

PRELIMINARY SITE INVESTIGATION

238 STOCK ROAD & 49a DUNDEE DRIVE FLAXMERE

PROJECT NO. EAM2122-REP-01

PREPARED FOR
ARATAKI PROPERTY

PREPARED BY
KAREN TOULMIN
SEPTEMBER 2021

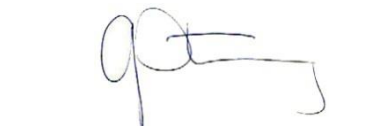
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LIMITATIONS:

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1 INTRODUCTION

EAM NZ Limited (EAM) has been engaged by Arataki Property to undertake a Preliminary Site Investigation (PSI), at 238 Stock Road, and 49a Dundee Drive, Flaxmere. It is our understanding that the client plans to develop the site into residential allotments.

This PSI has been undertaken to provide a contamination assessment of the Site and to evaluate human health risks at the Site. A phased approach has been adopted for this investigation with an initial investigation, assembling background information to identify potential sources of contamination from past and present activities. This information is then used to develop a conceptual Site model and investigation strategy.

This report provides the following information:

- Background information.
- Site history.
- A conceptual Site model.
- Site visit and sampling
- Laboratory results.
- Conclusions and recommendations.

This investigation has been carried out in accordance with the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (NES).

2 SITE DETAILS

2.1 SITE DESCRIPTION

The Site is classified as general residential/plain's production. It is predominantly used for orchard and vineyard but also encompasses a house section, and an area of implement shedding. The legal description for the Site is SEC 1 9 SO 454705 (49a Dundee drive) and PT LOT 5 DP 2976 SECS 18 20 22 SO 438108 (238 Stock Rd). The combined land area of both titles is 28.16ha. Figures 1 and 2 illustrate the property location, and the boundary of the property.

FIGURE 1. TOPOGRAPHIC MAP SHOWING LOCATION IN RED



FIGURE 2. BOUNDARY OF 238 STOCK ROAD AND 49A DUNDEE DRIVE



3 ENVIRONMENTAL SETTING

The site is located in a plains production/general residential zoned area. The topography of the site and surrounding area is low gradient flat land. The immediate surrounds of the site are residential to the north and north east, and agricultural production land in all other directions.

Soils at the site are described by Landcare Research(2020) as a mixture of Recent soils, Raw soils and Gley soils. Recent soils are weakly developed with a distinct topsoil, but a weak or absent B horizon. They typically occur on alluvial floodplains and young land surfaces. These soils are typical of low-lying areas close to river channels. These soils travel along the same pathway as the Irongate stream, which travels in a south easterly direction through the site. Soils at the north east extent of the site are Gley soils. Gley soils have a high bulk density and movement through the soil is limited when soils are wet. They are prone to waterlogging, which typically occurs during winter and spring. They have light grey subsoils, usually with reddish brown or brown mottles. The grey colours usually extend to more than 100 cm depth.

The southern half of the site is dominated by Raw soils, which are very young soils. Raw soils are moderately well draining as they lack a distinct topsoil or are fluid at shallow depth. Topsoil development is prevented by rockiness, by active erosion, or deposition.

The Irongate stream travels in an easterly direction along the southern boundary of the site. A tributary of this stream commences in the northern extent of the site, taking surface water from the site and travelling in a southerly direction until it meets the Irongate stream.

4 DESKTOP REVIEW OF SITE HISTORY

A desktop study was undertaken to gain an understanding of the history of the site. The review looks to determine potential contaminants which may be present at the site as a result of past and present land uses. The following information was sourced to establish the history of the site:

- Hawkes Bay Regional Council Property Search
- Property File Search
- Historical Aerial Photographs
- Site Inspection

4.1 HAWKES BAY REGIONAL COUNCIL LAND USE REGISTER

The site is considered HAIL as it is used as an orchard.

4.2 PROPERTY FILES

No property files referring to a potential contaminant source were found.

4.3 HISTORICAL AERIAL PHOTOGRAPHS

Historical aerial photographs of the site, from 1959 through to 2020, were sourced from Retrolens and Hastings District Council, and reviewed. Aerial photographs for the years 1959, 1969, 1977, 1988, 1994, 1999, 2008, 2014 and 2020 are presented in Appendix 1.

The earliest available historical imagery was from 1959, and shows the site as farmland. Trees are sparsely scattered across the site, and tributaries of the Irongate Stream travel through the site. No

significant changes are observed at the site until 1999, when imagery shows that the north and western extent of the site is planted in orchard. The site remains much in this context until 2015 when some of the orchard is removed, and by 2020, the entire area to the left of the Irongate Stream tributary, which travels through the centre of property, is orchard.

