



EAM

ENVIRONMENTAL
CONSULTANTS

DETAILED SITE ASSESSMENT WITH NATIONAL ENVIRONMENTAL STANDARD FOR ASSESSING AND MANAGING CONTAMINANTS IN SOIL TO PROTECT HUMAN HEALTH



HAVELOCK ROAD/HOWARD ROAD HASTINGS,

PROJECT NO. EAM560-REP-01

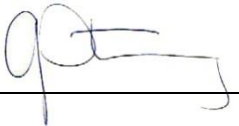
PREPARED FOR
HASTINGS DISTRICT COUNCIL

PREPARED BY
JASON STRONG

JUNE 2016

Report prepared by:

Jason Strong (MSc)
Principal Environmental Scientist
EAM NZ Limited



LIMITATIONS:

This report has been prepared on the basis of information provided by third parties. EAM NZ LTD has not independently verified the provided information and has relied upon it being accurate and sufficient for use by EAM NZ LTD in preparing the report. EAM NZ LTD accepts no responsibility for errors or omissions in, or the currency or sufficiency of, the provided information. This report has been prepared by EAM NZ LTD on the specific instructions of Hastings District Council for the limited purposes described in the report. EAM NZ LTD accepts no liability to any other person for their use of or reliance on this report, and any such use or reliance will be solely at their own risk.

© EAM NZ Limited



EXECUTIVE SUMMARY

EAM NZ Limited (EAM) has been engaged by Hastings District Council to undertake a Detailed Site investigation (DSI) across a large tract of land located between Havelock Road and Howard Street, Hastings.

The Site has been identified for further residential expansion and as such a variation to the proposed district plan is required (Proposed Variation 3a as below).

Proposed Variation 3 sets out to rezone a Greenfield growth area identified in the Hawke's Bay Regional Policy Statement (RPS) and Heretaunga Plains Urban Development Strategy (HPUDS) for urban residential purposes in the Proposed Hastings District Plan (Proposed Plan).

In summary, the proposed variation involves:

- i) Rezoning approximately 21.2 hectares of land between Howard Street and Havelock Road, on the eastern fringe of Hastings City, from 'Plains Production Zone' to 'Hastings General Residential Zone' (including the Parkvale School site – 1.8 hectares);
- ii) Inserting an accompanying Structure Plan and structure plan provisions for the area into the Proposed Plan;
- iii) Consequential amendments to the Proposed Plan.

Historically, the Site has been utilised for a mixture of activities including market gardening (including glasshouses) and orchards which have resulted in the potential for soil contamination at the Site.

On the basis of the findings of this report:

- A review of the Site history was carried out that indicated a requirement for Site sampling due to historic activities including orchards and market gardens, both of which are listed on the NES HAIL;
- Appropriate Site sampling and preliminary laboratory soil analysis was then carried out;
- Fourteen composite samples exceeded the NES soil standard values for arsenic (20 mg/kg) for the land use scenario of residential (10% produce). The majority of these samples were located towards the southern end of the Site on properties identified as 180 Havelock Road and 1259 Howard Street. This is not surprising as these two properties were shown to have had orchards on them for many decades going back to at least the 1950s;
- Two samples exceeded the NES SCS value of 210 mg/kg for lead;
- The remainder of results indicate that soil arsenic and lead concentrations are similar to Hawke's Bay Background Soils of 9 mg/kg and 27 mg/kg respectively and therefore do not represent a health risk to humans under the NES land use scenario of residential (10% produce);
- A total of 16 Composite samples were analysed for organo-chlorine compounds. The only compounds recorded for all composites analysed were DDT isomers and ranged between <0.06 mg/kg Σ DDT isomers and 4.5 mg/kg Σ DDT isomers. These results are considered to be at trace concentrations and well below the soil contaminant standard value of 45 mg/kg allowed under the NES for the identified land use scenario of Residential (10% produce). As such OCPs in soils under this assessment are considered low risk to human health.

In summary, it is apparent that the majority of the Site is compliant with the NES with regards to human health under the land use scenario of Residential (10% produce). Two areas identified with elevated levels of arsenic and/or lead will require further investigation and likely remedial works if they are to be developed into Residential subdivision.

