

Appendix J – Land Contamination Reports prepared by 4Sight Consultants





LAND. PEOPLE. WATER.

Preliminary Site Investigation
162 Studholme Street, Morrinsville

For Lockerbie Estate Limited

August 2019

REPORT INFORMATION AND QUALITY CONTROL

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CONTENTS

Page

EXECUTIVE SUMMARY	1
1 INTRODUCTION	3
1.1 Scope of Works	3
2 SITE DETAILS	3
2.1 Site Topography	4
2.2 Land Use – Current and Proposed	4
2.3 Geology and Hydrology	4
3 SITE HISTORY	6
3.1 Aerial Photographs	6
3.2 Council Records	6
3.2.1 Land Use Information Registry	6
3.2.2 Property File Review	7
3.2.3 Hazardous Substances and Incidents Report	7
3.3 Landowner Information	7
4 SITE INVESTIGATION	7
4.1 Initial Site Walkover	7
4.2 Soil Sampling	8
4.2.1 Sampling Methodology	10
4.2.2 QA/QC	10
4.3 Sampling Observations	10
4.4 Evaluation Criteria	11
4.5 Results	11
4.6 Discussion	12
5 CONCEPTUAL SITE MODEL	15
6 CONCLUSIONS	17
REFERENCES	19
LIMITATIONS	19

List of Tables

Table 1: Address and Site Information	3
Table 2: Address and Lot Information	6
Table 3: Initial Soil Sampling Details and Laboratory Analytical Schedule	10
Table 4: Summary of Heavy Metals, OCPs, and pH Analysis	14
Table 5: Tabulated Conceptual Site Model	15

List of Figures

Figure 1: Site Location and Features Plan	5
Figure 2: Sample Location Plan	9

List of Appendices

Appendix A: Site Contour Plan
Appendix B: Historical Aerial Photographs
Appendix C: Land Use Information Register
Appendix D: Site Inspection Photographs
Appendix E: Laboratory Results

EXECUTIVE SUMMARY

4Sight Consulting Ltd (4Sight) has been engaged by Lockerbie Estate (the client) to undertake a Preliminary Site Investigation (PSI) with limited soil sampling at 162 Studholme Street, Morrinsville (herein referred to as “the Site”).

The purpose of this PSI is to assess potential implications for the proposed subdivision, change of land use and soil disturbance under the National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health (NESCS) (MfE,2011).

Based on the findings of this investigation the following conclusions have been made:

- Waikato Regional Council (WRC) confirmed that the Site ‘*does appear on the Land Information Register*’ with a classification of ‘Unverified HAIL’ due to past land use for Ministry for the Environment (MfE) Hazardous Activities and Industries List (HAIL) activity ‘A8. Livestock dip or spray race operations’ associated with a Potential Sheep Dip on O Taukoro Road, Morrinsville;
- This PSI has shown that the Site soils have been slightly impacted by the application of superphosphate. However, the concentrations of cadmium detected in all samples analysed were below the pH adjusted NESCS Soil Contaminant Standards (SCS) guideline value for rural residential/lifestyle (2.34 mg/kg);
- Arsenic concentrations in field composite sample DS01, collected from the soils beneath a stockpile of disused tyres, was above the NESCS SCS for rural residential/lifestyle land use, the NESCS SCS for commercial / industrial outdoor worker, the Waikato cleanfill criteria, and the Waikato background concentration;
- Lead concentration in sample LP01, collected from the soils surrounding the residential dwelling, was above the NESCS SCS for rural residential/lifestyle land use, the Waikato cleanfill criteria, and the Waikato background concentration;
- The concentrations of organochlorine pesticides (OCPs) detected in sample DS01, collected from the area of potential sheep dip/spray race operations, were all below the analytical limits of reporting (LOR) and therefore are below the cleanfill criteria;
- During the Site inspection and soil sampling, no visual or olfactory evidence of contamination was identified on the Site; and
- It is considered that the potential risk to human health across the Site has been adequately delineated. Based on results of this PSI and limited soil sampling, it is considered highly unlikely that the Site poses a risk to human health or the environment in light of the proposed development, with the exception of localised arsenic and lead impacts as identified.

The following recommendations have been made, based on the findings of this PSI:

- Due to the elevated concentrations of arsenic detected in sample DS01 and lead detected in sample LP01 (together, the “piece of land”), the soils in these areas of the Site will require removal to a suitably licenced fill facility. Specifically, soils beneath the tyre stockpile and within a 1 m radius around the dwelling, to a depth of a minimum of 0.2 m below ground level will require removal (see Figure 1). Based on the identified concentrations of contaminants in shallow soils, a basic Contaminated Site Management Plan (CSMP) is recommended to adequately control potential risk to human health during soil removal activities;
- As the NESCS Permitted Activity volumes within the piece of land are not likely to be met, a Restricted Discretionary consent under Regulation 10 of the NESCS will be required for the proposed soil disturbance associated with the removal of the contaminated soils.;
- In accordance with Regulation 10 of the NESCS, following remediation, validation samples will need to be collected from the base and side walls of the excavated areas at a frequency sufficient to meet the requirements of the Contaminated Land Management Guidelines No.5 (MfE, 2011);
- Following remediation works, a Site Validation Report (SVR) will need to be prepared by a suitably qualified and experienced practitioner (SQEP) which details at a minimum; the volumes of soil removed, validation sampling results, copies of weighbridge/disposal docket, records of any unexpected/accidental discovery of further contamination, and a summary of any additional sampling that has been undertaken in accordance with the CLMG No. 5;

- The soils removal works can also be undertaken as a Permitted Activity under Rule 5.3.4.6 of the Waikato Regional Plan – Land and Soil Module if permitted activity conditions are met, that is a CSMP and a SVR are to be prepared by a SQEP; and
- Except for soils within the area of sample location DS01 and LP01 (“piece of land”), the Site soils are suitable to remain on-site and if removed from Site they can be disposed of as cleanfill material, however, this should be confirmed with the disposal facility prior to removal from the Site.

This investigation and associated reporting has been carried out and reviewed by a SQEP in accordance with the requirements of the NESCS.

1 INTRODUCTION

4Sight Consulting Ltd (4Sight) has been engaged by Lockerbie Estate (the client) to undertake a Preliminary Site Investigation (PSI) with limited soil sampling at 162 Studholme Street, Morrinsville (herein referred to as “the Site”), to assess potential implications for the proposed future residential development under the National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health (NESCS) (MfE,2011).

The purpose of this PSI is to determine whether:

- An activity or industry listed on the Ministry for the Environment’s (MfE) Hazardous Activities and Industries List (HAIL) is being, has been, or is more likely than not to have been undertaken on the Site; and
- Contaminants in soils are at levels above the adopted NESCS or Waikato background concentration guideline values, to enable an assessment for potential resource consents for the proposed subdivision, change of land use and soil disturbance.

Waikato Regional Council (WRC) have indicated that there is potential for an activity listed on the Ministry for the Environment’s Hazardous Activities and Industries List (HAIL) to have occurred on the Site and therefore consideration is required to be given to the NESCS. Land covered in the NESCS is defined in regulation 5(7) as:

A piece of land that is described by one of the following:

- a) *An activity or industry described in the HAIL is being undertaken on it;*
- b) *An activity or industry described in the HAIL has been undertaken on it;*
- c) *It is more likely than not that an activity or industry described in the HAIL is being or has been undertaken on it.*

1.1 Scope of Works

The scope of this PSI has included the following:

- A review of selected publicly available information for the site, including Council files and aerial photographs to determine whether or not any activities or industries on the HAIL are, have been, or might have been undertaken on the Site;
- Site inspection to visually assess the presence of any activities or industries listed on the HAIL or evidence of any potential contamination;
- Collection and analysis of selected soil samples taken from areas across the Site that were deemed high risk for ground contamination; and
- Collection of soil samples to determine whether broad scale superphosphate application has impacted the Site soils; and
- An overall assessment of the applicability of the NESCS.

2 SITE DETAILS

The Site is located at 162 Studholme Street, Morrinsville, Waikato. The property details are provided in Table 1. The location and layout of the Site is shown in Figure 1.

Table 1: Address and Site Information

Address	Legal Description	Approximate Area
162 Studholme Street, Morrinsville “the Site”	Lot 1 DP 24498	18.16 Hectares
	Lot 2 DP 463166	60.95 Hectares
	Lot 1 DPS 22500	708 m ²

2.1 Site Topography

The Site gradually slopes downhill in a south to north direction. The Site contour plan is presented as Appendix A.

2.2 Land Use – Current and Proposed

The southern portion of the Site is zoned 'Residential Zone' and the northern portion of the Site is Zoned 'Rural Zone' under the Matamata-Piako District Council (MPDC) District Plan (June 2018). The Site is currently being used for agricultural purposes (Dairy). The proposed future development is for residential purposes.

2.3 Geology and Hydrology

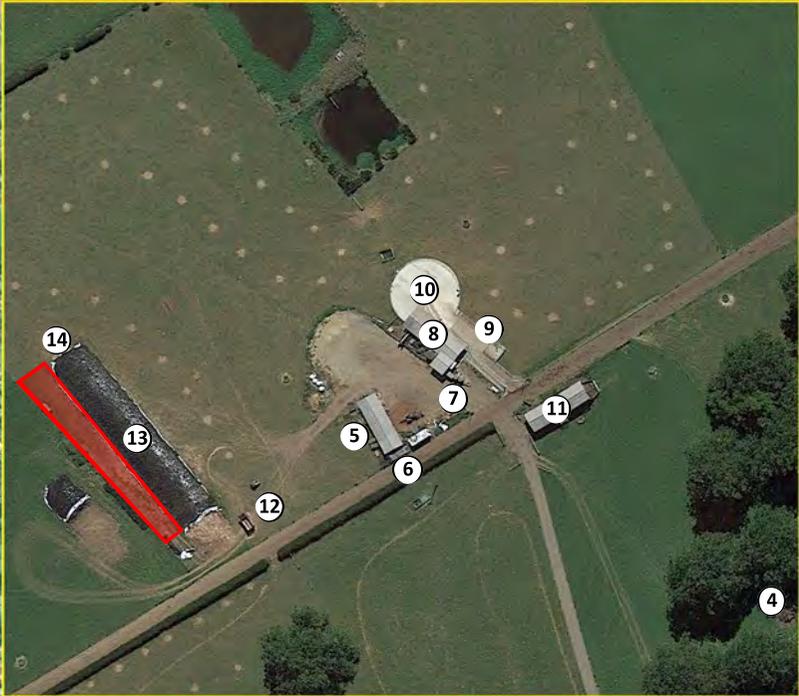
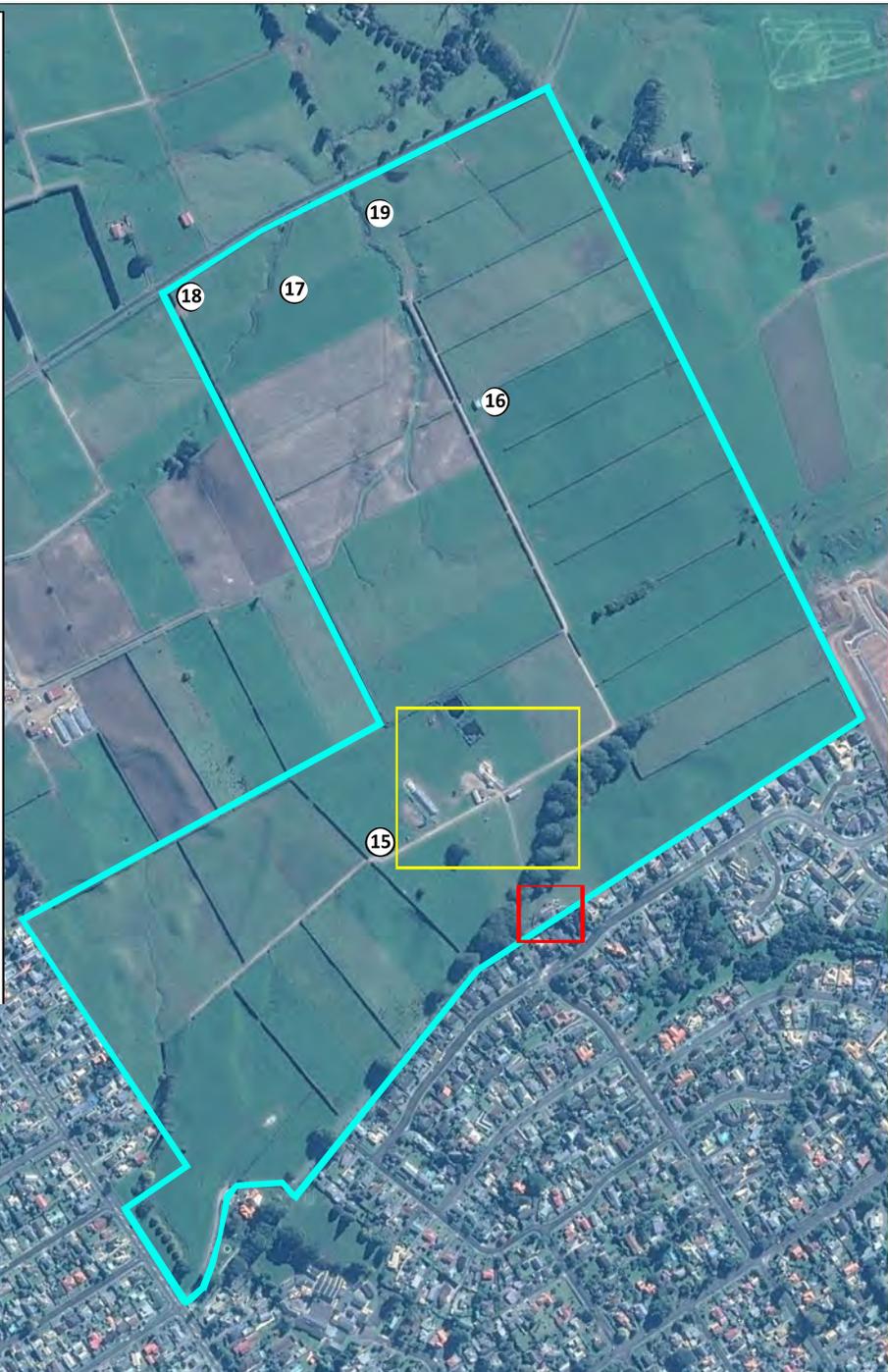
The Institute of Geological and Nuclear Sciences (GNS) 1:250,000 online geological map shows that the site is primarily underlain by Early Pleistocene – Middle Pleistocene river and igneous deposits consisting of alluvium dominated by primary and reworked, non-welded ignimbrite. A small portion of the Site, situated in the south-western area, is underlain by Late Pleistocene - Holocene river deposits consisting of moderately weathered, poorly to moderately sorted gravel with minor sand and silt underlying terraces; includes minor fan deposits.

The closest surface water body is an unnamed stream that extends across the northern portion of the Site in a south-west to north-east direction.

A search of the WRC groundwater maps show that there are two bores situated on the Site and their details are listed below. Information regarding the depth and/or purpose of the below bores was not provided.

- Well No.: 72_8428 located at 162 Studholme Street; and
- Well No.: 64_205 located at 0 Taukoro Road was completed in December 1993 and the total bore depth is 39.60 m.

- Approximate Site Boundary
- Indicative Removal Area
- 1 Residential dwelling
- 2 Garage
- 3 Storage for firewood
- 4 Wood chip stockpile
- 5 Metal farm shed
- 6 Extension off farm shed
- 7 Water tank
- 8 Milking shed
- 9 Milking parlour
- 10 Feed pad
- 11 Metal shelter 1
- 12 Gravel stockpile
- 13 Tyre stockpile
- 14 Feed stockpile
- 15 Metal shed
- 16 Metal shelter 2
- 17 Area of potential sheep dip
- 18 Area of former dwelling
- 19 Small clay stockpile



Satellite imagery sourced from Google Earth Pro. Map data © 2019 Google.

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Scale 1:10,000 @ A4



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Figure 1: Site Location and Features Plan

Figure prepared for Lockerbie Estate Ltd by 4Sight Consulting.

Date: 11/07/2019

Version: 1.0

Drawn: Sam Hendrikse

Checked: Andrew Barr

Approved: Nigel Mather



3 SITE HISTORY

To understand the history of the site and particularly the nature and location of any potentially contaminating activities, a review of publicly available information for the site was undertaken. This included searches of

- Selected historical aerial photographs available through Retrolens and Google® Earth™;
- Land Use Information Register (LUIR) from the WRC;
- Property files from the MPDC;
- Hazardous Substances and Incidents Report, provided by the Environmental Protection Agency (EPA); and
- Landowner information.

3.1 Aerial Photographs

Historical aerial photographs were sourced from Retrolens and Google Earth. These are described below and can be found in Appendix B:

Table 2: Address and Lot Information

Year	Reference	Observations
1941	Retrolens (Black & white)	Although only the south-western area of the Site is visible, it appears that the Site is being utilised for grazing. A Site building can be seen along the southern boundary and a further site building can be seen to its north-west. Residential dwellings can be seen to the east and south of the Site.
1966	Retrolens (Black & white)	The Site is grassed and sectioned into paddocks for grazing. A driveway extends into the Site along the southern boundary which leads to the site building along the boundary and into the Site to several structures, likely to be a milking shed. Site structures are visible in the north-western corner of the Site and to the south-east of this area further Site structures can be seen. Two gully systems can be seen in the northern area of the Site and residential intensification can be observed to the south of the Site.
1979, 1982 & 1990	Retrolens (Black & white)	The Site structures situated in the northern portion of the Site have been removed together with a considerable amount of internal fencing and/or hedges in this area of the Site. A small Site structure can be seen near the centre of the Site.
1995	Retrolens (Black & white)	The Site remains relatively unchanged from the 1966 to 1990 photographs however, two effluent ponds have been constructed to the north of the milking shed located in the southern portion of the Site indicating that the Site is likely in use as a dairy farm.
2008 and 2011	(Google® Earth™)	The Site remains relatively unchanged from the 1995 photograph, however, the Site structure situated in the north-western corner of the Site has been removed. Several Site structures, likely associated with milking, are visible to the south of the effluent ponds. The land to the south-east of the Site is under development for the construction of a subdivision.
2016 and 2017	(Google® Earth™)	The Site remains relatively unchanged from the 2008 to 2011 photographs however, two small areas of disturbed soil can be seen in the most north-eastern paddock and a stockpile of tyres are visible to the west of the milking shed. The Site is grassed and in use for grazing.

3.2 Council Records

3.2.1 Land Use Information Registry

A search of the LUIR, maintained by WRC, was requested and results were provided on 18 June 2019. The LUIR provides a detailed register of properties known to be contaminated on the basis of chemical measurements, or potentially contaminated on the basis of past land use.

WRC confirmed that the Site *'does appear on the Land Information Register'* with a classification of 'Unverified HAIL' due to past land use for HAIL activity 'A8. Livestock dip or spray race operations' associated with a Potential Sheep Dip on 0 Taukoro Road, Morrinsville. The LUIR provides a location of the former livestock dip/spray race operation.

The LUIR response can be found in Appendix C.

3.2.2 Property File Review

A MPDC property file search was requested by 4Sight for the Site. The property file contained building consent information relating to drainage works on the cottage, and for the construction of a kitchen and garage. No other information pertinent to this PSI was identified within the Property File.

3.2.3 Hazardous Substances and Incidents Report

The Environmental Protection Agency (EPA) maintained a list of reported hazardous substance incidents over the period July 2006 – December 2011. A review of this information did not identify any incidents of significance in relation to the Site or the adjacent properties.

3.3 Landowner Information

A questionnaire produced by 4Sight was issued to the landowner for the purpose of understanding the Sites history. The following information was provided:

- The property was purchased in 1932 and has only been used for dairy since purchase;
- Phosphate-based fertilisers have been applied to the land however, fertilisers have not been stored on-site;
- No knowledge of sheep dips and/or spray races as the Site; and
- The only burning undertaken on-site was for vegetation.