5 SITE VISIT

A site visit was completed on Friday 3rd September. The site entrance is at 238 Stock Road and is via gravel driveway. To the right, the Irongate stream enters the property, alongside the driveway. Firmly packed vehicle track leads off to the left and right, and travels around and throughout the site. The track to the left ventures along the back of housing on Dundee drive, looping through the vineyard and meeting up with the right-side track. The track to the right leads to a series of implement sheds, approximately 150m in from the entrance. Two main implement sheds face each other with a concrete sealed area extending beneath both, and an open area in between. Two small chemical sheds are present either side of the sheds, one locked and in good condition, the other open and dilapidated. An above ground fuel tank is located to the side of the sheds. The surrounds are used for storage of drums, fruit crates and other materials. Two 44-gallon drums used as burn bins are present, and full of burnt material. The shedding area is surrounded by the orchard. Track extends past the implement shed area and through the orchard and vineyard. There are many areas of piled up posts, fruit crates, netting and rubbish which appear in piles mounded up as if to be burned.

Site photographs are shown in Figures 3 through 8.

FIGURE 3. AREA AROUND MAIN IMPLEMENT SHEDS



FIGURE 4. DILAPIDATED STORAGE/CHEMICAL SHED



FIGURE 5. ABOVE GROUND FUEL TANK



FIGURE 6. OPEN IMPLEMENT SHED



FIGURE 7. PHOTO LOOKING EAST



FIGURE 8. SOUTH EASTERN CORNER



FIGURE 8. VINEYARD



FIGURE 8. STONE FRUIT ORCHARD



6 SOIL INVESTIGATION AND RISK ASSESSMENT PROCESS

6.1 CONCEPTUAL SITE MODEL

The overall rationale for the site investigation was to determine whether historical activities on the Site may have caused soil contamination that would affect the proposed land use.

The following is an analysis of potential contaminants, receptors, and pathways between potentially contaminated soils, and the proposed residential land use.

6.1.1 HAZARDOUS SUBSTANCES AND POTENTIAL CONTAMINANTS OF CONCERN

For the purposes of this investigation, the following contaminants were considered.

- Metals (As, Cd, Cu, Cr, Pb, Ni, Zn)
- Organo-Chlorine Pesticides (OCP)
- Total Petroleum Hydrocarbons (TPH)
- Polycyclic Aromatic Hydrocarbons (PAH)

Orchards and nurseries established pre-1970's are renowned for soil contamination as a result of historical pesticide use, particularly in the form of metals and Organo-Chlorine Pesticides. The site was not planted in orchard until sometime between 1994 and 1999, and therefore the potential for OCP contamination is considered low. However, to cover off all bases, analysis for OCP is considered.

A burning bin was observed during the site visit, in the implement shed area, with spillage and ash on the grounds surrounding it. A test for Polycyclic Aromatic Hydrocarbons, was therefore considered at this area.

Total Petroleum Hydrocarbons were analysed to assess spillage/ leakage from the above ground fuel tank.

6.1.2 POTENTIAL RECEPTORS

Potential receptors are the current and future users residing at the Site.

6.1.3 EXPOSURE PATHWAYS

A human health risk can only occur when there is a direct link between contaminant source and receptor. Potential complete pathways are:

- Dermal (skin) with soil
- Direct contact and inhalation of dusts and soil during construction and site works
- Consumption of foods grown in contaminated soils
- Consumption of groundwater contaminated by the source
- Consumption of soils, particularly by children.
- Uptake by grazing animals, and then ingestion of animal products.

6.2 SITE SAMPLING

6.2.1 SOIL SAMPLING

Sampling locations across the Site were established using reference to the “Contaminated Land Guidelines No. 5” (MfE 2011).

Samples were collected from 12 sample locations across the site, with the locations shown in Figure 9. Soil samples were collected using a 150mm soil augur.

FIGURE 9. TRIAL PIT LOCATIONS



6.2.2 FIELD QUALITY ASSURANCE AND QUALITY CONTROL (QA/QC)

Quality Assurance and Quality Control procedures undertaken during sampling included the following:

- Changing of disposable gloves after each sample;
- Decontamination and rinsing of augur between each sample;
- Collection of soil samples in new, clean, appropriately labelled sample bags;

- Use of chain of custody procedures and forms; and
- Use of IANZ accredited laboratories with in-house QA/QC procedures for the analyses requested.

7 LABORATORY ANALYSIS AND RESULTS

7.1 GUIDELINES

New Zealand guidelines/Standards are the foremost assessment guidelines/Standards employed when assessing contaminated sites in New Zealand. Standard values are imposed to assist with determining the suitability of a site for its intended purpose; and to indicate the potential health risk to receptors.

Health based guidelines are derived through consideration of a variety of potential exposure pathways and the degree of exposure based on the physical setting of each land use. Potential pathways may be considered in the form of oral ingestion, dermal absorption and inhalation.

The soil analysis results for the Site were compared directly with the soil contamination standards for Health (*SCS_(health)*) from the National Environmental Standard (NES) (MfE, 2012). In addition to this, the results were also compared to an uncontaminated (background) Hawke's Bay soil. Sample analysis was compared against the residential land use criteria. The NES describes residential land use as *"Standard residential Lot, for single dwelling sites with gardens, including homegrown produce consumption (10 percent)"*.

There are currently no risk-based acceptance criteria for Nickel or Zinc within New Zealand. In their absence, the Australian NEPC (2013) guidelines were adopted. Application of these criteria is considered to provide a reasonable assessment of risk for the current land use and associated risks to human health, in the context of this assessment.

