DETAILED SITE INVESTIGATION (DSI)

8 WHANGAPOURI ROAD, KARAKA, AUCKLAND

Reference Number: REP-1625/DSI/JUL21

PREPARED FOR: ERGO CONSULTING LTD

03 AUGUST 2021

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Statement

This site investigation has been prepared in accordance with the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011. It has been managed by a suitably qualified and experienced practitioner (SQEP); and reported on in accordance with the current edition of the Ministry for the Environment's *Contaminated Land Management guidelines No.1 – Reporting on Contaminated Sites in New Zealand.*

Report prepared on behalf of GSL by:	Report authorised on behalf of GSL by:
	
Maria Serrano Environmental Scientist Geosciences Ltd	Carl O'Brien General Manager Geosciences Ltd

Thank you for the opportunity to carry out this investigation. Should you have any queries regarding this report please do not hesitate to contact us on 09 475 0222.

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EXECUTIVE SUMMARY

It is proposed to subdivide the property located at 8 Whangapouri Road for the purposes of establishing a new substation within the western portion of the site. The proposed development will comprise a switch room with a 2m deep basement for the switch room and transformers constructed on concrete pad foundations. The eastern portion of the property will remain under its existing residential configuration.

GSL were engaged to undertake a detailed site investigation (DSI) of the piece of land to determine the site history and to assess the soil quality at the site with respect to any risk to human health or the environment alongside advising on any off-site disposal requirements for surplus soil generated during site preparation earthworks.

The DSI included a desktop study of the site's history through the review of the current and historic certificates of title, historic aerial photographs, and Auckland Council property file. Desktop investigation identified that the site was developed into a residential configuration prior to 1940 in the eastern portion of the site and this area has only undergone minor changes since, including the construction of a subsidiary residential dwelling with an associated septic tank in 2004 in the western portion of the site and a swimming pool between 2017 and 2021 in the north-eastern portion of the property. As mentioned above, the proposed development includes the construction of a substation only in the western portion of the site and the retaining of the existing residential configuration in the eastern portion. Consequently, the desktop study revealed that there was no distinct evidence of HAIL activities having occurred, currently occurring or more likely than to have occurred on site.

Based on this, GSL undertook a judgemental soil sampling methodology across the western portion of the site which included the collection of soil samples from seven locations in the area of the proposed future earthworks. Surface samples were collected from the seven locations mentioned above alongside a total of four depth samples at three locations. To certify soil quality for disposal, soil samples were submitted for suites of heavy metals, organochlorine pesticides, polycyclic aromatic hydrocarbons and asbestos as appropriate.

Analytical results revealed that one sample (SS1) returned a concentration of arsenic in excess of the NES SCS commercial/industrial outdoor worker (unpaved) and the AUP(OP) permitted activity criteria and, as a result, remediation of an area of an estimated 1380m² will be necessary. Additionally, soil sample SS5, collected at 300mm returned concentrations of heavy metals that exceed the expected naturally occurring background ranges for the underlying geology but that do not exceed the NES SCS or the AUP(OP) permitted activity criteria. All remaining soil samples returned concentrations of heavy metals and organic compounds that are within the expected naturally occurring background ranges for non-volcanic soils in the Auckland Region.

In light of the identified arsenic concentration, a remediation action plan will be required to address the regulations of the NES and AUP(OP) and set out the necessary controls to be in place and effective for the duration of remedial works. Given the current soil quality data, GSL recommend that additional delineation soil sampling be undertaken to determine the full vertical and lateral extents of the arsenic impacted soils. Additionally, given the concentrations of arsenic and lead encountered in sample SS5, further soil sampling is recommended to determine the lateral extents of soil containing concentrations of heavy metals above the background ranges for the underlying geology for purposes of soil disposal cost.

As a result of concentrations of priority contaminants in excess of the NES SCS for the proposed land use and above the expected naturally occurring background ranges for the underlying geology, the piece of land cannot meet regulation 5(9) and the Regulations of the NES are applicable to the proposed development. Based on this, GSL consider that the activity will likely trigger resource consent as a restricted discretionary activity under regulation 10 on account of the localised exceedance of the NES SCS.

Likewise, as concentrations of heavy metals were returned in excess of the AUP(OP) permitted activity criteria, the proposed development will not meet the requirements of a permitted activity under Chapter E.30 of the AUP(OP). Consequently, the proposed subdivision and development will likely require consent as a controlled activity under Rule E.30.7 of the AUP(OP).

1 INTRODUCTION

Geosciences Ltd (GSL) has prepared the following report for Ergo Consulting Ltd in accordance with the GSL proposal, Ref: *Pro-2294/Feb21, dated 05 February 2021*.

This report has been prepared in accordance with the Ministry for the Environment (MfE) Contaminated Land Management Guidelines (CLMG): No. 1 - "*Guidelines for Reporting on Contaminated Sites in New Zealand*", and No. 5 – "*Site Investigation and Analysis of Soils*" (References 1 and 2).

2 PROPERTY DETAILS

Location:	8 Whangapouri Road, Karaka, Auckland
Legal Description:	Lot 2 DP 473807
Size:	1.0724 Ha
Zoning:	Rural-Mixed Rural Zone

The property at the above address and shown in Figure 1 in this report, is located in the rural area of Karaka approximately 40 km to the south of the Auckland CBD. To the southern boundary of the property is the Karaka Road and approximately 550 m to the east is the Oira Creek. The site under investigation in this report encompasses the western portion of the property and is currently the location of a residential dwelling and open pasture. In the surrounding area are the Karaka School and the Pukekohe Golf Club.

3 ENVIRONMENTAL CONTEXT

3.1 GEOLOGY & GEOHYDROLOGY

The local geology is described by Edbrooke (Reference 7) as pumiceous mud, sand and gravel with muddy peat and lignite: rhyolite pumice, including non-welded ignimbrite, tephra and alluvia from the Puketoka Formation.

3.2 TOPOGRAPHY AND DRAINAGE

The area of the proposed development is moderately flat with a modest crest of 35 m elevation above sea level (asl) in the middle eastern of the site which slopes down undulatingly to 33m, 34m, 34m and 32 m asl towards the southeast, northeast, southwest and northwest of the property, respectively. Drainage is via soakage through permeable surfaces and via over land flow to the municipal stormwater network which discharges into a tributary of the Oira Creek, approximately 300 m to the northeast of the property. The Auckland Council GEOMaps show an overland flow path that starts in the north-western portion of the property and flows northwards along Whangapouri Road.

The site is not located within a floodplain, flood prone nor flood sensitive area and falls within the footprint of the Paerata Waitemata Aquifer.

4 PROPOSED CHANGE IN LANDUSE, SUBDIVISION AND DEVELOPMENT

Counties Power propose to subdivide the property, creating an eastern residential lot retaining its' existing residential configuration and a new western lot (the site) where a substation, comprising of a switch room with a 2m deep basement, outdoor transfer on a pad foundation, outdoor electrical equipment on steel stands and concrete pad foundations, power pole structures, and associated accessways will be constructed. A proposed scheme plan is attached in Appendix A.

5 STANDARDS AND REGULATIONS

Because of the subdivision and proposed development outlined above it will be necessary to address the requirements of the following standards, rules, and regulations applicable for the site.

5.1 NATIONAL ENVIRONMENTAL STANDARD (NES)

The *National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health* (NES) (MfE, 2012) ensures that land affected by contaminants in soil is appropriately identified and assessed. When soil disturbance and/or land development activities take place it should be, if necessary, remediated or the contaminants contained to make the land safe for human use.

Under the NES, land is considered to be actually or potentially contaminated if an activity or industry on the MfE Hazardous Activities and Industries List (HAIL) has been, is, or is more likely than not to have been, undertaken on the land. Consequently, a subdivision, or development requires a preliminary or detailed site investigation (PSI/DSI) of the land to determine if there is a risk to human health as a result of any current or former HAIL activities that are occurring, or may have occurred, on the land under investigation.

5.2 AUCKLAND UNITARY PLAN (OPERATIVE IN PART) (AUP(OP))

Section 30(1)(f) of the RMA provides the Auckland Council with a statutory duty to investigate land for the purposes of identifying and monitoring contaminated land and for the control of discharges of contaminants into or onto land or water and discharges of water into water.

The Auckland Unitary Plan (Operative in Part) (AUP(OP)), which was formally notified on 30 September 2013, is a combined regional policy statement, regional coastal plan, regional plan, and district plan. Auckland Council notified an operative in part version of the plan on 15 November 2016 (Reference 4).

Chapter E.30 of the AUP(OP) deals specifically with contaminated land and maintains that Council is required to manage both the use of land containing elevated levels of contaminants and the discharge of contaminants from land containing elevated levels of contaminants. As no appeals have been lodged on Chapter E.30, the provisions of that section can be considered operative under Section 87 of the Resource Management Act 1991. For all purposes of this investigation, the relevant provisions of the AUP(OP) relating to soil contamination have legal jurisdiction and those provision have been considered where they may have an impact on the proposed development.

6 DSI OBJECTIVES

The objectives of this investigation were to assess:

- if the land is covered by the NES as a result of current or former HAIL activities;
- the extent of current or former HAIL activities on site;
- what, if any, contaminated land rules of the AUP(OP) apply to the proposed development;
- the soil quality and associated risk to human health and the environment as a result of former activities on the site; and
- the need, if any, for further detailed investigations.