4 SITE INVESTIGATION

4.1 Initial Site Walkover

A site visit was undertaken on 24 June 2019 and photos of the Site visit are presented in Appendix D. The following observations were made during the Site visit:

- The Site was accessed from Studholme Street in the south-western corner via a gravel driveway which provided access into the Site and to the associated Site structures;
- A residential dwelling on piles constructed of painted timber, and a detached painted metal garage, were identified along the southern boundary;
- The soffits of the dwelling appeared to be constructed of timber and polystyrene insulation was being stored beneath the dwelling;
- A timber extension off the garage appeared to have been used for the storage of firewood;
- A stockpile of timber chips was situated in the paddock to the north of the dwelling and it contained gravel on the top of the stockpile;
- The gravel driveway led to a painted metal farm shed constructed of timber and an extension off the metal farm shed was identified on its southern side;
- A water tank, milking shed, milking parlour and feed pad were situated to the north-west of the metal farm shed;
- A metal shelter (1) was located to the south of the milking shed and it was being used to store a tractor;
- A small stockpile of gravel was situated to the west of the metal farm shed and a stockpile of tyres and stock feed were situated to the north of the gravel;
- A metal shed constructed on a concrete slab was situated to the west of the tyre stockpile;
- A farm race led to the northern area of the Site and associated paddocks;

- Several concrete troughs were situated around the Site and a vacant metal shelter (2) was located in the northern area of the Site;
- The area identified on the LUIR as potentially being subject to sheep dip/spray operations was covered in grass. A spade was used to dig down in selected locations across this area to try and identify any debris or footings. No visible or olfactory signs of contamination were identified;
- Broken concrete was identified in the north-western corner of the Site which appeared to be the remnants of a former driveway. A spade was used to dig down at selected locations to try and identify any footings or debris from the former site structure that occupied this area of the Site. No visible or olfactory signs of contamination were identified;
- A mound of soil and two small stockpiles of clay materials were identified in the north-eastern area of the Site. The soils appeared to have been sourced on-site and likely came from the creek and /or from the recontouring of this area of the Site;
- Housekeeping at the Site was tidy, with no rubbish or disused equipment visible;
- There were no visible signs of contamination such as oil or grease, and no areas of significant stressed or dying vegetation; and
- No evidence of current or historical above/underground storage tanks, sumps, pits, or lagoons were identified during the Site walkover and inspection.

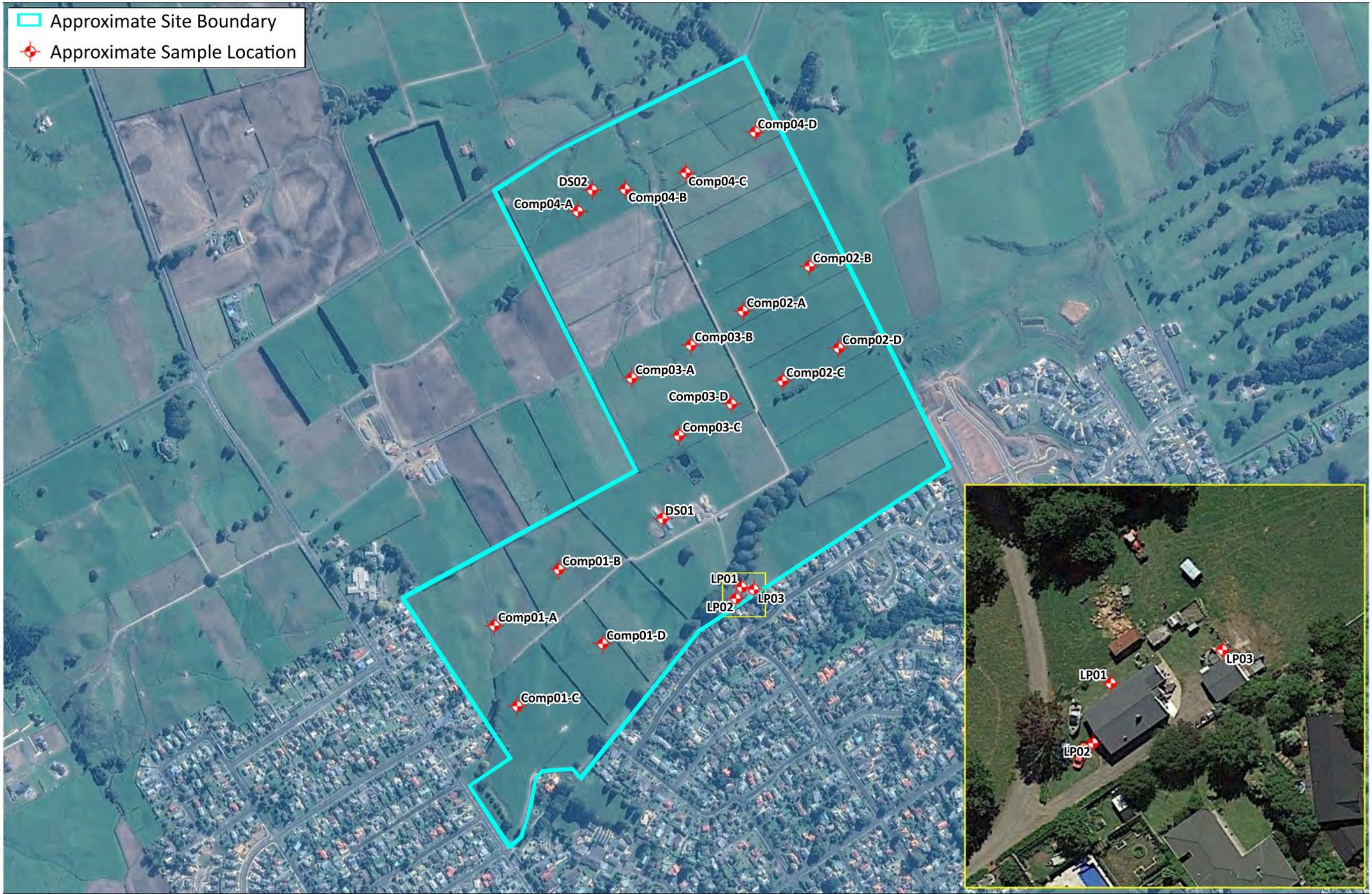
4.2 Soil Sampling

On 24 June 2019, a total of 16 discrete surface soil samples were collected from across the Site at a depth of 0.0 - 0.1 meters below ground level (m bgl) and were, together with a single reference sample (Ref01) taken from the roadside berm, analysed for cadmium and pH to assess for potential impact associated with superphosphate application at the Site.

In addition, three surface soil samples (LP01, LP02 and LP03) were collected from the soils surrounding the residential dwelling and garage and were analysed for the presence of lead associated with potential maintenance works. Furthermore, a single field composite sample (DS01) was collected from the soils beneath a stockpile of used car tyres and it was analysed for the presence of heavy metals (arsenic, cadmium, chromium, copper, lead, nickel and zinc) and polycyclic aromatic hydrocarbons (PAH). A single soil sample (DS02) was collected from the area identified as potentially being subject to sheep dip/spray operations and it was analysed for the presence of arsenic, cadmium, copper, lead and organochlorine pesticides (OCP).

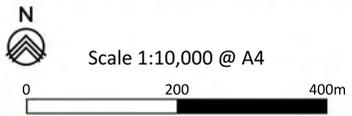
The limited soil sampling was undertaken in general accordance with the Contaminated Land Guidelines No.5 Site Investigation and Analysis of Soils (CLMG No.5 MfE, 1999, revised 2011). The methodology for the soil sampling is set out below. Soil sampling locations are shown in Figure 2.

- Approximate Site Boundary
- Approximate Sample Location



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Figure 2: Approximate Sampling Locations

Figure prepared for Lockerbie Estate Ltd by 4Sight Consulting.

Date: 04/07/2019
Version: 1.0
Drawn: Sam Hendrikse
Checked: Andrew Barr
Approved: Nigel Mather



4.2.1 Sampling Methodology

The following methodology was adopted during the soil sampling works:

- A stainless-steel spade and trowel were used to collect all surface soil samples (approximately 0.0 - 0.1 m bgl);
- A clean pair of nitrile gloves were worn to collect each soil sample to limit the potential for cross-contamination;
- Soil samples were placed in laboratory provided clean sample jars and identified with a unique sample identifier, which was documented on the sample label; sample log; and chain of custody form;
- All soil samples were placed in an ice-cooled storage box (i.e. Chilly Bin) immediately after collection and transported under chain of custody documentation to the analytical laboratory; and
- All field sampling equipment was decontaminated prior to use at each soil sample location to limit the potential for cross-contamination. Decontamination of field equipment involved: wash with clean potable water; scrubbing in a detergent solution (Decon® 90) and potable water; and a final rinse in clean water.

Soil sampling works were completed in general accordance with CLMG No.5.

The soil samples were transported under full Chain of Custody documentation to RJ Hill Laboratories, Hamilton (Hill Laboratories). The soil sample analytical schedule presented in Table 3.

Table 3: Initial Soil Sampling Details and Laboratory Analytical Schedule

Sample ID	Depth (m bgl)	Soil Type	Lab Analysis
Comp01 A-D	0.0 - 0.10	Topsoil (dark brown)	Cadmium & pH
Comp02 A-D			
Comp03 A-D			
Comp04 A-D			
Ref 01			Lead
LP01			
LP02			
LP03			Arsenic, Cadmium, Chromium, Copper, Lead and Nickel
DS01			Arsenic, Cadmium, Copper, Lead and OCPs
DS02			

4.2.2 QA/QC

Standard field quality assurance protocols were followed. All tools used for sampling were washed in a decontaminant solution, followed by clean water, between samples to reduce the risk of cross contamination. Nitrile gloves were also used and disposed of between each sample. Hill Laboratories are a New Zealand accredited laboratory (by International Accreditation NZ). Their primary quality standard is NZS/ISO/IEC 17025:2005 which incorporates the aspects of ISO 9000 relevant to testing laboratories. Refer to the laboratory analysis report in Appendix E for further information on accreditation.

4.3 Sampling Observations

Photos of the Site investigation and the typical soil profiles are presented in Appendix D. The following soil characteristics and observations for the Site are described below:

- All surface soil samples collected from the Site consisted of dark brown topsoil from 0.0 - 0.10 m bgl, and
- No visual or olfactory evidence of contamination was identified at any of the sample locations.

4.4 Evaluation Criteria

The soil sample results have been screened against the following criteria:

- As the future use of the Site is proposed for residential and rural residential land use, as a conservative approach, the NESCS Soil Contaminant Standards (SCS) using the rural residential / lifestyle block (25% produce) land use scenario (considered most appropriate given proposed redevelopment of the Site);
- Background concentrations for heavy metals (95% upper limit) as presented on the WRC website. These values are used as a guideline for typical naturally occurring concentrations in the Waikato Region; and
- WRC Cleanfill Criteria. These criteria were selected to provide guidance on suitable off-site disposal options, if required.

4.5 Results

A summary of the laboratory results is presented in Table 4. The full results are contained in the laboratory analysis report provided in Appendix E. The following is noted:

- With the exception of soil samples Comp01-C (0.89 mg/kg), Comp02-B (0.84 mg/kg), Comp02-C (0.96 mg/kg) and Comp04-D (0.9 mg/kg), the concentrations of cadmium detected in all samples analysed were below the NESCS SCS for rural residential/lifestyle land use (0.8 mg/kg), and below the Waikato cleanfill criteria (1 mg/kg), but above the Waikato background concentration (0.22 mg/kg);
- As the pH concentration detected in sample Comp04-D (6.2 pH) was above the NESCS SCS reporting value of 5 pH for cadmium, and given that the adjusted guideline value for cadmium with a pH value of 6.0 (based off the pH value detected in reference sample Ref01 5.9 pH) would increase to 2.34 mg/kg, in accordance with the Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health (MfE, 2011), the concentration of cadmium detected in samples Comp01-C (0.89 mg/kg), Comp02-B (0.84 mg/kg), Comp02-C (0.96 mg/kg) and Comp04-D (0.9 mg/kg), do not exceed the adjusted guideline value. As the application of superphosphate across the Site is likely to be uniform in its distribution, the concentrations of cadmium across the Site are also expected to be uniform;
- The intention of reference sample Ref01 collected from the roadside berm was to provide an understanding of likely background soil conditions outside of an area subject to superphosphate use. The concentration of cadmium detected in sample Ref01 (0.25 mg/kg) was below the adopted guideline criteria for the Site but does indicate that the Site is more likely than not to have been slightly impacted by the application of superphosphate;
- The concentration of arsenic detected in sample DS01 (100 mg/kg) was above the NESCS SCS for rural residential/lifestyle land use (17 mg/kg), the Waikato cleanfill criteria (20 mg/kg) and the Waikato background concentration (6.8 mg/kg).
 - The concentration of arsenic was also elevated above the NESCS SCS for commercial / industrial outdoor worker (70 mg/kg);
- The concentration of copper and nickel in sample DS01 (8 mg/kg and 4 mg/kg, respectively) were below their respective NESCS SCS for rural residential/lifestyle land use, the Waikato cleanfill criteria and the Waikato background concentrations;
- The concentration of lead detected in sample DS01 (49 mg/kg) and DS02 (25 mg/kg) were below the NESCS SCS for rural residential/lifestyle land use (160 mg/kg) and the Waikato cleanfill criteria (78 mg/kg), but were above the Waikato background concentration (20 mg/kg);
- The concentration of zinc detected in sample DS01 (178 mg/kg) was below the adopted NESCS SCS for rural residential/lifestyle land use (7,400 mg/kg) but above the Waikato cleanfill criteria (175 mg/kg) and the Waikato background concentration (53 mg/kg);
- The concentration of arsenic detected in sample DS02 (6 mg/kg) was below the NESCS SCS for rural residential/lifestyle land use, the Waikato cleanfill criteria and the Waikato background concentrations;
- The concentration of lead detected in sample LP01 (410 mg/kg) was above the NESCS SCS for rural residential/lifestyle land use (160 mg/kg), the Waikato cleanfill criteria (78 mg/kg) and the Waikato background concentration (20 mg/kg);

- The concentration of lead detected in sample LP02 (97 mg/kg) was below the NESCS SCS for rural residential/lifestyle land use (160 mg/kg), but above the Waikato cleanfill criteria (78 mg/kg) and the Waikato background concentration (20 mg/kg);
- The concentrations of lead detected in sample LP03 (62 mg/kg) was below the NESCS SCS for rural residential/lifestyle land use (160 mg/kg) and the Waikato cleanfill criteria (78 mg/kg), but above the Waikato background concentration (20 mg/kg); and
- The concentrations of organochlorine pesticides (OCPs) detected in sample DS01 were all below the analytical limits of reporting (LOR) and therefore are below the cleanfill criteria.

4.6 Discussion

- We understand that the Client’s representatives have held informal discussion with MPDC regarding the HAIL status of the Site. MPDC has confirmed that the only areas of the Site considered to be a ‘piece of land’ in accordance with the NESCS are the soils beneath the tyre stockpile (sample location DS01) and around the residential dwelling (LP01). Although the application of superphosphate has occurred across the Site which has resulted in cadmium concentrations above typical background levels, we understand that MPDC does not consider these areas of the Site to be subject to the NESCS;
- As part of the proposed development, it is recommended that soils beneath the tyre stockpile (sample location DS01) and around the residential dwelling (LP01) (together, the “piece of land”) are excavated and disposed of off-site to a suitably licensed facility. Specifically, soil should be excavated to a minimum of 0.2 m bgl, and it is recommended that the soils are excavated to approximately 1 m out from the north and west sides of the dwelling (see Figure 1). No TCLP analysis of contaminant concentrations in soil has been undertaken as part of this limited soil investigation. The receiving facility may require TCLP analysis of soils prior to confirming acceptance of soils. This should be confirmed with the receiving facility prior to transport;
- In accordance with regulation 8(3) of the NESCS, ‘the volume of the disturbance of the soil of the piece of land must be no more than 25m³ per 500m²’ and ‘a maximum of 5 m³ per 500 m² of soil may be taken away per year’.
 - It is estimated that the required soil removal from the areas of sample locations DS01 and LP01 (“piece of land”) equate to approximately 275 m². It will be necessary to cut down to a depth of approximately 0.2 metres below ground level (m bgl) and therefore the estimated total volume of soil requiring removal from Site is approximately 55 m³;
 - Based on the area of the piece of land being approximately 275 m², the maximum permitted soil disturbance at the Site under the NESCS is 13.75 m³ and the maximum permitted soil disposal is 2.75 m³;
- As the NESCS Permitted Activity volumes are not likely to be met, a Restricted Discretionary consent under Regulation 10 of the NESCS will be required for the proposed soil disturbance associated with the removal of the contaminated soils;
- In accordance with Regulation 10 of the NESCS, following remediation, validation samples will need to be collected from the base and side walls of the excavated areas at a frequency sufficient to meet the requirements of the Contaminated Land Management Guidelines No.5 (MfE, 2011);
- The soils removal works can be undertaken as a Permitted Activity under Rule 5.3.4.6 of the Waikato Regional Plan – Land and Soil Module if the permitted activity conditions are met. This rule relates to discharges from the remediation of contaminated land. On the basis that discharges are not anticipated as part of the limited soil removal process (to either air, land, or water), a Contaminated Site Management Plan (CSMP) is considered adequate to address the requirements of this rule. A Site Validation Report is required to meet the permitted activity requirements in Rule 5.3.4.6. Based on the limited extent of contaminants in soil, it is recommended that a brief site validation report is prepared to demonstrate to WRC that contaminants have been removed and disposed from the site in an appropriate manner;
 - A Contaminated Site Management Plan (CSMP) prepared by a suitably qualified and experienced practitioner (SQEP) should be completed in order to set out to set out extent of remediation required, the safe handling and disposal procedures of the arsenic and lead contaminated soil materials and to manage the potential risk to human health and the environment;

- Following remediation works, a Site Validation Report (SVR) will need to be prepared by a SQEP which details at a minimum; the volumes of soil removed, validation sampling results, copies of weighbridge/disposal dockets, records of any unexpected/accidental discovery of further contamination, and a summary of any additional sampling that has been undertaken in accordance with the CLMG No. 5.
- A copy of the CSMP, SVR, and this PSI report should be provided to WRC to meet the requirements of Rule 5.3.4.6.
- Except for soils within the area of sample location DS01 and LP01 (“piece of land”), the Site soils are suitable to remain on-site and if removed from Site they can be disposed of as cleanfill material, however, this should be confirmed with the disposal facility prior to removal from the Site; and
- Tyres from the vicinity of DS01 should also be appropriately disposed of off-site to a suitably licensed facility (preferably one which re-uses, repurposes or recycles the tyres).

Table 4: Summary of Heavy Metals, OCPs, and pH Analysis

Summary of Heavy Metals and Asbestos in Soil Samples																						Guideline Criteria							
Sample Name	Comp01-A	Comp01-B	Comp01-C	Comp01-D	Comp02-A	Comp02-B	Comp02-C	Comp02-D	Comp03-A	Comp03-B	Comp03-C	Comp03-D	Comp04-A	Comp04-B	Comp04-C	Comp04-D	Ref01	LP01	LP02	LP03	DS01	DS02	NESCS SCS - Rural / Residential ¹	NESCS SCS - Commercial / Industrial Outdoor ²	Waikato Natural Background Concentrations ⁴	Waikato Cleanfill Criteria ⁵			
Composite or Individual Sample	Individual					Individual	Individual	Individual																					
Soil Type	Topsoil					Topsoil	Topsoil	Topsoil																					
Sample Date	25-Jun-19					25-Jun-19	25-Jun-19	25-Jun-19																					
Sample Depth (m bgl)	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1				
Lab Number	2199339.8	2199339.9	2199339.1	2199339.11	2199339.12	2199339.13	2199339.14	2199339.15	2199339.16	2199339.17	2199339.18	2199339.19	2199339.2	2199339.21	2199339.22	2199339.23													
Arsenic	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100	6	17	70	6.8	20		
Cadmium	0.64	0.68	0.89	0.72	0.76	0.84	0.96	0.78	0.38	0.6	0.65	0.51	0.48	0.63	0.77	0.9	0.25	-	-	-	-	0.61	0.63	0.8	1,300	0.22	1		
Chromium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	-	290	6,300	30	56		
Copper	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	26	26	>10,000	>10,000	25	120		
Lead	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	410	97	62	49	25	160	3,300	20	78		
Nickel	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	400 ²	6000 ²	7.6	33		
Zinc	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	178	-	7400 ³	400000 ²	53	175		
pH	6.6	6.4	6.5	6.8	6.1	6.3	6.2	6.5	6.4	6.5	6.2	7	6.2	6.3	6.1	6.2	5.9	-	-	-	-	-	-	-	-	-	-		
Total DDT Isomers	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.08	45	1,000		
Dieldrin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.014	1.1	160		
All other OCPs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	BDL	-	BDL		

All results and criteria are expressed in mg/kg dry weight.
Any results exceeding adopted criteria are shaded accordingly.

- BDL = Below Laboratory Detection Limits
- 1: National Environmental Standards for Managing and Assessing Contaminants in Soil to Protect Human Health' - Soil Contaminant Standards (SCS), (MfE, 2012) for Rural / Residential land use. Exceedances are in yellow.
- 2: Guideline values derived in accordance with the Contaminated Land Management Guidelines number 2 – Hierarchy and Application in New Zealand of Environmental Guideline Values (MfE, 2011), and taken from Schedule B(1) of the National Environment Protection (Assessment of Site Contamination) Measure 1999 for Residential A (yellow) and commercial / industrial D (blue).
- 3: National Environmental Standards for Managing and Assessing Contaminants in Soil to Protect Human Health' - Soil Contaminant Standards (SCS), (MfE, 2012) for Commercial / Industrial land use. Exceedances are in blue.
- 4: Waikato Background Concentrations for heavy metals (95% upper limit) as presented on the WRC website. Exceedances in orange.
- 5: Typical Cleanfill Criteria for the Waikato Region. Exceedances in green.