7.2 LABORATORY ANALYSIS-METALS

A summary of the soil metals results is presented in Table 1. The full laboratory report is presented in Appendix 1.

TABLE 1 SUMMARY OF SOIL METAL RESULTS (ALL RESULTS mg/kg⁻¹ DRY WEIGHT)

Sample	As	Cd	Cr	Cu	Pb	Ni	Zn
Sample #1	16	0.37	30	1020	32	8	360
Sample #2	14	0.14	017	300	16.9	8	137
Sample #3	12	0.15	19	49	16.2	9	123
Sample #4	5	0.15	13	94	25	9	109
Sample #5	5	0.14	13	53	22	9	119
Sample #8	5	0.16	12	63	17.4	9	85
Sample #9	4	0.19	12	57	21	8	100
Sample #10	4	0.13	11	116	29	8	85
Sample #11	5	0.17	12	113	41	7	83
Sample #12	62	0.12	44	52	62	10	158
Hawkes Bay background soil	9	0.7	24	32	27	69	105
Residential (10%)	20	3	>10,000	>10,000	210	-	-
NEPM Residential A*	-	-	-	-	-	400	7400

*Residential with garden/accessible soil (home grown produce <10% fruit and vegetable intake (no poultry), also includes childcare centres, preschools and primary schools.

Metal results were all within the NES guidelines except for sample 12. Sample 12 was collected from soil next to a treated post in the vineyard and reported concentrations of arsenic (62mg/kg) in exceedance of the residential (10% produce) guideline of 20mg/kg. This sample was collected based on the known ability for CCA treated posts to leach into the soil. Site soils exceed all background metal concentrations except for cadmium and nickel.

In relation to Hawkes Bay uncontaminated soil values, the Site soils indicate exceedance of arsenic, chromium, copper, lead, and zinc.

7.3 TPH/PAH

Sample #6, collected beneath the above ground fuel tank was analysed for TPH. Laboratory analysis reported acceptable concentrations.

Sample #7 was collected from the soil around two drums used for burning off. Laboratory analysis reported concentrations of PAH below the laboratory detection limits.

7.4 ORGANOCHLORINE PESTICIDES

Eight samples were composited to make two, four-part samples for OCP analysis. Laboratory analysis reported concentrations of OCP below the laboratory detection limits for both samples analysed.

8 CONCLUSIONS AND RECOMMENDATIONS

From this investigation, due consideration was given to the full range of potential contaminants that might be expected to occur at this site. The following key point summarise this investigation:

- A review of the site history shows that the site has been farmland up until between 1994 and 1999, when it began being used as orchard.
- Analysis of samples for OCP's, show that historical orchard pesticides are not present at this site.
- TPH and PAH sample analysis reported acceptable concentrations.
- Sample #12, collected from near a treated vineyard post, reported exceedance (62 mg/kg) of the NES (10% produce) limit for arsenic (20mg/kg) in a residential setting. It is most likely this is a result of CCA leachate from the vineyard post, and it is expected that a similar trend is likely across the site.
- It is likely that tillage of site soils will be required to dilute elevate arsenic levels across the site to meet the acceptable NES residential (10% produce) concentrations. Validation of the site, to ensure tilled soils have been sufficiently diluted will be required.

The assessment has identified that the soils at this site currently do not meet the NES, and further work will be required.

9 REFERENCES

MfE 2011 Contaminated Land Management Guidelines No.1 Reporting on Contaminated Sites in New Zealand. Ministry for the Environment.

MfE 2012 Users' Guide National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health. Ministry for the Environment.

