- This investigation is provided to Waipa District Council (WDC) and Waikato Regional Council (WRC) with any resource consent application relating to subdivision, change of land use, or soil disturbance.part of any subdivision application.

[17] HAIL activities evaluated at the site are HAIL A.8: Livestock dip or spray race operations;— HAIL A.17: Storage tanks or drums for fuel;— HAIL A.18: Bulk storage of treated timber;— F.4: Motor vehicle workshops; HAIL G.5: Burn pit;— HAIL G.5: Offal pits;— HAIL I: Any other land that has been subject to intentional or accidental release of hazardous substances in sufficient quantity that they could be a risk to human health or the environment.

8 REPORT LIMITATIONS

The focus of this report is on Part Lot 1 DP 35654 and Lot 1 DPS 36696. The main residential dwelling and surrounding area has not been investigated as part of this PSI report, see Appendix A. If soil disturbance is to occur in the location of the dwelling and surrounding area as part of the subdivision, further investigation under the NESCS is required.

This report has used information provided by third parties which has been taken to be accurate and correct. BTW Company is not responsible for any inaccuracies in this information.

This report has been prepared by BTW Company to satisfy the requirements of the NESCS regulations and to deliver the objectives outlined within the report. BTW Company accepts no liability if the report is used for any other purpose or is relied on by any person(s) other than the client. Any such use or reliance will be solely at their own risk.

No soil investigation or desktop investigation can guarantee the absence of contaminated soil as soil conditions by nature are not uniform. This report is representative of all the information available to the author, and the conclusions and recommendations made in this report are derived from that information which was available at the time the report was written.

The services of this project are in accordance with current best practise and known professional standards for environmental site assessments at the time of investigation. Should additional information become available at a later date, BTW Company reserves the right to update this report.

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APPENDIX A SITE PLAN AND PIECE OF LAND DECRAMATION

BTW COMPANY

Site Plan and Piece of Land Decramation
2025 Ohaupo Road, Te Awamutu

0 50 100 m

SCALE 1:3000

APPENDIX B HISTORICAL IMAGERY

BTW COMPANY

1943 Aerial Image
2025 Ohaupo Road, Te Awamutu

Disclaimer:
Image georectified using selected features from Google Earth imagery for the purpose of visual land-use change assessment (displayed in ESPG 4326 WGS84). Photographic imagery has been imported from Retrolens. Areas and dimensions may be subject to scale error. Scaling from this image is not recommended and is at the user's risk.

Attribution:
Aerial image sourced from http://retrolens.nz and licensed by LINZ CC-BY 3.0.

0 100 200 m

SCALE 1:6000

BTW COMPANY

1957 Aerial Image
2025 Ohaupo Road, Te Awamutu

Disclaimer:
Image georectified using selected features from Google Earth imagery for the purpose of visual land-use change assessment (displayed in ESPG 4326 WGS84). Photographic imagery has been imported from Retrolens. Areas and dimensions may be subject to scale error. Scaling from this image is not recommended and is at the user's risk.

Attribution:
Aerial image sourced from http://retrolens.nz and licensed by LINZ CC-BY 3.0.

0 100 200 m

SCALE 1:6000

BTW COMPANY

1967 Aerial Image
2025 Ohaupo Road, Te Awamutu

Disclaimer:
Image georectified using selected features from Google Earth imagery for the purpose of visual land-use change assessment (displayed in ESPG 4326 WGS84). Photographic imagery has been imported from Retrolens. Areas and dimensions may be subject to scale error. Scaling from this image is not recommended and is at the user's risk.

Attribution:
Aerial image sourced from http://retrolens.nz and licensed by LINZ CC-BY 3.0.

0 100 200 m

SCALE 1:6000

BTW COMPANY

1974 Aerial Image
2025 Ohaupo Road, Te Awamutu

Disclaimer:
Image georectified using selected features from Google Earth imagery for the purpose of visual land-use change assessment (displayed in ESPG 4326 WGS84). Photographic imagery has been imported from Retrolens. Areas and dimensions may be subject to scale error. Scaling from this image is not recommended and is at the user's risk.

Attribution:
Aerial image sourced from http://retrolens.nz and licensed by LINZ CC-BY 3.0.

0 100 200 m

SCALE 1:6000

BTW COMPANY

1979 Aerial Image
2025 Ohaupo Road, Te Awamutu

Disclaimer:
Image georectified using selected features from Google Earth imagery for the purpose of visual land-use change assessment (displayed in ESPG 4326 WGS84). Photographic imagery has been imported from Retrolens. Areas and dimensions may be subject to scale error. Scaling from this image is not recommended and is at the user's risk.

Attribution:
Aerial image sourced from http://retrolens.nz and licensed by LINZ CC-BY 3.0.

0 100 200 m

SCALE 1:6000

BTW COMPANY

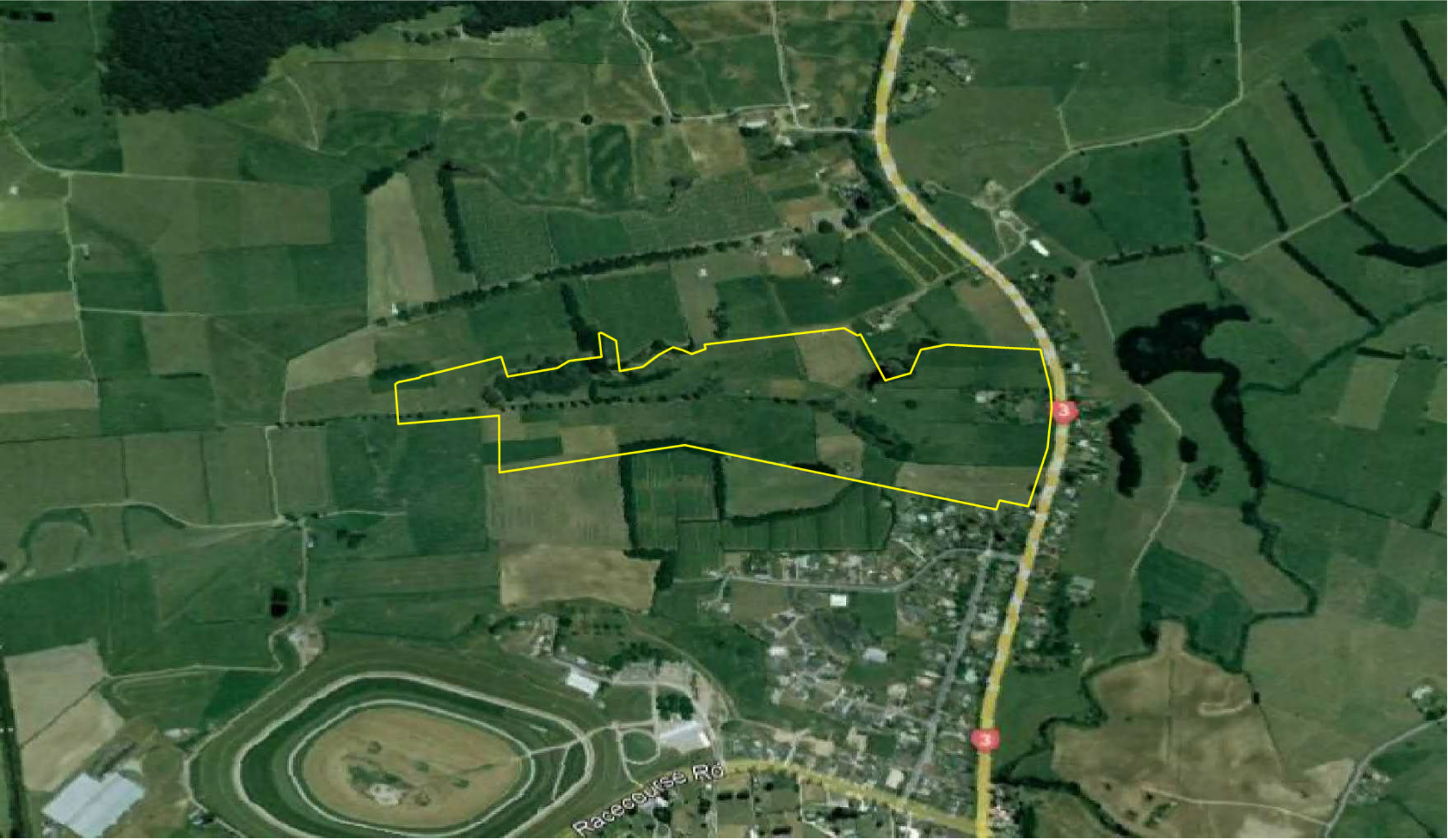
1995 Aerial Image
2025 Ohaupo Road, Te Awamutu