5 CONCEPTUAL SITE MODEL

A conceptual site model (CSM) (Table 5) provides a detailed description of the identified potential sources, pathways and receptors, and a qualitative assessment of complete or potentially complete source-pathway-receptor (SPR) linkages. A risk is only present if there is a complete SPR linkage. The CSM detailed in Table 5 is not intended to be an exhaustive assessment of all potential SPR linkages. The CSM has been developed based on available information, any omissions are not indicative of no risk.

Table 5: Tabulated Conceptual Site Model

Source	Pathway	Receptor	Human Health & Environmental	Discussion	SPR Linkage
Heavy metals in Soils	Direct contact, inhalation and/or ingestion	Maintenance / excavation Workers	Human Health	<p>The concentration of arsenic detected in sample DS01 and the concentration of lead detected in sample LP01 were at levels above the NESCS SCS for rural residential/lifestyle land use scenario, which has conservatively been adopted as the assessment guideline criteria for the proposed future use of the Site.</p> <p>Sample DS01 was a field composite collected from the soils beneath a tyre stockpile and therefore the extent of this contamination is likely to be restricted to the area of the stockpile.</p> <p>Sample LP01 was taken from the soils surrounding the residential dwelling on its northern side and the source of the lead is likely attributed to lead-based paint from maintenance work having been undertaken on the dwelling.</p> <p>When taking the size of the Site into consideration, the areas requiring removal of contaminated soils are not considered significant. However, the soils beneath the tyre stockpile (DS01) and the soils surrounding the dwelling (LP01) will require removal to a suitably licenced landfill facility.</p>	<p>Complete</p> <p>The concentration of arsenic detected in sample DS01 (100 mg/kg) was above the NESCS commercial / industrial outdoor worker (unpaved) (70 mg/kg).</p>
		Site users		<p>Complete</p> <p>The concentration of arsenic detected in sample DS01 (100 mg/kg) and the concentration of lead (410 mg/kg) detected in sample LP01 exceed their respective NESCS assessment criteria's (17 mg/kg and 160 mg/kg, respectively) for the proposed site use (rural residential/lifestyle land use).</p>	
	Leaching to groundwater and/or river	Groundwater / River	Environmental	<p>No assessment of groundwater or leachable concentration of heavy metals has been undertaken (by Toxicity Characteristic Leaching Procedure (TCLP)).</p> <p>The closest surface water body is an unnamed tributary that extends across the northern portion of the Site in a south-west to north-east direction. The location of the stream is approximately 330 m to the north of the tyre stockpile.</p>	<p>Highly Unlikely</p> <p>While it is possible that site-sourced contaminants could leach to groundwater at the Site, the presence of contamination in soil is restricted to a relatively small area of the site, and the closest surface water body, excluding the effluent ponds, is approximately 330 m to the north of the tyre stockpile.</p> <p>Excluding samples DS01 and LP01, where contaminants are present in soil outside of typical background ranges, it is typically marginally so. Contaminants reported above background ranges (in particular arsenic and lead sourced from lead-based</p>

Source	Pathway	Receptor	Human Health & Environmental	Discussion	SPR Linkage
					paints) are generally immobile in surface soils. Therefore, contaminant leaching and remobilisation due to surface infiltration is unlikely to occur at concentrations considered likely to pose a risk.
Organochlorine Pesticides in Soils	Direct contact, inhalation and/or ingestion	Maintenance / excavation Workers	Human Health	Concentrations of OCPs were below the assessment criteria for the protection of human health for rural residential/lifestyle land use.	<p style="text-align: center;">Incomplete</p> The concentrations of OCPs detected in soil sample DS02 do not exceed the NESCS assessment criteria for rural residential/lifestyle land use.
		Site users			
	Leaching to groundwater and/or river	Groundwater / River	Environmental	No groundwater / surface water monitoring has been undertaken as part of these works. However, low concentrations in soil while not indicative of no risk to groundwater would indicate that the likelihood or risk to groundwater / surface water is low.	<p style="text-align: center;">Highly Unlikely</p> The concentrations of OCPs detected in soil sample DS02 were below the analytical detection limits and therefore are not considered to be at concentrations that would pose a leachable risk to groundwater / nearby surface water bodies.

6 CONCLUSIONS

4Sight has been engaged by Lockerbie Estate (the client) to undertake a PSI with limited soil sampling at 162 Studholme Street, Morrinsville (the Site) to assess potential implications for the proposed subdivision, change of land use and soil disturbance under the NESCS.

We understand that the future use for the Site is residential development, as a conservative approach, the soil sampling results have been compared against the NESCS SCS guideline values for rural residential / lifestyle block 25% produce.

The key findings of this PSI are as follows:

- Historical aerial photography has shown that the Site is likely to have been impacted by the application of fertilisers associated with potential agricultural activities. Therefore, there was evidence to suggest that an activity listed in the HAIL has been, or is more likely than not to have been, undertaken on the Site;
- In addition, the WRC LUIR confirmed that the Site *'does appear on the Land Information Register'* with a classification of 'Unverified HAIL' due to past land use for HAIL activity 'A8. Livestock dip or spray race operations' associated with a Potential Sheep Dip on O Taukoro Road, Morrinsville;
- Furthermore, aerial photographs indicated that former site structures have occupied the Site at various times. However, these structures or indicators of these structures, such as foundations or building debris, were not identified during the Site inspection;
- Soil sampling indicated that the Site soils have been slightly impacted by the application of superphosphate. However, the concentrations of cadmium detected in all samples analysed were below the adjusted NESCS guideline value for rural residential/lifestyle land use and the Waikato cleanfill criteria, but were above the Waikato background concentrations (95% upper limit);
- The concentration of arsenic detected in field composite sample DS01 (100 mg/kg), collected from the soils beneath a stockpile of disused tyre's, was above the NESCS SCS for rural residential/lifestyle land use (17 mg/kg), the NESCS SCS for commercial / industrial outdoor worker (70 mg/kg), the Waikato cleanfill criteria (20 mg/kg) and the Waikato background concentration (6.8 mg/kg);
- The concentration of lead detected in sample LP01 (410 mg/kg), collected from the soils surrounding the residential dwelling, was above the NESCS SCS for rural residential/lifestyle land use (160 mg/kg), the Waikato cleanfill criteria (78 mg/kg) and the Waikato background concentration (20 mg/kg);
- The concentrations of organochlorine pesticides (OCPs) detected in sample DS01, collected from the area of potential sheep dip/spray race operations, were all below the analytical limits of reporting (LOR) and therefore are below the cleanfill criteria;
- During the Site inspection and soil sampling, no visual or olfactory evidence of contamination was identified on the Site; and
- Based on the results of this PSI and limited soil sampling, it is considered highly unlikely that the Site poses a risk to human health or the environment in light of the proposed development.

Based on the findings of this investigation the following recommendations have been made:

- As part of the proposed development, it is recommended soils from the vicinity of DS01 and LP01 ("piece of land") are excavated and disposed of off-site to a suitably licensed facility. That is, the soils to approximately 1 m out from the dwelling will be require removal (see Figure 1);
 - No TCLP analysis of contaminant concentrations in soil has been undertaken as part of this limited soil investigation. The receiving facility may require TCLP analysis of soils prior to confirming acceptance of soils. This should be confirmed with the receiving facility prior to transport;
- In accordance with regulation 8(3) of the NESCS, 'the volume of the disturbance of the soil of the piece of land must be no more than 25m³ per 500m²' and 'a maximum of 5 m³ per 500 m² of soil may be taken away per year'.
 - It is estimated that the required soil removal from the areas of sample locations DS01 and LP01 ("piece of land") equate to approximately 275 m². It will be necessary to cut down to a depth of approximately 0.2

metres below ground level (m bgl) and therefore the estimated total volume of soil requiring removal from Site is approximately 55 m³(see Figure 2);

- Based on the area of the piece of land being approximately 275 m², the maximum permitted soil disturbance within the piece of land under the NESCS is 13.75 m³ and the maximum permitted soil disposal is 2.75 m³;
- As the NESCS Permitted Activity volumes are not likely to be met, a Restricted Discretionary consent under Regulation 10 of the NESCS will be required for the proposed soil disturbance associated with the removal of the contaminated soils;
- In accordance with Regulation 10 of the NESCS, following remediation, validation samples will need to be collected from the base and side walls of the excavated areas at a frequency sufficient to meet the requirements of the Contaminated Land Management Guidelines No.5 (MfE, 2011);
- Following remediation works, a Site Validation Report (SVR) will need to be prepared by a SQEP which details at a minimum; the volumes of soil removed, validation sampling results, copies of weighbridge/disposal docket, records of any unexpected/accidental discovery of further contamination, and a summary of any additional sampling that has been undertaken in accordance with the CLMG No. 5;
- The soils removal works can also be undertaken as a Permitted Activity if the requirements under Rule 5.3.4.6 of the Waikato Regional Plan – Land and Soil Module are met, that is, a Contaminated Site Management Plan (CSMP) and a SVR will be required for the Site;
 - A CSMP prepared by a suitably qualified and experienced practitioner (SQEP) should be completed in order to set out safe handling and disposal procedures of the arsenic and lead contaminated soil materials and to manage the potential risk to human health and the environment;
 - A copy of the CSMP, SVR, and this PSI report should be provided to WRC to meet the requirements of Rule 5.3.4.6; and
- Except for soils within the area of sample location DS01 and LP01 (“piece of land”), the Site soils are suitable to remain on-site and if removed from Site they can be disposed of as cleanfill material, however, this should be confirmed with the disposal facility prior to removal from the Site.

This investigation and associated reporting has been carried out and reviewed by a SQEP in accordance with the requirements of the NESCS.

REFERENCES

- Environmental Protection Agency [EPA]. (2011). *Hazardous Substance Incidents Reports*. Retrieved from <http://www.epa.govt.nz/about-us/monitoring/Pages/HS-incident-reports-archive.aspx>, accessed July 2019.
- Environment Waikato Technical Report No.2009/02 (2009): *Erosion & Sediment Control Guidelines for Soil Disturbing Activities*.
- Geological and Nuclear Sciences [GNS]. (2018). *New Zealand Geology Web Map*. Retrieved from <http://data.gns.cri.nz/geology/>, May 2019.
- Google Earth (2019).
- Retrolens (2019). Retrieved from <http://retrolens.nz> and licensed by LINZ CC-BY 3.0, accessed July 2019.
- Ministry for the Environment, 2001. *Contaminated land management guidelines No. 1: Reporting on contaminated sites in New Zealand (revised 2011)*. Ministry for the Environment, Wellington, New Zealand.
- Ministry for the Environment, 2004. *Contaminated land management guidelines No. 5: Site investigation and analysis of soils (revised 2011)*. Ministry for the Environment, Wellington, New Zealand.
- Ministry for the Environment. 2011. *Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011*. Ministry for the Environment, Wellington, New Zealand.
- Ministry for the Environment. 2011. *Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health*. Ministry for the Environment, Wellington, New Zealand.
- Waikato Regional Council [WRC]. (2016). *Natural Background Concentrations in the Waikato Region*. Retrieved from <http://www.waikatoregion.govt.nz/Services/Regional-services/Waste-hazardous-substances-and-contaminated-sites/Contaminated-sites/Natural-background-concentrations/>, accessed July 2019.
- Waikato Regional Council [WRC]. (2018). *Requests for Official Information*. Retrieved from <http://www.waikatoregion.govt.nz/Council/About-us/Requests-for-official-information/>, accessed July 2019.

LIMITATIONS

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From a technical perspective, the subsurface environment at any site may present substantial uncertainty. It is a heterogeneous, complex environment, in which small subsurface features or changes in geologic conditions can have substantial impacts on water, vapour and chemical movement. 4Sight Consulting's professional opinions are based on its professional judgement, experience, and training. These opinions are also based upon data derived from the testing and analysis described in this document. It is possible that additional testing and analysis might produce different results and/or different opinions. This document was prepared based on information provided by others. Should additional information become available, this report should be updated accordingly.



Appendix A:

Site Contour Plan



Legend

— River

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Site Contour Plan



Date: 26/06/2019



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Appendix B:

Historical Aerial Photographs

 Approximate Site Boundary



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Scale 1:10,000 @ A4



AA4624 - 162 Studholme Street - PSI

Aerial Photograph of the Site Taken in 1941

Figure prepared for Lockerbie Estate Ltd by 4Sight Consulting.

Date: 03/07/2019

Version: 1.0

Drawn: Sam Hendrikse

Checked: Andrew Barr

Approved: Nigel Mather



Approximate Site Boundary

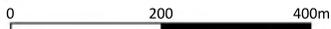


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AA4624 - 162 Studholme Street - PSI

Aerial Photograph of the Site Taken in 1966

Figure prepared for Lockerbie Estate Ltd by 4Sight Consulting.

Date: 03/07/2019

Version: 1.0

Drawn: Sam Hendrikse

Checked: Andrew Barr

Approved: Nigel Mather

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Approximate Site Boundary

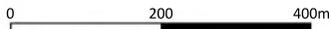


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AA4624 - 162 Studholme Street - PSI

Aerial Photograph of the Site Taken in 1979

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Date: 03/07/2019

Version: 1.0

Drawn: Sam Hendrikse

Checked: Andrew Barr

Approved: Nigel Mather

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Approximate Site Boundary

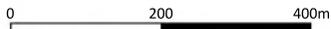


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AA4624 - 162 Studholme Street - PSI

Aerial Photograph of the Site Taken in 1982

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Date: 03/07/2019

Version: 1.0

Drawn: Sam Hendrikse

Checked: Andrew Barr

Approved: Nigel Mather

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Approximate Site Boundary

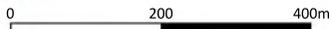


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Aerial Photograph of the Site Taken in 1990

Figure prepared for Lockerbie Estate Ltd by 4Sight Consulting.

Date: 03/07/2019

Version: 1.0

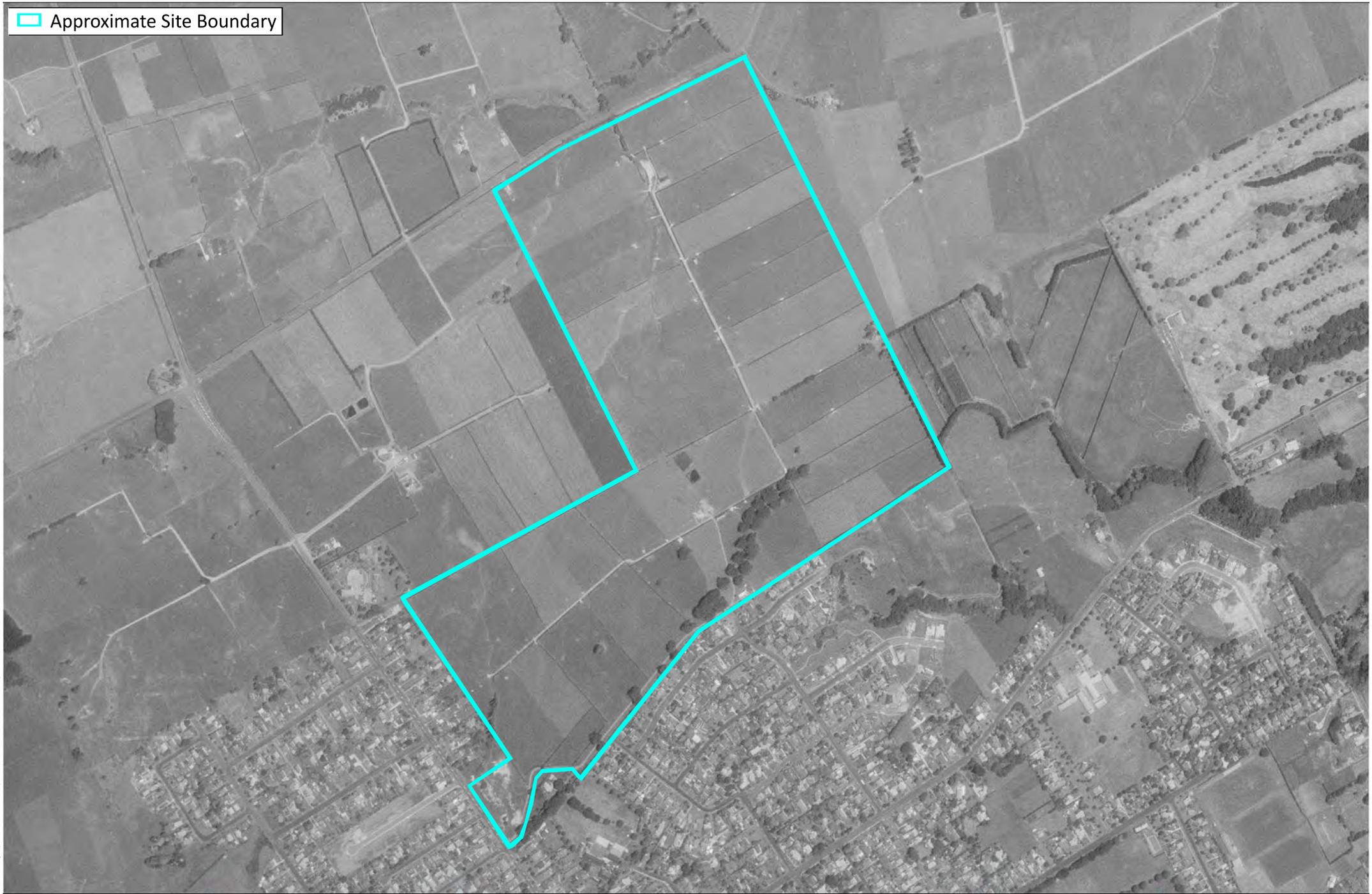
Drawn: Sam Hendrikse

Checked: Andrew Barr

Approved: Nigel Mather

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Approximate Site Boundary



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AA4624 - 162 Studholme Street - PSI

Aerial Photograph of the Site Taken in 1995

Figure prepared for Lockerbie Estate Ltd by 4Sight Consulting.

Date: 03/07/2019

Version: 1.0

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Checked: Andrew Barr

Approved: Nigel Mather

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Approximate Site Boundary

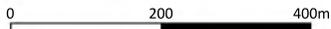


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AA4624 - 162 Studholme Street - PSI

Satellite Photograph of the Site Taken in 2008

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Date: 03/07/2019

Version: 1.0

Drawn: Sam Hendrikse

Checked: Andrew Barr

Approved: Nigel Mather

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Approximate Site Boundary

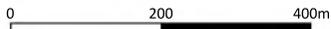


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AA4624 - 162 Studholme Street - PSI

Satellite Photograph of the Site Taken in 2011

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Date: 03/07/2019

Version: 1.0

Drawn: Sam Hendrikse

Checked: Andrew Barr

Approved: Nigel Mather

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Approximate Site Boundary

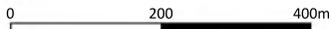


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AA4624 - 162 Studholme Street - PSI

Satellite Photograph of the Site Taken in 2016

Figure prepared for Lockerbie Estate Ltd by 4Sight Consulting.

Date: 03/07/2019

Version: 1.0

Drawn: Sam Hendrikse

Checked: Andrew Barr

Approved: Nigel Mather



Approximate Site Boundary

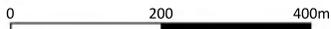


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Scale 1:10,000 @ A4



AA4624 - 162 Studholme Street - PSI

Satellite Photograph of the Site Taken in 2017

Figure prepared for Lockerbie Estate Ltd by 4Sight Consulting.

Date: 03/07/2019

Version: 1.0

Drawn: Sam Hendrikse

Checked: Andrew Barr

Approved: Nigel Mather

4SIGHT
CONSULTING



Appendix C:

Land Use Information Register

Andrew Barr

From: Caitlin Holm <Caitlin.Holm@waikatoregion.govt.nz>
Sent: Tuesday, 18 June 2019 9:38 AM
To: Andrew Barr
Subject: RE Land Use Information Register enquiry 162 Studholme Street & 0 Taukoro Road, Morrinsville (REQ150850) LUI11446

Dear Andrew,

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

- **162 Studholme Street, Morrinsville:** Lot 2 DP 463166 (VRN 05305/241/05) & **0 Taukoro Road, RD5, Morrinsville:** Lot 1 DP 24498 (VRN 05305/240/00)



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

This property:

- I can confirm that one of your sites of interest **does** appear on the Land Use Information Register, as indicated by the **blue point** on the map below.



The blue point above (LUI11446) appears on the Land Use Information Register with a classification of 'Unverified HAIL' due to past land use for HAIL activity 'A8. Livestock dip or spray race operations' associated with a Potential Sheep Dip on 0 Taukoro Road, Morrinsville.

This site is included on the register for land use information only; we do not hold soil investigation reports regarding the presence or otherwise of hazardous substances in the soil.