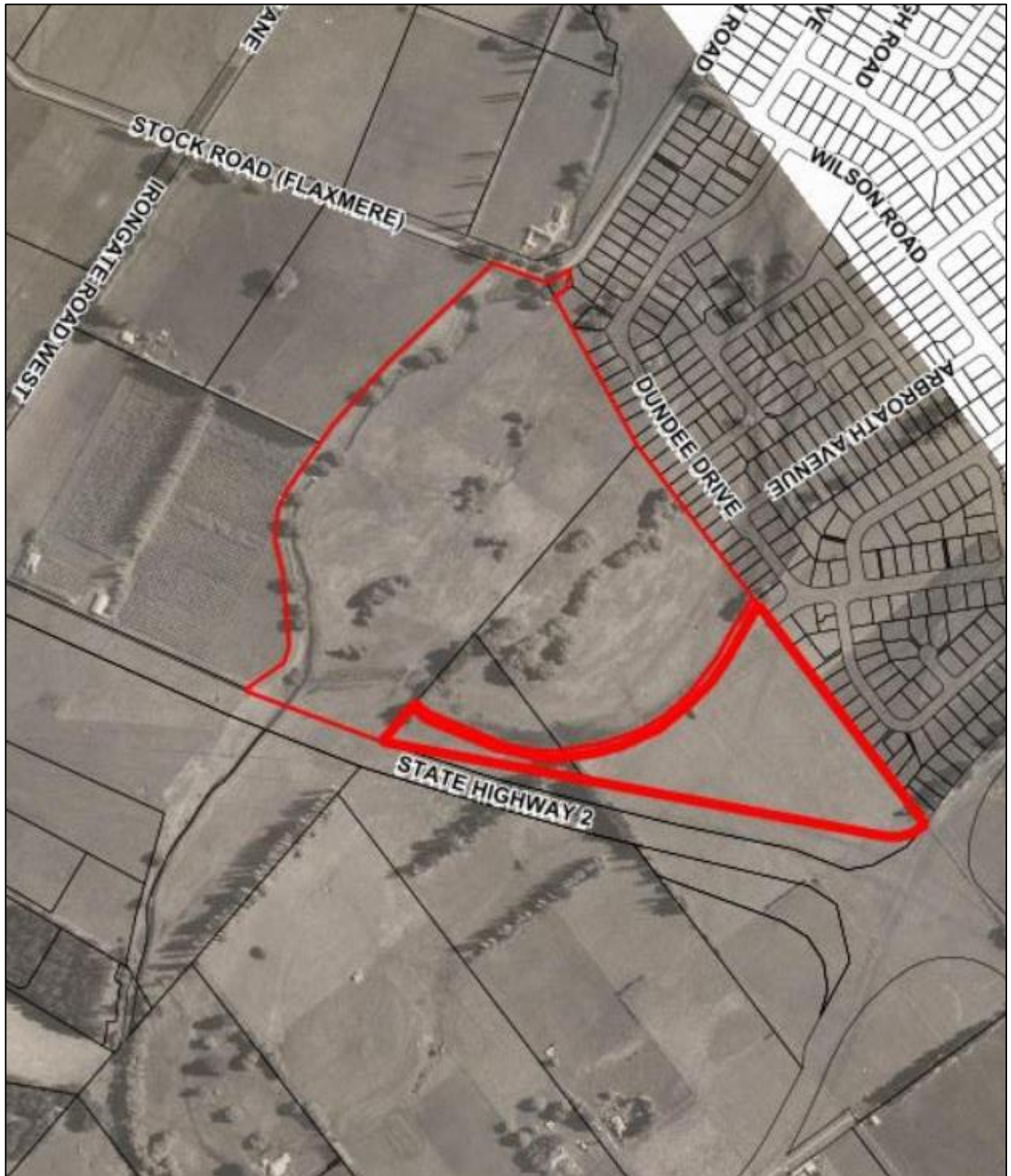
MfE 2011 Contaminated Land Management Guidelines No.5; Site Investigation and Analysis of Soil. Ministry for the Environment.

Hawkes Bay Region: Background Soil Concentrations for Managing Soil Quality, Landcare Research, 2014.

<https://soils-maps.landcareresearch.co.nz> (2020)

APPENDIX 1-AERIAL PHOTOGRAPHS

1959 (Source, HDC)



1969 (Source, HDC)



1977 (Source, HDC)



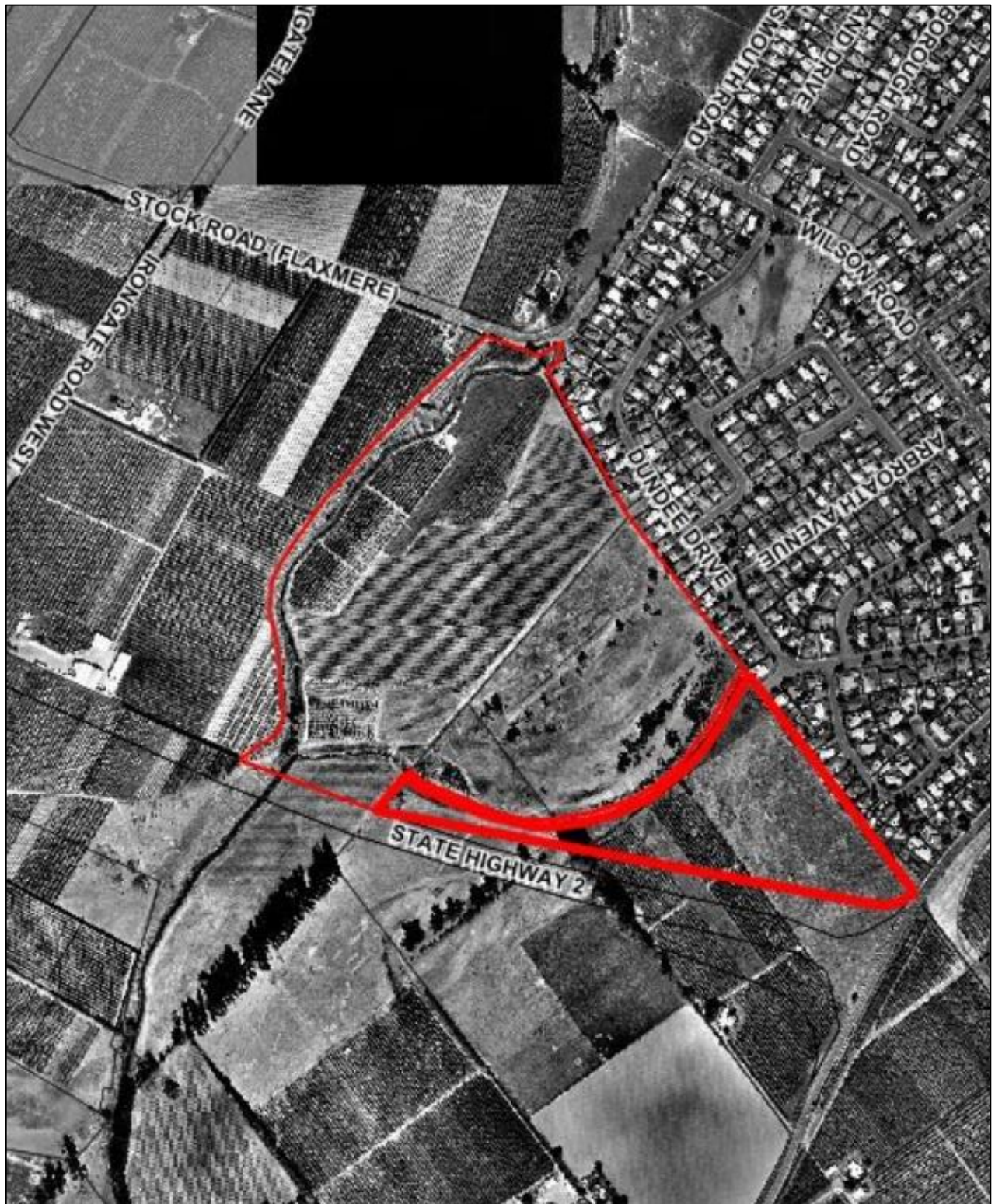
1988 (Source, Retrolens)