7 SCOPE OF WORKS

To achieve the objectives of the DSI, GSL has undertaken the following:

- an historical appraisal of the property by a study of historical aerial photographs;
- a review of the certificates of titles of the property;
- a review of the property file held by council;
- a site visit and walkover of the property;
- the collection of 11 soil samples from 7 locations from the proposed earthworks footprints (transformer, switch room, etc.). Samples were collected from surface and depths of 300mm and 500mm at two locations;
- laboratory analysis of all surface and 300mm deep soil samples and one 500mm deep soil sample for a suite of heavy metals, alongside the analysis of 2 surface and two 300mm deep soil samples for polycyclic aromatic hydrocarbons (PAHs); four surface and one 500mm deep soil samples for organochlorine pesticides (OCPs); and 2 samples for asbestos fibres in soil.
- the preparation of a Preliminary Site Investigation report or a Detailed Site Investigation Report (pending on the results of the soil samples collected) in accordance with Contaminated Land Management Guideline No. 1 – "*Reporting on Contaminated Sites in New Zealand*" (Ministry for the Environment, 2011) detailing the findings of this investigation;

8 SITE HISTORY

A desktop study of publicly available files and photographs was undertaken to determine the history of the site with respect to any current or historic potentially contaminating land uses.

8.1 CERTIFICATE OF TITLE

GSL has reviewed the copies of the Certificates of Title for the aforementioned property, including any instruments on the title which detail relevant property information such as: current ownership,

registered interests, easements, covenants, lease restrictions and transmissions, to determine if pre-existing consent notices or other restrictions / notifications which may be relevant to historic uses or potential soil contamination are held against the property. No distinct notes relating to actual or potential contamination were recorded on file. Copies of all titles are included in Appendix B.

8.2 HISTORIC AERIAL PHOTOGRAPHS

Historic aerial photographs from 1942, 1961, 1971 and 1981 are available for the site on the Retrolens website while images from 2001, 2010, and 2017 are available on the Auckland Council GEOMaps website. The findings of the historic aerial photograph review are summarised below, while copies of these aerial photographs have been attached in Appendix C.

1942-1961 This is the earliest photograph available for the site and despite the poor quality of the image, it is clear that a residential dwelling has already been established in the north-eastern portion of the site with what appears to be a garage and a garden shed in proximity. A circular driveway can be seen connecting the dwelling with Karaka Road while the western area of the site is vacant pasture with no distinctive structures noted.

The plate also shows that Karaka Road and Whangapouri Road had been established at the time the 1942 photograph was taken and the wide area shows minor residential activity, being mainly vacant pastureland.

The site shows no significant changes through the images up to 1961 apart from the increased vegetation in the back and front yard of the dwelling.

1971-1981 The 1971 image is of better quality allowing the features of the site to be observed in more detail. The same general configuration is maintained from previous plates and except for three water tanks are now observable next to garage towards the rear of the dwelling (north) as well as a new double carport/garage to the southwest of the dwelling and a fence dividing the site in two areas.

The imagery from 1981 shows no significant changes in the site except from the tanks and storage garages mentioned above which have then been removed and what appears to be two new storage garages and a small garden shed have been erected.

2001 The 2001 plate is the first coloured image available for the site and shows the site in the same residential configuration with some changes in the layout. These changes include the relocation of the driveway which now provides access to the dwelling from Whangapouri Road; the removal of some structures in the rear of the dwelling; and the addition of what appears to be a garden shed to the west of the dwelling.

2010 This plate shows few new features have been developed in the site. A new residential dwelling with a garage and a garden shed has been erected in the middle-north portion of the site by the northern boundary. The appearance of the surface in the northeast and southwest portions of the site suggests that minor earthworks are taking place in the site. Additionally, a vegetable garden area with a small glasshouse can be seen in the south-eastern corner of the site as well as four shipping containers in the south-western corner of the site with a stockpile of unknown materials.

2017-2021 The 2017 plate shows the site in the same general configuration. The garden shed by the northern boundary of the site has been removed and additional features include what appears to be a detached addition to the pre-existing residential dwelling in the north-eastern portion of the site alongside new ornamental landscaping features in the same area.

There are no significant changes in the 2021 plate apart from the development of a swimming pool in the north-eastern corner of the site and the extension of the garage in the eastern portion of the site to the front of the residential dwelling.

8.2.1 Summary of Aerial Imagery

Historic aerial images show that the site has been a residential property since prior to 1942 and has remained in the same general configuration until the time of the most recent aerial imagery. During this time only minor changes such as the relocation of a driveway, the construction and removal of storage sheds, a subsidiary dwelling, a vegetable garden, and the construction of a swimming pool can be observed. No distinct evidence of HAIL activities having been, currently being or more likely than not to have been undertaken on the property were identified in the historic aerial images.

8.3 Property File

GSL requested the property file from Auckland Council for review of historic activities. While applications for resource consents for the construction of a garage in 2005 and the construction of a subsidiary dwelling in 2004 (noting the presence of a septic tank and Biocycle water treatment system in the property) were provided in the property file, no items of note relating to actual or potential contamination on the site were noted on Council Records

9 Site Inspection & Infrastructure

GSL personnel undertook a site inspection of the site on 13 July 2021, at which time the site looked similar to how it appears in the 2021 aerial photograph. That is, a residential dwelling with an associated garage were present while the remainder was generally vacant pasture. A modern septic tank located to the east side of the residential dwelling was noted alongside an isolated number of medium sized panel fragments underneath the house, consistent in appearance with modern fibre cement board.

Excavations for intrusive soil sampling revealed a layer of topsoil overlying subgrade clays consistent with the natural geology except for soil sample location SS5 where a thin layer of buried topsoil was encountered at 300mm below relative ground level.

No other features of note were observed on site and site photographs are attached in Appendix D.

10 Potential for Contamination

Historic aerial images show that the property was developed into a residential configuration prior to 1940 in the eastern portion with slight changes having occurred since then, including the construction of a subsidiary residential dwelling on the site with an associated septic tank in 2004.

As, the proposed development is for the construction of a substation only in the western portion of the property, the conceptual model has not identified any evidence of actual or potential HAIL activities having occurred, currently occurring, or more likely than not to have occurred within the piece of land under assessment (the site).

With respect to the proposed eastern lot following subdivision, GSL notes that no change in landuse or proposed development activities are proposed for this area and consequently no further consideration is required to the existing buildings.

11 SOIL SAMPLING AND ANALYSIS

While no distinct evidence of actual or potential soil contamination was encountered within the desktop assessment, it is understood that the proposed development will require the removal of the bulk of topsoil across the development footprint with excavations extending beyond 2m below relative ground level for the proposed basement. As there will be limited room for retention of soil on site, certification of disposal is required for waste receiving facilities to determine acceptance.

Consequently, GSL employed a judgemental soil sampling methodology across the western portion of the site through the collection of soil samples from seven locations within the locations of proposed future earthworks. Soil sample locations are shown in Figure 2.

Seven soil samples were collected from the surface 0-75mm alongside three samples collected at 300mm and one sample collected at 500mm using a hand auger and were transferred directly from the auger head to laboratory provided glass jars and plastic sampling containers with the date, location, sample identification number, sample depth, and initials of the sampler noted on the bag.

Soil sampling equipment was decontaminated in between samples using a soft soap solution in accordance with GSL internal quality control procedures.

11.1 LABORATORY ANALYSIS AND QUALITY CONTROL

Sample glass jars were placed in a chilly bin packed with ice with a chain of custody (COC) document indicating the analysis to be performed and were dispatched to Analytica Laboratories Ltd in Hamilton for analysis of heavy metals, PAHs and OCPs.

Soil samples for the semi-quantitative analysis of asbestos were packed in a box with a COC indicating the analysis to be performed and dispatched to Analytica Laboratories in Auckland.

Analytica Laboratories are accredited by International Accreditation New Zealand (IANZ) for the analysis of heavy metals, PAHS and OCPs.

GSL notes that while IANZ do not accredit semi-quantitative analysis of asbestos at this stage, Analytica are accredited for the identification of asbestos and are suitable experienced in analytical methodologies as required under the BRANZ/ALGA *New Zealand Guidelines for Assessing and Managing Asbestos in Soil* (2017).

11.2 ACCEPTANCE CRITERIA AND RELEVANT GUIDELINES

The NES mandates fourteen soil contaminants standards (SCS) for the protection of human health for inorganic elements and organic compounds for various land use scenarios. The NES human

health SCS for commercial / industrial workers on an unpaved site has been applied as a suitably conservative risk assessment in the context of the proposed development.

The AUP(OP) also sets permitted activity environmental discharge and soil acceptance criteria for potentially contaminated sites against which the analytical results have been compared.

Results are also compared against the expected naturally occurring background concentration ranges for volcanic soil in the Auckland Region.

12 ANALYTICAL RESULTS

A comparison of the analytical results with the relevant guideline criteria is provided in Table 1 below. Copies of the laboratory COC and analytical transcripts are included in Appendix E while a discussion of the results is provided below. No asbestos fibres were detected in any of the soil samples submitted for analysis, nor were any detectable concentrations of PAH or OCP compounds identified at the laboratory limit of reporting. These results have therefore been omitted from the table of results.

12.1 HEAVY METALS

Except for soil sample SS1 (0-75mm), all soil samples returned concentrations of heavy metals below the applicable NES SCS and the AUP(OP) permitted activity criteria. Surface soil sample SS1 returned a concentration of arsenic that exceeds the NES SCS and the AUP(OP) thresholds alongside concentrations of chromium, copper, and lead that are above the expected naturally occurring background for the underlying geology. Soil Sample SS5 also returned concentrations of arsenic and lead that exceed the expected naturally occurring background concentrations for non-volcanic soils in the Auckland Region.

All remaining soil samples were within the expected naturally occurring background ranges for the underlying geology.

12.2 ORGANOCHLORINE PESTICIDES

No soil sample returned detectable concentrations of any OCPs. Consequently, no soil sample returned a concentration of any OCPs which exceeded exceed the Commercial / Industrial worker standard of the NES or the AUP(OP) permitted activity soil acceptance criteria.

12.3 POLYCYCLIC AROMATIC HYDROCARBONS (PAHS)

No soil sample returned detectable concentrations of any PAHs. Consequently, no soil sample returned a concentration of any PAHs which exceeded exceed the commercial / industrial worker land use SCS of the NES or the AUP(OP) permitted activity soil acceptance criteria.