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

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

Additional Information: Please note that:

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

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

Regards,
Caitlin Holm

Caitlin Holm Student | Geothermal & Air, Land Ecology & Contamination, Science and Stra
WAIKATO REGIONAL COUNCIL | Te Kaunihera ā Rohe o Waikato
 Take a look at the work we do
 P: +6479497129
 F: facebook.com/waikatoregion
 Private Bag 3038, Waikato Mail Centre, Hamilton, 3240, New Zealand

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Appendix D:

Site Inspection Photographs

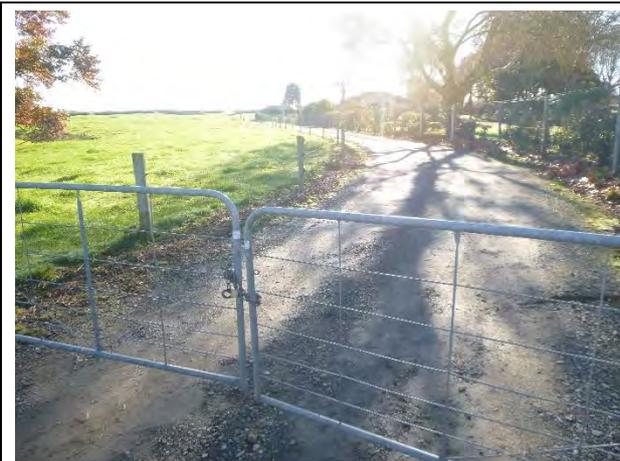


Photo 1: Entrance to the Site from Morrinsville-Tahuna Road.



Photo 2: Southern corner of the Site – Looking north-west. Morrinsville-Tahuna Road can be seen in the left side of the photograph.



Photo 3: Gravel driveway leading into the Site.



Photo 4: Western side of the residential dwelling.



Photo 5: Northern side of the residential dwelling.



Photo 6: Soffits on the dwelling were constructed of timber.



Photo 7: Insulation material beneath the dwelling.



Photo 8: Eastern side of the dwelling.



Photo 9: Paint flaking off the timber cladding on the dwelling.



Photo 10: Metal garage.



Photo 11: Timber storage for firewood.



Photo 12: Wood chip stockpile.



Photo 13: Gravel/gap material on top of wood chip stockpile.



Photo 14: Metal farm shed.



Photo 15: Inside metal farm shed.



Photo 16: Extension off farm shed used to store timber, PVC pipes and farm fencing.



Photo 17: Water tank situated on the southern side of the milking shed.



Photo 18: Inside the milking shed.



Photo 19: Tank stored inside the milking shed.



Photo 20: Fuse box situated on the inside wall of the milking shed.



Photo 21: Milking parlour.



Photo 22: Feed pad.



Photo 23: Metal shelter 1.



Photo 24: Inside metal shelter 1.



Photo 25: Gravel stockpile.



Photo 26: Close up of gravel stockpile.



Photo 27: Close up of gravel stockpile.



Photo 28: Typical concrete trough.



Photo 29: Stockpile of used car tyres.



Photo 30: Feed stockpile.



Photo 31: Water tank.



Photo 32: Metal shed.



Photo 33: Inside metal shed.



Photo 34: Location of composite soil sample Comp01-A.



Photo 35: Location of composite soil sample Comp01-B.



Photo 36: Location of composite soil sample Comp01-C.



Photo 37: Location of composite soil sample Comp01-D.



Photo 38: Typical concrete trough.



Photo 39: Typical concrete trough.



Photo 40: Typical concrete trough.



Photo 41: Typical concrete trough.



Photo 42: Location of composite soil sample Comp03-A.



Photo 43: Metal shelter 2.



Photo 44: Area of potential sheep dip.



Photo 45: Former driveway.



Photo 46: Area of former dwelling.



Photo 47: Typical topsoil profile within the area of the former dwelling.



Photo 48: Mound of soil.



Photo 49: Clay stockpile.



Photo 50: Clay stockpile.



Appendix E:

Laboratory Results



Certificate of Analysis

Client: 4SIGHT Consulting Limited Contact: Andrew Barr C/- 4SIGHT Consulting Limited PO Box 911310 Victoria Street West Auckland 1142	Lab No: 2199339 Date Received: 27-Jun-2019 Date Reported: 02-Jul-2019 Quote No: 82451 Order No: AA4624 Client Reference: Studholme Street Submitted By: Andrew Barr	SPV1
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Sample Type: Soil

Sample Name:	DS01 25-Jun-2019	DS02 25-Jun-2019	LP01 25-Jun-2019	LP02 25-Jun-2019	LP03 25-Jun-2019
Lab Number:	2199339.1	2199339.2	2199339.3	2199339.4	2199339.5

Individual Tests

Dry Matter	g/100g as rcvd	-	73	-	-	-
Total Recoverable Arsenic	mg/kg dry wt	-	6	-	-	-
Total Recoverable Cadmium	mg/kg dry wt	-	0.63	-	-	-
Total Recoverable Copper	mg/kg dry wt	-	26	-	-	-
Total Recoverable Lead	mg/kg dry wt	-	25	410	97	62

Heavy Metals, Screen Level

Total Recoverable Arsenic	mg/kg dry wt	100	-	-	-	-
Total Recoverable Cadmium	mg/kg dry wt	0.61	-	-	-	-
Total Recoverable Chromium	mg/kg dry wt	8	-	-	-	-
Total Recoverable Copper	mg/kg dry wt	26	-	-	-	-
Total Recoverable Lead	mg/kg dry wt	49	-	-	-	-
Total Recoverable Nickel	mg/kg dry wt	4	-	-	-	-
Total Recoverable Zinc	mg/kg dry wt	178	-	-	-	-

Organochlorine Pesticides Screening in Soil

Aldrin	mg/kg dry wt	-	< 0.014	-	-	-
alpha-BHC	mg/kg dry wt	-	< 0.014	-	-	-
beta-BHC	mg/kg dry wt	-	< 0.014	-	-	-
delta-BHC	mg/kg dry wt	-	< 0.014	-	-	-
gamma-BHC (Lindane)	mg/kg dry wt	-	< 0.014	-	-	-
cis-Chlordane	mg/kg dry wt	-	< 0.014	-	-	-
trans-Chlordane	mg/kg dry wt	-	< 0.014	-	-	-
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	-	< 0.04	-	-	-
2,4'-DDD	mg/kg dry wt	-	< 0.014	-	-	-
4,4'-DDD	mg/kg dry wt	-	< 0.014	-	-	-
2,4'-DDE	mg/kg dry wt	-	< 0.014	-	-	-
4,4'-DDE	mg/kg dry wt	-	< 0.014	-	-	-
2,4'-DDT	mg/kg dry wt	-	< 0.014	-	-	-
4,4'-DDT	mg/kg dry wt	-	< 0.014	-	-	-
Total DDT Isomers	mg/kg dry wt	-	< 0.08	-	-	-
Dieldrin	mg/kg dry wt	-	< 0.014	-	-	-
Endosulfan I	mg/kg dry wt	-	< 0.014	-	-	-
Endosulfan II	mg/kg dry wt	-	< 0.014	-	-	-
Endosulfan sulphate	mg/kg dry wt	-	< 0.014	-	-	-
Endrin	mg/kg dry wt	-	< 0.014	-	-	-
Endrin aldehyde	mg/kg dry wt	-	< 0.014	-	-	-
Endrin ketone	mg/kg dry wt	-	< 0.014	-	-	-
Heptachlor	mg/kg dry wt	-	< 0.014	-	-	-



Sample Type: Soil					
Sample Name:	DS01 25-Jun-2019	DS02 25-Jun-2019	LP01 25-Jun-2019	LP02 25-Jun-2019	LP03 25-Jun-2019
Lab Number:	2199339.1	2199339.2	2199339.3	2199339.4	2199339.5
Organochlorine Pesticides Screening in Soil					
Heptachlor epoxide	mg/kg dry wt	-	< 0.014	-	-
Hexachlorobenzene	mg/kg dry wt	-	< 0.014	-	-
Methoxychlor	mg/kg dry wt	-	< 0.014	-	-
Sample Name:	COMP01 A 25-Jun-2019	COMP01 B 25-Jun-2019	COMP01 C 25-Jun-2019	COMP01 D 25-Jun-2019	COMP02 A 25-Jun-2019
Lab Number:	2199339.8	2199339.9	2199339.10	2199339.11	2199339.12
Individual Tests					
Total Recoverable Cadmium	mg/kg dry wt	0.64	0.68	0.89	0.72
pH*	pH Units	6.6	6.4	6.5	6.8
Sample Name:	COMP02 B 25-Jun-2019	COMP02 C 25-Jun-2019	COMP02 D 25-Jun-2019	COMP03 A 25-Jun-2019	COMP03 B 25-Jun-2019
Lab Number:	2199339.13	2199339.14	2199339.15	2199339.16	2199339.17
Individual Tests					
Total Recoverable Cadmium	mg/kg dry wt	0.84	0.96	0.78	0.38
pH*	pH Units	6.3	6.2	6.5	6.4
Sample Name:	COMP03 C 25-Jun-2019	COMP03 D 25-Jun-2019	COMP04 A 25-Jun-2019	COMP04 B 25-Jun-2019	COMP04 C 25-Jun-2019
Lab Number:	2199339.18	2199339.19	2199339.20	2199339.21	2199339.22
Individual Tests					
Total Recoverable Cadmium	mg/kg dry wt	0.65	0.51	0.48	0.63
pH*	pH Units	6.2	7.0	6.2	6.3
Sample Name:	COMP04 D 25-Jun-2019	Ref01 25-Jun-2019			
Lab Number:	2199339.23	2199339.24			
Individual Tests					
Total Recoverable Cadmium	mg/kg dry wt	0.90	0.25	-	-
pH*	pH Units	6.2	5.9	-	-

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 clean 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. 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%.	-	1-5, 8-24
Environmental Solids Sample Preparation	Air dried at 35°C and sieved, <2mm fraction. Used for sample preparation. May contain a residual moisture content of 2-5%.	-	2-5, 8-24
Soil Prep Dry & Sieve for Agriculture	Air dried at 35°C and sieved, <2mm fraction.	-	8-24
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
Organochlorine Pesticides Screening in Soil	Sonication extraction, SPE cleanup, dual column GC-ECD analysis (modified US EPA 8082). Tested on as received sample	0.010 - 0.06 mg/kg dry wt	2
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
Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	2-5, 8-24
Total Recoverable Arsenic	Dried sample, sieved as specified (if required). Nitric/Hydrochloric acid digestion, ICP-MS, screen level. US EPA 200.2.	2 mg/kg dry wt	2
Total Recoverable Cadmium	Dried sample, sieved as specified (if required). Nitric/Hydrochloric acid digestion, ICP-MS, screen level. US EPA 200.2.	0.10 mg/kg dry wt	2, 8-24

Sample Type: Soil			
Test	Method Description	Default Detection Limit	Sample No
Total Recoverable Copper	Dried sample, sieved as specified (if required). Nitric/Hydrochloric acid digestion, ICP-MS, screen level. US EPA 200.2.	2 mg/kg dry wt	2
Total Recoverable Lead	Dried sample, sieved as specified (if required). Nitric/Hydrochloric acid digestion, ICP-MS, screen level. US EPA 200.2.	0.4 mg/kg dry wt	2-5
pH*	1:2 (v/v) soil : water slurry followed by potentiometric determination of pH.	0.1 pH Units	8-24

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

Samples are held at the laboratory after reporting for a length of time depending on the preservation used and the stability of the analytes being tested. Once the storage period is completed the samples are discarded unless otherwise advised by the client.

This certificate of analysis must not be reproduced, except in full, without the written consent of the signatory.

Kim Harrison MSc
Client Services Manager - Environmental

CONTAMINATED SITE MANAGEMENT PLAN – 162 Studholme Street, Morrinsville

1 INTRODUCTION

1.1 Purpose of this Contaminated Site Management Plan

4Sight Consulting Ltd (4Sight) has been engaged by Lockerbie Estate Limited (the Client) to develop a Contaminated Site Management Plan (CSMP) to support the future residential development of 162 Studholme Street, Morrinsville (“the Site”). The areas of the Site subject to this CSMP are shown in red in Figure 1.

This CSMP should be read in conjunction with the PSI report titled ‘Preliminary Site Investigation, 162 Studholme Street, Morrinsville’ (August, 2019).

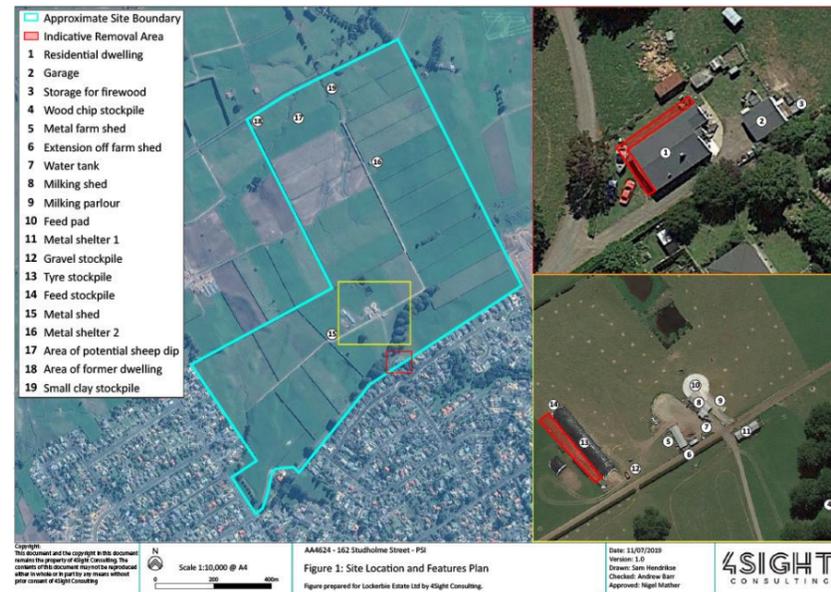


Figure 1: Site Location Plan

Due to elevated concentrations of arsenic detected in the soils beneath a tyre stockpile and lead detected in the surface soils surrounding the dwelling, the soils in these areas, as shown in red in Figure 1, require excavation and disposal to a suitably licenced fill facility.

This CSMP sets out site management procedures and health and safety controls to manage the potential risks to the environment and construction workers during soil disturbance works within these areas, and from the potential discovery of previously unidentified contaminated soils. It also serves as a management plan in regard to the Ministry for the Environment (MfE) National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health 2011 (NESCS).

This CSMP is a ‘live document’ and should be updated based on Site condition changes, development plan changes, or when remediation/management of soils is required.

1.2 Site History

4Sight conducted a PSI at the Site in August 2019 and the key findings of it are as follows. The Waikato Regional Council identified a potential sheep dip on the site, an activity which is classified on the Ministry for the Environment (MfE) Hazardous Activities and Industries List (HAIL) as ‘A8. Livestock dip or spray race operations’. Therefore, consideration to the National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health (NESCS) was required.

Soil sample results have shown that soils across the Site have been slightly impacted by the application of superphosphate. However, the concentrations of cadmium detected in all samples analysed were below the pH adjusted NESCS Soil Contaminant Standards (SCS) guideline value for rural residential/lifestyle land use. The cadmium concentrations above the Waikato cleanfill criteria(s) are expected to mix and blend during earthworks, given the size of the Site, thus diluting concentrations to below their respective cleanfill criteria(s) and therefore no further action is required.

Arsenic concentration in field composite sample DS01, collected from the soils beneath a stockpile of disused tyres, was above the NESCS SCS for rural residential/lifestyle land use, the NESCS SCS for commercial / industrial outdoor worker, the Waikato cleanfill criteria, and the Waikato background concentration.

Lead concentration in sample LP01, collected from the soils surrounding the residential dwelling, was above the NESCS SCS for rural residential/lifestyle land use, the Waikato cleanfill criteria, and the Waikato background concentration.

MPDC has confirmed that the only areas of the Site considered to be a ‘piece of land’ in accordance with the NESCS are the soils beneath the tyre stockpile (sample location DS01) and around the residential dwelling (LP01). Although the application of superphosphate has occurred across the Site, which has resulted in cadmium concentrations above typical background levels, we understand that MPDC does not consider these areas of the Site to be subject to the NESCS.

Due to the elevated concentrations of arsenic and lead detected, the soils in the areas shown in red in Figure 1 require disposal to a suitably licenced fill facility.

Except for soils within the area of sample locations DS01 and LP01 (shown in red in Figure 1), the Site soils are suitable to remain on-site and if removed from Site they can be disposed of as cleanfill material, however, this should be confirmed with the disposal facility prior to removal from the Site.

All soil materials on the Site are to be handled and disposed of in accordance with this CSMP. Tyres from the vicinity of DS01 should also be appropriately disposed of off-site to a suitably licensed facility (preferably one which re-uses, repurposes or recycles the tyres).

Based on the results of this PSI and limited soil sampling, it is considered highly unlikely that the Site poses a risk to human health or the environment in light of the proposed development, with the exception of soils within the area of sample location DS01 and LP01 (“piece of land”).

2 REMEDIAL ACTION PLAN

Soils across the piece of land should be excavated to a minimum depth of 0.2 meters below ground level (m bgl). Specifically, this includes all soil beneath the tyre stockpile, and soils within a 1.0 m radius of the dwelling.

Target remediation concentrations following soil removal are:

- Arsenic: 17 mg/kg.
- Lead: 160 mg/kg.

3 ENVIRONMENTAL MANAGEMENT PROCEDURES

3.1 Accidental Discovery and Management of Unexpected Contamination

The presence of discoloured soils, staining, odours, fibrous material (such as presumed asbestos containing material), and general refuse may indicate possible contamination and immediate steps need to be undertaken to address the situation as described in Table 1.

Table 1: Proposed contingency plan for unexpected discovery of contamination during construction

Event	Potential Impacts	Contingency Plan
Uncovering or disturbance of unexpected contamination – as evidenced by the following: <ul style="list-style-type: none"> ▪ Discoloured soils; ▪ Staining; ▪ Odours; ▪ General refuse; and ▪ Fibrous materials (asbestos). 	Discharges to the environment and risks to health and safety of workers	<p>Stop work in area of discovery. Area to be cordoned off until the material has been identified and decisions made on how to progress.</p> <p>Site Manager to be notified of any contaminated material identified.</p> <p>Site Manager to contact a Suitably Qualified and Experienced Person (SQEP) to assess the nature of the material.</p> <p>Work to re-commence only once advised by a SQEP.</p>

In addition to the procedures to be followed in the event of unexpected discovery of contamination, the following procedures also apply to all construction works.

3.2 Earthworks

Excavated material from the areas of heavy metal contamination (see Figure 1) will be loaded by the contractor directly onto trucks for off-site disposal. If immediate disposal is not possible, material will be temporarily stockpiled in accordance with procedures provided in Section 2.4. The following general procedures will be followed for earthworks:

- Trucks will be loaded as close to the Site as possible with dust suppression available to control dust release, where run-off and possible spills during loading can be controlled and contained;
- Each truck will have a tracking document signed on-site and collected at the receiving facility to track each load of material. Written approval shall be

CONTAMINATED SITE MANAGEMENT PLAN – 162 Studholme Street, Morrinsville

obtained by the contractor from the disposal destination prior to transportation. The contractor is responsible for obtaining this approval;

- Loads will be dampened and covered with close fitting tarpaulins to avoid dust emissions; and
- Good housekeeping of the worksite shall be maintained to avoid the spread of potentially contaminated material outside the Site, including tracking and spilling on roadways.

3.3 Disposal of Excavated Material

Any material excavated from the areas of heavy metal contamination will require disposal to a suitably licenced fill facility.

Stockpiling of contaminated or potentially contaminated soil shall be avoided where possible, however if immediate disposal is not possible, the material may be stockpiled on-site in accordance with Section 3.4 of this CSMP or may be segregated and stockpiled at the disposal facility pending analysis.

Suitable tracking documentation for all material taken off-site, including weighbridge tonnage, will be provided to the project manager for recording purposes and made available to Council upon request.

3.4 Stockpiling of Contaminated Soils

Stockpiling of material which is contaminated, or suspected to be contaminated, will be managed by the contractor as follows:

- The stockpiled material shall be placed on plastic sheeting or hardstand to prevent the potential contamination of underlying soil. If this is not practical, soil underlying stockpiles should also be removed;
- A bund will be constructed around the stockpile to minimise stormwater run-on and run-off;
- Stockpiles will be wetted and/or kept covered with plastic sheeting or a geotextile layer when material is not being added or removed to prevent erosion and dust generation; and
- Following stockpile removal, the underlying plastic will be properly disposed of at a suitably licensed facility (if stockpiled soils contain contaminants above acceptable standards). If the underlying plastic is breached, sampling or removal and appropriate disposal and validation of underlying soil may be required.

3.5 Stormwater and Sediment Control

Erosion and sediment controls shall be put in place to ensure that the generation of potentially contaminated sediment and stormwater is minimised and managed.