1994 (Source, HDC)



1999 (Source, HDC)



2008 (Source, HDC)



2015 (Source, HDC)



2020 (Source, HDC)



APPENDIX 2-CHAIN OF CUSTODY


Hill Laboratories
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Quote No

Primary Contact Karen Toulmin 278861
Submitted By Karen Toulmin 278861
Client Name EAM NZ Limited 181284

Address PO Box 1154
 Napier 4140, New Zealand

s 9(2)(a)

Charge To EAM NZ LTD**Client Reference** Patuillo's nurseries**Additional Client Ref****Order No****Results To**
 Reports will be emailed to Primary Contact by default.
 Additional Reports will be sent as specified below.

- ☒ Email Primary Contact ☒ Email Submitter ☐ Email Client
☐ Email Other _____
☐ Other _____

 Dates of testing are not routinely included in the Certificates of Analysis.
 Please inform the laboratory if you would like this information reported.
ADDITIONAL INFORMATION / KNOWN HAZARDS

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

Job No: Date Recv: 12-Aug-21 09:15

267 6315

T 0508 HILL LAB (44 555 2
E +64 7 858 2000
W mail@hill-labs.co.nz
 www.hill-laboratories.com

Received by: Peter Allen

**CHAIN OF CUSTODY RECORD**
Sent to
 Hill Laboratories

Date & Time: 11.8

☒ Tick if you require COC
 to be emailed back

Name: K. Toulmin

Signature: *[Signature]*
Received at
 Hill Laboratories

Date & Time:

Name:

Signature:

Condition
☐ Room Temp ☐ Chilled ☐ Frozen

Temp: 5

☐ Sample & Analysis details checked

Signature:

Priority ☐ Low ☒ Normal ☐ High

☐ Urgent (ASAP, extra charge applies, please contact lab first)

Requested Reporting Date: _____

Quoted Sample Types

--

No.	Sample Name	Sample Date/Time	Sample Type	Tests Required
1	#1 0-150	11.8	Soil	Please analyse all samples
2	#2 0-150	"	"	for metals.
3	#3 0-150	"	"	Please also Composite
4	#4 0-150	"	"	#1 0-150, #3 0-150, #6 0-150,
5	#5 0-150	"	"	#8 0-150 + test for
6	#6 0-150	"	"	OCP.
7	#6a	"	"	
8	#7 0-150	"	"	Please hold all samples

Listed over page Cold.

 Continued on
 next page

PRELIMINARY SITE INVESTIGATION, 238 STOCK ROAD & 49A DUNDEE DRIVE, FLAXMERE

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
13	#8 0-150	11.8		Soil	
14	#9 0-150	11.8		soil	
15	#1 150-300	11.8		soil	
16	#4 150-300	11.8		Soil	
17	#7 150-300	11.8		Soil.	
18					
19	/ / / / / / / / / / / / / / / /				
20	Please hold				
21	Cold &				
22	#1 300-500				
23	#2 150-300				
24	#2 300-500				
25	#3 150-350				
26	#5 150-300				
27	#5 300-400				
28	#6 150-300				
29	#6 300-500				
30	#7 300-500				
31	#8 150-300				
32	#8 300-500				
33	#9 150-300				
34					
35					
36					
37					
38					
39					
40					