Table 1: Analytical Results-Heavy Metals[1]

	Arsenic	Cadmium	Chromium	Copper	Lead	Nickel	Zinc
SS1 (0-75mm)	141	0.31	**90.5**	**109**	**122**	12.9	124
SS2 (0-75mm)	11	0.21	26.7	26.3	38.3	13.8	55.9
SS3 (0-75mm)	10	0.30	24.8	28.4	44.8	9.95	84.8
SS4 (0-75mm)	9.3	0.40	26.0	22.0	45.5	10.5	62.4
SS4 (300mm)	8.5	0.11	26.0	23.3	29.9	10.6	40.7
SS5 (0-75mm)	9.2	0.31	20.5	29.2	36.1	9.17	66.9
SS5 (300mm)	**15.5**	0.090	22.1	32.3	**71.5**	9.46	53.1
SS5 (500mm)	9.1	0.10	35.0	34.5	33.2	15.2	46.9
SS6 (0-75mm)	6.7	0.31	25.5	18.5	39.2	8.84	62.2
SS7 (0-75mm)	7.9	0.33	28.2	26.0	30.4	10.3	73.6
SS7 (300mm)	8.2	0.057	29.1	24.1	26.5	8.10	52.6
NES[2]	70	1300	6300	>10,000	3300	-	-
AUP(OP)[3]	100	7.5	400	325	250	105	400
Background[4]	0.4-12	<0.1-0.65	2-55	1-45	<5-65	0.9-35	9-180

Notes:

1. All concentrations measured in mg/kg
2. National Environmental Standards for Assessing and Managing Contaminants in Soil to Protect Human Health – Commercial/Industrial outdoor worker (unpaved) land use.
3. Auckland Unitary Plan (Operative in Part) - Table E.30.6.1.4.1 permitted activity soil acceptance criteria
4. Auckland Regional Council Technical Publication No 153 - Expected naturally occurring background concentrations ranges of inorganic elements in volcanic soils in the Auckland Region
5. Values in **BOLD** exceed the NES criteria, values in **BOLD** exceed the AUP(OP) criteria, values in **BOLD** exceed the background ranges
6. ND = not detected

13 CONCLUSIONS

GSL has conducted a desktop study, in accordance with the MfE Contaminated Land Management Guidelines to determine the location and extent of current and / or former HAIL Activities on site and the potential for soil contamination, and any associated risk to human health and the environment that may arise as a result. GSL has consequently concluded:

- The piece of land under investigation has been part of a wider residential lot since prior to 1942 and no evidence of any actually or potentially contaminating activities were encountered within the available site history;

- Intrusive soil sampling identified one soil sample, SS1 (0-75mm), that returned a concentration of arsenic in excess of the NES commercial / industrial landuse SCS and AUP(OP) permitted activity criteria. Concentrations of chromium, copper and lead were also elevated in this sample above the expected naturally occurring background ranges;
- One further soil sample, SS5 (300mm) from within a thin layer of buried topsoil returned concentrations of arsenic and lead in excess of the naturally occurring background ranges for the parent geology, but not at a level that presents any risk to human health or the environment;
- As a result of the above identified NES SCS and AUP(OP) exceedance remediation of an area of approximately 1,380m^2 will be necessary (Figure 3). Further delineation soil sampling is recommended to accurately determine the lateral and vertical extents of impacted soil;
- No other soil sample returned concentrations of heavy metals in excess of neither the NES commercial/industrial outdoor worker (unpaved) or the AUP(OP) permitted activity criteria.
- the concentrations of the heavy metals encountered in the remaining site area are highly unlikely to present a risk to human health, and, as such, the proposed subdivision is assessed as highly unlikely to present a risk to human health and / or the environment. Development conditions can ensure the identified arsenic contamination will be remediated as part of any proposed development process;
- as no detectable concentrations of organochlorine pesticides, polycyclic aromatic hydrocarbons and asbestos were encountered, these contaminants do not represent a risk to either human health or the environment;

13.1 National Environmental Standard (NES)

As a result of concentrations of priority contaminants in excess of the NES SCS for the proposed land use and above the expected naturally occurring background ranges for the underlying geology, the piece of land cannot meet regulation 5(9) and the remaining Regulations of the NES are applicable to the proposed development. Based on this, GSL consider that the activity will likely trigger resource consent as a restricted discretionary activity under regulation 10 on account of the localised exceedance of the NES SCS.

13.2 The Auckland Unitary Plan (Operative in Part) (AUP(OP))

As concentrations of lead and zinc were returned in excess of the AUP(OP) permitted activity criteria, the proposed development will not meet the requirements of a permitted activity under Chapter E.30 of the AUP(OP). Consequently, the proposed subdivision and development will likely require consent as a controlled activity under Rule E.30.7 of the AUP(OP).

14 Recommendations

As a result of the findings of this investigation, GSL recommend:

- a remediation action plan be developed that sets out the appropriate controls to be implemented to ensure any risks to human health and the environment are mitigated for the duration of soil disturbance works on site;
- Delineation soil sampling should be undertaken to refine the characterisations of soil on site by:
    - Assessing the lateral and vertical extents of the identified elevated concentrations of arsenic that exceeds the NES SCS and AUP(OP) thresholds; and
    - Assess the extent of managed fill within the identified buried topsoil at SS5(300mm) to rationalise the disposal costs of soil from this area during development earthworks; and
- Following completion of remediation of the currently estimated impacted area of 1380m^2 , a site validation report will be required to certify that impacted soil has been appropriately addressed and residual soil is highly unlikely to present any risk to human health or the environment.

15 REFERENCES

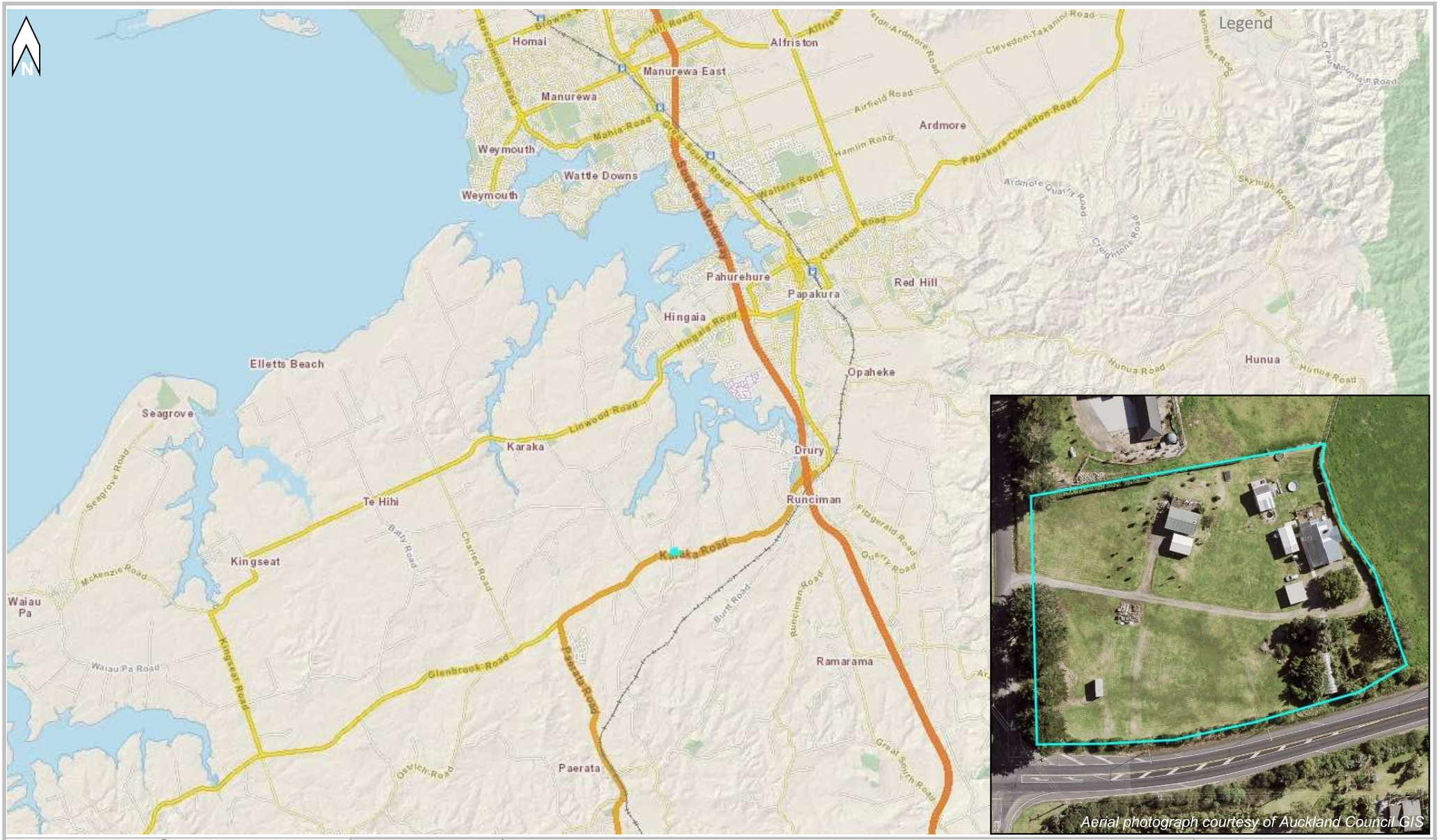
1. Ministry for the Environment (2003) — *Contaminated Land Management Guidelines No.1: Reporting on contaminated Sites in New Zealand*. Ministry for the Environment, Wellington, New Zealand.
2. Ministry for the Environment (2003) — *Contaminated Land Management Guidelines No.5: Site Investigation and Analysis of Soils*. Ministry for the Environment, Wellington, New Zealand.
3. Ministry for the Environment (2012) - Users Guide National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health. Ministry for the Environment, Wellington, New Zealand.
4. Auckland Council (2013) –*Auckland Unitary Plan (Operative in Part)*, Auckland, New Zealand.
5. Auckland Council (2011) - *Auckland Council GEOMAPS*. http://geomapspublic.aucklandcouncil.govt.nz/viewer/index.html
6. Retrolens Historical Image Resource - www.retolens.co.nz
7. Edbrooke, S.W (2001) — *Geology of the Auckland Urban Area* Institute of Geological and Nuclear Sciences Geological Map 3, Lower Hutt, New Zealand.
8. Ministry for the Environment (2011) – *Methodology for Deriving Standards for contaminants in Soil to Protect Human Health.* Ministry for the Environment, Wellington, New Zealand.
9. Auckland Regional Council (2001) – Background Concentrations of Inorganic Elements in Soils from the Auckland region (TP153) – Auckland.