Sediment controls will be undertaken in accordance with the site-specific Erosion and Sediment Control Plan (ESCP) (if available), and industry best practice. Erosion and sediment controls will be adequate to ensure that contaminated soil does not travel off-site.

3.6 Dust Control

Dust must be managed during the excavation works to ensure that it generally complies with the Ministry for the Environment (MfE) Good Practice Guide for Assessing and Managing the Environmental Effects of Dust Emissions (2016). To control the generation of dust, the contractor will ensure that:

- The soils are regularly dampened down with a misting system during dry and windy conditions. When utilising water to control dust, the contractor will ensure that:
 - The volume of water used does not exceed soil field capacity of the wetted areas causing surface run-off that could discharge in stormwater systems or other waterways; and
 - The application of water does not induce soil erosion and/or soil pugging.
- Stockpiled material is covered as outlined in Section 3.4;
- Vehicle access onto the works area is limited; and
- Working in windy conditions is avoided.

A dust and odour complaints log will be maintained by the contractor.

2.7 Groundwater and Dewatering

It is not anticipated that groundwater will be encountered. If it is, the construction manager will contact a SQEP to determine any further actions that may be required.

2.8 Validation Sampling

Soil validation is required following removal of heavy metal impacted soil. Validation sampling will be conducted at a frequency sufficient to meet the requirements of the Contaminated Land Management Guidelines No.5 (MfE, 2011). All remediation and validation work must be supervised by a SQEP.

4 HEALTH AND SAFETY MEASURES

The health and safety procedures described in this section of the CSMP shall be implemented by the contractor, in addition to those covered by their own Health and Safety Plan (HSP) and documents.

4.1 Site Access and Signage

Fencing or other barricades will be put in place prior to the start of works to provide for Site access control. Only authorised personnel may be allowed to enter the Site. All persons entering the Site will sign in and out, and will be briefed on the HSP. Workers are required to be briefed on the applicable requirements of this CSMP.

4.2 Identification of Hazards and Management

The following contaminated land related hazards may be encountered during the works if contaminated soil is encountered:

- Dermal skin contact with soil or groundwater;
- Inhalation of contaminated dust; and

- Ingestion of contaminated soil or groundwater.

Further unspecified hazards may be identified during the course of the works. The hazards identified above will be managed through the wearing of appropriate personal protective equipment (PPE) and the procedures set out in Sections 4.3 and 4.4. The primary hazard management method is minimising exposure to contaminated soil during excavation and transportation. Maintenance of earthworks controls (Section 3.2) is a key component of contaminated soil hazard management.

4.3 Personal Protective Equipment

The following PPE will be mandatory for all personnel involved in soil disturbance activities where the potential for direct contact (including accidental contact) with contaminated materials exists:

- Clothing that covers the body; Safety footwear; Gloves (if soil is handled);
- Dust masks (P2 dust masks, if there is a potential for the generation of contaminated dust);
- Safety glasses; Hard hat (if working around plant); and Hi-vis vest.

Should any asbestos be identified during future earthworks, accidental discovery, management procedures and additional PPE controls may be required as directed by a SQEP.

4.4 Hazard Minimisation Procedures

The following procedures to minimise hazards related to contaminated soil will be implemented by the contractor:

- Dust controls, according to the procedures set out in Section 3.6;
- Contact with potentially contaminated material is expected to be minimal because the excavations are proposed to be undertaken using machinery.
- Maintaining good personnel hygiene, including:
 - No eating, drinking or smoking in the works area while potentially contaminated soils are being excavated to prevent contaminated soil contacting food or being ingested directly through soiled hands;
 - Avoiding hand to mouth and hand to face contact during work with potentially contaminated soils;
 - Washing boots if contaminated soil has been contacted;
 - Disposing of gloves that have contacted contaminated material; and
 - Hands and face will be washed before eating, drinking and smoking, which is only permitted where site personnel are offsite or in designated areas.

5 CONTACTS

The main regulatory authorities to be consulted in respect of the Site management controls proposed, any unexpected discoveries related to potential contamination, and emergencies are as follows:

CONTAMINATED SITE MANAGEMENT PLAN – 162 Studholme Street, Morrinsville



Table 2: Contacts during construction

ORGANISATION	CONTACT	TELEPHONE
The Client	Lockerbie Estate Limited	TBC
Construction Contractor	TBC	TBC
4Sight Consulting - SQEP	Nigel Mather	021 612 799
New Zealand Fire and Ambulance Service		111
National Poisons and Hazardous Chemicals Information Hotline		0800 764 766
WorkSafe New Zealand		0800 030 040

REFERENCES

4Sight, August 2019. Preliminary Site Investigation, 162 Studholme Street, Morrinsville.

Ministry for the Environment. 2004 (revised 2011). *Contaminated Land Management Guidelines No. 1: Reporting on Contaminated Sites in New Zealand*. Ministry for the Environment, Wellington, New Zealand

Ministry for the Environment. 2004 (revised 2011). *Contaminated Land Management Guidelines No. 5: Site Investigation and Analysis of Soils*. Ministry for the Environment, Wellington, New Zealand.

Ministry for the Environment, 2011. National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health.



LAND. PEOPLE. WATER.

**Combined Preliminary and Detailed Site
Investigation**

182 Morrinsville-Tahuna Road, Morrinsville

For Lockerbie Estate Limited

November 2021

REPORT INFORMATION AND QUALITY CONTROL

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CONTENTS

Page

EXECUTIVE SUMMARY	1
1 INTRODUCTION	4
1.1 Scope of Works	4
2 SITE DETAILS	5
2.1 Land Use – Current and Proposed	5
2.2 Site Topography	5
2.3 Geology and Hydrology	5
3 Surrounding Environment	5
4 SITE HISTORY	7
4.1 Aerial Photographs	7
4.2 Council Records	7
4.2.1 Land Use Information Registry	7
4.2.2 Property File Review	8
4.2.3 Hazardous Substances and Incidents Report	8
4.3 Initial Site Walkover	8
4.4 Onsite Interview	9
4.5 HAIL Classification	9
5 INITIAL CONCEPTUAL SITE MODEL	10
6 SITE INVESTIGATION	12
6.1 Soil Sampling	12
6.1.1 Sampling Methodology	12
6.1.2 QA/QC	16
6.2 Sampling Observations	16
6.3 Evaluation Criteria	16
6.4 Results	16
6.5 Discussion	19
7 REVISED CONCEPTUAL SITE MODEL	19
8 CONCLUSIONS	21
8.1 SQEP Statement	23
REFERENCES	24
LIMITATIONS	24

List of Tables

Table 1: Address and Site Information	5
Table 2: Historical Aerial Photography	7
Table 3: Tabulated Initial Conceptual Site Model	11
Table 4: Initial Sampling Details and Laboratory Analytical Schedule	13
Table 5: Summary of Cadmium, pH Analysis, Lead and Asbestos Soil Sampling	18
Table 6: Tabulated Revised Conceptual Site Model	20

List of Figures

Figure 1: Site Location and Features Plan	6
Figure 2: Site Location and Composite Soil Sample Plan	14
Figure 3: Soil Sample Plan – Residential Dwelling/Garage	15

List of Appendices

- Appendix A: Proposed Development / Zoning Plan
- Appendix B: WRC Site Contour Plan
- Appendix C: Surrounding Environment
- Appendix D: Historical Aerial Photographs
- Appendix E: Land Use Information Register
- Appendix F: Site Inspection Photographs
- Appendix G: Analytical Laboratory Report

EXECUTIVE SUMMARY

4Sight Consulting Ltd (4Sight) has been engaged by Lockerbie Estate (the client) to undertake a combined Preliminary and Detailed Site Investigation (DSI) at 182 Morrinsville-Tahuna Road, Morrinsville (herein referred to as “the Site”). The purpose of this DSI is to support a Private Plan Change (PPC) which will seek to rezone the Site, which is presently zoned Rural, to Residential. The Site is also currently zoned Future Residential Policy Area.

The DSI also intends to support consent requirements for future subdivision, change in land use and soil disturbance under the Ministry for the Environment (MfE) National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health, 2011 (NESCS) and the Waikato Regional Plan (WRP).

HAIL Classification

It was identified that phosphate-based fertilisers have been applied to the Site three times a year. Superphosphate has been shown to contain cadmium, and repeated applications can result in accumulation of cadmium in soil to concentrations which present a potential risk to human health. Therefore, in accordance with regulation 5(7)(c) of the NESCS it is more likely than not that an activity listed on the Ministry for the Environment (MfE) Hazardous Activities and Industries List (HAIL) has occurred at the Site, specifically Category I: ‘Any other land that has been subject to the intentional or accidental release of a hazardous substance in sufficient quantity that it could be a risk to human health or the environment.’ Consideration of the NESCS is therefore required.

Soil Characterisation

Sixteen surface soil samples were collected from across the Site and were composited at the laboratory (4:1) to form four soil samples. The four composite soil samples were analysed for cadmium and pH associated with the potential application of superphosphate.

- The concentrations of cadmium reported in all composite samples analysed were below the NESCS Soil Contaminant Standard (SCS) for residential land use (3 mg/kg), the pH adjusted NESCS SCS (8 mg/kg) and the Waikato cleanfill criteria (1 mg/kg), but above the Waikato background concentration (0.22 mg/kg).

In addition, nine surface samples were collected from the soils surrounding the Site buildings (residential dwelling and garage) situated in the south-western corner of the Site, to understand whether historic use of lead-based paint on buildings has impacted Site soils. Five of the nine samples were analysed for the presence of lead.

- The concentrations of lead reported in four of the five samples analysed exceed the NESCS SCS for residential land use (210 mg/kg). Concentrations ranged from 210 mg/kg to 3,600 mg/kg, and are above the Waikato cleanfill criteria (78 mg/kg) and the Waikato background concentration (20 mg/kg).

A single bulk sample (MTR-01) of potential asbestos containing material was collected from the ground at the location of the residential garage and it was analysed for the presence/absence of asbestos.

- Asbestos was detected in bulk sample MTR-01 in the form of Amosite (Brown / Grey Asbestos), Chrysotile (White Asbestos) and Crocidolite – (Blue Asbestos).

A single sample (MTR-06_100) was collected of the soils beneath the location of ACM bulk sample MTR-01 and it was analysed for asbestos (semi-quantitative method).

- No asbestos was detected in soil sample MTR-06_100 and therefore the concentrations of asbestos were below the adopted human health guidelines.

Discussion and Conclusions

- This DSI has shown that the Site soils have been slightly impacted by the ongoing application of superphosphate. However, the concentrations of cadmium are below the adopted pH adjusted NESCS SCS guideline value for the residential land use scenario and therefore cadmium in soil is considered highly unlikely to pose a risk to human health and the environment associated with the PPC. On this basis, the application of superphosphate is not considered to have occurred in sufficient quantities to be classified as an activity listed on the HAIL;

- Due to the elevated concentrations of lead reported in samples collected from the surface soils surrounding the Site buildings in the south-western corner of the Site (together, the “piece of land”), the soils surrounding these structures will present a risk to human health and therefore require management / removal from Site;
- Removal of any asbestos containing materials from the Site will need to be undertaken in accordance with the Health and Safety at Work (Asbestos) Regulations (MBIE, 2016) and the Approved Code of Practice for the Management, Removal of Asbestos (Worksafe New Zealand, 2016); and
- Soils from the area of burning will require disposal to a suitably licensed facility.

Consenting Requirements

NESCS

- As the NESCS Permitted Activity volumes within the piece of land are not likely to be met, a Restricted Discretionary consent under Regulation 10 of the NESCS will be required for the proposed soil disturbance associated with the removal of the lead contaminated soils;
- In accordance with Regulation 10 of the NESCS the following is required:
 - Management / removal of the lead contaminated soils is to be undertaken in accordance with a combined Remediation Action Plan and Contaminated Site Management Plan (RAP/CSMP) prepared by a suitably qualified and experienced practitioner (SQEP) prior to earthworks within the areas of contamination. The RAP/CSMP should outline proposed soil remediation strategies, management and controls for the safe handling and disposal of the contaminated soils to mitigate and/or manage the potential human health and environmental risks, and detail procedures for managing unexpected discoveries of contamination;
 - Following remediation, validation samples will be required from the excavated areas at a frequency sufficient to meet the requirements of the Contaminated Land Management Guidelines No.5 (MfE, 2021); and
 - Following remediation works, a Site Validation Report (SVR) will need to be prepared by a suitably qualified and experienced practitioner (SQEP) which details remediation works undertaken, and the results of the soil validation sampling. At a minimum the SVR needs to confirm that the Site is suitable for the proposed use, and that following remediation / management the risk to human health is highly unlikely. Depending on the remediation / management strategy, the SVR may include the volumes of soil removed, validation sampling results, copies of weighbridge/disposal docket, records of any unexpected/accidental discovery of further contamination, and a summary of any additional sampling that has been undertaken in accordance with the CLMG No. 5.

Based on the results of this DSI, in accordance with the NESCS requirements, the Site is suitable for its proposed future re-zoning from Rural to Residential as part of the proposed PPC following management / remediation of the lead contaminated soils.

WRP

- The management / removal of identified lead impacted soil from around the existing dwelling / structures works can also be undertaken as a Permitted Activity under Rule 5.3.4.6 of the Waikato Regional Plan – Land and Soil Module if permitted activity conditions are met, that is a RAP/CSMP and a SVR are to be prepared by a SQEP.

Recommendations

- All earthworks should be undertaken in accordance with the Waikato Regional Councils Erosion and Sediment Control Guide for Soil Disturbing Activities in the Waikato region, Environment Waikato Technical Report No.2009/02;
- If potential contamination is identified during works (accidental discovery), such as asbestos containing material (ACM) or visually impacted or odorous soils identified, the Site Manager is to contact a SQEP to assess the nature of the material; and
- Due to the estimated age of the Site buildings being pre-2000, there is the potential for ACM to be present in areas not visually assessed as part of this DSI (such as electrical switchboards, underfloor lining, gaskets, ceiling etc.). Therefore, prior to the demolition of any of the Site buildings, a demolition survey of the Site buildings is required which must be completed by a suitably licensed asbestos surveyor.

This investigation and associated reporting has been carried out and reviewed by a SQEP in accordance with the requirements of the NESCS.

1 INTRODUCTION

4Sight Consulting Ltd (4Sight) has been engaged by Lockerbie Estate (the client) to undertake a combined Preliminary and Detailed Site Investigation (DSI) at 182 Morrinsville-Tahuna Road, Morrinsville (herein referred to as “the Site”).

The purpose of this DSI is to support a Private Plan Change (PPC) which will seek to rezone the Site, which is presently zoned Rural to Residential. The Site is also currently zoned Future Residential Policy Area. The DSI also intends to assist in supporting consent requirements for future subdivision, change in land use and soil disturbance under the Ministry for the Environment (MfE) National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health, 2011 (NESCS) and the Waikato Regional Plan (WRP).

The purpose of this DSI is to determine whether:

- An activity or industry listed on the Ministry for the Environment’s (MfE) Hazardous Activities and Industries List (HAIL) is being, has been, or is more likely than not to have been undertaken on the Site;
- The suitability of the Site for its proposed future re-zoning from Rural to Residential as part of a Private Plan Change (PPC); and
- Contaminants in soils are at levels above the adopted NESCS or Waikato background concentration guideline values, to enable an assessment for potential resource consents for the proposed subdivision, change of land use and soil disturbance.

Consideration of the NESCS is required for the activities of subdivision, change of land use and soil disturbance on pieces of land that have been subject to any activities or industries listed on the Ministry for the Environment (MfE) Hazardous Activities and Industries List (HAIL).

Land covered in the NESCS is defined in regulation 5(7) as:

A piece of land that is described by one of the following:

- a) An activity or industry described in the HAIL is being undertaken on it:*
- b) An activity or industry described in the HAIL has been undertaken on it:*
- c) It is more likely than not that an activity or industry described in the HAIL is being or has been undertaken on it.*

1.1 Scope of Works

The scope of this DSI has included the following:

- A review of selected publicly available information for the Site, including Council files and aerial photographs to determine whether or not any activities or industries on the HAIL are, have been, or might have been undertaken on the Site;
- Site inspection to visually assess the presence of any activities or industries listed on the HAIL or evidence of any potential contamination;
- Collection of soil samples to determine whether broad scale superphosphate application has impacted the Site soils; and
- An overall assessment of the applicability of the NESCS and Waikato Regional Plan (WRP).

2 SITE DETAILS

The Site is located in Morrinsville. The Site details are provided in Table 1 and the Site location and features plan is shown in Figure 1.

Table 1: Address and Site Information

Address	Legal Description	Titles	Approximate Area
182 Morrinsville-Tahuna Road, Morrinsville, Waikato ("the Site").	Part Lot 2 DP 7445	SA1036/162	40.54 Hectares

2.1 Land Use – Current and Proposed

The Site is zoned 'Future Residential Policy Area' and 'Rural Zone' under the Matamata-Piako District Council (MPDC) District Plan (June 2018). The Site is currently being used for agricultural purposes (Dairy), paddocks at the site are used to graze livestock. The proposed PPC is for future residential development.

The proposed development/zoning plan is presented in Appendix A.

2.2 Site Topography

The Site undulates between 43 metres above sea level datum (m asld) in the north-eastern corner of the Site and 58 m asld at the location of the Site buildings. A gully is present at the location of a small stream on-site, which is an overland flow path, in the northern portion of the Site.

A WRC Site contour plan is presented as Appendix B.

2.3 Geology and Hydrology

The Institute of Geological and Nuclear Sciences (GNS) 1:250,000 online geological map shows that the Site is underlain by Early Pleistocene – Middle Pleistocene river and igneous deposits consisting of alluvium dominated by primary and reworked, non-welded ignimbrite.

The closest open surface water body (excluding the onsite effluent ponds) is an unnamed stream situated in the northern portion of the Site which flows to the north-east ultimately discharging into the Maungahaumia Stream. In addition, the Morrinsville Stream is located approximately 130 metres to the west of the Site.

A search of the WRC groundwater maps shows that there are two bores situated on the Site and their details are listed below. Information regarding the purpose of the below bores was not provided. However, an on-site discussion with the landowner identified that the bores are being used to supply water for the current on-site dairy milking operations such as wash down practices.

- Well No.: 72_8455 located at 182 Morrinsville-Tahuna Road. The bore depth is ~50 metres (m); and
- Well No.: 72_8456 located at 182 Morrinsville-Tahuna Road. The bore depth is ~57 m.

During the Site inspection (discussed in Section 4.3) records showed that the groundwater depths within the bores are between 25 metres and 27 metres.

3 Surrounding Environment

The Site is located in Morrinsville, Waikato. The surrounding land to the north, east and west is rural in use and the land immediately adjacent the Site to its south and south-east is under development for a residential subdivision.

A Surrounding Environment Plan is presented in Appendix C.



- Legend**
- Site Boundary
 - 1: Gravel Driveway
 - 2: Milking Parlour / Shed
 - 3: Bore Location
 - 4: Farm Shed 1
 - 5: Chemical Storage
 - 6: Farm Shed 2
 - 7: Above Ground Diesel Tank
 - 8: Hay Shelter
 - 9: Soil Shelter
 - 10: Silage
 - 11: Concrete Feed Storage Area
 - 12: Effluent Ponds
 - 13: Feed Stockpiles
 - 14: Area of Storage
 - 15: Burn Pile
 - 16: Stream
 - 17: Pond
 - 18: Stock Tunnel
 - 19: Residential Dwelling, Garage and Shed



LINZ CC BY 4.0 © Imagery Basemap contributors



Produced by **Datanest.earth**

Title: Site Location and Features Plan		
Client: Lockerbie Estate Limited		Figure No: 1 Size: A4
Project: 182 Morrinsville-Tahuna Road	Drawn: AB	
Date: 09-11-2021	Checked: NM	
Proj No: 10006	Scale: 1:5500	Version: 1.0

4 SITE HISTORY

To understand the history of the Site and particularly the nature and location of any potentially contaminating activities, a review of publicly available information for the Site was undertaken. This included searches of

- Selected historical aerial photographs available through Retrolens® and Google® Earth™;
- Land Use Information Register (LUIR) from the WRC;
- Property files from the MPDC;
- Hazardous Substances and Incidents Report, provided by the Environmental Protection Agency (EPA); and
- Onsite interview with the landowner.