Disclaimer:
Image georectified using selected features from Google Earth imagery for the purpose of visual land-use change assessment (displayed in ESPG 4326 WGS84). Photographic imagery has been imported from Retrolens. Areas and dimensions may be subject to scale error. Scaling from this image is not recommended and is at the user's risk.

Attribution:
Aerial image sourced from http://retrolens.nz and licensed by LINZ CC-BY 3.0.

0 100 200 m

SCALE 1:6000



BTW COMPANY

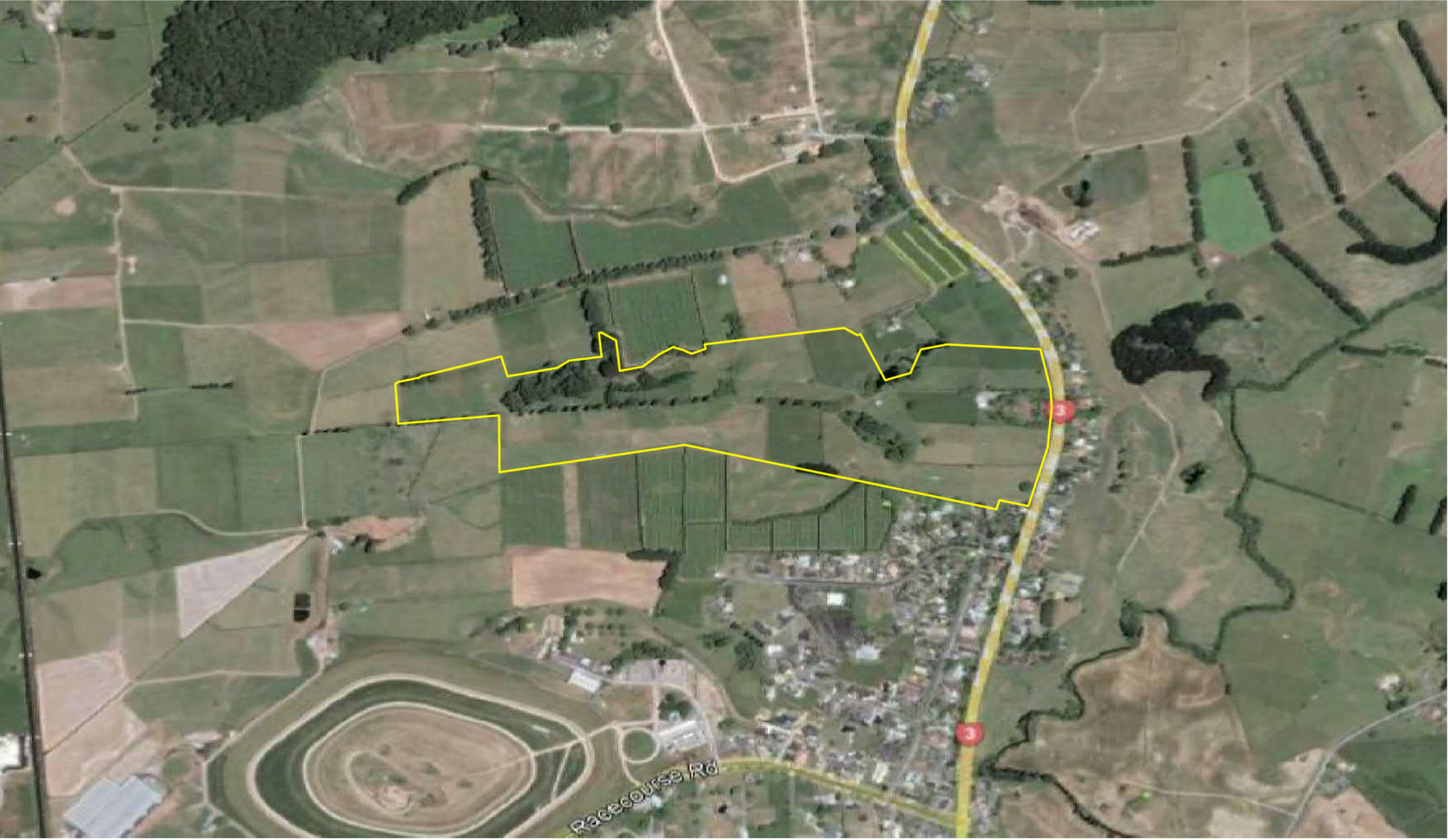
2008 Aerial Image
2025 Ohaupo Road, Te Awamutu

Photographic imagery has been imported from Google Earth for the purpose of visual land-use change assessment. Areas and dimensions may be subject to scale error. Scaling from this image is not recommended and is at the user's risk.