16 LIMITATIONS

The conclusions and all information in this Report are given strictly in accordance with and subject to the following limitations and recommendations:

1. The assessment undertaken to form this conclusion is limited to the scope of work agreed between GSL and the client, or the client's agent as outlined in this Report. This report has been prepared for the sole benefit of the client and neither the whole nor any part of this report may be used or relied upon by any other party.
2. The investigations carried out for the purposes of the report have been undertaken, and the report has been prepared, in accordance with normal prudent practice and by reference to applicable environmental regulatory authority and industry standards, guidelines and assessment criteria in existence at the date of this report.
3. This report should be read in full and no excerpts are to be taken as representative of the findings. No responsibility is accepted by GSL for use of any part of this report in any other context.
4. This Report was prepared on the dates and times as referenced in the report and is based on the conditions encountered on the site and information reviewed during the time of preparation. GSL accepts no responsibility for any changes in site conditions or in the information reviewed that have occurred after this period of time.
5. Where this report indicates that information has been provided to GSL by third parties, GSL has made no independent verification of this information except as expressly stated in the report. GSL assumes no liability for any inaccuracies in or omissions to that information.
6. Given the limited Scope of Works, GSL has only assessed the potential for contamination resulting from past and current known uses of the site.
7. Environmental studies identify actual sub-surface conditions only at those points where samples are taken and when they are taken. Actual conditions between sampling locations may differ from those inferred. The actual interface between materials may be far more gradual or abrupt than an assessment indicates. Actual conditions in areas not sampled may differ from that predicted. Nothing can be done to prevent the unanticipated and GSL does not guarantee that contamination does not exist at the site.
8. Except as otherwise specifically stated in this report, GSL makes no warranty or representation as to the presence or otherwise of asbestos and/or asbestos containing materials ("ACM") on the site. If fill has been imported on to the site at any time, or if any buildings constructed prior to 1970 have been demolished on the site or materials from such buildings disposed of on the site, the site may contain asbestos or ACM .
9. Except as specifically stated in this report, no investigations have been undertaken into any off-site conditions, or whether any adjoining sites may have been impacted by contamination or other conditions originating from this site. The conclusion set out above is based solely on the information and findings contained in this report.
10. Except as specifically stated above, GSL makes no warranty, statement or representation of any kind concerning the suitability of the site for any purpose or the permissibility of any use, development or re-development of the site.
11. The investigation and remediation of contaminated sites is a field in which legislation and interpretation of legislation is changing rapidly. Our interpretation of the investigation findings should not be taken to be that of any other party. When approval from a statutory authority is required for a project, that approval should be directly sought by the client.
12. Use, development or re-development of the site for any purpose may require planning and other approvals and, in some cases, environmental regulatory authority and accredited site auditor approvals. GSL offers no opinion as to whether the current or proposed use has any or all approvals required, is operating in accordance with any approvals, the likelihood of obtaining any approvals, or the conditions and obligations which such approvals may impose, which may include the requirement for additional environmental works.
13. GSL makes no determination or recommendation regarding a decision to provide or not to provide financing with respect to the site. The on-going use of the site and/or planned use of the site for any different purpose may require the owner/user to manage and/or remediate site conditions, such as contamination and other conditions, including but not limited to conditions referred to in this report.
14. Except as required by law, no third party may use or rely on, this report unless otherwise agreed by GSL in writing. Where such agreement is provided, GSL will provide a letter of reliance to the agreed third party in the form required by GSL.
15. To the extent permitted by law, GSL expressly disclaims and excludes liability for any loss, damage, cost or expenses suffered by any third party relating to or resulting from the use of, or reliance on, any information contained in this Report. GSL does not admit that any action, liability, or claim may exist or be available to any third party.
16. Except as specifically stated in this section, GSL does not authorise the use of this report by any third party.

FIGURES



geosciences ltd ENVIRONMENTAL	Title:	Figure 1 - Site Location	Reference: J1625
			Date: 25/06/2021
Level 1, 47 Clyde Road, Browns Bay, 0630 Tel: (09) 475 0222	Project name:	8 Whangapouri Road, Karaka	Drawn: MS
			Approved: COB

geosciences ltd
ENVIRONMENTAL
Level 1, 47 Clyde Road,
Browns Bay, 0630
Tel: (09) 475 0222

Figure 2 - Soil Sample Locations

8 Whangapouri Road, Karaka

Reference:	J1625
Date:	12/07/2021
Drawn:	CD
Approved:	COB

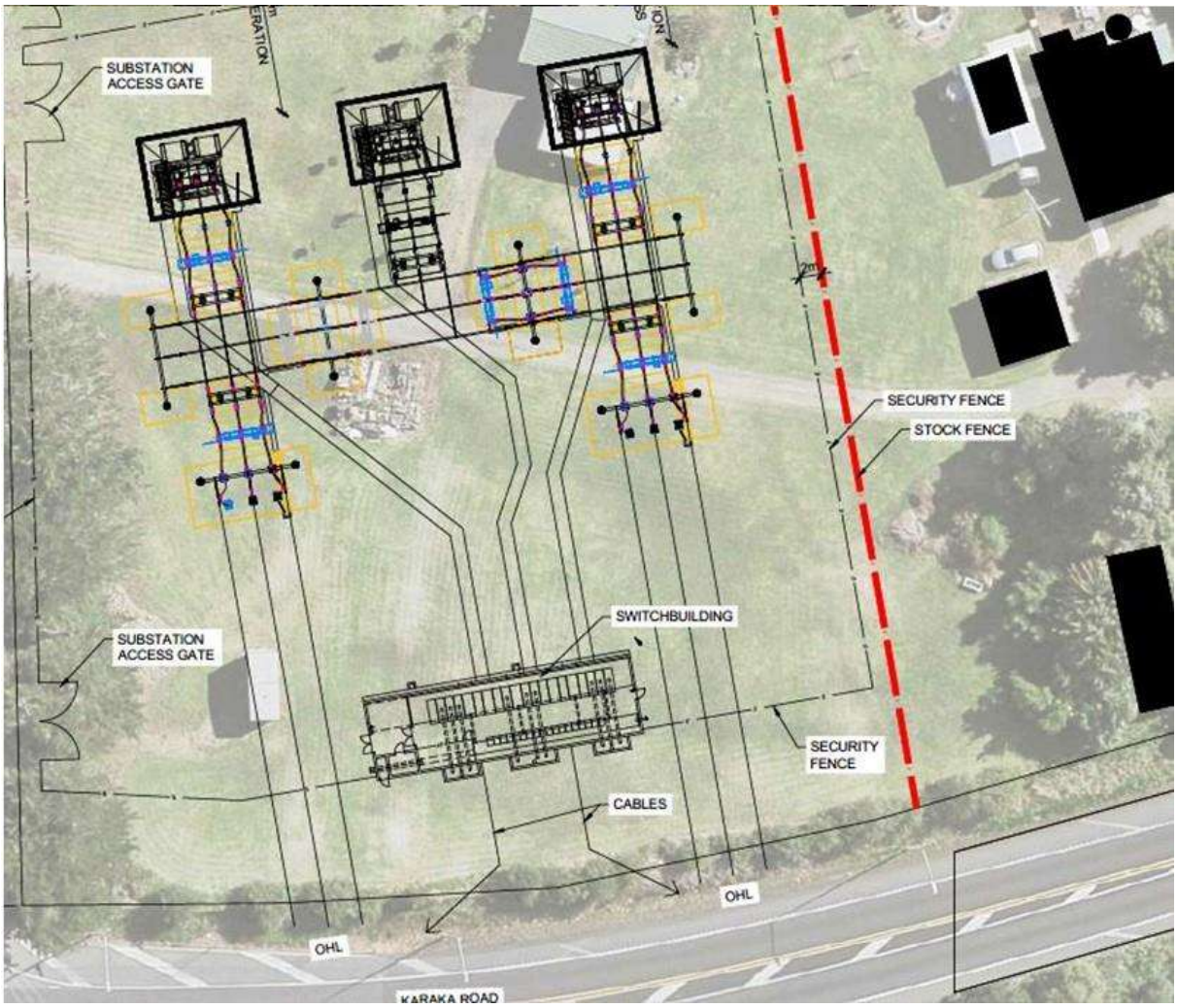
geosciences ltd
ENVIRONMENTAL
Level 1, 47 Clyde Road,
Browns Bay, 0630
Tel: (09) 475 0222

Figure 3 - Remediation Extents

8 Whangapouri Road, Karaka

Reference:	J1625
Date:	02/08/2021
Drawn:	CD
Approved:	COB

APPENDIX A PRELIMINARY SCHEME PLAN


SUBSTATION ACCESS GATE
SECURITY FENCE
STOCK FENCE
SWITCHBUILDING
SUBSTATION ACCESS GATE
SECURITY FENCE
CABLES
OHL
OHL
KARAKA ROAD

APPENDIX B CERTIFICATE OF TITLE

RECORD OF TITLE
UNDER LAND TRANSFER ACT 2017
FREEHOLD

Historical Search Copy

R.W. Muir
Registrar-General
of Land

Constituted as a Record of Title pursuant to Sections 7 and 12 of the Land Transfer Act 2017 - 12 November 2018