TABLE OF CONTENTS

Executive Summary	II
Table of Contents	III
1.0 Introduction	1
2.0 Site Details	3
2.1 Site Identification and Zoning.....	3
2.2 Site Description and Current Land Use.....	3
3.0 Environmental Setting	4
3.1 General Setting	4
4.0 Desktop Review of Site History	5
4.1 Hastings District Council Property Files	5
4.2 HBRC Land Use Register.....	5
4.3 Historical Aerial Photographs	5
4.4 Site Inspection.....	11
4.5 Summary of desktop review	11
5.0 Investigation & Risk Assessment Process	15
5.1 Conceptual Site Model	15
5.1.1 Hazardous Substances & Potential Contaminants of Concern.....	15
5.1.2 Potential Receptors	15
5.1.3 Exposure Pathways.....	15
5.2 Investigation Rationale	15
5.2.1 Site Sampling	15
5.2.2 Sample Compositing	16
5.2.3 Field Quality Assurance and Quality Control.....	16
6.0 Results of Analysis - Discussion	23
6.1 Metals	23
6.2 Organo-chlorine Compounds.....	28
6.3 Risk assessment	28
7.0 Conclusions	30
8.0 References	30

Figures

Figure 1: Site Location	2
Figure 2: Excerpt of soil map of Heretaunga Plains	4
Figure 3: Historic (1945) aerial photo of Site.....	6
Figure 4: Historic (1969) aerial photo of Site.....	7
Figure 5: Historic (1994) aerial photo of Site.....	8
Figure 6: Historic (2004) aerial photo of Site.....	9
Figure 7: Historic (2010) aerial photo of Site.....	10
Figure 8: Assessment site Looking North West showing glasshouses	12
Figure 9: Assessment site looking North Showing inside glasshouse	12
Figure 10: Assessment site looking North West showing water supply at glasshouse	13
Figure 11: Assessment site looking North West Showing storage areas.....	13
Figure 12: Aerial showing areas of interest during site visits.....	14
Figure 13: Sample Sites at 258 Havelock Road.....	16
Figure 14: Sample Sites at 246 Havelock Road.....	17
Figure 15: Sample Sites at 238 Havelock Road.....	17
Figure 16: Sample Sites at 226 Havelock Road.....	18
Figure 17: Sample Sites at 214 Havelock Road.....	18
Figure 18: Sample Sites at 208 Havelock Road.....	19
Figure 19: Sample Sites at 204 Havelock Road.....	19
Figure 20: Sample Sites at 180 Havelock Road.....	20
Figure 21: Sample Sites at 1259 Howard Street	20
Figure 22: Sample Sites at 1217 Howard Street	21
Figure 23: Sample Sites at 1239 Howard Street	21
Figure 24: Sample Sites at 1217 Howard Street	22
Figure 25: Area of elevated arsenic and/or lead	31

Tables

Table 1: Individual property information	3
Table 2: Summary of arsenic and lead results.....	24
Table 3: Summary of Soil organic compound results	28
Table 4: Pathways and potential receptors	29

Appendices

Appendix 1: Lorentz Agronomy DSI Report	32
Appendix 2: Laboratory reports of analysis	54

1.0 INTRODUCTION

1.1 BRIEF

EAM NZ Limited (EAM) has been engaged by Hastings District Council to undertake a Detailed Site Investigation (DSI) across a large tract of land located between Havelock Road and Howard Street, Hastings (Herein referred to as the Site; see Figure 1).

The Site has been identified for further residential expansion and as such a variation to the proposed district plan is required (Proposed Variation 3a as below).

Proposed Variation 3 sets out to rezone a Greenfield growth area identified in the Hawke's Bay Regional Policy Statement (RPS) and Heretaunga Plains Urban Development Strategy (HPUDS) for urban residential purposes in the Proposed Hastings District Plan (Proposed Plan).

In summary, the proposed variation involves:

- iv) Rezoning approximately 21.2 hectares of land between Howard Street and Havelock Road, on the eastern fringe of Hastings City, from 'Plains Production Zone' to 'Hastings General Residential Zone' (including the Parkvale School site – 1.8 hectares);
- v) Inserting an accompanying Structure Plan and structure plan provisions for the area into the Proposed Plan;
- vi) Consequential amendments to the Proposed Plan.

Historically, the Site has been utilised for a mixture of activities including market gardening (including glasshouses) and orchards which have resulted in the potential for soil contamination at the Site.

This DSI has been undertaken to provide an assessment of the Sites contaminative status and to assess the human health risks for the proposed development.