Image Waipa District Council

0 100 200 m

SCALE 1:6000



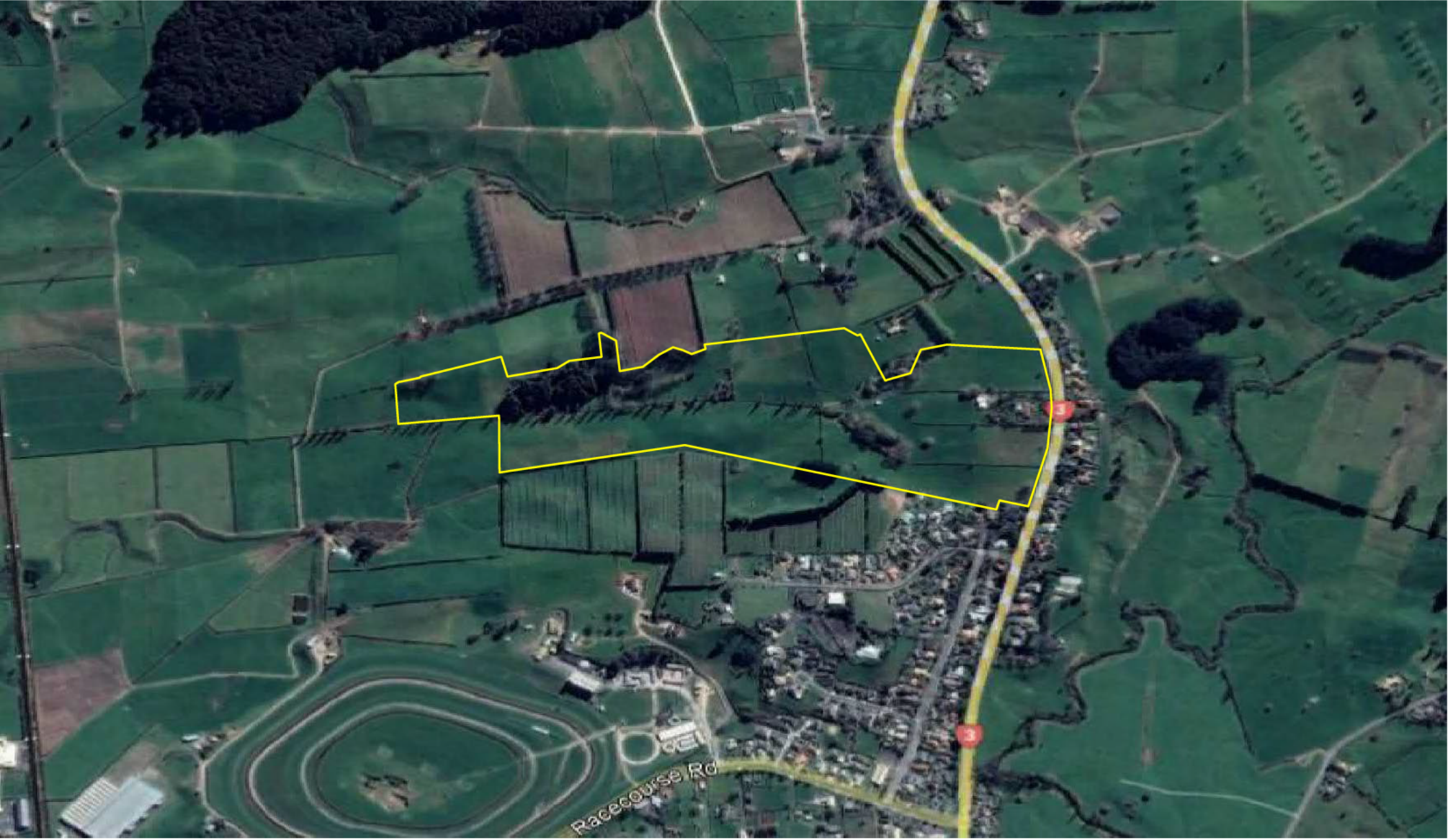
BTW COMPANY

2010 Aerial Image
2025 Ohaupo Road, Te Awamutu

Photographic imagery has been imported from Google Earth for the purpose of visual land-use change assessment. Areas and dimensions may be subject to scale error. Scaling from this image is not recommended and is at the user's risk.

0 100 200 m

SCALE 1:6000



BTW COMPANY

2013 Aerial Image
2025 Ohaupo Road, Te Awamutu

Photographic imagery has been imported from Google Earth for the purpose of visual land-use change assessment. Areas and dimensions may be subject to scale error. Scaling from this image is not recommended and is at the user's risk.

0 100 200 m

SCALE 1:6000

BTW COMPANY

2017 Aerial Image
2025 Ohaupo Road, Te Awamutu

Photographic imagery has been imported from external sources for the purpose of visual land-use change assessment. Areas and dimensions may be subject to scale error. Scaling from this image is not recommended and is at the user's risk.

Image Waipa District Council

0 100 200 m

SCALE 1:6000

BTW COMPANY

2021 Aerial Image
2025 Ohaupo Road, Te Awamutu

Photographic imagery has been imported from Google Earth for the purpose of visual land-use change assessment. Areas and dimensions may be subject to scale error. Scaling from this image is not recommended and is at the user's risk.

0 100 200 m

SCALE 1:6000

APPENDIX C LABORATORY RESULTS

Hill Laboratories
TRIED, TESTED AND TRUSTED

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

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

Certificate of Analysis

Client:	BTW Company Ltd - Hamilton Branch	**Lab No:**	2773314	SPv1
Contact:	Dean Sandwel	**Date Received:**	19-Nov-2021	
	C/- BTW Company Ltd - Hamilton Branch	**Date Reported:**	24-Nov-2021	
	PO Box 551	**Quote No:**	115099	
	New Plymouth 4340	**Order No:**		
		Client Reference:	211365	
		Submitted By:	Dean Sandwell	

Sample Type: Soil

Sample Name:		M-1-150 18-Nov-2021 4:28 pm	O-1-150 18-Nov-2021 4:30 pm	O-20-150 18-Nov-2021 5:25 pm	O-30-150 18-Nov-2021 5:43 pm	O-40-150 18-Nov-2021 5:38 pm
Lab Number:		2773314.1	2773314.2	2773314.3	2773314.4	2773314.5
Individual Tests						
Dry Matter	g/100g as rcvd	-	63	59	66	62
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	6	8	16	9	11
Total Recoverable Cadmium	mg/kg dry wt	0.61	0.59	0.36	0.92	0.65
Total Recoverable Chromium	mg/kg dry wt	11	10	10	13	11
Total Recoverable Copper	mg/kg dry wt	45	44	28	45	54
Total Recoverable Lead	mg/kg dry wt	17.4	18.1	20	15.7	17.5
Total Recoverable Nickel	mg/kg dry wt	5	6	5	6	6
Total Recoverable Zinc	mg/kg dry wt	107	97	112	104	126
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	-	< 0.016	< 0.017	< 0.015	< 0.016
alpha-BHC	mg/kg dry wt	-	< 0.016	< 0.017	< 0.015	< 0.016
beta-BHC	mg/kg dry wt	-	< 0.016	< 0.017	< 0.015	< 0.016
delta-BHC	mg/kg dry wt	-	< 0.016	< 0.017	< 0.015	< 0.016
gamma-BHC (Lindane)	mg/kg dry wt	-	< 0.016	< 0.017	< 0.015	< 0.016
cis-Chlordane	mg/kg dry wt	-	< 0.016	< 0.017	< 0.015	< 0.016
trans-Chlordane	mg/kg dry wt	-	< 0.016	< 0.017	< 0.015	< 0.016
2,4'-DDD	mg/kg dry wt	-	< 0.016	< 0.017	< 0.015	< 0.016
4,4'-DDD	mg/kg dry wt	-	< 0.016	< 0.017	< 0.015	< 0.016
2,4'-DDE	mg/kg dry wt	-	< 0.016	< 0.017	< 0.015	< 0.016
4,4'-DDE	mg/kg dry wt	-	< 0.016	< 0.017	< 0.015	< 0.016
2,4'-DDT	mg/kg dry wt	-	< 0.016	< 0.017	< 0.015	< 0.016
4,4'-DDT	mg/kg dry wt	-	< 0.016	< 0.017	< 0.015	< 0.016
Total DDT Isomers	mg/kg dry wt	-	< 0.10	< 0.10	< 0.09	< 0.10
Dieldrin	mg/kg dry wt	-	< 0.016	< 0.017	< 0.015	< 0.016
Endosulfan I	mg/kg dry wt	-	< 0.016	< 0.017	< 0.015	< 0.016
Endosulfan II	mg/kg dry wt	-	< 0.016	< 0.017	< 0.015	< 0.016
Endosulfan sulphate	mg/kg dry wt	-	< 0.016	< 0.017	< 0.015	< 0.016
Endrin	mg/kg dry wt	-	< 0.016	< 0.017	< 0.015	< 0.016
Endrin aldehyde	mg/kg dry wt	-	< 0.016	< 0.017	< 0.015	< 0.016
Endrin ketone	mg/kg dry wt	-	< 0.016	< 0.017	< 0.015	< 0.016
Heptachlor	mg/kg dry wt	-	< 0.016	< 0.017	< 0.015	< 0.016
Heptachlor epoxide	mg/kg dry wt	-	< 0.016	< 0.017	< 0.015	< 0.016
Hexachlorobenzene	mg/kg dry wt	-	< 0.016	< 0.017	< 0.015	< 0.016
Methoxychlor	mg/kg dry wt	-	< 0.016	< 0.017	< 0.015	< 0.016