Identifier **648577**

Land Registration District **North Auckland**

Date Issued 17 September 2014

Prior References
350260

Estate Fee Simple

Area 1.0724 hectares more or less

Legal Description Lot 2 Deposited Plan 473807

Original Registered Owners
Anthony William Wallnutt and Linda Joy Wallnutt

Interests

7529433.9 Mortgage to Kiwibank Limited - 5.9.2007 at 9:00 am

9025500.1 CAVEAT BY FINANCE DIRECT LIMITED - 29.3.2012 at 12:33 pm

9355666.1 CAVEAT BY FINANCE DIRECT LIMITED - 28.3.2013 at 12:03 pm

9682843.1 CAVEAT BY FINANCE DIRECT LIMITED - 26.3.2014 at 2:16 pm

282807.1 Gazette Notice declaring adjoining State Highway to be a limited access road - 12.6.1974 at 2.25 pm

Fencing Covenant in Transfer 6103163.1 - 4.8.2004 at 9:00 am

9706754.1 Withdrawal of Caveat 9025500.1 - 23.10.2014 at 11:29 am

9706754.2 Withdrawal of Caveat 9355666.1 - 23.10.2014 at 11:29 am

9706754.3 Withdrawal of Caveat 9682843.1 - 23.10.2014 at 11:29 am

9706754.4 Discharge of Mortgage 7529433.9 - 23.10.2014 at 11:29 am

9706754.7 Mortgage to ANZ Bank New Zealand Limited - 23.10.2014 at 11:29 am

9706754.8 CAVEAT BY FINANCE DIRECT LIMITED - 23.10.2014 at 11:29 am

10012981.1 Withdrawal of Caveat 9706754.8 - 31.3.2015 at 12:10 pm

10012981.2 CAVEAT BY FINANCE DIRECT LIMITED - 31.3.2015 at 12:10 pm

11877558.1 Withdrawal of Caveat 10012981.2 - 29.9.2020 at 10:31 am

12143634.1 CAVEAT BY COUNTIES POWER LIMITED - 2.6.2021 at 5:43 pm

RECORD OF TITLE
UNDER LAND TRANSFER ACT 2017
FREEHOLD

Search Copy

R.W. Muir
Registrar-General
of Land

Identifier **648577**

Land Registration District **North Auckland**

Date Issued 17 September 2014

Prior References
350260

Estate Fee Simple

Area 1.0724 hectares more or less

Legal Description Lot 2 Deposited Plan 473807

Registered Owners
Anthony William Wallnutt and Linda Joy Wallnutt

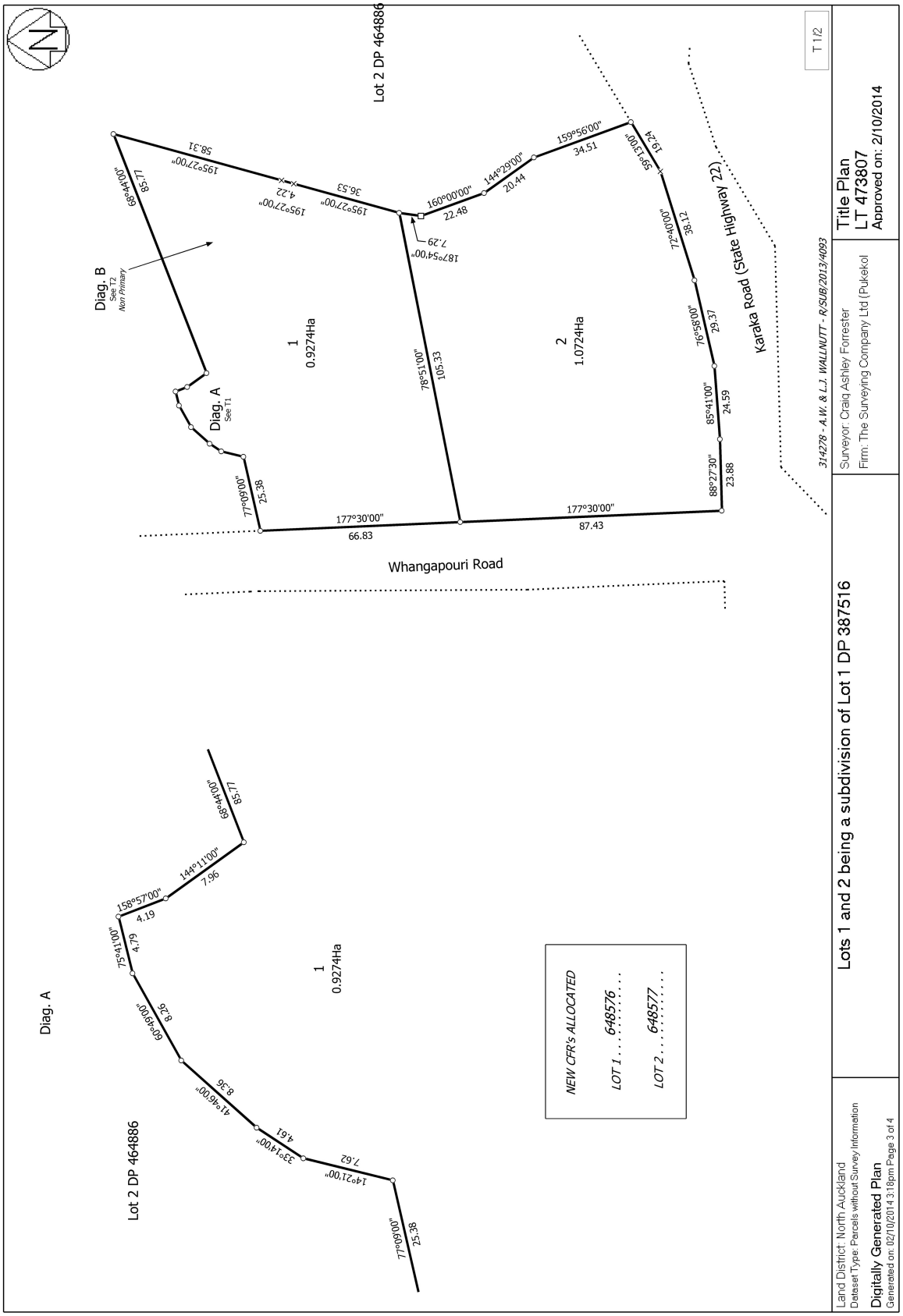
Interests

282807.1 Gazette Notice declaring adjoining State Highway to be a limited access road - 12.6.1974 at 2.25 pm

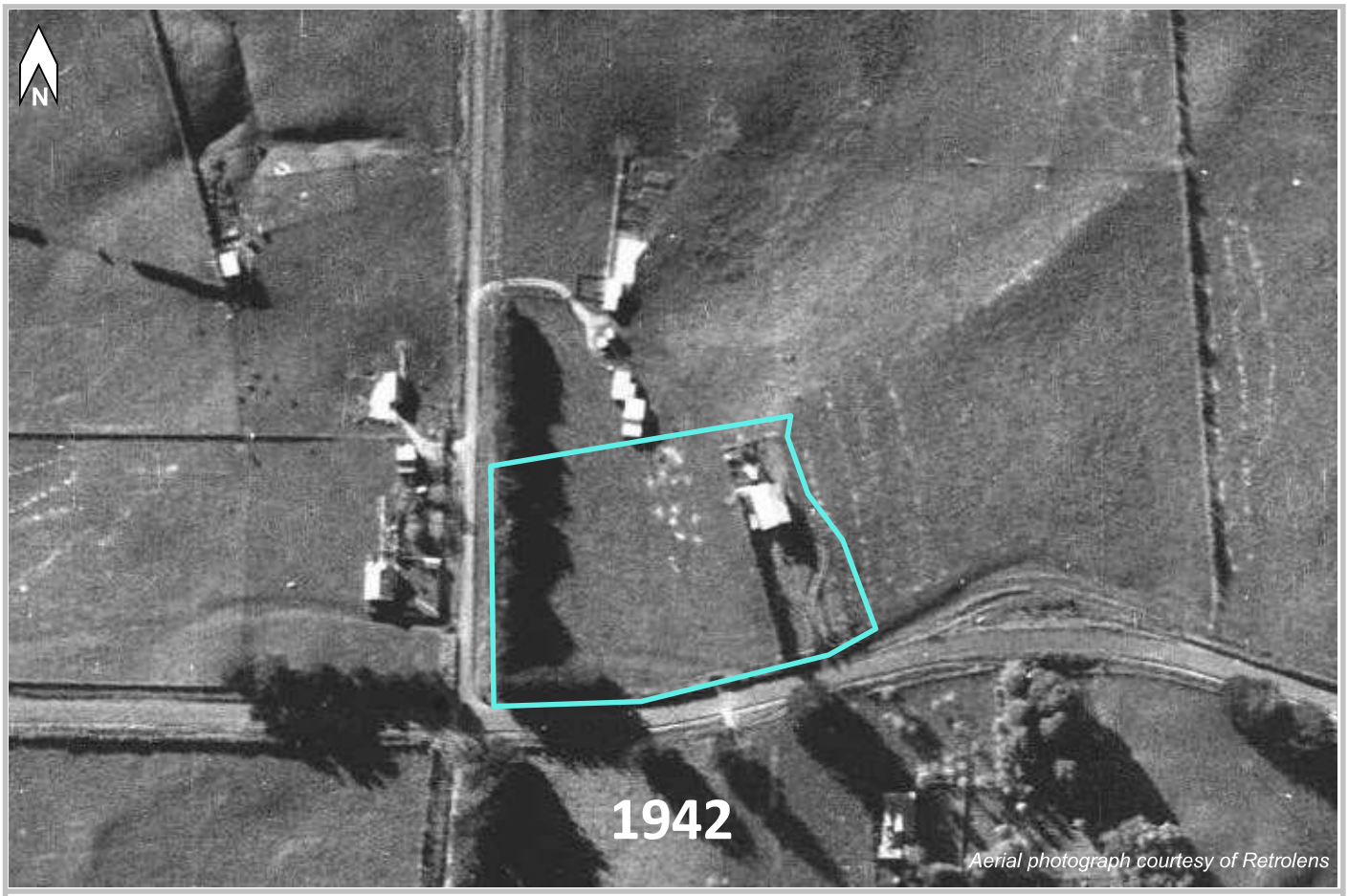
Fencing Covenant in Transfer 6103163.1 - 4.8.2004 at 9:00 am