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Job Information Summary

Page 1 of 2

Client:	EAM NZ Limited	Lab No:	2676315
Contact:	J Strong	Date Registered:	12-Aug-2021 4:04 pm
	C/- EAM NZ Limited	Priority:	High
	233B Thompson Road	Quote No:	72316
	RD 10	Order No:	
	Hastings 4180	Client Reference:	Patuillo's Nurseries
		Add. Client Ref:	
		Submitted By:	Karen Toulmin
		Charge To:	EAM NZ Limited
		Target Date:	17-Aug-2021 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	#1 0-150 11-Aug-2021	Soil	cpBag	Heavy Metals, Screen Level; Composite Environmental Solid Samples
2	#2 0-150 11-Aug-2021	Soil	cpBag	Heavy Metals, Screen Level
3	#3 0-150 11-Aug-2021	Soil	cpBag	Heavy Metals, Screen Level; Composite Environmental Solid Samples
4	#4 0-150 11-Aug-2021	Soil	cpBag	Heavy Metals, Screen Level
5	#5 0-150 11-Aug-2021	Soil	cpBag	Heavy Metals, Screen Level
6	#6 0-150 11-Aug-2021	Soil	cpBag	Heavy Metals, Screen Level; Composite Environmental Solid Samples
7	#6a 11-Aug-2021	Soil	cpBag	Heavy Metals, Screen Level
8	#7 0-150 11-Aug-2021	Soil	cpBag	Heavy Metals, Screen Level
9	#8 0-150 11-Aug-2021	Soil	cpBag	Heavy Metals, Screen Level; Composite Environmental Solid Samples
10	#9 0-150 11-Aug-2021	Soil	cpBag	Heavy Metals, Screen Level
11	#1 150-300 11-Aug-2021	Soil	cpBag	Hold Cold
12	#4 150-300 11-Aug-2021	Soil	cpBag	Hold Cold
13	#7 150-300 11-Aug-2021	Soil	cpBag	Hold Cold
14	#1 300-500 11-Aug-2021	Soil	cpBag	Hold Cold
15	#2 150-300 11-Aug-2021	Soil	cpBag	Hold Cold
16	#2 300-500 11-Aug-2021	Soil	cpBag	Hold Cold
17	#3 150-350 11-Aug-2021	Soil	cpBag	Hold Cold
18	#5 150-300 11-Aug-2021	Soil	cpBag	Hold Cold
19	#5 300-400 11-Aug-2021	Soil	cpBag	Hold Cold
20	#6 150-300 11-Aug-2021	Soil	cpBag	Hold Cold
21	#6 300-500 11-Aug-2021	Soil	cpBag	Hold Cold
22	#7 300-500 11-Aug-2021	Soil	cpBag	Hold Cold
23	#8 150-300 11-Aug-2021	Soil	cpBag	Hold Cold
24	#8 300-500 11-Aug-2021	Soil	cpBag	Hold Cold
25	#9 150-300 11-Aug-2021	Soil	cpBag	Hold Cold
26	Composite of #1 0-150, #3 0-150, #6 0-150 & #8 0-150	Soil	OrgComp	Organochlorine Pesticides Screening in Soil

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%.	-	1-10

Lab No: 2676315

Hill Laboratories

Page 1 of 2

Sample Type: Soil			
Test	Method Description	Default Detection Limit	Sample No
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	1-10
Organochlorine Pesticides Screening in Soil	Sonication extraction, GC-ECD analysis. Tested on as received sample. In-house based on US EPA 8081.	0.010 - 0.06 mg/kg dry wt	26
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	26
Composite Environmental Solid Samples	Individual sample fractions mixed together to form a composite fraction.	-	1, 3, 6, 9

APPENDIX 3- LABORATORY REPORT



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Certificate of Analysis

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Client:	EAM NZ Limited	Lab No:	2694880	SPv1
Contact:	J Strong	Date Received:	04-Sep-2021	
	C/- EAM NZ Limited	Date Reported:	10-Sep-2021	
	233B Thompson Road	Quote No:	72316	
	RD 10	Order No:		
	Hastings 4180	Client Reference:	238 Stock rd	
		Submitted By:	Karen Toulmin	

Sample Type: Soil					
Sample Name:	238 Stock Rd #1	238 Stock Rd #2	238 Stock Rd #3	238 Stock Rd #4	238 Stock Rd #5
Lab Number:	2694880.1	2694880.2	2694880.3	2694880.4	2694880.5
Heavy Metals, Screen Level					
Total Recoverable Arsenic	mg/kg dry wt	16	14	12	5
Total Recoverable Cadmium	mg/kg dry wt	0.37	0.14	0.15	0.15
Total Recoverable Chromium	mg/kg dry wt	30	17	19	13
Total Recoverable Copper	mg/kg dry wt	1,020	300	49	94
Total Recoverable Lead	mg/kg dry wt	32	16.9	16.2	25
Total Recoverable Nickel	mg/kg dry wt	8	8	9	9
Total Recoverable Zinc	mg/kg dry wt	360	137	123	109