Sample Type: Soil						
Sample Name:		M-2-150 18-Nov-2021 6:02 pm	M-3-150 18-Nov-2021 4:58 pm	M-4-150 18-Nov-2021 4:28 pm	M-5-150 18-Nov-2021 5:01 pm	M-6-150 18-Nov-2021 5:17 pm
Lab Number:		2773314.6	2773314.7	2773314.8	2773314.9	2773314.10
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	7	3	8	6	6
Total Recoverable Cadmium	mg/kg dry wt	0.99	0.13	0.41	0.96	0.95
Total Recoverable Chromium	mg/kg dry wt	10	7	11	10	11
Total Recoverable Copper	mg/kg dry wt	36	11	39	39	29
Total Recoverable Lead	mg/kg dry wt	15.3	16.2	25	15.2	15.0
Total Recoverable Nickel	mg/kg dry wt	5	2	6	5	5
Total Recoverable Zinc	mg/kg dry wt	93	40	100	106	145

Sample Name:		M-7-150 18-Nov-2021 4:08 pm	M-8-150 18-Nov-2021 4:40 pm	M-9-150 18-Nov-2021 5:56 pm	M-10-150 18-Nov-2021 4:43 pm	
Lab Number:		2773314.11	2773314.12	2773314.13	2773314.14	
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	7	4	7	6	-
Total Recoverable Cadmium	mg/kg dry wt	0.25	0.27	0.87	1.02	-
Total Recoverable Chromium	mg/kg dry wt	14	9	11	11	-
Total Recoverable Copper	mg/kg dry wt	30	20	48	45	-
Total Recoverable Lead	mg/kg dry wt	20	18.2	16.6	15.5	-
Total Recoverable Nickel	mg/kg dry wt	6	4	6	5	-
Total Recoverable Zinc	mg/kg dry wt	58	60	115	112	-

Summary of Methods

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

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%.	-	1-14
Heavy Metals, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1-14
Organochlorine Pesticides Screening in Soil	Sonication extraction, GC-ECD analysis. Tested on as received sample. In-house based on US EPA 8081.	0.010 - 0.06 mg/kg dry wt	2-5
Dry Matter (Env)	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	2-5

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

Testing was completed between 22-Nov-2021 and 24-Nov-2021. For completion dates of individual analyses please contact the laboratory.

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

Carole Rodgers-Carroll BA, NZCS
Client Services Manager - Environmental

APPENDIX D CHAIN OF CUSTODY RECORD

Hill Laboratories
TRIED, TESTED AND TRUSTED

ANALYSIS REQUEST

R J Hill Laboratories Limited2JobN7o: 7Date R3ecv:319-No1v-21412:11

28 Duke Street Frankton 32(
Private Bay 3205
Hamilton 3240 New Zealand

W WWW.hill-laboratories.con

Received by: A.d S d
i a ar an

Quote No 115099

Primary Contact 'DE A(\J SANDWELL

Submitted By DEAN SANDWELL

BTW Company Ltd - Hamilton Branch 268297

Address Cl- BTW Company Limited, PO Box 551
New Plymouth 4340

Phone s 9(2)(a) Mobile s 9(2)(a)

Email s 9(2)(a)

Charge To BTW Company Limited 40949

Client Reference 11365

Order No

Results To Reports will be emailed to Primary Contact by default.
Additional Reports will be sent as specified below.
Email Primary Contact D Email Submitter D Email Client
Email Other
Other Nakeysha.Lammers@btw.nz
Dates of testing are not routine/ included in the Certificates of Analysis.
Please inform the laboratory if you would like this information reported.

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories
Date & Time: 14/11/21 1200
Name: Dean Sandwell
Signature:
if you require COG to be emailed back

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

Condition D Room Temp D Chilled Frozen
Temp: 9.

D Sample & Analysis details checked
Signature:

Priority D Low D Normal [:£High
D Urgent (ASAP, extra charge applies, please contact lab first)
NOTE: The estimated turnaround time for the types and number of samples and analyses specified on this quote is by 4:30 pm, 2 working days following the day of receipt of the samples at the laboratory.

Requested Reporting Date:

ADDITIONAL INFORMATION / KNOWN HAZARDS

Pg 1 of 2

(HMSoil) Heavy Metals Screening
(OCPsc) Organochlorine Pesticides Screening
All Samples collected 18/11/2021

Quoted Sample Types

Soil (Soil)

No.	Sample Name	Sample Date/Time	Sample Type	Tests Required
1	M-1-150	18/11/21 1628	Soil	HMs Soil
2	0-1-150	1630		HMs Soil, OCPsc
3	0-20-150	1725		HMs Soil, OCPsc
4	0-30-150	1743		HMs Soil, OCPsc
5	0-40-150	1738		HMs Soil, OCPsc
6	M-2-150	1802		HMs Soil
7	M-3-150	1658		HMs Soil
8	M-4-150	1628		HMs Soil
9	M-5-150	1701		HMs Soil
10	M-6-150	18/11/21 1717	Soil	HMs Soil

Hill Laboratories
TRIED, TESTED AND TRUSTED

ANALYSIS REQUEST

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

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

Office use only
(Job No)

Quote No 115099

Primary Contact J)EA1,[illegible] S[illegible]1\:iDWELL

Submitted By DEAN SANDWELL

Client Name BTW Company Ltd - Hamilton Branch 268297

Address Cl- BTW Company Limited, PO Box 551
New Plymouth 4340

Phone s 9(2)(a) *Mobile*

Email s 9(2)(a)

Charge To BTW Company Limited 40949

Client Reference [illegible]

Order No

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

☒ *Email Primary Contact* D *Email Submitter* D *Email Client*

☐ *Email Other* ------[illegible]

☒ *Other* [illegible]

Dates of testing are

Please inform the laboratory if you would like this information reported.