4.1 Aerial Photographs

Historical aerial photographs were sourced from Retrolens® and Google® Earth™. These are described below and can be found in Appendix D:

Table 2: Historical Aerial Photography

Year	Reference	Observations
1948 and 1966	Retrolens® (Black & white)	On-site: The Site is in pasture and appears to be in use for grazing livestock. A building can be seen near the centre of the Site and a stream can be seen in the north-eastern portion of the Site. Site buildings can be seen in the south-western corner of the Site. Off-site: The surrounding land is in use for rural purposes. Morrinsville-Tahuna Road can be seen along the southern boundary and Taukoro Road can be seen along the northern boundary.
1979, 1982 and 1990	Retrolens® (Black & white)	On-site: The Site is grassed and sectioned into paddocks for grazing. A driveway extends into the Site along the western boundary which leads to the building near the centre of the Site, likely to be a milking shed. A farm race can be seen to extend north from the milking shed to the northern boundary, which appears to extend beneath Taukoro Road (tunnel). A farm race also extends from the milking shed to the east. The 1990 photograph appears to show effluent ponds to the north of the milking shed (shaded dark), suggesting that the Site is likely in use as a dairy farm. The Site buildings in the south-western corner of the Site are still visible. Off-site: Residential intensification can be observed to the south of the Site, adjacent Morrinsville-Tahuna Road.
2008	(Google® Earth™)	On-site: The Site remains relatively unchanged from the 1948 to 1990 photographs however, Site structures have been constructed around the milking shed located near the centre of the Site. The two effluent ponds are visible, and the stream and pond located in the eastern portion of the Site can be observed. The Site buildings in the south-western corner of the Site can be seen. Offsite: The surrounding land remains relatively unchanged from the 1979 to 1990 aerial photographs.
2020	(Google® Earth™)	On-site: The Site remains relatively unchanged from the 2008 photograph. Off-site: The land to the south-east of the Site is under development for the construction of a subdivision. Areas of disturbed soil and a sediment retention pond can be observed.

4.2 Council Records

4.2.1 Land Use Information Registry

A search of the LUIR, maintained by WRC, was requested and results were provided on 8 July 2021. The LUIR provides a detailed register of properties known to be contaminated on the basis of chemical measurements, or potentially contaminated on the basis of past land use.

WRC confirmed that the Site *'does not currently appear on the Land Use Information Register'*. The LUIR also notes that frequent use of superphosphate fertilisers can potentially result in elevated levels of cadmium in soil. In addition, the use of lead-based paints and asbestos products on buildings that are in a deteriorated state can pose a contamination risk. Furthermore, an email response from MPDC on 9 July 2021 also noted that they do not hold any record of HAIL activities in the LUIR or in the property file for the Site.

The LUIR response can be found in Appendix E.

4.2.2 Property File Review

A MPDC property file search was requested by 4Sight for the Site. The property file contained building plans, consent information and producer statements relating to the construction of ancillary and farm buildings in 2007 and 2015. No other information pertinent to this DSI was identified within the Property File.

4.2.3 Hazardous Substances and Incidents Report

The Environmental Protection Agency (EPA) maintained a list of reported hazardous substance incidents over the period July 2006 – December 2011. A review of this information did not identify any incidents of significance in relation to the Site or the adjacent properties.

4.3 Initial Site Walkover

A Site visit was undertaken on 12 July 2021 and photos of the Site visit are presented in Appendix F. The following observations were made during the Site visit:

- The Site was accessed from Morrinsville-Tahuna Road in the south-western corner via a gravel driveway which provided access into the Site and to the associated Site structures;
- A milking parlour, three farm sheds, and associated smaller structures constructed of corrugated iron were located near the centre of the Site. The buildings / structures did not appear to be constructed from hazardous building materials such as asbestos containing materials (ACM) or contain lead-based paints;
- A small above ground storage tank (AST) for diesel used to fuel farm equipment was present in the centre of the Site adjacent to existing structures. The tank was not bunded but it appeared in good condition, no visible spills or staining on the ground was identified;
- A feed storage area was located adjacent the farm sheds to the south and effluent ponds were located to the north of the milking parlour;
- A small area of general rubbish was piled to the north of the effluent ponds (approximately 5 m²). Information provided by the landowner indicated this area was used for general farm burn offs of general rubbish and vegetation;
- A stream and pond were located in the north-eastern portion of the Site, and a tunnel for cow traffic beneath a road was identified in the north-eastern corner of the Site;
- The remainder of the Site was covered in grass and in use for grazing cows for milking; and
- Housekeeping at the Site was tidy, with no disused equipment visible. There were no visible signs of contamination no indicators of the bulk storage of chemicals.

An additional Site visit was undertaken on 28 October 2021 to inspect the Site buildings in the south-western corner of the Site:

- The dwelling and garage located in the south-western corner of the Site were constructed of painted timber. The paint appeared in some areas to be in a deteriorated state (flaking paint);
- The gable end cladding and the soffits on the dwelling appeared to be constructed with potential asbestos containing material (PACM);
- A piece of PACM was collected from the ground at the location of the garage; and
- With the exception of a piece of PACM on the ground, no other visible or olfactory evidence of contamination was identified during the Site walkover.

4.4 Onsite Interview

On 12 July 2021, an on-site interview was had between 4Sight personnel and the landowner for the purpose of understanding the Sites history. The following information was noted:

- The property was purchased in stages over the past 50 years and has only been used for dairy since purchase (currently 300 cows);
- Phosphate-based fertilisers have been applied to the land (three times a year) however, fertilisers have not been stored on-site;
- A small locked chemical storage area is located in one of the on-site sheds and it is constructed on a concrete slab. Chemicals used for general farming activities on a small scale; and
- No knowledge of sheep dips and/or spray races at the Site;
- No importation of fill materials, no archaeological sites, and no areas of the Site have been used for burial purposes (such as refuse);
- The only burning undertaken on-site has been a small burn pile area used for general waste and vegetation (approximately 5 m²);
- Two groundwater bores located on-site and there is a diesel AST (1,865 litres) used to fuel farm machinery; and
- The neighbouring property to the east previously contained a woolshed.

4.5 HAIL Classification

Based on a review of the available background information for the Site, and from an onsite interview, the Site has largely been used for pasture and as part of a dairy farm. Activities undertaken at the Site are largely typical of agricultural and dairy practices. While some of these activities are listed on the MfE HAIL, based on background information review it is considered unlikely that the following HAIL activities have been undertaken at the Site in sufficient quantity to pose a risk to human health and/or the environment as part of the PPC:

- **A6:** Chemical manufacture, application and bulk storage - Fertiliser manufacture or bulk storage
 - Associated with the application of superphosphate to the Site. While fertilisers have been applied to the Site up to three times a year, the landowner indicated this is done by an external contractor. As no fertilisers are manufactures or stored on-site, it is considered highly unlikely that this HAIL activity has occurred;
- **A8:** Chemical manufacture, application and bulk storage - Livestock dip or spray race operations;
 - Background information review of the Site history and Site inspection did not indicate any evidence of livestock dips or spray races at the Site;
- **A17:** Chemical manufacture, application and bulk storage - Chemical manufacture, application and bulk storage;
 - Associated with presence of 1,865 L diesel AST at the Site for fuelling farm machinery. Given the small size of the AST, and Site observations noted the AST was in good condition with no spills or surface staining, it is considered highly unlikely that any leaks from the AST have occurred sufficiently to contaminate soil and hence the potential risk to human health and the environment from the AST is considered highly unlikely;
- **E1:** Mineral extraction, refining and reprocessing, storage and use - Asbestos products manufacture or disposal including sites with buildings containing asbestos products known to be in a deteriorated condition;
 - Associated with the presence of structures / buildings on-site constructed prior to 2003. The Site inspection indicated that these structures were constructed from corrugated iron. ACM and lead-based paints were observed on the outside of the Site structures located in the south-western corner of the Site; and
- **I:** Any other land that has been subject to the intentional or accidental release of a hazardous substance in sufficient quantity that it could be a risk to human health or the environment;
 - Associated with the small burn area at the Site. While the landowner has indicated that small burn-offs have occurred at the Site associated with normal farming practices, given the area of burning (~5 m²) it is considered, in the context of the size of the Site (~40 ha), that it is highly unlikely that burning would result in contamination to soil such that it would be in sufficient quantity to pose a risk to human health; and

- Associated with potential lead contamination from lead-based paints used on exterior building materials.

The application of superphosphate to the Site up to three times a year by an external contractor is considered likely to be indicative of a HAIL activity (under HAIL category I). Therefore, it is considered more likely than not that the Site may have been subject to HAIL Activity I, and further investigation is required to inform the Conceptual Site Model (CSM) for the Site.

5 INITIAL CONCEPTUAL SITE MODEL

An initial CSM (Table 3), based on the findings of the Site history and background information review provides a detailed description of the identified potential sources, pathways and receptors, and a qualitative assessment of complete or potentially complete source-pathway-receptor (SPR) linkages. A risk is only present if there is a complete SPR linkage. The CSM detailed in Table 3 is not intended to be an exhaustive assessment of all potential SPR linkages. The CSM has been developed based on available information, any omissions are not indicative of no risk.

Table 3: Tabulated Initial Conceptual Site Model

Source	Pathway	Receptor	Human Health & Environmental	Discussion	SPR Linkage
Heavy Metals in Soils	Direct contact, inhalation and/or ingestion	Maintenance / excavation Workers	Human Health	<p>The Site has been subject to the application of superphosphate fertilisers up to three times a year. Superphosphate fertilisers typically contain cadmium which is a priority contaminant in the NESCS.</p> <p>While the application of fertilisers at agricultural Sites is typically uniform, investigation works are required to assess whether this HAIL activity has occurred in sufficient quantity to pose a risk to human health.</p> <p>Other heavy metals, such as arsenic (from lead arsenate sprays) have been ruled out based on a review of Site history and the Site inspection indicating that the bulk storage and use of lead-arsenate spray pesticides have not occurred at the Site.</p> <p>During the additional Site walkover, the potential for lead (from lead-based paints) in soil was identified in the south-western corner of the Site, potentially originating from the use of lead-based paints on external building materials.</p>	<p>Potentially Complete</p> <p>Investigation of the presence of cadmium in soils at the Site is required to assess whether the Site has been impacted by the application of superphosphate fertilisers such that a risk to human health is present. Investigation of the presence of lead from the use of lead-based paints.</p>
		Site users			
	Leaching to groundwater and/or river	Groundwater / River	Environmental	<p>The closest surface water body is an unnamed stream situated in the northern portion of the Site which flows to the north-east ultimately discharging into the Maungahaumia Stream.</p> <p>There is potential should heavy metals concentrations in soil exceed the applicable standard that contaminants may migrate to groundwater and surface water via leaching and overland flow.</p>	<p>Potentially Complete</p> <p>While it is possible that site-sourced contaminants could leach to groundwater, the presence of cadmium contamination in soil is likely to be below the adopted assessment criteria in all locations given the application of superphosphate fertilisers is typically uniform across a Site. There is however the potential for that lead (from lead-based paints) to exceed the adopted Site assessment criteria.</p>
Hydrocarbons in Soils	Direct contact, inhalation and/or ingestion	Maintenance / excavation Workers	Human Health	<p>A small (1,835 L) diesel AST is present at the Site. This was noted to be in good condition with no surface spills / staining noted.</p>	<p>Highly Unlikely</p> <p>While it is possible that the storage of hydrocarbons / fuels at a Site could result in contamination to soil, leaks from ASTs are typically noticed and addressed quicker than those in Underground Storage Tanks (USTs), which have a much higher likelihood of resulting in contamination to soil. As no obvious leaks, or surface spills / staining were noted during the Site inspection, it is considered highly unlikely that the presence of a diesel AST at the Site has resulted in contamination to soil or groundwater.</p>
		Site users			
	Leaching to groundwater and/or river	Groundwater / River	Environmental		
Asbestos in Soils	Direct contact, inhalation and/or ingestion	Maintenance / excavation Workers	Human Health	<p>WRC LUIR response suggested the potential for ACM to be present in on-site structures. Given the ages of some structures on the Site (prior to 2003) there is potential for structures to be constructed with hazardous building materials. The gable end cladding and the soffits on the dwelling located in the south-western corner of the Site were identified as potentially being constructed with ACM.</p>	<p>Highly Unlikely</p> <p>A piece of broken ACM / asbestos was observed on the ground outside of the Site structures located in the south-western corner of the Site during the Site inspection. Concentrations of asbestos in soil beneath the bulk sample were below the adopted human health criteria. Therefore, it is considered highly unlikely that asbestos would be present in soils at the Site.</p>
		Site Users			

6 SITE INVESTIGATION

6.1 Soil Sampling

To assess the potential application of cadmium-based superphosphate chemicals to the Site, limited soil sampling was undertaken to assess the potentially completed SPR as detailed in the initial CSM (Table 3).

Based on our experience of fertiliser application at dairy properties in Waikato and wider New Zealand, fertiliser distribution tends to be uniform. As there was no evidence of the bulk storage of fertilisers or other chemicals on-site in the background Site history review, the limited soil sampling undertaken consisted of the collection of 16 soil samples on a random loose grid across the Site. The purpose of the soil sampling was to understand likely presence of cadmium in soils at the Site resulting from the known application of superphosphate.

On 12 July 2021, a total of 16 discrete surface soil samples were collected from across the Site at a depth of 0.0 – 0.1 meters below ground level (m bgl) and were subsequently composited at the analytical laboratory at a rate of 4:1 to create four composite samples. In addition to the soil samples collected from the Site, a single reference sample (Ref01) was collected from the roadside berm. Composite soil sampling locations are shown in Figure 2. All composite soil samples were subject to laboratory analysis for cadmium and pH only to assess for potential impact associated with superphosphate application at the Site.

On 28 October 2021, nine surface samples were collected from the soils surrounding the Site buildings (residential dwelling and garage) situated in the south-western corner of the Site, for historic use of lead-based paint on buildings. Five of the nine sample were analysed for lead.

A single bulk sample of potential asbestos containing material was collected from the ground at the location of the residential garage and it was analysed for the presence/absence of asbestos. A single sample of soil was also collected from beneath the location of ACM bulk sample MTR-01 and it was analysed for asbestos (semi-quantitative method). Sampling locations from the south-western area of the Site are shown in Figure 3.

The limited soil sampling was undertaken in general accordance with the Contaminated Land Guidelines No.5 Site Investigation and Analysis of Soils (CLMG No.5 MfE, Revised 2021). The methodology for the soil sampling is set out below.

6.1.1 Sampling Methodology

The following methodology was adopted during the soil sampling works:

- A stainless-steel spade and trowel were used to collect all surface soil samples (approximately 0.0 - 0.1 m bgl);
- A clean pair of nitrile gloves were worn to collect each soil sample to limit the potential for cross-contamination;
- Soil samples were placed in laboratory provided clean sample jars and identified with a unique sample identifier, which was documented on the sample label; sample log; and chain of custody form;
- All soil samples were placed in an ice-cooled storage box (i.e. Chilly Bin) immediately after collection and transported under chain of custody documentation to the analytical laboratory; and
- All field sampling equipment was decontaminated prior to use at each soil sample location to limit the potential for cross-contamination. Decontamination of field equipment involved: wash with clean potable water; scrubbing in a detergent solution (Decon® 90) and potable water; and a final rinse in clean water.

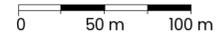
The soil samples were transported under full Chain of Custody documentation to RJ Hill Laboratories, Hamilton (Hill Laboratories). The soil sample analytical schedule presented in Table 4.

Table 4: Initial Sampling Details and Laboratory Analytical Schedule

Sample ID	Depth (m bgl)	Soil Type	Lab Analysis
Comp01 A-D	0.0 - 0.10	Topsoil (dark brown)	Cadmium & pH
Comp02 A-D			
Comp03 A-D			
Comp04 A-D			
Ref 01			
MTR-01_100		Topsoil (dark brown), potential paint flakes visible	Lead
MTR-02_100			
MTR-03_100			
MTR-05_100			
MTR-06_100			
MTR-01	-	Bulk Sample	Asbestos (presence/absence)
MTR-06_100	0.0 - 0.10	Topsoil (dark brown)	Asbestos (semi-quantitative method)



- Legend**
- Site Boundary
 - ⊕ Approximate Sample Locations
 - Composite Area 01
 - Composite Area 02
 - Composite Area 03
 - Composite Area 04



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Produced by **Datanest.earth**

Title: Site Location and Composite Soil Sample Plan

Client: Lockerbie Estate Limited		Figure No: 2 Size: A4
Project: 182 Morrinsville-Tahuna Road	Drawn: AB	
Date: 09-11-2021	Checked: NM	Version: 1.0
Proj No: 10006	Scale: 1:5500	



Legend

- Site Boundary
- ⊕ Lead Samples

0 5 m 10 m

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4SIGHT
CONSULTING

Produced by **Datanest.earth**

Title: Soil Sample Plan - Residential Dwelling/Garage		
Client: Lockerbie Estate Limited		Figure No: 3 Size: A4
Project: 182 Morrinsville-Tahuna Road	Drawn: AB	
Date: 09-11-2021	Checked: NM	Version: 1.0
Proj No: 10006	Scale: 1:691	

6.1.2 QA/QC

Standard field quality assurance protocols were followed. All tools used for sampling were washed in a decontaminant solution, followed by clean water, between samples to reduce the risk of cross contamination. Nitrile gloves were also used and disposed of between each sample. Hill Laboratories are a New Zealand accredited laboratory (by International Accreditation NZ). Their primary quality standard is NZS/ISO/IEC 17025:2005 which incorporates the aspects of ISO 9000 relevant to testing laboratories. Refer to the laboratory analysis report in Appendix G for further information on accreditation.

6.2 Sampling Observations

Photos of the Site investigation and the typical soil profiles are presented in Appendix F. The following soil characteristics and observations for the Site are described below:

- All surface soil samples collected from the Site consisted of dark brown topsoil from 0.0 - 0.10 m bgl,
- Potential visible paint flakes in surface samples collected from soils surrounding the Site buildings in the south-western corner of the Site;
- A single piece of potential ACM in the form of a cement product was collected; and
- With the exception of paint flakes and a piece of potential ACM, no visual or olfactory evidence of contamination was identified at any of the sample locations.

6.3 Evaluation Criteria

The soil sample results have been screened against the following criteria:

- As the future use of the Site is proposed for residential land use, the NESCS Soil Contaminant Standards (SCS) using the residential (10% produce) land use scenario (considered most appropriate given that the proposed Private Plan Change (PPC) will rezone the Site from Rural to Residential);
- Background concentrations for heavy metals (95% upper limit) as presented on the WRC website. These values are used as a guideline for typical naturally occurring concentrations in the Waikato Region;
- WRC Cleanfill Criteria. These criteria were selected to provide guidance on suitable off-site disposal options, if required; and
- New Zealand Guidelines for Assessing and Managing Asbestos in Soil (NZ GAMAS November 2017), using 'residential land use scenario'. Combined Fibrous Asbestos + Asbestos Fines (FA/AF) and Asbestos Containing Material (ACM) Bonded as % of Total Sample % w/w.

6.4 Results

A summary of the laboratory results is presented in Table 5. The full results are contained in the laboratory analysis report provided in Appendix G. The following is noted:

Superphosphate Sampling

- The concentrations of cadmium reported in all composite samples analysed were below the NESCS SCS for residential land use (3 mg/kg) and the Waikato cleanfill criteria (1 mg/kg), but above the Waikato background concentration (0.22 mg/kg);
- As the pH concentrations reported in all composite samples were above the NESCS SCS reporting value of 5 pH for cadmium, and given that the adjusted guideline value for cadmium with a pH value of 6.0 (based off the pH value detected in reference sample Ref01 6.1 pH) would increase to 8 mg/kg, in accordance with the Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health (MfE, 2011) (NESCS Methodology), the concentration of cadmium detected in all samples analysed do not exceed the adjusted guideline value; and
- The intention of reference sample Ref01 collected from the roadside berm was to provide an understanding of likely background soil conditions outside of an area subject to superphosphate use. The concentration of cadmium

detected in sample Ref01 (0.36 mg/kg) was below the adopted NESCS SCS for residential land use (3 mg/kg) and the Waikato cleanfill criteria (1 mg/kg), but above the Waikato background concentration (0.22 mg/kg).

Lead Paint Sampling

- The concentrations of lead reported in four of the five samples analysed exceed the NESCS SCS for residential land use (210 mg/kg). Concentrations ranged from 210 mg/kg to 3,600 mg/kg, and are above the Waikato cleanfill criteria (78 mg/kg) and the Waikato background concentration (20 mg/kg).

Asbestos Sampling

- Asbestos was detected in bulk sample MTR-01 in the form of Amosite (Brown / Grey Asbestos), Chrysotile (White Asbestos) and Crocidolite – (Blue Asbestos); and
- No asbestos was detected in soil sample MTR-06_100 and therefore the concentrations of asbestos were below the adopted human health guidelines.