Sample Name:	238 Stock Rd #6	238 Stock Rd #7	238 Stock Rd #8	238 Stock Rd #9	238 Stock Rd #10
Lab Number:	2694880.6	2694880.7	2694880.8	2694880.9	2694880.10
Individual Tests					
Dry Matter	g/100g as rcvd	78	85	-	-
Heavy Metals, Screen Level					
Total Recoverable Arsenic	mg/kg dry wt	-	-	5	4
Total Recoverable Cadmium	mg/kg dry wt	-	-	0.16	0.19
Total Recoverable Chromium	mg/kg dry wt	-	-	12	12
Total Recoverable Copper	mg/kg dry wt	-	-	63	57
Total Recoverable Lead	mg/kg dry wt	-	-	17.4	21
Total Recoverable Nickel	mg/kg dry wt	-	-	9	8
Total Recoverable Zinc	mg/kg dry wt	-	-	85	100
Polycyclic Aromatic Hydrocarbons Screening in Soil*					
Total of Reported PAHs in Soil	mg/kg dry wt	-	< 0.3	-	-
1-Methylnaphthalene	mg/kg dry wt	-	< 0.012	-	-
2-Methylnaphthalene	mg/kg dry wt	-	< 0.012	-	-
Acenaphthylene	mg/kg dry wt	-	< 0.012	-	-
Acenaphthene	mg/kg dry wt	-	< 0.012	-	-
Anthracene	mg/kg dry wt	-	< 0.012	-	-
Benzo[a]anthracene	mg/kg dry wt	-	< 0.012	-	-
Benzo[a]pyrene (BAP)	mg/kg dry wt	-	< 0.012	-	-
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	-	< 0.03	-	-
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	-	< 0.03	-	-
Benzo[b]fluoranthene + Benzo[j]fluoranthene	mg/kg dry wt	-	< 0.012	-	-
Benzo[e]pyrene	mg/kg dry wt	-	< 0.012	-	-
Benzo[g,h,i]perylene	mg/kg dry wt	-	< 0.012	-	-
Benzo[k]fluoranthene	mg/kg dry wt	-	< 0.012	-	-
Chrysene	mg/kg dry wt	-	< 0.012	-	-



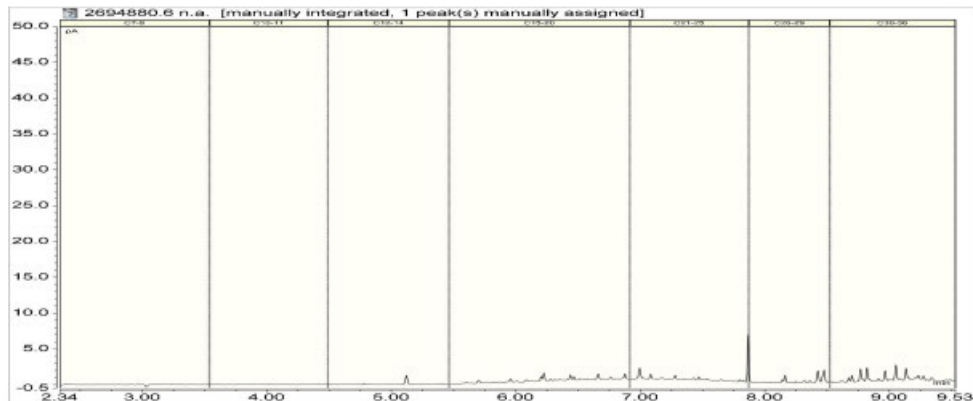
This Laboratory is accredited by International Accreditation New Zealand (IANZ), which represents New Zealand in the International Laboratory Accreditation Cooperation (ILAC). Through the ILAC Mutual Recognition Arrangement (ILAC-MRA) this accreditation is internationally recognised. The tests reported herein have been performed in accordance with the terms of accreditation, with the exception of tests marked * or any comments and interpretations, which are not accredited.