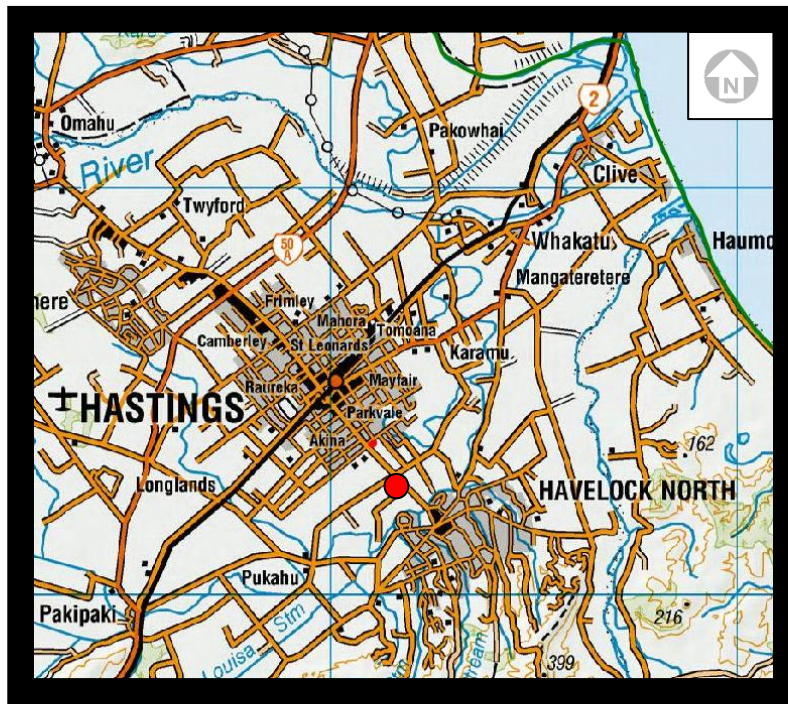
A phased approach has been adopted for the investigation, including an initial Preliminary Site Investigation (PSI) of assembling background information in order to develop a conceptual site model and investigation strategy.

This report details the results of the complete investigation and provides the following information:

- Background information;
- Site history and laboratory results;
- A conceptual Site model;
- Evaluation of determinants and risk assessment;
- Brief outline of recommendations; and
- Conclusions.

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).

FIGURE 1: SITE LOCATION



2.0 SITE DETAILS

2.1 SITE IDENTIFICATION AND ZONING

The Site is located between Hastings and Havelock North (Figure 1). The Site in total covers an area of approximately 21.2 hectares and is zoned Plains Production Zone as per the Hastings District Plan. Table 1 shows the legal Descriptions, property numbers, property addresses and land areas of the individual land holdings at the Site.

TABLE 1: INDIVIDUAL PROPERTY INFORMATION

Property Address	Property Number	Legal Description	Land Area (ha)
260 Havelock Road	96427	Lot 2 DP 850 BLK IV TE MATA SD	0.4882
258 Havelock Road	55490	Lot 1 DP 336086	1.3910
250 Havelock Road	55492	Lot 1 DP 8949 BLK IV TE MATA SD	0.1848
246 Havelock Road	55491	Lot 41 DP 752 BLK IV TE MATA SD	1.6187
238 Havelock Road	55493	Lot 42 DP 752 BLK IV TE MATA SD	1.6187
226 Havelock Road	55494	Lots 43 44 DP 752 BLK IV TE MATA SD	3.2375
220 Havelock Road	55495	Lot 1 DP 8367 BLK IV TE MATA SD	0.2023
214 Have lock Road	55497	PT Lot 2 DP 8367 BLK IV TE MATA SD	1.0016
208 Have lock Road	55498	PT Lot 2 DP 8367 BLK IV TE MATA SD	1.5631
204 Havelock Road	55499	Lot 47 DP 752 BLK IV TE MATA SD	1.2141
180 Havelock Road	94952	Lot 3 DP 305096 SEC 1 SO 10508 Lot 3 DP 28632 SUBJ TO & INT IN RW BLK IV TE MATA SD	3.5153
1217 Howard Street	55506	Lots 1 2 35 DP 3146 BLK VI TE MATA SD	1.8698
1239 Howard Street	55505	Lots 3-6 DP 3146 BLK IV TE MATA SD	2.8207
1245 Howard Street	101597	Lot 1DP 492632	0.5848
1259 Howard Street	101598	Lot 2 DP 492632	2.7655

2.2 SITE DESCRIPTION AND CURRENT LAND USE

The Site is flat and consists of mixed land uses including such activities as livestock grazing, a school (Parkvale), market gardening, orchards, residential dwellings, an engineering workshop and a café.

Most of the Site is either grassed or being used for market gardening. In the area where market gardening occurs there are four large glasshouses/greenhouses as well as large implement sheds.