Summary of Cadmium and pH in Soil Samples												Guideline Criteria					
Sample Name	Comp01_A-B	Comp02_A-B	Comp03_A-B	Comp04_A-B	Ref01	MTR-01_100	MTR-02_100	MTR-03_100	MTR-05_100	MTR-06_100	MTR-01	NESCS SCS - Residential ¹	pH adjusted NESCS SCS - Residential ²	Waikato Natural Background Concentrations ³	Waikato Cleanfill Criteria ⁴	NZ GAMAS ⁵	
Composite or Individual Sample	Composite	Composite	Composite	Composite	Individual	Individual	Individual	Individual	Individual	Individual	-						
Soil Type	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Bulk Sample						
Sample Date	12-Jul-21					28-Oct-21											
Sample Depth (m bgl)	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	-						
Lab Number	2655197.18	2655197.19	2655197.20	2655197.21	2655197.17	748672.1	2748672.3	2748672.5	2748672.8	2748672.10	-						
Cadmium	mg/kg	0.82	0.7	0.79	0.6	0.36	-	-	-	-	-	3	8	0.22	1	-	
Lead		-	-	-	-	-	730	3,600	1,270	210	280	210	-	20	78	-	
pH		6.8	6.8	6.5	7	6.1	-	-	-	-	-	-	-	-	-	-	
Asbestos	Presence / Absence	-	-	-	-	-	-	-	-	-	-	Asbestos Not Detected	-	-	-	-	Asbestos Detected
	Form	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Combined FA + AF	-	-	-	-	-	-	-	-	-	-	< 0.001	-	-	-	-	0.001
	ACM (bonded)	-	-	-	-	-	-	-	-	-	-	< 0.001	-	-	-	-	0.01

All results and criteria are expressed in mg/kg dry weight.

Any results exceeding adopted criteria are shaded accordingly.

BDL = Below Laboratory Detection Limits

1: National Environmental Standards for Managing and Assessing Contaminants in Soil to Protect Human Health¹ - Soil Contaminant Standards (SCS), (MfE, 2012) for Rural / Residential land use. Exceedances are in yellow.

2: pH adjusted National Environmental Standards for Managing and Assessing Contaminants in Soil to Protect Human Health - Soil Contaminant Standards (SCS), (MfE, 2012) for Residential land use (10% produce), in accordance with the Ministry for the Environment (MfE, 2011) Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health, using a pH value of 6.0. Exceedances in blue.

3: Waikato Background Concentrations for heavy metals (95% upper limit) as presented on the WRC website. Exceedances in orange.

4: Typical Cleanfill Criteria for the Waikato Region. Exceedances in green.

5: New Zealand Guidelines for Assessing and Managing Asbestos in Soil (NZ GAMAZ, 2017) - Residential land use scenario of 0.001% combined fibrous asbestos and asbestos fines (FA/AF) and/or 0.01% asbestos containing material (ACM bonded). Exceedances are in pink.

6.5 Discussion

Cadmium concentrations in composite soil samples comprising of 16 individual soil samples collected from across the Site were below the NESCS SCS for standard residential use, and the pH adjusted guideline value for residential use. The reported concentrations however, while below the adopted Waikato Cleanfill criteria, do exceed the adopted Waikato background concentrations.

Comparison of cadmium in composite samples against the concentration of cadmium, in the reference sample (Ref01) collected from the roadside berm off-site indicated cadmium concentrations in on-site soils are typically twice that of those of the reference sample. However, it is noted that the concentration of cadmium in the reference sample also exceeds the adopted Waikato background concentration.

This suggests that the application of superphosphate to the Site has resulted in low-level contamination of surface soils above background concentrations, but below adopted NESCS SCS for residential use. Therefore, it is considered highly unlikely that a risk to human health is present in light of the proposed residential development at the Site.

It is acknowledged that 16 soil samples composited to four soil samples does not meet the sampling frequency requirements for hot spot identification as outlined in CLMG No.5 (2021). However, these sampling requirements are outlined not as minimum sampling requirements, but as suggested options to identify hotspots on sites where insufficient site history may be present, or where large-scale grid-based sampling is undertaken. Based on the Site history suggesting the only HAIL activity to have occurred at the Site was the application of super-phosphate and based on our experience on sites in the Waikato and across New Zealand, the application of superphosphate is typically uniform. As such, the distribution of cadmium is also likely to be uniform across the Site. This is demonstrated well in the composite sampling undertaken which shows cadmium concentrations varying from 0.6 mg/kg to 0.82 mg/kg. Based on these results and our experience, it is considered highly unlikely that the sampling has missed a large hot-spot of elevated cadmium concentrations in soil, and that the sampling conducted is suitable to assess the Site.

A small area of burning (~5 m²) was located on the Site. The landowner advised that all burning is and has been associated with normal farming practices i.e. burning vegetation and general rubbish. Therefore, in the context of the size of the Site (~40 ha), it is considered highly unlikely that burning would result in contamination to soil such that it would be in sufficient quantity to pose a risk to human health or the environment. Any soils removed from the area of burning will likely require disposal to a suitably licenced facility.

Due to the elevated concentrations of lead reported in samples collected from the surface soils surrounding the Site buildings in the south-western corner of the Site (together, the "piece of land"), the soils surrounding these structures will present a risk to human health and therefore require management / removal from Site under appropriate controls.

7 REVISED CONCEPTUAL SITE MODEL

A revised CSM (Table 6) provides an update to the initial CSM (presented in Table 3). This revised CSM is based on the results of soil sampling undertaken at the Site, and only focussed on those SPRs identified as potentially complete in Table 3. The CSM has been developed based on available information, any omissions are not indicative of no risk.

Table 6: Tabulated Revised Conceptual Site Model

Source	Pathway	Receptor	Human Health & Environmental	Discussion	SPR Linkage
Cadmium and Lead in Soils	Direct contact, inhalation and/or ingestion	Maintenance / excavation Workers	Human Health	<p>The concentrations of cadmium detected in all composite samples analysed were below the NESCS SCS criteria for residential land use, which has been adopted as the assessment guideline criteria for the proposed future use of the Site.</p> <p>The concentration of cadmium reported in all composite samples analysed was below the NESCS residential land use criteria (3 mg/kg), and hence is also below the commercial / industrial outdoor worker (unpaved) (1,300 mg/kg).</p> <p>Concentrations of lead reported in samples analysed from the soils surrounding the Site buildings in the south-western corner of the Site were above the NESCS residential land use criteria. Concentrations ranged between 210 mg/kg and 3,600 mg/kg.</p>	<p>Complete</p> <p>Concentrations of lead reported in samples analysed from the soils surrounding the Site buildings in the south-western corner of the Site were above the NESCS residential land use criteria.</p>
		Site users			
	Leaching to groundwater and/or river	Groundwater / River	Environmental	<p>No assessment of groundwater or leachable concentration of heavy metals has been undertaken (by Toxicity Characteristic Leaching Procedure (TCLP)).</p> <p>The closest surface water body is an unnamed stream situated in the northern portion of the Site which flows to the north-east ultimately discharging into the Maungahaumia Stream.</p> <p>Elevated concentrations of lead were reported and therefore there is potential for contaminant mobilisation in the subsurface however, paint flakes generally are restricted to shallow soils.</p>	
Asbestos in soils	Direct contact, inhalation and/or ingestion	Site users	Human Health	<p>Asbestos was detected in bulk sample MTR-01 in the form of Amosite (Brown / Grey Asbestos), Chrysotile (White Asbestos) and Crocidolite – (Blue Asbestos).</p> <p>No asbestos was detected in soil sample MTR-06_100 and therefore the concentrations of asbestos were below the adopted human health guidelines.</p>	<p>Incomplete</p> <p>No asbestos was detected in the analysed soil sample.</p>

8 CONCLUSIONS

4Sight has been engaged by Lockerbie Estate (the client) to undertake a combined Preliminary and Detailed Site Investigation (DSI) at 182 Morrinsville-Tahuna Road, Morrinsville (herein referred to as “the Site”). The existing residential dwelling, and land immediately surrounding it, situated in the south-western corner of the Site has been excluded from this investigation at the request of the client.

The purpose of this DSI is to support a PPC which will seek to rezone the Site which is presently zoned Rural to Residential. The Site is currently zoned Future Residential Policy Area. The DSI also intends to support consent requirements for future subdivision, change in land use and soil disturbance under the MfE NESCS and the WRP.

Site History

- The Site has a long history for being in use for pastoral farming and grazing. The Site has most recently been used as a small dairy farm, with the farm expanding over the last circa-50 years;
- Site history information indicated buildings and structures being present on the Site from the 1970s. WRC records also suggested that given the age of buildings they may be constructed from hazardous building materials such as ACM and/or contain lead-based paints. However, a Site inspection walkover indicated Site structures were constructed from corrugated iron, with no evidence of asbestos / ACM building materials on the outside of the structures;
- A small diesel AST (1,835 L) was observed in the centre of the Site, used for fuelling farm machinery. The AST was observed to be in good condition, with no obvious surface spills or stains to underlying soil;
- A small area of a rubbish and vegetation pile occupying an area of approximately 5 m² was also observed to the north of on-site effluent pond. The landowner indicated this was an area of burning, typical of standard farming practices; and
- The Site is subject to fertilisation with superphosphate up to three times a year. An external contractor is engaged to attend the Site to conduct this.

HAIL Classification

Based on the application of superphosphate fertilisers to the Site, it was considered there was potential for the Site to have been subject to HAIL Activity I: *‘Any other land that has been subject to the intentional or accidental release of a hazardous substance in sufficient quantity that it could be a risk to human health or the environment.’* To inform the CSM for the Site, it was determined a limited sub-surface investigation was required to fully assess risk to human health and/or the environment.

Soil Characterisation

Sixteen surface soil samples were collected from across the Site and were composited at the laboratory (4:1) to form four soil samples. The four composite soil samples were analysed for cadmium associated with the potential application of superphosphate.

- The concentrations of cadmium reported in all composite samples and the reference sample analysed were below the NESCS SCS for residential land use (3 mg/kg), the pH adjusted NESCS SCS (8 mg/kg) and the Waikato cleanfill criteria (1 mg/kg), but above the Waikato background concentration (0.22 mg/kg).

In addition, nine surface samples were collected from the soils surrounding the Site buildings (residential dwelling and garage) situated in the south-western corner of the Site, to understand whether historic use of lead-based paint on buildings has impacted Site soils. Five of the nine samples were analysed for the presence of lead.

- The concentrations of lead reported in four of the five samples analysed exceed the NESCS SCS for residential land use (210 mg/kg). Concentrations ranged from 210 mg/kg to 3,600 mg/kg, and are above the Waikato cleanfill criteria (78 mg/kg) and the Waikato background concentration (20 mg/kg).

A single bulk sample (MTR-01) of potential asbestos containing material was collected from the ground at the location of the residential garage and it was analysed for the presence/absence of asbestos.

- Asbestos was detected in bulk sample MTR-01 in the form of Amosite (Brown / Grey Asbestos), Chrysotile (White Asbestos) and Crocidolite – (Blue Asbestos).

A single sample (MTR-06_100) was collected of the soils beneath the location of ACM bulk sample MTR-01 and it was analysed for asbestos (semi-quantitative method).

- No asbestos was detected in soil sample MTR-06_100 and therefore the concentrations of asbestos were below the adopted human health guidelines.

Discussion and Conclusions

- As concentrations of cadmium in soil exceed the adopted background concentrations, the Site has been low-level contaminated by the application of superphosphate fertilisers. However, reported concentrations were below the adopted NESCS SCS and the pH adjusted NESCS assessment criteria for the protection of human health (standard residential land use);
- The application of superphosphate fertilisers is typically uniform. Based on our experience of similar sites, the resulting distribution of cadmium in soils is also typically uniform. The sampling undertaken as part of this DSI is therefore considered suitable to characterise concentrations of cadmium in soil at the Site;
- As concentrations of cadmium in soil do not exceed the adopted human health assessment criteria, it is considered highly unlikely that the application of superphosphate has been in sufficient quantity such that it poses a risk to human health and/or the environment;
- Due to the elevated concentrations of lead reported in samples collected from the surface soils surrounding the Site buildings in the south-western corner of the Site (together, the “piece of land”), the soils surrounding these structures will present a risk to human health and therefore requires management / removal from Site;
- Removal of any asbestos containing materials from the Site will need to be undertaken in accordance with the Health and Safety at Work (Asbestos) Regulations (MBIE, 2016) and the Approved Code of Practice for the Management, Removal of Asbestos (Worksafe New Zealand, 2016);
- In this regard, based on the results of this assessment, it is considered that the Site has been subject to HAIL Activity I as the concentrations of lead are ‘at sufficient quantity that it could be a risk to human health and/or the environment’; and
- Soils from the area of burning will require disposal to a suitably licensed facility.

Consenting Requirements

NESCS

- As the NESCS Permitted Activity volumes within the piece of land are not likely to be met, a Restricted Discretionary consent under Regulation 10 of the NESCS will be required for the proposed soil disturbance associated with the removal of the lead contaminated soils;
- In accordance with Regulation 10 of the NESCS the following is required:
 - Management / removal of the lead contaminated soils is to be undertaken in accordance with a combined Remediation Action Plan and Contaminated Site Management Plan (RAP/CSMP) prepared by a suitably qualified and experienced practitioner (SQEP) prior to earthworks within the areas of contamination. The RAP/CSMP should outline proposed soil remediation strategies, management and controls for the safe handling and disposal of the contaminated soils to mitigate and/or manage the potential human health and environmental risks, and detail procedures for managing unexpected discoveries of contamination;
 - Following remediation, validation samples will be required from the excavated areas at a frequency sufficient to meet the requirements of the Contaminated Land Management Guidelines No.5 (MfE, 2021); and
 - Following remediation works, a Site Validation Report (SVR) will need to be prepared by a suitably qualified and experienced practitioner (SQEP) which details remediation works undertaken, and the results of the soil validation sampling. At a minimum the SVR needs to confirm that the Site is suitable for the proposed use, and that following remediation / management the risk to human health is highly unlikely. Depending on the remediation / management strategy, the SVR may include the volumes of soil removed, validation sampling results, copies of weighbridge/disposal dockets, records of any unexpected/accidental discovery of further

contamination, and a summary of any additional sampling that has been undertaken in accordance with the CLMG No. 5.

Based on the results of this DSI, in accordance with the NESCS requirements, the Site is suitable for its proposed future re-zoning from Rural to Residential as part of the proposed PPC following management / remediation of the lead contaminated soils.

WRP

- The management / removal of identified lead impacted soil from around the existing dwelling / structures works can also be undertaken as a Permitted Activity under Rule 5.3.4.6 of the Waikato Regional Plan – Land and Soil Module if permitted activity conditions are met, that is a RAP/CSMP and a SVR are to be prepared by a SQEP.

Recommendations

- All earthworks should be undertaken in accordance with the Waikato Regional Councils Erosion and Sediment Control Guide for Soil Disturbing Activities in the Waikato region, Environment Waikato Technical Report No.2009/02;
- If potential contamination is identified during works (accidental discovery), such as asbestos containing material (ACM) or visually impacted or odorous soils identified, the Site Manager is to contact a suitably qualified and experienced practitioner (SQEP) to assess the nature of the material; and
- Due to the estimated age of the Site buildings being pre-2000, there is the potential for ACM to be present in areas not visually assessed as part of this DSI (such as electrical switchboards, underfloor lining, gaskets, ceiling etc.). Therefore, prior to the demolition of any of the Site buildings, a demolition survey of the Site buildings is required which must be completed by a suitably licensed asbestos surveyor.

8.1 SQEP Statement

I, James Blackwell of 4Sight Consulting Ltd certify that this DSI meets the requirements of the NESCS because it has been:

- Reviewed and certified by a suitably qualified and experienced practitioner (SQEP);
 - Evidence of my qualifications as a SQEP is in the form of me being a Certified Environmental Practitioner – Site Contamination Specialist (CEnvP SC) No. SC41083. My approved seal is included on the signature page of this report; and
- The report has been prepared in general accordance with CLMG No. 1 and 5 (revised 2021).

The results of this DSI have identified concentrations of lead at levels above the adopted NESCS SCS guideline values at selected locations on the Site and therefore a Restricted Discretionary consent under Regulation 10 of the NESCS will be required for the proposed soil disturbance, change of land use and subdivision associated with the proposed development.

REFERENCES

- Environmental Protection Agency [EPA]. (2011). *Hazardous Substance Incidents Reports*. Retrieved from <http://www.epa.govt.nz/about-us/monitoring/Pages/HS-incident-reports-archive.aspx>, accessed July 2021.
- Environment Waikato Technical Report No.2009/02 (2009): *Erosion & Sediment Control Guidelines for Soil Disturbing Activities*.
- Geological and Nuclear Sciences [GNS]. (2018). *New Zealand Geology Web Map*. Retrieved from <http://data.gns.cri.nz/geology/>, July 2021.
- Google Earth (2021).
- Retrolens (2019). Retrieved from <http://retrolens.nz> and licensed by LINZ CC-BY 3.0, accessed July 2021.
- Ministry for the Environment, 2021. *Contaminated land management guidelines No. 1: Reporting on contaminated sites in New Zealand (revised 2021)*. Ministry for the Environment, Wellington, New Zealand.
- Ministry for the Environment, 2021. *Contaminated land management guidelines No. 5: Site investigation and analysis of soils (revised 2021)*. Ministry for the Environment, Wellington, New Zealand.
- Ministry for the Environment. 2011. *Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011*. Ministry for the Environment, Wellington, New Zealand.
- Ministry for the Environment. 2011. *Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health*. Ministry for the Environment, Wellington, New Zealand.
- Waikato Regional Council [WRC]. (2016). Natural Background Concentrations in the Waikato Region. Retrieved from <http://www.waikatoregion.govt.nz/Services/Regional-services/Waste-hazardous-substances-and-contaminated-sites/Contaminated-sites/Natural-background-concentrations/>, accessed July 2021.
- Waikato Regional Council (WRC) (2021). Groundwater Map. <https://waikatomaps.waikatoregion.govt.nz/Groundwater/>, accessed July 2021.
- Waikato Regional Council [WRC]. (2018). *Requests for Official Information*. Retrieved from <http://www.waikatoregion.govt.nz/Council/About-us/Requests-for-official-information/>, accessed July 2021.
- New Zealand Guidelines for Assessing and Managing Asbestos in Soil (NZ GAMAS, November 2017).