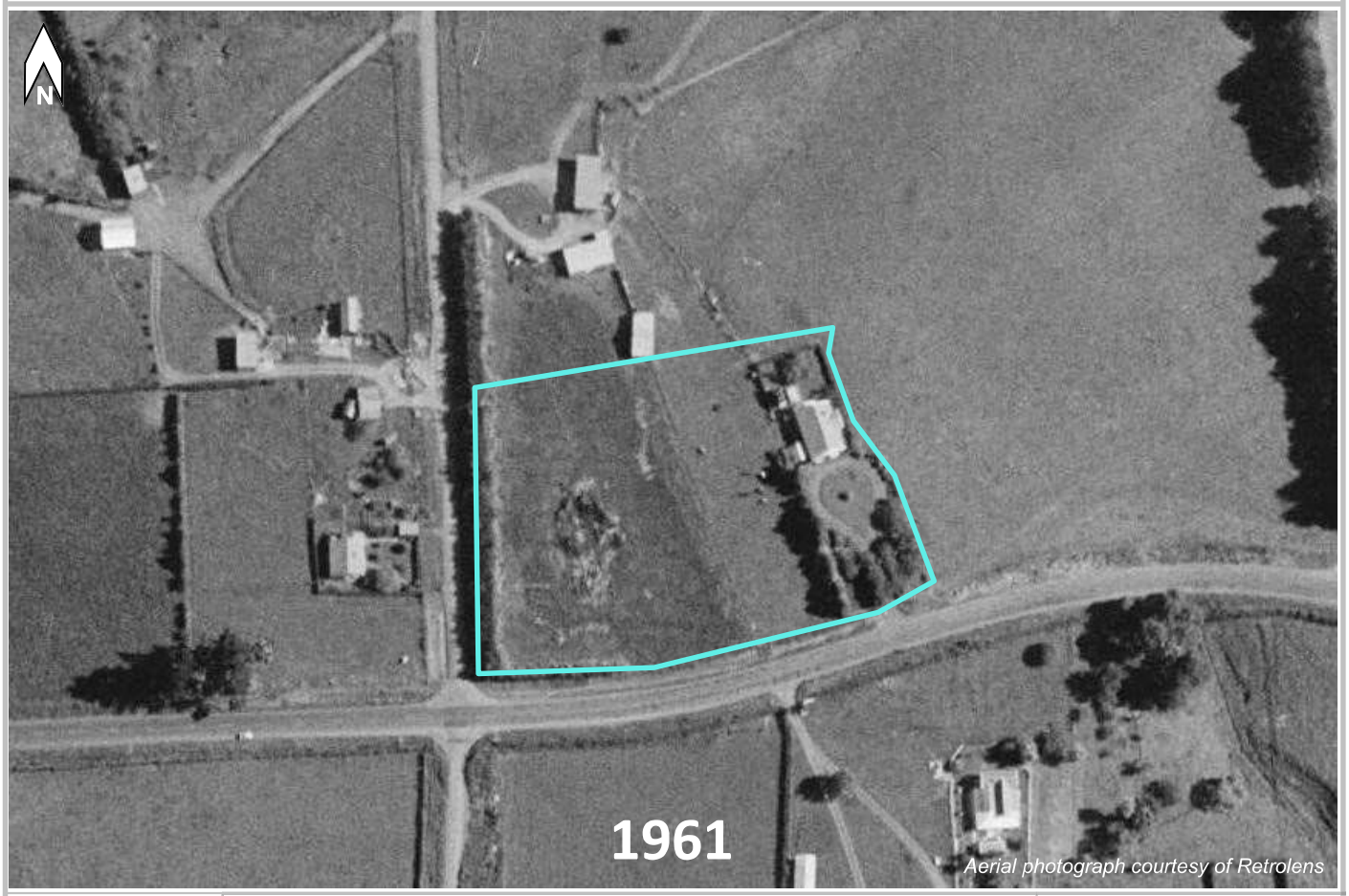
9706754.7 Mortgage to ANZ Bank New Zealand Limited - 23.10.2014 at 11:29 am

12143634.1 CAVEAT BY COUNTIES POWER LIMITED - 2.6.2021 at 5:43 pm

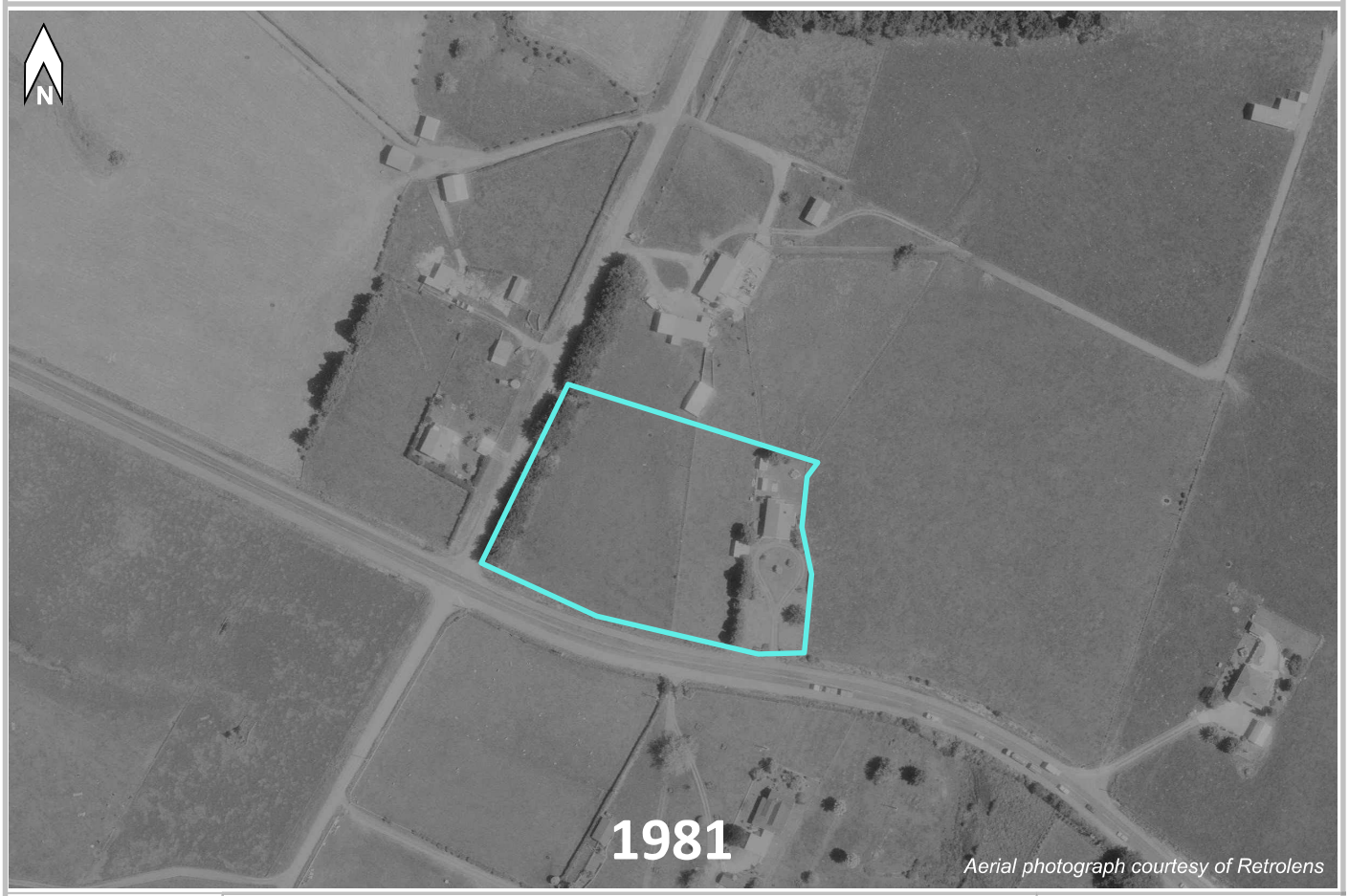

Lot 2 DP 464886
Karaka Road (State Highway 22)
Whangapouri Road
Diag. B
See T2
Non Primary
Diag. A
See T1
1
0.9274Ha
2
1.0724Ha
Diag. A
1
0.9274Ha
Lot 2 DP 464886
NEW CFR's ALLOCATED
LOT 1 648576
LOT 2 648577
Lots 1 and 2 being a subdivision of Lot 1 DP 387516
314278 - A.W. & L.J. WALLNUTT - R/SUB/2013/4093
Surveyor: Craig Ashley Forrester
Firm: The Surveying Company Ltd (Pukekol
Title Plan
LT 473807
Approved on: 2/10/2014
T 1/2
Land District: North Auckland
Dataset Type: Parcels without Survey Information
Digitally Generated Plan
Generated on: 02/10/2014 3:18pm Page 3 of 4