3.0 ENVIRONMENTAL SETTING

3.1 GENERAL SETTING

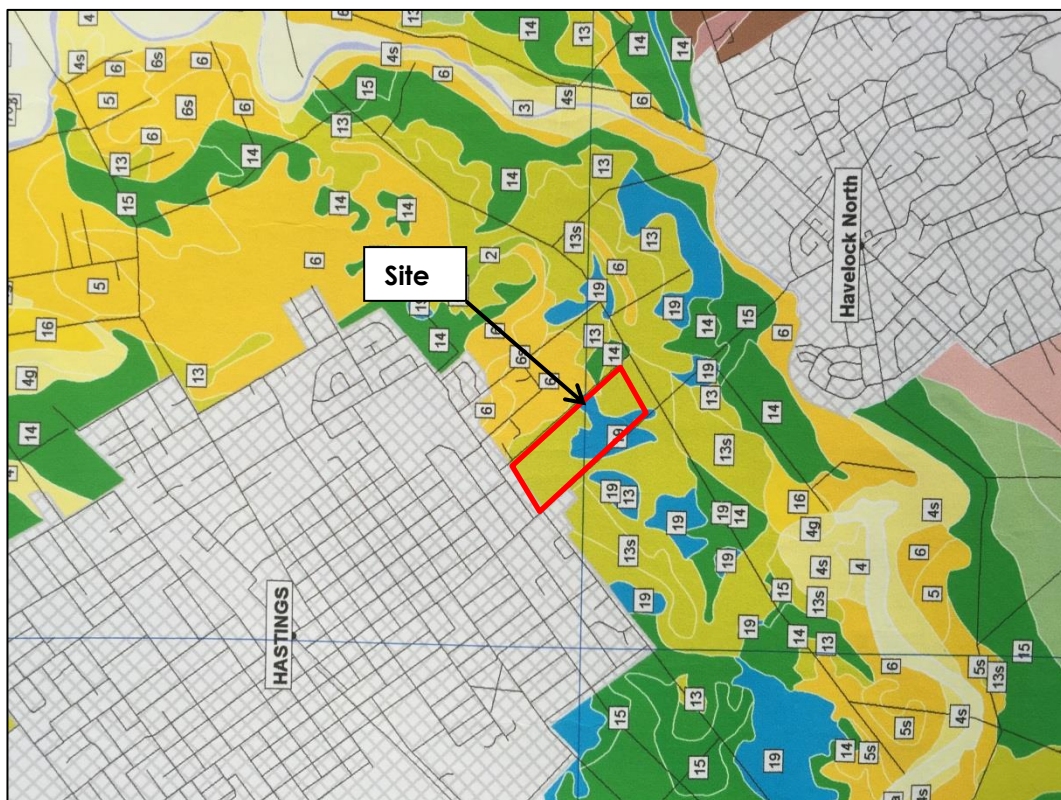
The site and surrounding area is relatively flat. The surrounding land use is a mixture of residential, agriculture and horticulture (orchards and market gardens) activities.

The nearest natural waterway is the Awahou Stream approximately 300 metres (at its closest point) to the north east.

Two distinct soil types are described for the site by Griffiths 2011 (Soil Map of The Heretaunga Plains – see Figure 2).

The predominant soil type is Karamu Soils which are described as 30-45 cm silt loam/clay loam on sand with imperfect drainage (WT >60 cm). A secondary soil type is also present towards the middle and south of the site and these are described as Kaiapo soils. These soils are >30 cm clay loam on silt loam and have poor drainage with WT <30cm.

FIGURE 2: EXCERPT OF SOIL MAP OF HERETAUNGA PLAINS (GRIFFITHS 2011)



4.0 DESKTOP REVIEW OF SITE HISTORY

A desktop assessment was undertaken to provide an overview of any potential contaminants of concern that may be present at the site as a result of any documented past and present activities. The following information was sourced in order to establish the history of the site:

- Hastings District Council (HDC) Resource Consents Database and Property Files;
- A search of the Land Use Register held at Hawke's Bay Regional Council (HBRC);
- Historical aerial photographs
- Site Inspection.

4.1 HASTINGS DISTRICT COUNCIL PROPERTY FILES

EAM viewed the property files for the site at HDC offices but very little information with regards to possible sources of contamination could be found.

The only information regarded to be relevant were the records for the construction of the large glasshouses located at 226 and 246 Havelock Road and a previous DSI carried out in September 2015 at 1259 Howard Street. This DSI was carried out by Lorentz Agrology and concluded that soil metals including arsenic and lead, as well as organo-chlorine pesticide compounds were well below the NES Soil Contaminant Standards for the land use scenario of Rural Residential (25% produce). The full DSI is attached to this report as Appendix 1.

4.2 HAWKE'S BAY REGIONAL COUNCIL LAND USE REGISTER

A search was made for information from HBRCs Listed Land Use Register (LLUR). This register is used to hold information about sites that have used, stored or disposed of hazardous substances, based on activities detailed in the Ministry for the Environment's (MfE) Hazardous Activities and Industries List (HAIL) (MfE, 2011a). The search revealed that there has been no recorded or identified HAIL activity within the site by HBRC.

4.3 HISTORICAL AERIAL PHOTOGRAPHS

Historical aerial photographs of the Site from 1945 onwards have been reviewed. The aerial photographs were sourced from HDC and are shown as Figures 2-7.