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories
B''' *Tick if you require COG to be emailed back*

Date & Time: 19/11/21 1200
Name: Dean Sandwell
Signature:

Received at Hill Laboratories

Date & Time:
Name:
Signature:

Condition D *Room Temp* D *Chilled* *Frozen*

Temp:

D Sample & Analysis details checked

Signature:

ADDITIONAL INFORMATION / KNOWN HAZARDS

pg 2 of 2

All samples collected 18/11/2021

Priority D **Low** D **Normal** **High** D

Urgent (ASAP, extra charge applies, please contact lab first) **NOTE:** The estimated turnaround time for the types and number of samples and analyses specified on this quote is by 4:30 pm, 2 working days following the day of receipt of the samples at the laboratory.

Requested Reporting Date:

Quoted Sample Types

Soil (Soil)

No.	Sample Name	Sample Date/Time	Sample Type	Tests Required
1	M-7-150	18/11/21 1608	SOIL	HMs Soil
2	M-8-150	1640	SOIL	HMs Soil
3	M-9-150	1756	SOIL	HMs Soil
4	M-10-150	18/11/21 1643	SOIL	HMs Soil
5				
6				
7				
8				
9				
10				

Hill Laboratories
TRIED, TESTED AND TRUSTED

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

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

Job Information Summary

Client:	BTW Company Ltd - Hamilton Branch	**Lab No:**	2773314
Contact:	Dean Sandwell	**Date Registered:**	19-Nov-2021 5:56 pm
	C/- BTW Company Ltd - Hamilton Branch	**Priority:**	High
	PO Box 551	**Quote No:**	115099
	New Plymouth 4340	**Order No:**	
		Client Reference:	211365
		Add. Client Ref:	
		Submitted By:	Dean Sandwell
		Charge To:	BTW Company Limited
		Target Date:	23-Nov-2021 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	M-1-150 18-Nov-2021 4:28 pm	Soil	PSoil250	Heavy Metals, Screen Level
2	O-1-150 18-Nov-2021 4:30 pm	Soil	GSoil300	Heavy Metals, Screen Level; Organochlorine Pesticides Screening in Soil
3	O-20-150 18-Nov-2021 5:25 pm	Soil	GSoil300	Heavy Metals, Screen Level; Organochlorine Pesticides Screening in Soil
4	O-30-150 18-Nov-2021 5:43 pm	Soil	GSoil300	Heavy Metals, Screen Level; Organochlorine Pesticides Screening in Soil
5	O-40-150 18-Nov-2021 5:38 pm	Soil	GSoil300	Heavy Metals, Screen Level; Organochlorine Pesticides Screening in Soil
6	M-2-150 18-Nov-2021 6:02 pm	Soil	PSoil250	Heavy Metals, Screen Level
7	M-3-150 18-Nov-2021 4:58 pm	Soil	PSoil250	Heavy Metals, Screen Level
8	M-4-150 18-Nov-2021 4:28 pm	Soil	PSoil250	Heavy Metals, Screen Level
9	M-5-150 18-Nov-2021 5:01 pm	Soil	PSoil250	Heavy Metals, Screen Level
10	M-6-150 18-Nov-2021 5:17 pm	Soil	PSoil250	Heavy Metals, Screen Level
11	M-7-150 18-Nov-2021 4:08 pm	Soil	PSoil250	Heavy Metals, Screen Level
12	M-8-150 18-Nov-2021 4:40 pm	Soil	PSoil250	Heavy Metals, Screen Level
13	M-9-150 18-Nov-2021 5:56 pm	Soil	PSoil250	Heavy Metals, Screen Level
14	M-10-150 18-Nov-2021 4:43 pm	Soil	PSoil250	Heavy Metals, Screen Level

Summary of Methods

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

Sample Type: Soil

Test	Method Description	Default Detection Limit	Sample No
Environmental Solids Sample Drying	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%.	-	1-14
Heavy Metals, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1-14
Organochlorine Pesticides Screening in Soil	Sonication extraction, GC-ECD analysis. Tested on as received sample. In-house based on US EPA 8081.	0.010 - 0.06 mg/kg dry wt	2-5
Dry Matter (Env)	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	2-5

APPENDIX E COMPARISON OF SOIL SAMPLE RESULTS MEASURED WITH PREDICTED BACKGROUND CONCENTRATIONS

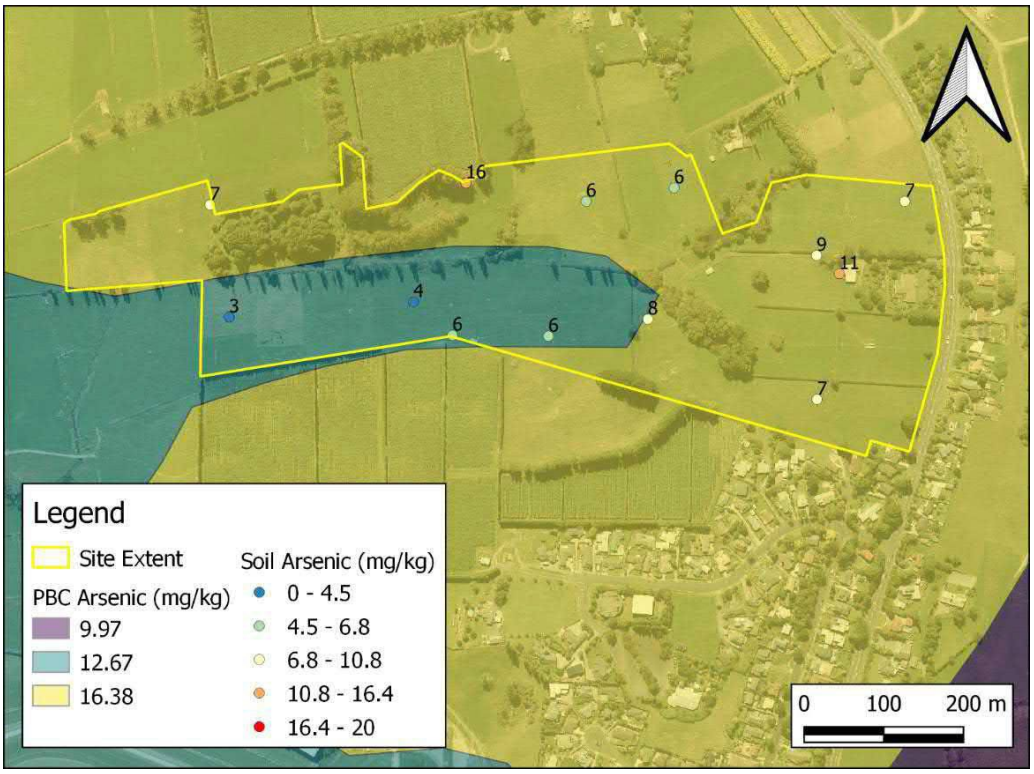


Figure E 1: Upper 95% predicted background concentration (PBC) of arsenic, overlaid with discrete soil sample results for arsenic (labels indicate concentration in mg/kg).