APPENDIX C HISTORICAL AERIAL PHOTOGRAPHS

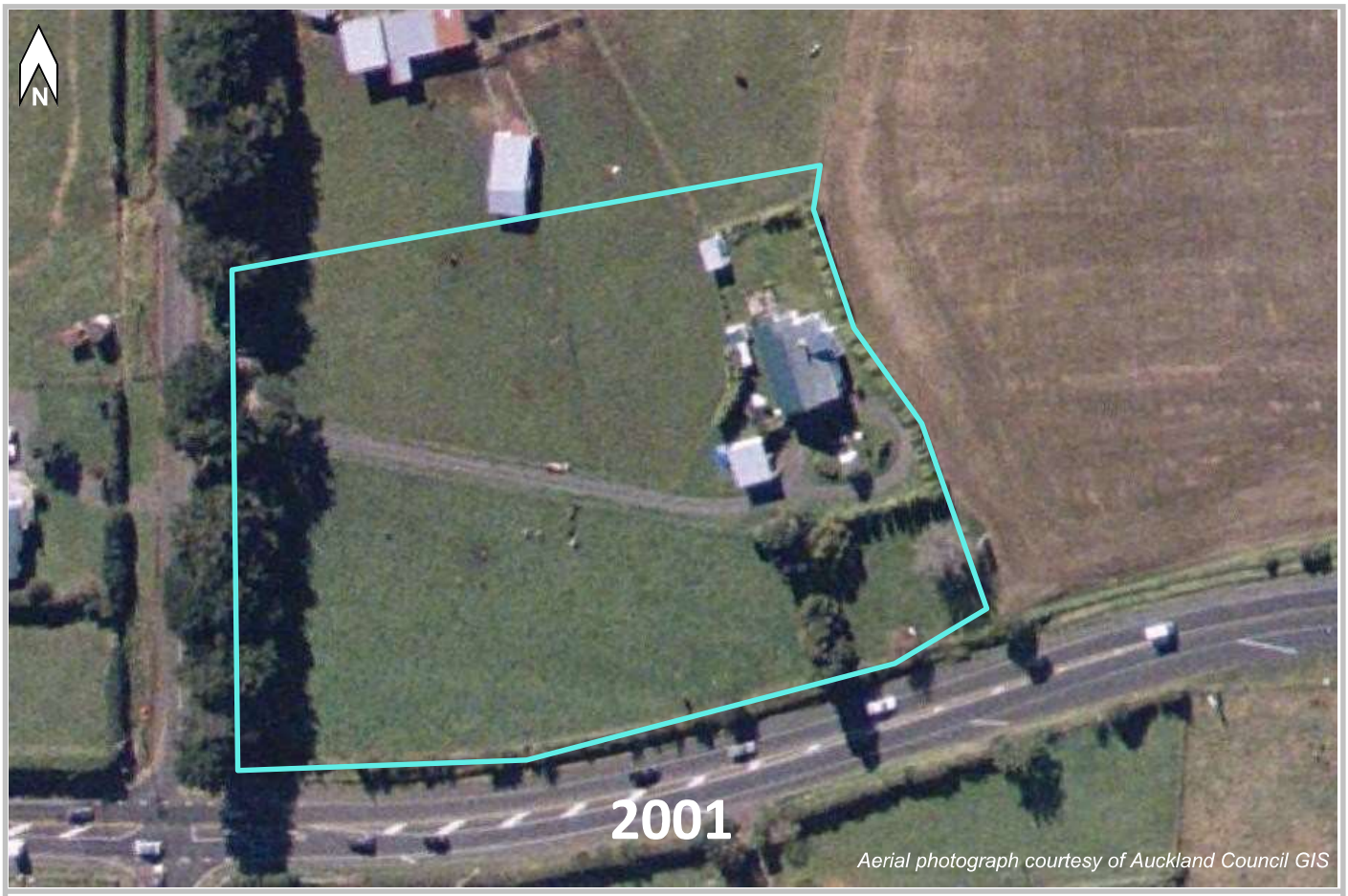




Title:	**Historic Aerial Photographs**	**Reference:**	J1625
Project name:	8 Whangapouri Road, Karaka	**Date:**	24/06/21
		Drawn:	MS
geosciences ltd ENVIRONMENTAL	Level 1, 47 Clyde Road, Browns Bay, 0630, Tel: (09) 475 0222	**Approved:**	COB



Title:	**Historic Aerial Photographs**	**Reference:**	J1625
Project name:	8 Whangapouri Road, Karaka	**Date:**	24/06/21
		Drawn:	MS
geosciences ltd ENVIRONMENTAL	Level 1, 47 Clyde Road, Browns Bay, 0630, Tel: (09) 475 0222	**Approved:**	COB



Title:	**Historic Aerial Photographs**	**Reference:**	J1625
Project name:	8 Whangapouri Road, Karaka	**Date:**	24/06/21
		Drawn:	MS
geosciences ltd ENVIRONMENTAL	Level 1, 47 Clyde Road, Browns Bay, 0630, Tel: (09) 475 0222	**Approved:**	COB

Title:	**Historic Aerial Photographs**	**Reference:**	J1625
Project name:	8 Whangapouri Road, Karaka	**Date:**	24/06/21
		Drawn:	MS
geosciences ltd ENVIRONMENTAL	Level 1, 47 Clyde Road, Browns Bay, 0630, Tel: (09) 475 0222	**Approved:**	COB

APPENDIX D SITE PHOTOGRAPHS

PLATE 1: VIEW OF WESTERN PORTION OF THE SITE FROM NORTHWEST.

PLATE 2: SOUTHERN PORTION OF THE SITE AND EXISTING BUILDINGS

PLATE 3: SIDE VIEW OF THE SOUTHERN PORTION OF THE SITE

PLATE 4: SOUTH-WESTERN CORNER OF THE SITE

APPENDIX E LABORATORY TRANSCRIPTS

Analytica Laboratories Limited
Ruakura Research Centre
10 Bisley Road
Hamilton 3214, New Zealand
Ph +64 (07) 974 4740
sales@analytica.co.nz
www.analytica.co.nz

Certificate of Analysis

Geosciences Ltd
PO Box 35366, Browns Bay
Auckland 0753

Attention: Carl O'Brien
Phone: 09 475 0222
Email: chris@geosciences.co.nz

Lab Reference: 21-31251
Submitted by: CD
Date Received: 15/07/2021
Testing Initiated: 15/07/2021
Date Completed: 20/07/2021
Order Number:
Reference: J1625

Sampling Site: 8 Whangapouri Road / Pukekohe North Substation

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		SS1 (0-75mm) 0-75mm	SS2 (0-75mm) 0-75mm	SS3 (0-75mm) 0-75mm	SS4 (0-75mm) 0-75mm	SS4 (300mm) 300mm
	Date Sampled		13/07/2021	13/07/2021	13/07/2021	13/07/2021	13/07/2021
Analyte	Unit	*Reporting Limit*	21-31251-1	21-31251-2	21-31251-3	21-31251-4	21-31251-5
Arsenic	mg/kg dry wt	*0.125*	141	11	10	9.3	8.5
Cadmium	mg/kg dry wt	*0.005*	0.31	0.21	0.30	0.40	0.11
Chromium	mg/kg dry wt	*0.125*	90.5	26.7	24.8	26.0	26.0
Copper	mg/kg dry wt	*0.075*	109	26.3	28.4	22.0	23.3
Lead	mg/kg dry wt	*0.25*	122	38.3	44.8	45.5	29.9
Nickel	mg/kg dry wt	*0.05*	12.9	13.8	9.95	10.5	10.6
Zinc	mg/kg dry wt	*0.05*	124	55.9	84.8	62.4	40.7

Heavy Metals in Soil

	Client Sample ID		SS5 (0-75mm) 0-75mm	SS5 (300mm) 300mm	SS5 (500mm) 500mm	SS6 (0-75mm) 0-75mm	SS7 (0-75mm) 0-75mm
	Date Sampled		13/07/2021	13/07/2021	13/07/2021	13/07/2021	13/07/2021
Analyte	Unit	*Reporting Limit*	21-31251-6	21-31251-7	21-31251-8	21-31251-9	21-31251-10
Arsenic	mg/kg dry wt	*0.125*	9.2	15.5	9.1	6.7	7.9
Cadmium	mg/kg dry wt	*0.005*	0.31	0.090	0.10	0.31	0.33
Chromium	mg/kg dry wt	*0.125*	20.5	22.1	35.0	25.5	28.2
Copper	mg/kg dry wt	*0.075*	29.2	32.3	34.5	18.5	26.0
Lead	mg/kg dry wt	*0.25*	36.1	71.5	33.2	39.2	30.4
Nickel	mg/kg dry wt	*0.05*	9.17	9.46	15.2	8.84	10.3
Zinc	mg/kg dry wt	*0.05*	66.9	53.1	46.9	62.2	73.6

Heavy Metals in Soil

			Client Sample ID	SS7 (300mm) 300mm
			Date Sampled	13/07/2021
Analyte	Unit	*Reporting Limit*	21-31251-11	
Arsenic	mg/kg dry wt	*0.125*	8.2	
Cadmium	mg/kg dry wt	*0.005*	0.057	
Chromium	mg/kg dry wt	*0.125*	29.1	
Copper	mg/kg dry wt	*0.075*	24.1	
Lead	mg/kg dry wt	*0.25*	26.5	
Nickel	mg/kg dry wt	*0.05*	8.10	
Zinc	mg/kg dry wt	*0.05*	52.6	