1945:- This photo shows that the predominant land use at the Site was pastoral grazing. Unfortunately this photograph is only a partial print and does not cover the land located to the south.

1969:- This historic aerial photograph shows that the areas shown previously in 1945 are still utilised predominantly for pastoral grazing however it appears that market gardening is occurring. To the south it is clear that well established orchards are present on the properties identified currently as 180 Havelock Road as well as 1245 Howard Street and 1259 Howard Street.

1994:- Largely unchanged land use from 1969 aerial photograph although market gardening looks to have intensified. .

2004:- This photo shows that the fruit trees have been removed from areas at properties identified today as 180 Havelock Road as well as 1245 Howard Street and 1259 Howard Street.

2010:- This aerial shows the most significant change has been the complete removal of fruit trees over the entire Site.

FIGURE 3: HISTORIC (1945) AERIAL PHOTOGRAPH OF THE SITE

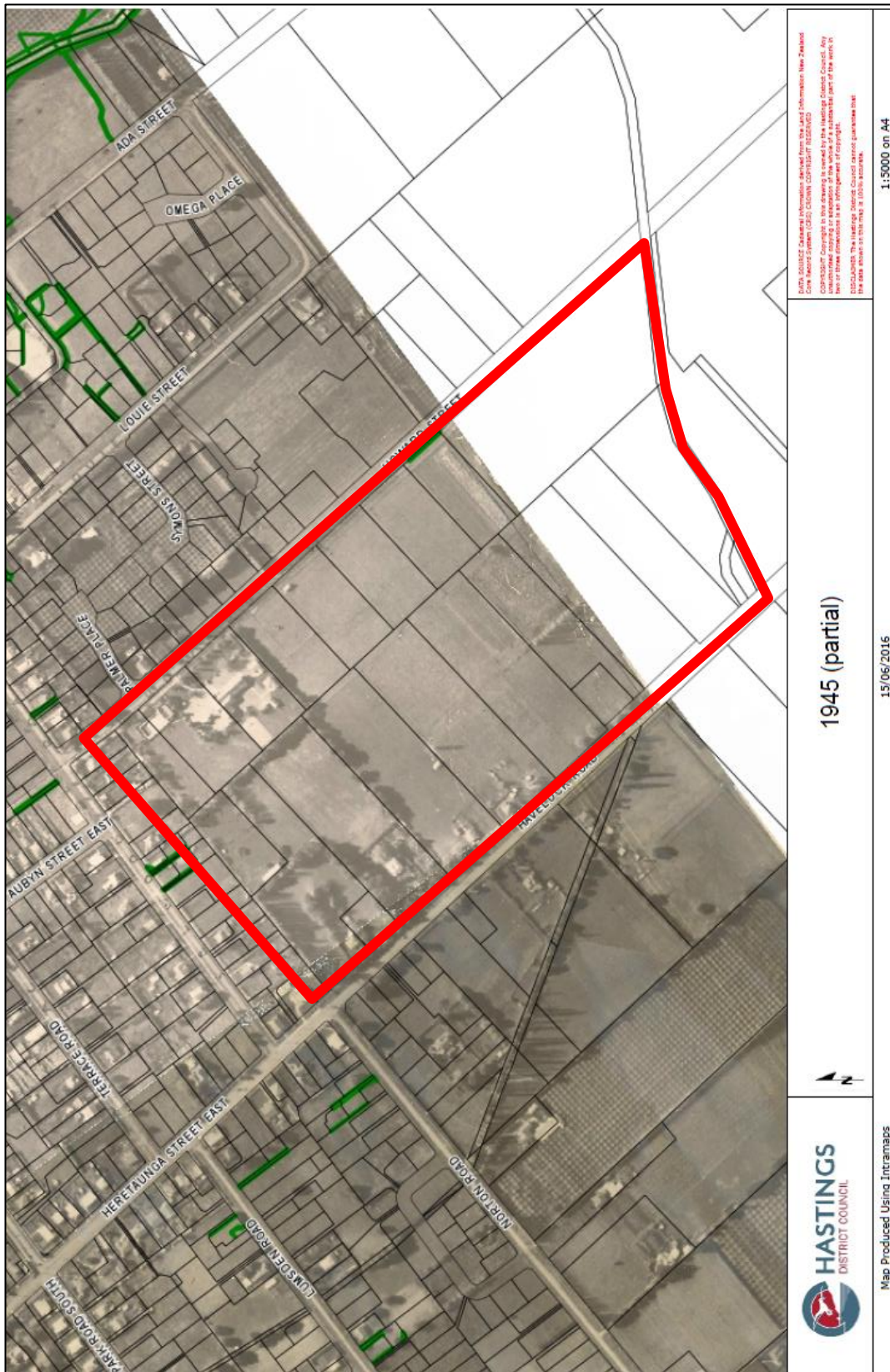


FIGURE 4: HISTORIC (1969) AERIAL PHOTOGRAPH OF THE SITE

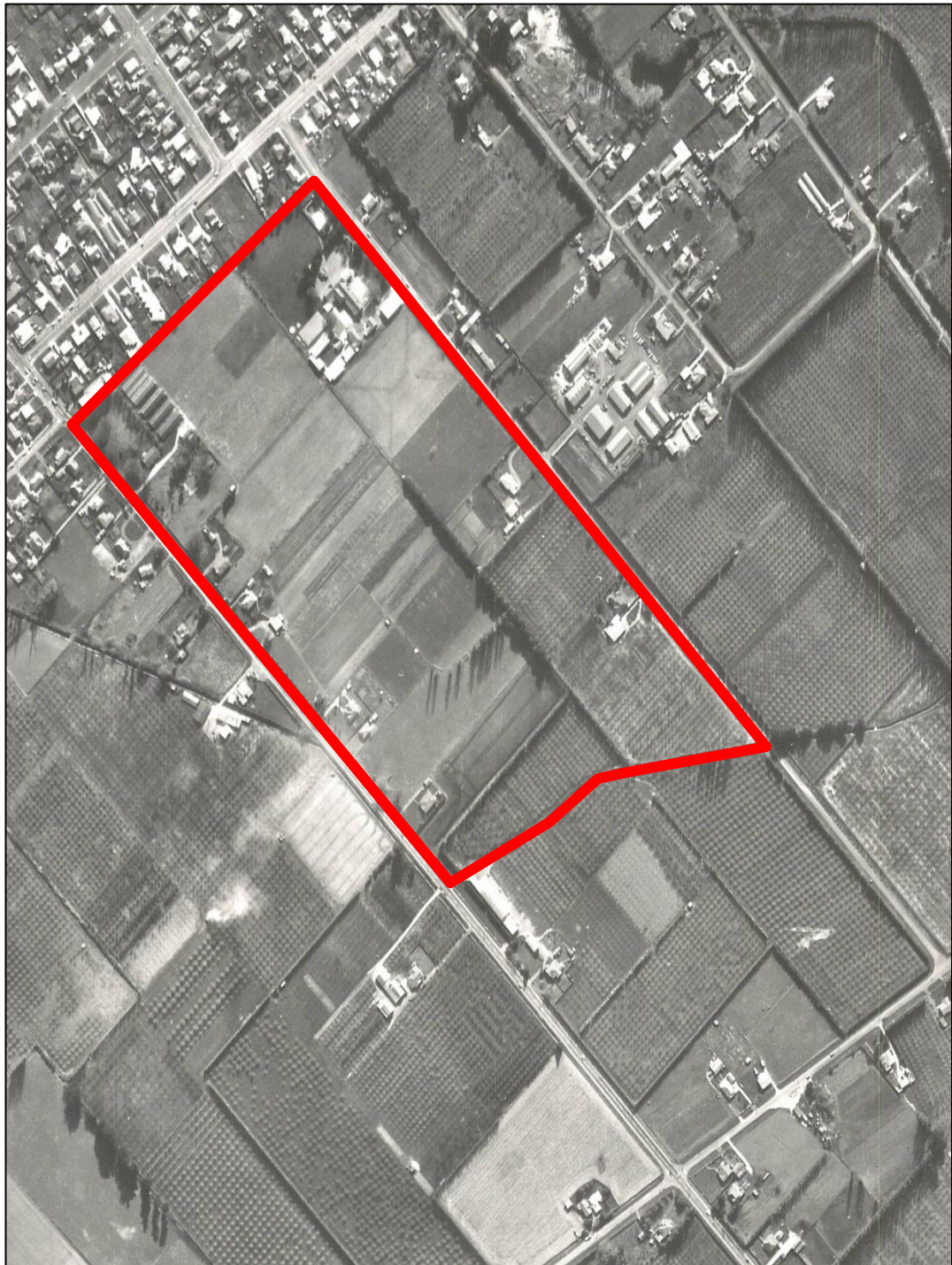


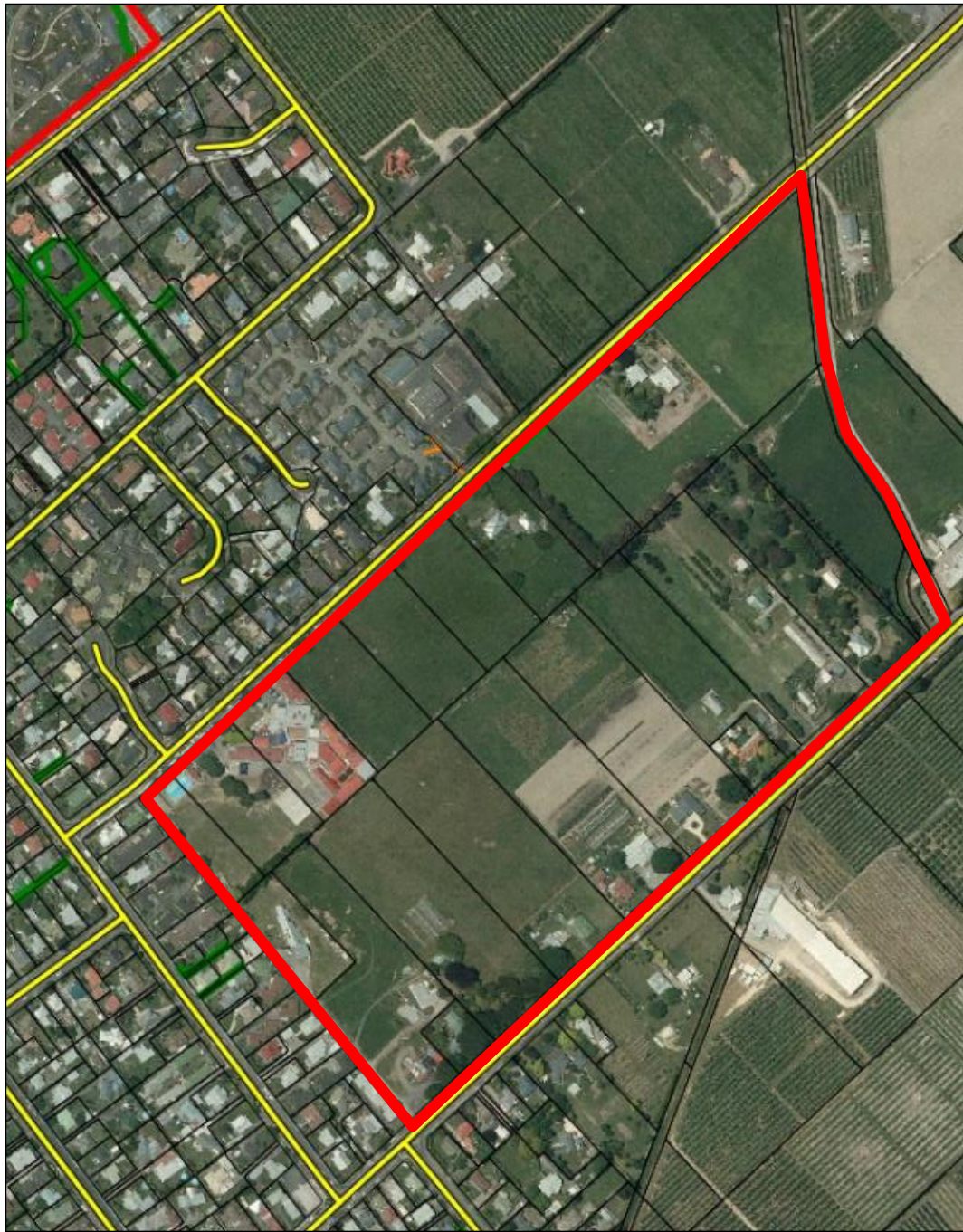
FIGURE 5: HISTORIC (1994) AERIAL PHOTOGRAPH OF THE SITE



FIGURE 6: HISTORIC (2004) AERIAL PHOTOGRAPH OF THE SITE



FIGURE 7: HISTORIC (2010) AERIAL PHOTOGRAPH OF THE SITE



4.4 SITE INSPECTION

Several site inspections across the site were carried out during May 2016, with the objective of identifying any potential sources of land contamination.

During these site visits no obvious contamination indicators (i.e. surface soil staining/odours) or other contamination sources were noted during the inspection of the Site.

Only the four large glasshouses (at 226 and 246 Havelock Road) and areas immediately surrounding them including water sources and sheds were identified as possible hotspots during the site visit (Figures 8 to 11). The location of these possible hotspots is shown in Figure 12.

4.5 SUMMARY OF DESKTOP REVIEW

This desktop review has identified that the Site has been used for a number of activities that are included on the HAIL. In particular market gardening (with glasshouses) and orchards are two activities that have the potential to contaminate soils above concentrations considered to be a health risk to human receptors.

Historic aerial photography indicates that orchards were most prevalent to the south of the Site with properties identified as 180 Havelock Road, 1245 Howard Street and 1259 Howard Street having this activity occurring since at least the 1950s.

As such it is determined that it a Detailed Site Investigation with intensive soil sampling be carried out to ascertain the contaminative status of the Site is warranted.