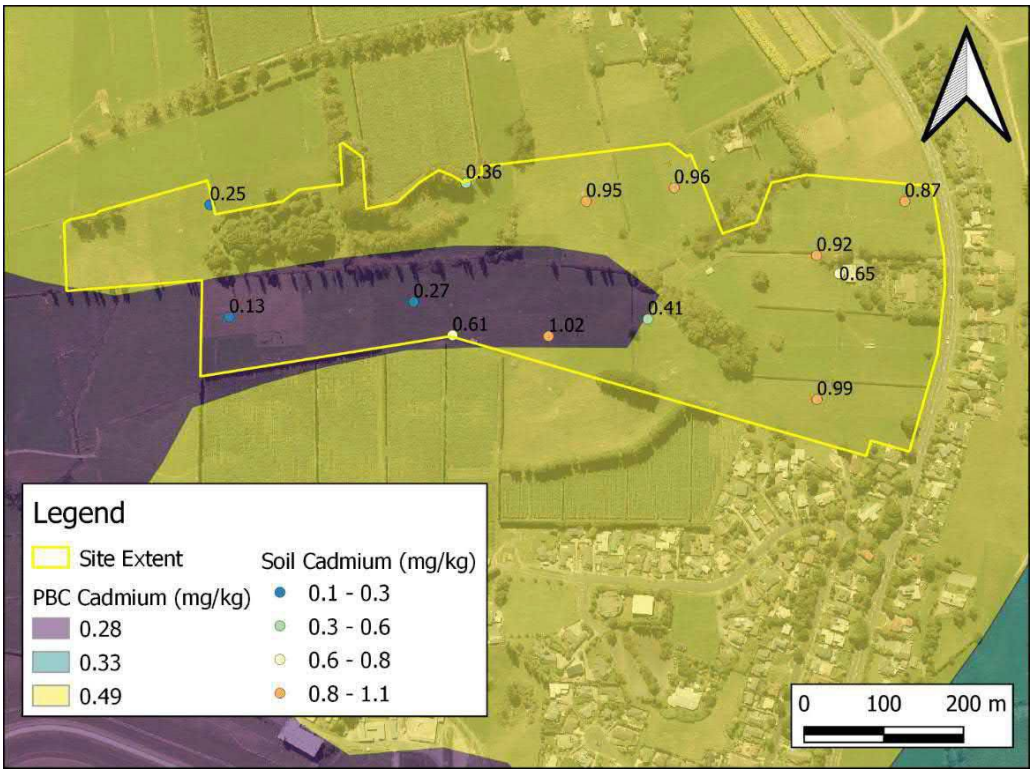


Figure E 2: Upper 95% predicted background concentration (PBC) of cadmium, overlaid with discrete soil sample results for cadmium (labels indicate concentration in mg/kg).

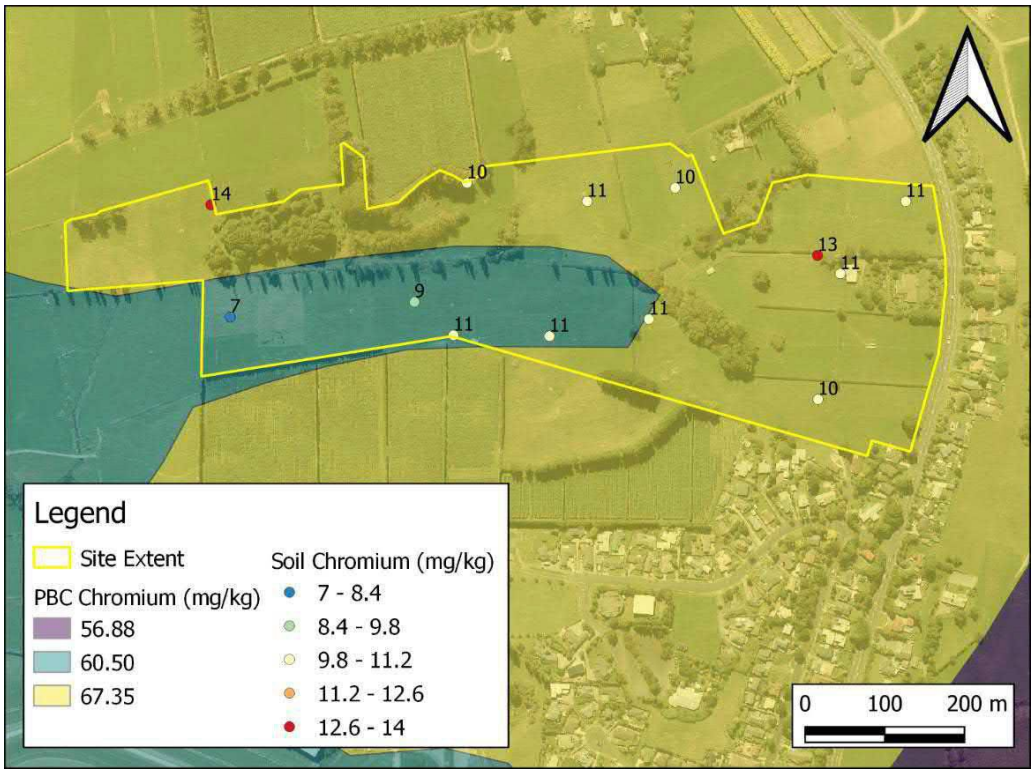


Figure E 3: Upper 95% predicted background concentration (PBC) of chromium, overlaid with discrete soil sample results for chromium (labels indicate concentration in mg/kg).