Polycyclic Aromatic Hydrocarbons - Soil

			Client Sample ID	SS5 (0-75mm) 0-75mm	SS5 (300mm) 300mm	SS7 (0-75mm) 0-75mm	SS7 (300mm) 300mm
			Date Sampled	13/07/2021	13/07/2021	13/07/2021	13/07/2021
Analyte	Unit	*Reporting Limit*		21-31251-6	21-31251-7	21-31251-10	21-31251-11
1-Methylnaphthalene	mg/kg dry wt	*0.01*		<0.010	<0.010	<0.010	<0.010
2-Methylnaphthalene	mg/kg dry wt	*0.01*		<0.010	<0.010	<0.010	<0.010
Acenaphthene	mg/kg dry wt	*0.01*		<0.010	<0.010	<0.010	<0.010
Acenaphthylene	mg/kg dry wt	*0.01*		<0.010	<0.010	<0.010	<0.010
Anthracene	mg/kg dry wt	*0.01*		<0.010	<0.010	<0.010	<0.010
Benz[a]anthracene	mg/kg dry wt	*0.02*		<0.020	<0.020	<0.020	<0.020
Benzo[a]pyrene	mg/kg dry wt	*0.01*		<0.010	<0.010	<0.010	<0.010
Benzo[b]&[j] fluoranthene	mg/kg dry wt	*0.02*		<0.020	<0.020	<0.020	<0.020
Benzo[g,h,i]perylene	mg/kg dry wt	*0.02*		<0.020	<0.020	<0.020	<0.020
Benzo[k]fluoranthene	mg/kg dry wt	*0.01*		<0.010	<0.010	<0.010	<0.010
Chrysene	mg/kg dry wt	*0.01*		<0.010	<0.010	<0.010	<0.010
Dibenz(a,h)anthracene	mg/kg dry wt	*0.01*		<0.010	<0.010	<0.010	<0.010
Fluoranthene	mg/kg dry wt	*0.02*		<0.020	<0.020	<0.020	<0.020
Fluorene	mg/kg dry wt	*0.01*		<0.010	<0.010	<0.010	<0.010
Indeno(1,2,3-cd)pyrene	mg/kg dry wt	*0.01*		<0.010	<0.010	<0.010	<0.010
Naphthalene	mg/kg dry wt	*0.01*		<0.010	<0.010	<0.010	<0.010
Phenanthrene	mg/kg dry wt	*0.01*		<0.010	<0.010	<0.010	<0.010
Pyrene	mg/kg dry wt	*0.02*		<0.020	<0.020	<0.020	<0.020
Benzo[a]pyrene TEQ (LOR)	mg/kg dry wt	*0.03*		0.030	0.030	0.030	0.030
Benzo[a]pyrene TEQ (Zero)	mg/kg dry wt	*0.01*		<0.010	<0.010	<0.010	<0.010
Anthracene-d10 (Surrogate)	%	*1*		100	99	98	98

Moisture Content

			Client Sample ID	SS5 (0-75mm) 0-75mm	SS5 (300mm) 300mm	SS7 (0-75mm) 0-75mm	SS7 (300mm) 300mm
			Date Sampled	13/07/2021	13/07/2021	13/07/2021	13/07/2021
Analyte	Unit	*Reporting Limit*		21-31251-6	21-31251-7	21-31251-10	21-31251-11
Moisture Content	%	*1*		26	34	32	28

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.
PAH in Soil	Solvent extraction, silica cleanup, followed by GC-MS analysis. **Benzo[a]pyrene TEQ (LOR)**: The most conservative TEQ estimate, where a result is reported as less than the limit of reporting (LOR) the LOR value is used to calculate the TEQ for that PAH. **Benzo[a]pyrene TEQ (Zero)**: The least conservative TEQ estimate, PAHs reported as less than the limit of reporting (LOR) are not included in the TEQ calculation. Benzo[a]pyrene toxic equivalence (TEQ) is calculated according to *'Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health'*. Ministry for the Environment. 2011. (In accordance with in-house procedure).
Moisture	Moisture content is determined gravimetrically by drying at 103 °C.

Sharelle Frank, B.Sc. (Tech)
Technologist

Yuri Zubenko, Ph.D.
Senior Technologist

Analytica Laboratories Limited
Unit 1, 30 Greenpark Road
Penrose
Auckland
sales@analytica.co.nz
www.analytica.co.nz

Certificate of Analysis

Geosciences Ltd
PO Box 35366, Browns Bay
Auckland 0753
Attention: Carl O'Brien
Phone: 09 475 0222
Email: carl@geosciences.co.nz

Lab Reference: 21-31284
Submitted by: CD
Date Received: 15/07/2021
Testing Initiated: 15/07/2021
Date Completed: 20/07/2021
Order Number:
Reference: J1625

Sampling Site: 8 Whangapouri Road / Pukekohe North Substation
Description of Work: J1625

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 (Semi-Quantitative)

Sample Details

Laboratory ID	Client Sample ID	Sample Location	Sample Description	Date Sampled	Date Analysed
21-31284-1	SS5 0 - 50 mm	N/A	Soil	13/07/2021	20/07/2021
21-31284-2	SS7 0 - 50 mm	N/A	Soil	13/07/2021	20/07/2021

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

Analysis Results (Summary)

Laboratory ID	Client Sample ID	Fibre Types	Sample Weight as Received	Moisture Content	Trace Asbestos (Presence / Absence)	Asbestos (Presence / Absence)
Units			g	%		
21-31284-1	SS5 0 - 50 mm	Asbestos NOT Detected. Organic Fibres	776.5	30.1	Absent	Absent
21-31284-2	SS7 0 - 50 mm	Asbestos NOT Detected. Organic Fibres	708.0	33.8	Absent	Absent

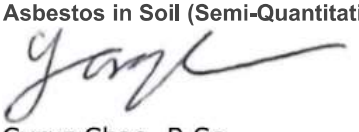
Information in the above table supplied by the client: Client Sample ID

Analysis Results (Size Fraction Breakdown)

Laboratory ID	Client Sample ID	Fraction Size	Fraction Weight*	AF/FA Weight*	ACM Weight*	ACM Content*	Asbestos Matrix	Asbestos Weight*	W/W% Asbestos*
	Units *Reporting Limit*		g 0	g 0	g 0	%		g 0	W/W% 0.001
21-31284-1	SS5 0 - 50 mm	>10mm	136.00	0.0000	0.0000	0	No Asbestos Detected	0.0000	<0.001 (ACM) <0.001 (AF/FA)
		2-10mm	264.50	0.0000	0.0000	0	No Asbestos Detected	0.0000	
		<2mm	142.50	0.0000	-	-	No Asbestos Detected	0.0000	
21-31284-2	SS7 0 - 50 mm	>10mm	67.50	0.0000	0.0000	0	No Asbestos Detected	0.0000	<0.001 (ACM) <0.001 (AF/FA)
		2-10mm	282.50	0.0000	0.0000	0	No Asbestos Detected	0.0000	
		<2mm	118.50	0.0000	-	-	No Asbestos Detected	0.0000	

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

Asbestos in Soil (Semi-Quantitative) Approver:



Cyrus Chao, B.Sc.
Technician

Method Summary

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

Analytica Laboratories Limited
Ruakura Research Centre
10 Bisley Road
Hamilton 3214, New Zealand
Ph +64 (07) 974 4740
sales@analytica.co.nz
www.analytica.co.nz

Certificate of Analysis

Geosciences Ltd
PO Box 35366, Browns Bay
Auckland 0753

Attention: Carl O'Brien
Phone: 09 475 0222
Email: carl@geosciences.co.nz

Lab Reference: 21-32998
Submitted by: CD
Date Received: 27/07/2021
Testing Initiated: 27/07/2021
Date Completed: 29/07/2021
Order Number:
Reference: J1625

Sampling Site: 8 Whangapouri Road / Pukekohe North Substation

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.

Organochlorine Pesticides - Soil

	Client Sample ID		SS1 (0-75mm) 0-75mm	SS4 (0-75mm) 0-75mm	SS5 (0-75mm) 0-75mm	SS5 (500mm) 500mm	SS7 (0-75mm) 0-75mm
	Date Sampled		13/07/2021	13/07/2021	13/07/2021	13/07/2021	13/07/2021
Analyte	Unit	*Reporting Limit*	21-32998-1	21-32998-2	21-32998-3	21-32998-4	21-32998-5
2,4'-DDD	mg/kg dry wt	*0.005*	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
2,4'-DDE	mg/kg dry wt	*0.005*	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
2,4'-DDT	mg/kg dry wt	*0.005*	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
4,4'-DDD	mg/kg dry wt	*0.003*	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
4,4'-DDE	mg/kg dry wt	*0.005*	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
4,4'-DDT	mg/kg dry wt	*0.005*	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Total DDT	mg/kg dry wt	*0.02*	<0.020	<0.020	<0.020	<0.020	<0.020
alpha-BHC	mg/kg dry wt	*0.005*	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Aldrin	mg/kg dry wt	*0.005*	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
beta-BHC	mg/kg dry wt	*0.005*	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
cis-Chlordane	mg/kg dry wt	*0.005*	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
cis-Nonachlor	mg/kg dry wt	*0.01*	<0.010	<0.010	<0.010	<0.010	<0.010
delta-BHC	mg/kg dry wt	*0.005*	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Dieldrin	mg/kg dry wt	*0.05*	<0.050	<0.050	<0.050	<0.050	<0.050
Endosulfan I	mg/kg dry wt	*0.005*	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Endosulfan II	mg/kg dry wt	*0.01*	<0.010	<0.010	<0.010	<0.010	<0.010
Endosulfan sulfate	mg/kg dry wt	*0.005*	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Endrin	mg/kg dry wt	*0.05*	<0.050	<0.050	<0.050	<0.050	<0.050
Endrin aldehyde	mg/kg dry wt	*0.01*	<0.010	<0.010	<0.010	<0.010	<0.010
Endrin ketone	mg/kg dry wt	*0.005*	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
gamma-BHC	mg/kg dry wt	*0.005*	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Heptachlor	mg/kg dry wt	*0.005*	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Heptachlor epoxide	mg/kg dry wt	*0.005*	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050

Organochlorine Pesticides - Soil

			Client Sample ID	SS1 (0-75mm) 0-75mm	SS4 (0-75mm) 0-75mm	SS5 (0-75mm) 0-75mm	SS5 (500mm) 500mm	SS7 (0-75mm) 0-75mm
			Date Sampled	13/07/2021	13/07/2021	13/07/2021	13/07/2021	13/07/2021
Hexachlorobenzene	mg/kg dry wt	*0.005*		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Methoxychlor	mg/kg dry wt	*0.01*		<0.010	<0.010	<0.010	<0.010	<0.010
trans-nonachlor	mg/kg dry wt	*0.01*		<0.010	<0.010	<0.010	<0.010	<0.010
trans-Chlordane	mg/kg dry wt	*0.01*		<0.010	<0.010	<0.010	<0.010	<0.010
Chlordane (sum)	mg/kg dry wt	*0.02*		<0.020	<0.020	<0.020	<0.020	<0.020
TCMX (Surrogate)	%	*1*		110	110	110	98	110

Method Summary

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

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

Rong Zhang
Technician