Sample Type: Soil						
Sample Name:		238 Stock Rd #6	238 Stock Rd #7	238 Stock Rd #8	238 Stock Rd #9	238 Stock Rd #10
Lab Number:		2694880.6	2694880.7	2694880.8	2694880.9	2694880.10
Polycyclic Aromatic Hydrocarbons Screening in Soil*						
Dibenzo[a,h]anthracene	mg/kg dry wt	-	< 0.012	-	-	-
Fluoranthene	mg/kg dry wt	-	< 0.012	-	-	-
Fluorene	mg/kg dry wt	-	< 0.012	-	-	-
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	-	< 0.012	-	-	-
Naphthalene	mg/kg dry wt	-	< 0.06	-	-	-
Perylene	mg/kg dry wt	-	< 0.012	-	-	-
Phenanthrene	mg/kg dry wt	-	< 0.012	-	-	-
Pyrene	mg/kg dry wt	-	0.072	-	-	-
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	< 8	-	-	-	-
C10 - C14	mg/kg dry wt	< 20	-	-	-	-
C15 - C36	mg/kg dry wt	270	-	-	-	-
Total hydrocarbons (C7 - C36)	mg/kg dry wt	270	-	-	-	-
Sample Name:		238 Stock Rd #11	238 Stock Rd #12	Composite of 238 Stock Rd #1, 238 Stock Rd #2, 238 Stock Rd #3 & 238 Stock Rd #4	Composite of 238 Stock Rd #8, 238 Stock Rd #9, 238 Stock Rd #10 & 238 Stock Rd #11	
Lab Number:		2694880.11	2694880.12	2694880.13	2694880.14	
Individual Tests						
Dry Matter	g/100g as rcvd	-	-	83	87	-
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	5	62	-	-	-
Total Recoverable Cadmium	mg/kg dry wt	0.17	0.12	-	-	-
Total Recoverable Chromium	mg/kg dry wt	12	44	-	-	-
Total Recoverable Copper	mg/kg dry wt	113	52	-	-	-
Total Recoverable Lead	mg/kg dry wt	41	62	-	-	-
Total Recoverable Nickel	mg/kg dry wt	7	10	-	-	-
Total Recoverable Zinc	mg/kg dry wt	83	158	-	-	-
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	-	-	< 0.012	< 0.012	-
alpha-BHC	mg/kg dry wt	-	-	< 0.012	< 0.012	-
beta-BHC	mg/kg dry wt	-	-	< 0.012	< 0.012	-
delta-BHC	mg/kg dry wt	-	-	< 0.012	< 0.012	-
gamma-BHC (Lindane)	mg/kg dry wt	-	-	< 0.012	< 0.012	-
cis-Chlordane	mg/kg dry wt	-	-	< 0.012	< 0.012	-
trans-Chlordane	mg/kg dry wt	-	-	< 0.012	< 0.012	-
2,4'-DDD	mg/kg dry wt	-	-	< 0.012	< 0.012	-
4,4'-DDD	mg/kg dry wt	-	-	< 0.012	< 0.012	-
2,4'-DDE	mg/kg dry wt	-	-	< 0.012	< 0.012	-
4,4'-DDE	mg/kg dry wt	-	-	< 0.012	< 0.012	-
2,4'-DDT	mg/kg dry wt	-	-	< 0.012	< 0.012	-
4,4'-DDT	mg/kg dry wt	-	-	< 0.012	< 0.012	-
Total DDT Isomers	mg/kg dry wt	-	-	< 0.07	< 0.07	-
Dieldrin	mg/kg dry wt	-	-	< 0.012	< 0.012	-
Endosulfan I	mg/kg dry wt	-	-	< 0.012	< 0.012	-
Endosulfan II	mg/kg dry wt	-	-	< 0.012	< 0.012	-
Endosulfan sulphate	mg/kg dry wt	-	-	< 0.012	< 0.012	-
Endrin	mg/kg dry wt	-	-	< 0.012	< 0.012	-
Endrin aldehyde	mg/kg dry wt	-	-	< 0.012	< 0.012	-
Endrin ketone	mg/kg dry wt	-	-	< 0.012	< 0.012	-
Heptachlor	mg/kg dry wt	-	-	< 0.012	< 0.012	-
Heptachlor epoxide	mg/kg dry wt	-	-	< 0.012	< 0.012	-
Hexachlorobenzene	mg/kg dry wt	-	-	< 0.012	< 0.012	-
Methoxychlor	mg/kg dry wt	-	-	< 0.012	< 0.012	-

2694880.6

238 Stock Rd #6

Client Chromatogram for TPH by FID



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			
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%.	-	1-5, 8-12
Total of Reported PAHs in Soil	Sonication extraction, GC-MS analysis. In-house based on US EPA 8270.	0.03 mg/kg dry wt	7
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	6-7, 13-14
Composite Environmental Solid Samples*	Individual sample fractions mixed together to form a composite fraction.	-	1-4, 8-11
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	BaP Potency Equivalence calculated from: Benzo(a)anthracene x 0.1 + Benzo(b)fluoranthene x 0.1 + Benzo(j)fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Benzo(a)pyrene x 1.0 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Fluoranthene x 0.01 + Indeno(1,2,3-c,d)pyrene x 0.1. Ministry for the Environment, 2011. Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health. Wellington: Ministry for the Environment.	0.002 mg/kg dry wt	7
Benzo[a]pyrene Toxic Equivalence (TEF)*	Benzo[a]pyrene Toxic Equivalence (TEF) calculated from: Benzo(a)pyrene x 1.0 + Benzo(a)anthracene x 0.1 + Benzo(b)fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Indeno(1,2,3-c,d)pyrene x 0.1. Guidelines for assessing and managing contaminated gasworks sites in New Zealand (GMG) (MfE, 1997).	0.002 mg/kg dry wt	7
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	1-5, 8-12
Organochlorine Pesticides Screening in Soil	Sonication extraction, GC-ECD analysis. Tested on as received sample. In-house based on US EPA 8081.	0.010 - 0.06 mg/kg dry wt	13-14
Polycyclic Aromatic Hydrocarbons Screening in Soil*	Sonication extraction, GC-MS analysis. Tested on as received sample. In-house based on US EPA 8270.	0.002 - 0.05 mg/kg dry wt	7
Total Petroleum Hydrocarbons in Soil			
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	6
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	8 mg/kg dry wt	6

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Sample Type: Soil			
Test	Method Description	Default Detection Limit	Sample No
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	6
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	6
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	6

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

Testing was completed between 07-Sep-2021 and 08-Sep-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.

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Kim Harrison MSc
Client Services Manager - Environmental