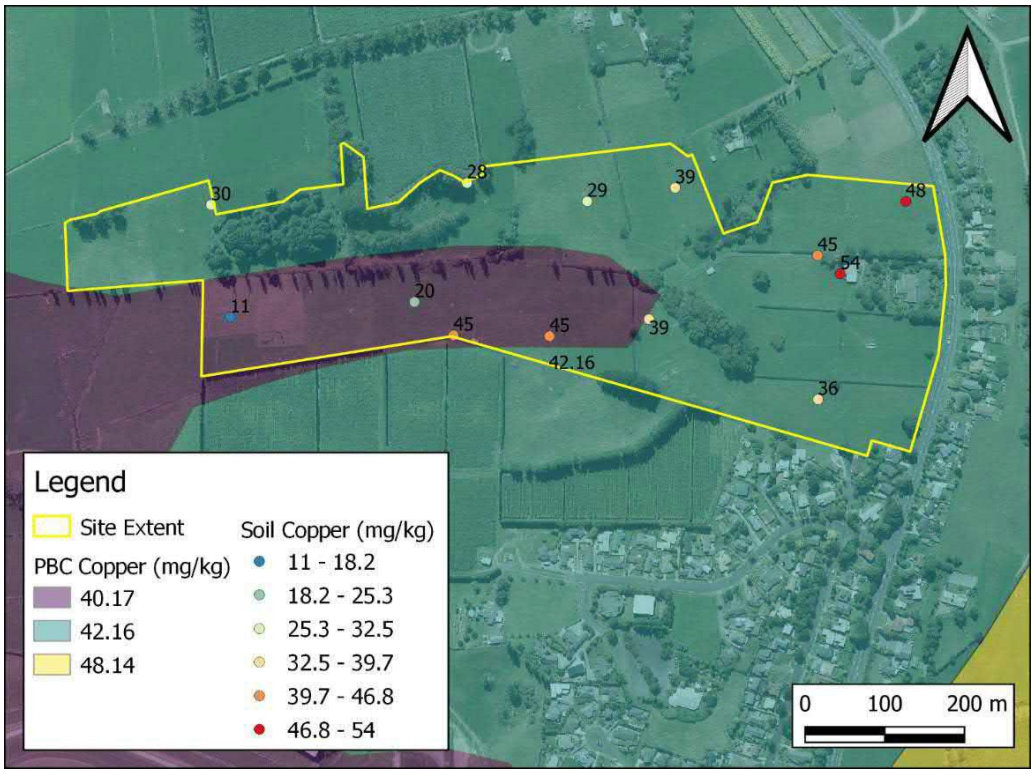


Figure E 4: Upper 95% predicted background concentration (PBC) of copper, overlaid with discrete soil sample results for copper (labels indicate concentration in mg/kg).

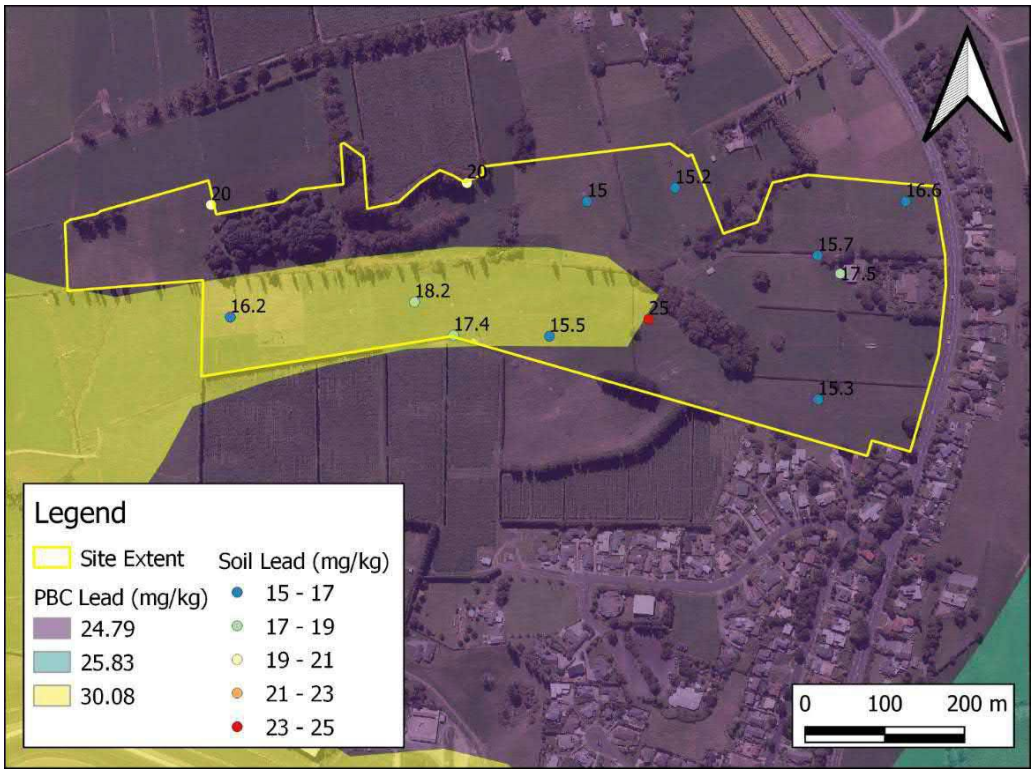


Figure E 5: Upper 95% predicted background concentration (PBC) of lead, overlaid with discrete soil sample results for lead (labels indicate concentration in mg/kg).

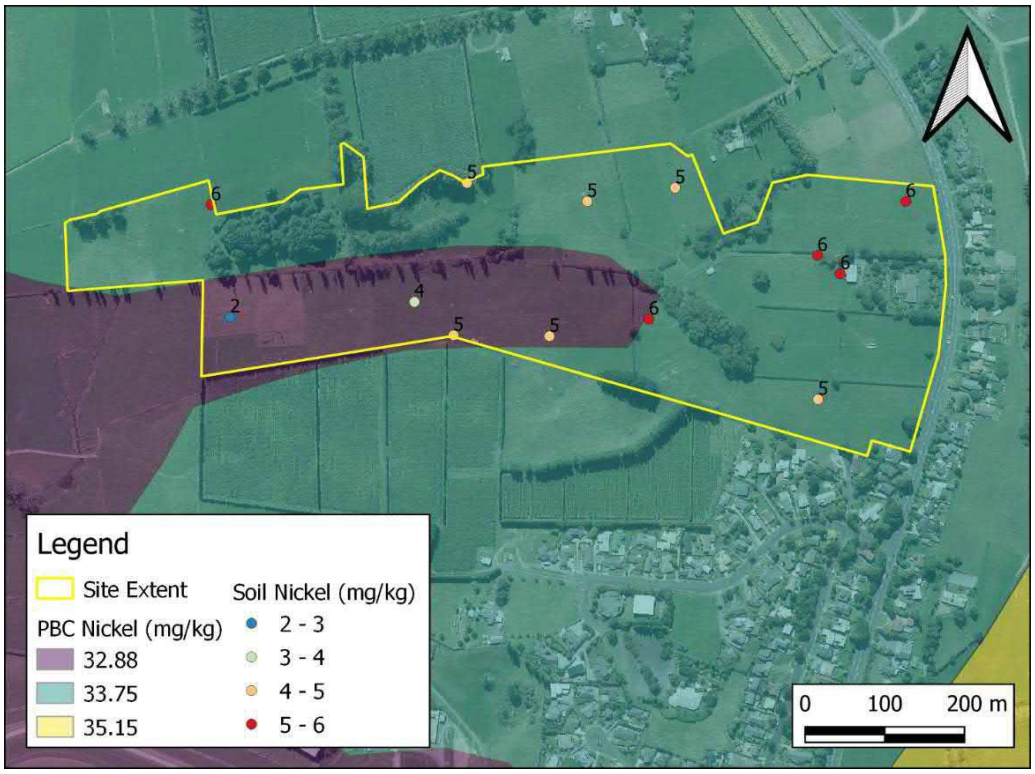


Figure E 6: Upper 95% predicted background concentration (PBC) of nickel, overlaid with discrete soil sample results for nickel (labels indicate concentration in mg/kg).