LIMITATIONS

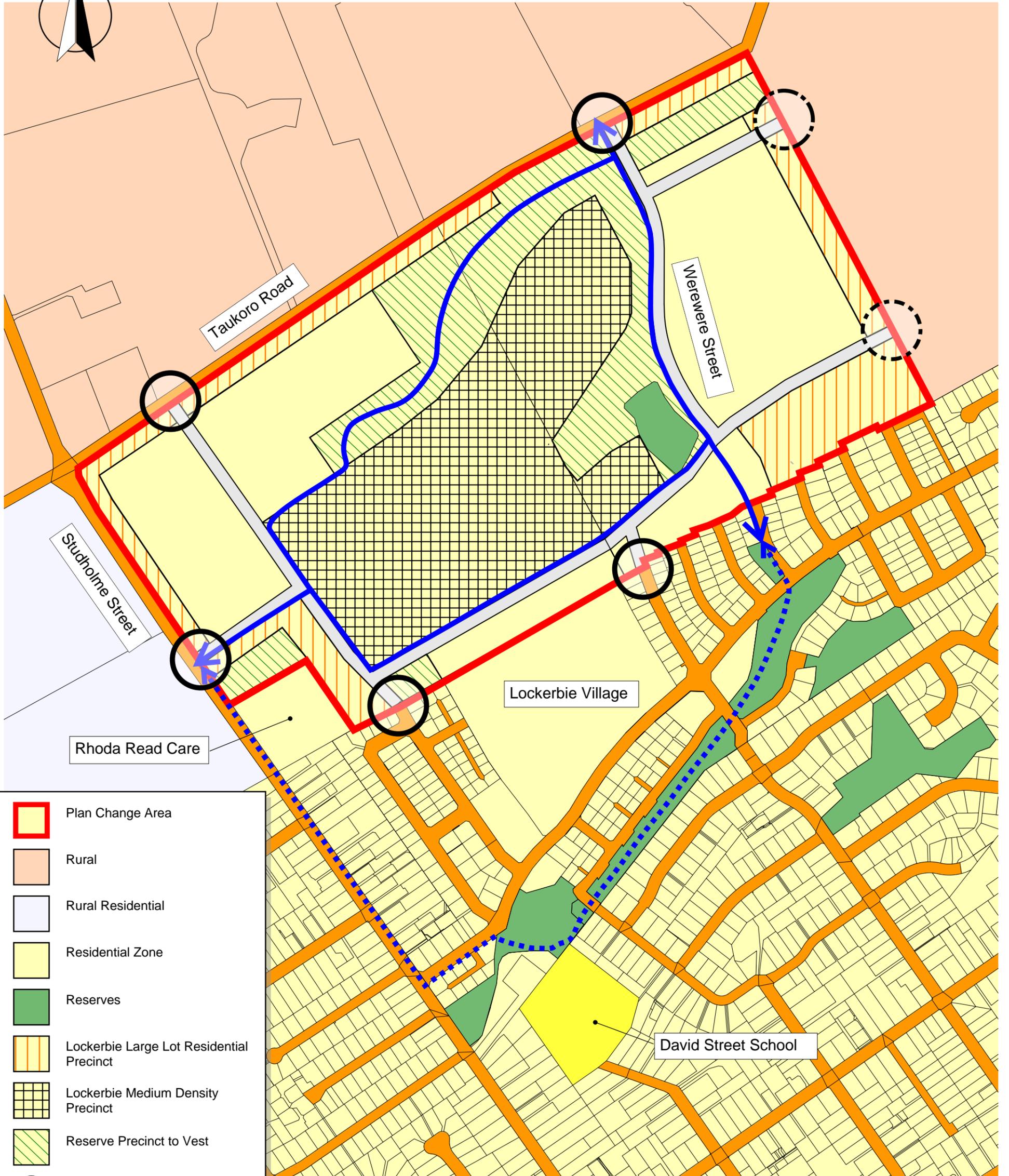
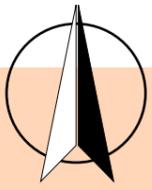
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From a technical perspective, the subsurface environment at any site may present substantial uncertainty. It is a heterogeneous, complex environment, in which small subsurface features or changes in geologic conditions can have substantial impacts on water, vapour and chemical movement. 4Sight Consulting's professional opinions are based on its professional judgement, experience, and training. These opinions are also based upon data derived from the testing and analysis described in this document. It is possible that additional testing and analysis might produce different results and/or different opinions. This document was prepared based on information provided by others. Should additional information become available, this report should be updated accordingly



Appendix A:

Proposed Development / Zoning Plan



- Plan Change Area
- Rural
- Rural Residential
- Residential Zone
- Reserves
- Lockerbie Large Lot Residential Precinct
- Lockerbie Medium Density Precinct
- Reserve Precinct to Vest
- Connections to road network
- Collector Roads
- Proposed Pedestrian Network
- Existing Pedestrian Network

LOCKERBIE ESTATE LIMITED DEVELOPMENT AREA PLAN



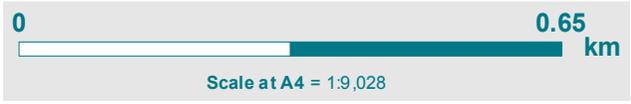
Appendix B:

WRC Site Contour Plan



Acknowledgements and Disclaimers:
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<https://www.waikatoregion.govt.nz/services/data-catalogue/>

Site Contour Plan



Date: 30/06/2021



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Appendix C:

Surrounding Environment



Legend
□ Site Boundary



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Produced by **Datanest.earth**

Title: Surrounding Environment

Client: Lockerbie Estate Limited		Figure No: 4 Size: A4
Project: 182 Morrinsville-Tahuna Road	Drawn: AB	
Date: 09-11-2021	Checked: NM	Version: 1.0
Proj No: 10006	Scale: 1:10000	

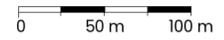


Appendix D:

Historical Aerial Photographs



- Legend**
- Site Boundary
 - 1948 Historical Aerial Photograph



LINZ CC BY 4.0 © Imagery Basemap contributors



Produced by **Datanest.earth**

Title: 1948 Historical Aerial Photograph		
Client: Lockerbie Estate Limited		Figure No: 5 Size: A4
Project: 182 Morrinsville-Tahuna Road	Drawn: AB	
Date: 09-11-2021	Checked: NM	
Proj No: 10006	Scale: 1:5500	Version: 1.0



- Legend**
- Site Boundary
 - 1966 Historical Aerial Photograph



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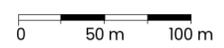


Produced by **Datanest.earth**

Title: 1966 Historical Aerial Photograph		
Client: Lockerbie Estate Limited		Figure No: 6 Size: A4
Project: 182 Morrinsville-Tahuna Road	Drawn: AB	
Date: 09-11-2021	Checked: NM	
Proj No: 10006	Scale: 1:5500	Version: 1.0



- Legend**
- Site Boundary
 - 📷 1979 Historical Aerial Photograph



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Produced by **Datanest.earth**

Title: 1979 Historical Aerial Photograph		
Client: Lockerbie Estate Limited		Figure No: 7 Size: A4
Project: 182 Morrinsville-Tahuna Road	Drawn: AB	
Date: 09-11-2021	Checked: NM	
Proj No: 10006	Scale: 1:5500	Version: 1.0



- Legend**
- Site Boundary
 - 1982 Historical Aerial Photograph



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Produced by **Datanest.earth**

Title: 1982 Historical Aerial Photograph		
Client: Lockerbie Estate Limited		Figure No: 8 Size: A4
Project: 182 Morrinsville-Tahuna Road	Drawn: AB	
Date: 09-11-2021	Checked: NM	
Proj No: 10006	Scale: 1:5500	Version: 1.0



- Legend**
- Site Boundary
 - 1990 Historical Aerial Photograph



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Produced by **Datanest.earth**

Title: 1990 Historical Aerial Photograph		
Client: Lockerbie Estate Limited		Figure No: 9 Size: A4
Project: 182 Morrinsville-Tahuna Road	Drawn: AB	
Date: 09-11-2021	Checked: NM	
Proj No: 10006	Scale: 1:5500	Version: 1.0



- Legend**
- Site Boundary
 - 2008 Historical Aerial Photograph



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Produced by **Datanest.earth**

Title: 2008 Historical Aerial Photograph

Client: Lockerbie Estate Limited		Figure No: 10 Size: A4
Project: 182 Morrinsville-Tahuna Road	Drawn: AB	
Date: 09-11-2021	Checked: NM	
Proj No: 10006	Scale: 1:5500	Version: 1.0



Legend

□ Site Boundary



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Produced by **Datanest.earth**

Title: 2020 Historical Aerial Photograph

Client: Lockerbie Estate Limited		Figure No: 11 Size: A4
Project: 182 Morrinsville-Tahuna Road	Drawn: AB	
Date: 09-11-2021	Checked: NM	
Proj No: 10006	Scale: 1:5500	Version: 1.0



Appendix E:

Land Use Information Register

Andrew Barr

From: Caitlin Holm <Caitlin.Holm@waikatoregion.govt.nz>
Sent: Thursday, 8 July 2021 8:25 PM
To: Andrew Barr
Subject: RE Land Use Information Register enquiry 182 Morrinsville-Tahuna Road, Morrinsville (REQ175529) No SLUS

Dear Andrew,

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

- **182 Morrinsville-Tahuna Road, Morrinsville:** PtL 2 DP 7445 (VRN 05305/233/05)



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

This property:

- I can confirm that this property **does not** currently appear on the Land Use Information Register.

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

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

Additional Information: Please note that:

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

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

Regards,

Caitlin Holm | SCIENTIST | Geothermal & Air, Land Ecology & Contamination, Science, Policy
 WAIKATO REGIONAL COUNCIL | Te Kaunihera ā Rohe o Waikato
 P: +6479497129
 M: +64212133330
 F: facebook.com/waikatoregion
 Private Bag 3038, Waikato Mail Centre, Hamilton, 3240



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Appendix F:

Site Inspection Photographs



Photo 1: Entrance to the Site / gravel driveway – looking west



Photo 2: Milking Parlour / Shed



Photo 3: Milking Shed



Photo 4: Bore at Milking Shed

SUBMERSIBLE PUMP DETAILS

NUMBER 1 BORE		NUMBER 2 BORE	
Cased to	114 ft	Cased to	172 ft
Depth of Bore	164 ft	Depth of Bore	188 ft
Water Level	82 ft	Water Level	88 ft
Pump Depth	110 ft	Pump Depth	120 ft

PRESSURE TANK

X TAP

- MILK ROOM
- TANK UNDER MILK ROOM
- FARM
- HOUSE and NUMBER 3

Photo 5: Bore Details



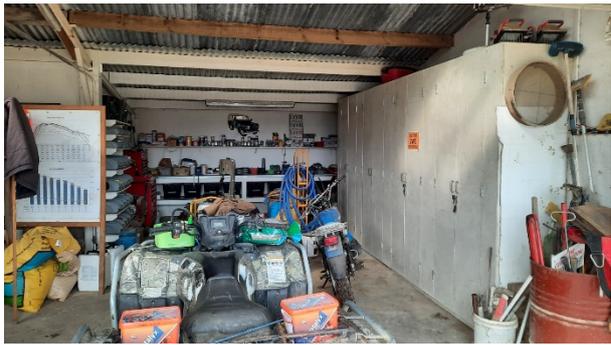


Photo 7: Inside Farm Shed



Photo 8: Small Scale Chemical Storage – Inside Farm Shed



Photo 9: Above Ground Diesel Tank

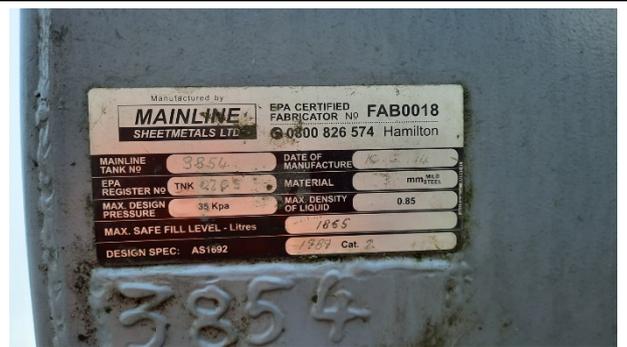


Photo 10: Label on Above Ground Diesel Tank



Photo 11: Hay Shelter



Photo 12: Soil Shelter



Photo 13: Silage Storage



Photo 14: Concrete Feed Storage Area



Photo 15: Effluent Pond



Photo 16: Effluent Pond



Photo 17: Feed Stockpile



Photo 18: Area of Storage



Photo 19: Composite Area 01 – Looking North



Photo 20: Composite Area 01 – Looking North



Photo 21: Sample Comp01-C



Photo 22: Burn Pile



Photo 23: Burn Pile



Photo 24: Stream – Located North-Eastern Area of the Site



Photo 25: Pond – Located North-Eastern Area of the Site



Photo 26: Composite Area 02



Photo 27: Composite Area 03



Photo 28: Sample Comp03-A



Photo 29: Sample Comp04-B



Photo 30: Tunnel for Cow traffic – Located North-Eastern Corner of the Site



Photo 31: Residential dwelling located in south-western corner of the Site



Photo 32: Residential dwelling located in south-western corner of the Site



Photo 33: South-western corner of the Site



Photo 34: PACM – gable end cladding on dwelling



Photo 35: Residential dwelling located in south-western corner of the Site



Photo 36: Shed located in south-western corner of the Site



Appendix G:

Analytical Laboratory Report



Certificate of Analysis

Client: 4SIGHT Consulting Limited	Lab No: 2655197	SPV1
Contact: Andrew Barr	Date Received: 12-Jul-2021	
C/- 4SIGHT Consulting Limited	Date Reported: 16-Jul-2021	
PO Box 911310	Quote No: 97403	
Victoria Street West	Order No: 10006	
Auckland 1142	Client Reference: Morrinsville - Tahuna Road	
	Submitted By: Nigel Mather	

Sample Type: Soil

Sample Name:	Ref01 12-Jul-2021	Composite of Comp01 A, Comp01 B, Comp01 C & Comp01 D	Composite of Comp02 A, Comp02 B, Comp02 C & Comp02 D	Composite of Comp03 A, Comp03 B, Comp03 C & Comp03 D	Composite of Comp04 A, Comp04 B, Comp04 C & Comp04 D
Lab Number:	2655197.17	2655197.18	2655197.19	2655197.20	2655197.21
Total Recoverable Cadmium mg/kg dry wt	0.36	0.82	0.70	0.79	0.60
pH* pH Units	6.1	6.8	6.8	6.5	7.0

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%.	-	17-21
Environmental Solids Sample Preparation	Air dried at 35°C and sieved, <2mm fraction. Used for sample preparation May contain a residual moisture content of 2-5%.	-	17-21
Soil Prep Dry & Sieve for Agriculture	Air dried at 35°C and sieved, <2mm fraction.	-	17-21
Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	17-21
Total Recoverable Cadmium	Dried sample, sieved as specified (if required). Nitric/Hydrochloric acid digestion, ICP-MS, screen level. US EPA 200.2.	0.10 mg/kg dry wt	17-21
pH*	1:2 (v/v) soil : water slurry followed by potentiometric determination of pH. In-house.	0.1 pH Units	17-21

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

Testing was completed on 16-Jul-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.

This certificate of analysis must not be reproduced, except in full, without the written consent of the signatory.

Graham Corban MSc Tech (Hons)
Client Services Manager - Environmental



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Certificate of Analysis

Client:	4SIGHT Consulting Limited	Lab No:	2748672	SPV1
Contact:	Andrew Barr C/- 4SIGHT Consulting Limited PO Box 911310 Victoria Street West Auckland 1142	Date Received:	29-Oct-2021	
		Date Reported:	02-Nov-2021	
		Quote No:	97403	
		Order No:	10006	
		Client Reference:	182 Morrinsville Tahuna Rd	
		Submitted By:	Jarrod Hall	

Sample Type: Soil

	Sample Name:	MTR-01_100	MTR-02_100	MTR-03_100	MTR-05_100	MTR-06_100
		28-Oct-2021	28-Oct-2021	28-Oct-2021	28-Oct-2021	28-Oct-2021
	Lab Number:	2748672.1	2748672.3	2748672.5	2748672.8	2748672.10
Total Recoverable Lead	mg/kg dry wt	730	3,600	1,270	210	280

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, 3, 5, 8, 10
Environmental Solids Sample Preparation	Air dried at 35°C and sieved, <2mm fraction. Used for sample preparation May contain a residual moisture content of 2-5%.	-	1, 3, 5, 8, 10
Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	1, 3, 5, 8, 10
Total Recoverable Lead	Dried sample, sieved as specified (if required). Nitric/Hydrochloric acid digestion, ICP-MS, screen level. US EPA 200.2.	0.4 mg/kg dry wt	1, 3, 5, 8, 10

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

Testing was completed on 02-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.

This certificate of analysis must not be reproduced, except in full, without the written consent of the signatory.

Kim Harrison MSc
Client Services Manager - Environmental



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Certificate of Analysis

Client: 4Sight Consulting Tauranga
Client Contact: Aaron Graham / Jarrod Hall
Tel: 07 394 4143
Email: aarong@4sight.co.nz / jarrodh@4sight.co.nz
Address: PO Box 13077, Tauranga Central, Tauranga 3141

Focus Analytics Ltd
 Suite 2 1277 Cameron Rd
 Tauranga

Site: 182 Morrinsville - Tahuna Road

Date sample(s) received: 28/10/2021 **Date sample(s) analysed and issued:** 28/10/2021
Samples taken by: Client **Certificate / Job Number:** T-03586/10006

Lab ID	Sample ID	Sample Details	Sample type	Sample size	Fibres Identified
1	MTR-01	In Soil	Cement Product	Sufficient	AMO, CHR, CRO

-Fibre Identification Key:

* – See Analytical Notes

CHR – Chrysotile (White Asbestos)
 AMO – Amosite (Brown / Grey Asbestos)
 CRO – Crocidolite – (Blue Asbestos)
 UMF – Unknown Mineral Fibre

ORF – Organic Fibre
 SMF – Synthetic Mineral Fibre
 NFD – No Fibres Detected
 NAD – No Asbestos Detected

Analysis Methods:

1. Samples submitted have been analysed to determine the presence of asbestos using low powered stereo microscopy followed by polarised light microscopy including dispersion staining techniques as documented in AS 4964-2004 and in company procedures NPM-TP03 Technical Procedure for Qualitative identification of asbestos in bulk samples
2. Any opinions and interpretation of test results fall outside the scope of accreditation.
3. The laboratory is not responsible for sampling errors when we have not taken the sample.
4. This certificate should be read in its entirety and shall not be reproduced except in full, without written approval of the laboratory.

Analyst Name: Meryn Tomson

Analyst Signature:



Reviewed By KTP: Meryn Tomson

Reviewer Signature:





Certificate of Analysis

Page 1 of 3

Client:	4SIGHT Consulting Limited	Lab No:	2749429	A2Pv1
Contact:	Andrew Barr C/- 4SIGHT Consulting Limited PO Box 911310 Victoria Street West Auckland 1142	Date Received:	29-Oct-2021	
		Date Reported:	04-Nov-2021	
		Quote No:	97403	
		Order No:	10006	
		Client Reference:	182 Morrinsville Tahuna Rd	
		Submitted By:	Jarrod Hall	

Sample Type: Soil

Sample Name:	MTR-06_100 28-Oct-2021				
Lab Number:	2749429.7				
Asbestos Presence / Absence	Asbestos NOT detected.	-	-	-	-
Description of Asbestos Form	-	-	-	-	-
Asbestos in ACM as % of Total Sample*	% w/w < 0.001	-	-	-	-
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	% w/w < 0.001	-	-	-	-
Asbestos as Fibrous Asbestos as % of Total Sample*	% w/w < 0.001	-	-	-	-
Asbestos as Asbestos Fines as % of Total Sample*	% w/w < 0.001	-	-	-	-
As Received Weight	g 555.8	-	-	-	-
Dry Weight	g 419.3	-	-	-	-
Moisture	% 25	-	-	-	-
Sample Fraction >10mm	g dry wt 17.0	-	-	-	-
Sample Fraction <10mm to >2mm	g dry wt 53.1	-	-	-	-
Sample Fraction <2mm	g dry wt 347.9	-	-	-	-
<2mm Subsample Weight	g dry wt 53.6	-	-	-	-
Weight of Asbestos in ACM (Non-Friable)	g dry wt < 0.00001	-	-	-	-
Weight of Asbestos as Fibrous Asbestos (Friable)	g dry wt < 0.00001	-	-	-	-
Weight of Asbestos as Asbestos Fines (Friable)*	g dry wt < 0.00001	-	-	-	-

Glossary of Terms

- Loose fibres (Minor) - One or two fibres/fibre bundles identified during analysis by stereo microscope/PLM.
 - Loose fibres (Major) - Three or more fibres/fibre bundles identified during analysis by stereo microscope/PLM.
 - ACM Debris (Minor) - One or two small (<2mm) pieces of material attached to fibres identified during analysis by stereo microscope/PLM.
 - ACM Debris (Major) - Large (>2mm) piece, or more than three small (<2mm) pieces of material attached to fibres identified during analysis by stereo microscope/PLM.
 - Unknown Mineral Fibres - Mineral fibres of unknown type detected by polarised light microscopy including dispersion staining. The fibres detected may or may not be asbestos fibres. To confirm the identities, another independent analytical technique may be required.
 - Trace - Trace levels of asbestos, as defined by AS4964-2004.
- For further details, please contact the Asbestos Team.

Please refer to the **BRANZ New Zealand Guidelines for Assessing and Managing Asbestos in Soil.**
<https://www.branz.co.nz/asbestos>

The following assumptions have been made:

1. Asbestos Fines in the <2mm fraction, after homogenisation, is evenly distributed throughout the fraction
2. The weight of asbestos in the sample is unaffected by the ashing process.

Results are representative of the sample provided to Hill Laboratories only.



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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
Individual Tests			
Wgt of Asbestos as Asbestos Fines in <10mm >2mm Fraction*	Measurement on analytical balance, from the <10mm >2mm Fraction. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.00001 g dry wt	7
New Zealand Guidelines Semi Quantitative Asbestos in Soil			
As Received Weight	Measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	7
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	7
Moisture	Sample dried at 100 to 105°C. Calculation = (As received weight - Dry weight) / as received weight x 100.	1 %	7
Sample Fraction >10mm	Sample dried at 100 to 105°C, 10mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g dry wt	7
Sample Fraction <10mm to >2mm	Sample dried at 100 to 105°C, 10mm and 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g dry wt	7
Sample Fraction <2mm	Sample dried at 100 to 105°C, 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g dry wt	7
Asbestos Presence / Absence	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0.01%	7
Description of Asbestos Form	Description of asbestos form and/or shape if present.	-	7
Weight of Asbestos in ACM (Non-Friable)	Measurement on analytical balance, from the >10mm Fraction. Weight of asbestos based on assessment of ACM form. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	7
Asbestos in ACM as % of Total Sample*	Calculated from weight of asbestos in ACM and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	7
Weight of Asbestos as Fibrous Asbestos (Friable)	Measurement on analytical balance, from the >10mm Fraction. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	7
Asbestos as Fibrous Asbestos as % of Total Sample*	Calculated from weight of fibrous asbestos and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	7
Weight of Asbestos as Asbestos Fines (Friable)*	Measurement on analytical balance, from the <10mm Fractions. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	7
Asbestos as Asbestos Fines as % of Total Sample*	Calculated from weight of asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	7
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	Calculated from weight of fibrous asbestos plus asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	7

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

Testing was completed on 04-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.

This certificate of analysis must not be reproduced, except in full, without the written consent of the signatory.

A handwritten signature in purple ink, appearing to be 'Dexter Paguirigan', written in a cursive style.

Dexter Paguirigan Dip Chem Engineering Tech
Laboratory Technician - Asbestos