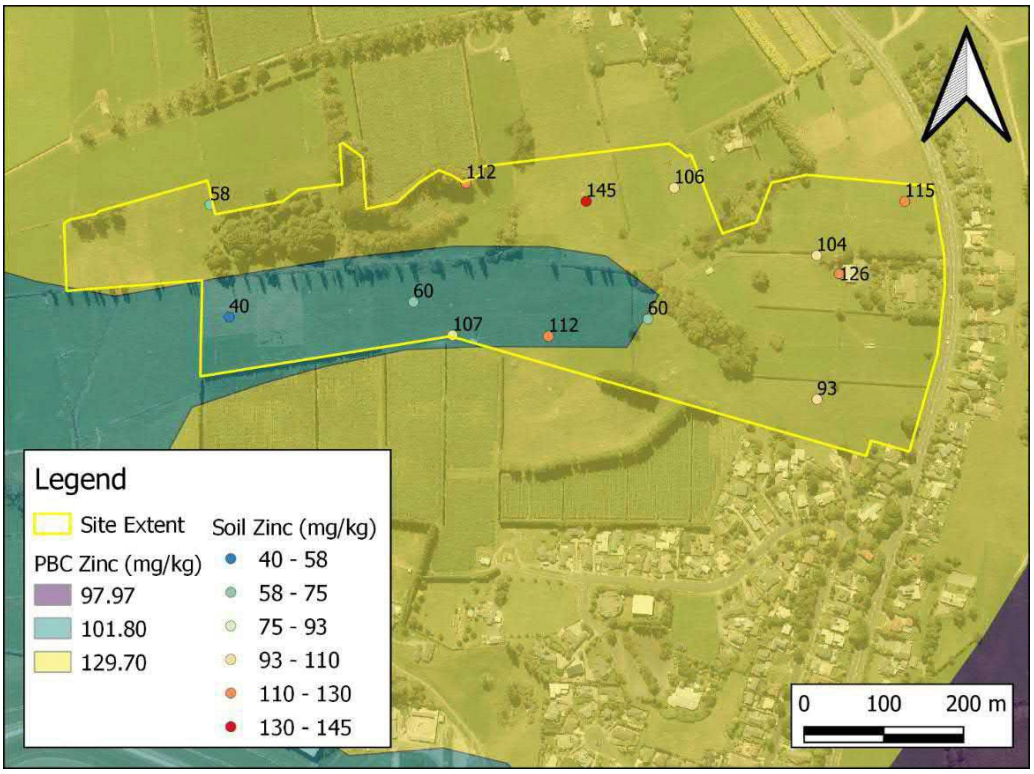


Figure E 7: Upper 95% predicted background concentration (PBC) of zinc, overlaid with discrete soil sample results for zinc (labels indicate concentration in mg/kg).

APPENDIX F COMPARISON OF SOIL SAMPLE RESULTS WITH SOIL ORDER

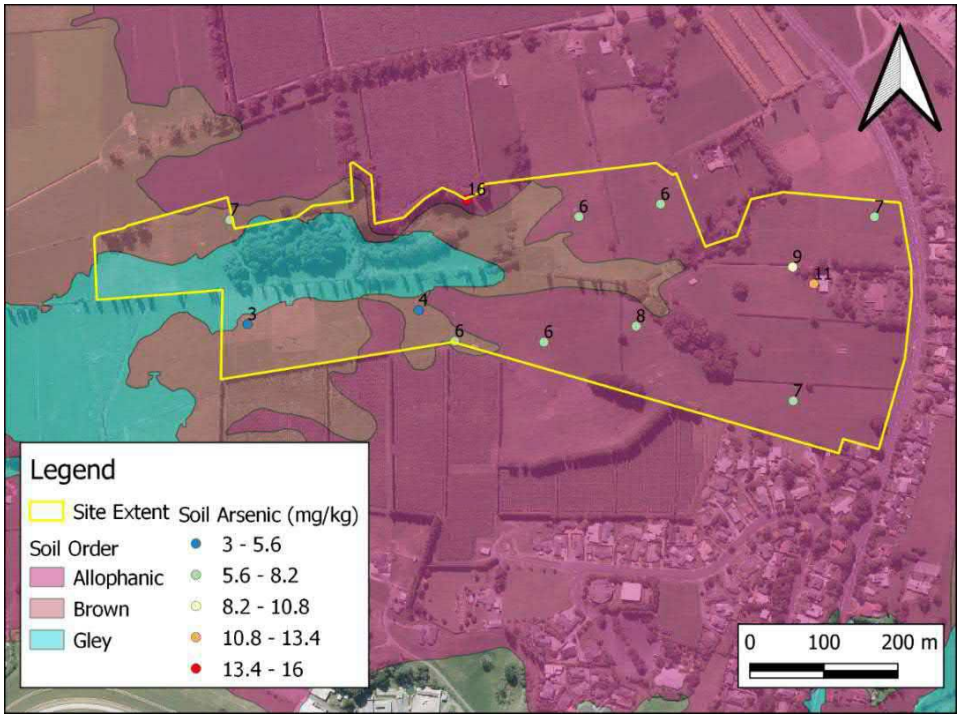


Figure F 8: Soil order overlaid with discrete soil sample results for arsenic (labels indicate concentration in mg/kg).

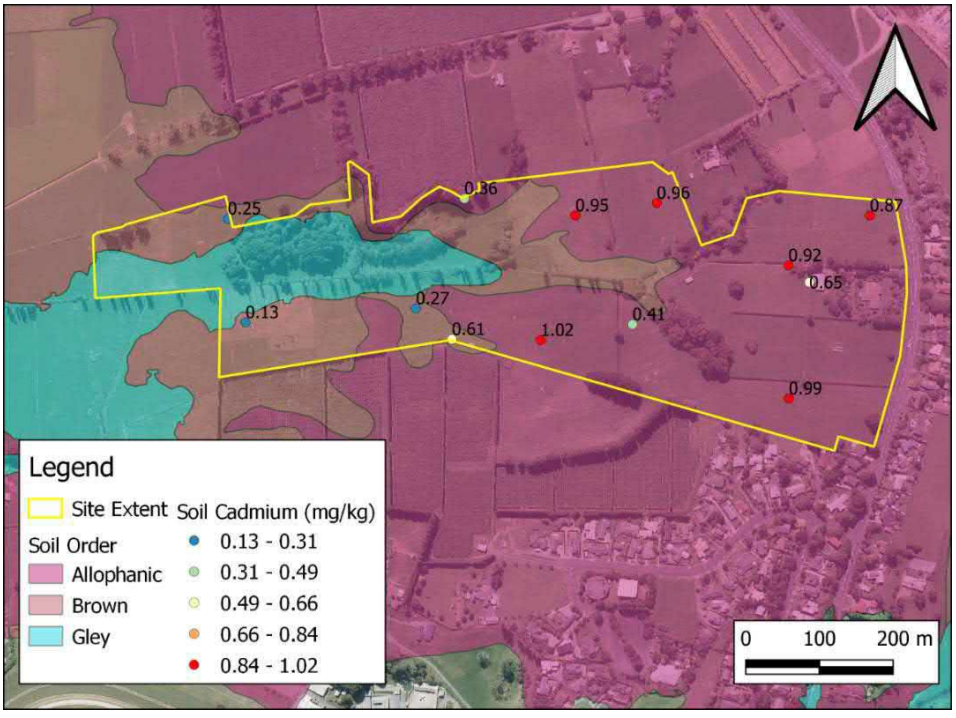


Figure F 9: Soil order overlaid with discrete soil sample results for cadmium (labels indicate concentration in mg/kg).