FIGURE 8: SITE PHOTOGRAPH LOOKING NORTHWEST SHOWING TWO GLASSHOUSES LOCATED AT 246 HAVELOCK ROAD



FIGURE 9: SITE PHOTOGRAPH LOOKING NORTH SHOWING INSIDE ONE OF TWO GLASSHOUSES LOCATED AT 226 HAVELOCK ROAD



FIGURE 10: SITE PHOTOGRAPH LOOKING NORTHWEST SHOWING WATER SUPPLY OUTSIDE ONE OF TWO GLASSHOUSES LOCATED AT 226 HAVELOCK ROAD



FIGURE 11: SITE PHOTOGRAPH LOOKING NORTHWEST SHOWING SHEDS AND STORAGE AREAS OUTSIDE ONE OF TWO GLASSHOUSES LOCATED AT 226 HAVELOCK ROAD



FIGURE 12: AERIAL PHOTOGRAPH SHOWING AREAS OF INTEREST DURING SITE VISITS. THESE AREAS WERE CONSIDERED LIKELY HOTSPOTS FOR CHEMICAL RESIDUE CONTAMINATION.



5.0 INVESTIGATION & RISK ASSESSMENT PROCESS

5.1 CONCEPTUAL SITE MODEL

The potential effects of the proposed activity of the Site from contaminated soils are outlined in a preliminary site conceptual model set out below. The following is an analysis of potential contaminants, receptors and pathways (linkages) between the two.

5.1.1 HAZARDOUS SUBSTANCES AND POTENTIAL CONTAMINANTS OF CONCERN

Hazardous substances potentially exist at the site as a result of past activities such as:

- Heavy metals from horticultural sprays in particular arsenic and lead may be present;
- Organic compounds such as organo-chlorines e.g. DDT and dieldrin etc. from horticultural sprays.

5.1.2 POTENTIAL RECEPTORS

Potential receptors include:

- Current and future residents of the Site;
- Excavation and construction workers during redevelopment of the Site.

5.1.3 EXPOSURE PATHWAYS

A human health risk can only occur where there is a complete pathway between contaminant sources and a receptor. Building floors, paved areas and grass will largely or completely prevent contact with soil and therefore direct exposure pathways are or will be incomplete for such areas. Potential complete pathways are:

- Direct contact (dermal) with soil;
- Direct contact and inhalation of dusts and soil during construction and ongoing site maintenance and/or subsurface maintenance works;
- Oral ingestion of soil through uptake by vegetables and by soil attached to vegetables where soil is exposed in garden areas;
- Adjacent sites through dermal absorption and inhalation and oral ingestion of soil.

5.2 INVESTIGATION RATIONALE

The overall rationale for the DSI was to determine whether any of the historical activities on the Site have caused soil contamination that would affect the proposed future use. In this instance it was decided to carry out a combination of targeted and broad-scale sampling. Targeted sampling was carried out in and around areas most likely to contain soil contaminants from historical practices and included in and around glasshouses, workshops and where any water source was associated with these.

5.2.1 SITE SAMPLING

The number of samples collected as part of this assessment was in keeping with the "Contaminated Land Guidelines No. 5" (MfE 2011). These guidelines set out (in Table A1; p63) the "*minimum sampling points required for detection of circular hotspots using a systematic sampling pattern at 95% confidence level*".

Soil samples were collected using a hand auger and/or spade and were handled using disposable gloves. Samples were collected in clean plastic zip-lock bags and labelled with sample name, number, time and date collected. Once collected, samples were stored in a chilly bin and then despatched to Hill Laboratories Ltd in Hamilton. Sample Sites were identified and marked using a wooden peg and co-ordinates were taken using a handheld GPS. The approximate locations of the sample sites for this assessment are shown in Figures 13 to 24.

NOTE: Sampling was carried out over all of the property located at 1259 Howard Street as some of this has already been assessed in the DSI by Lorentz Agronomy (Attachment 1).

5.2.2 SAMPLE COMPOSITING

To keep costs to a minimum samples collected were composited for arsenic and lead as well as for organo-chlorine compounds analysis. The composites were prepared by the laboratory. Note: When comparing composite results against guideline values, the guideline value must be adjusted by dividing the value by the number of sub-samples in the composite.

5.2.3 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;
- Decontaminating and rinsing of tools between each sample;
- Collection of soil samples in new, clean, appropriately labelled glass jars supplied by Hill Laboratories;
- Storing samples in chilled conditions whilst on Site and until delivery to the laboratory for analysis;
- Use of chain of custody procedures and forms; and Use of IANZ accredited laboratories with in-house QA/QC procedures for the analyses requested.

FIGURE 13: SAMPLE SITES AT 258 HAVELOCK STREET (PROPERTY NUMBER 55490)



FIGURE 14: SAMPLE SITES AT 246 HAVELOCK STREET (PROPERTY NUMBER 55491)

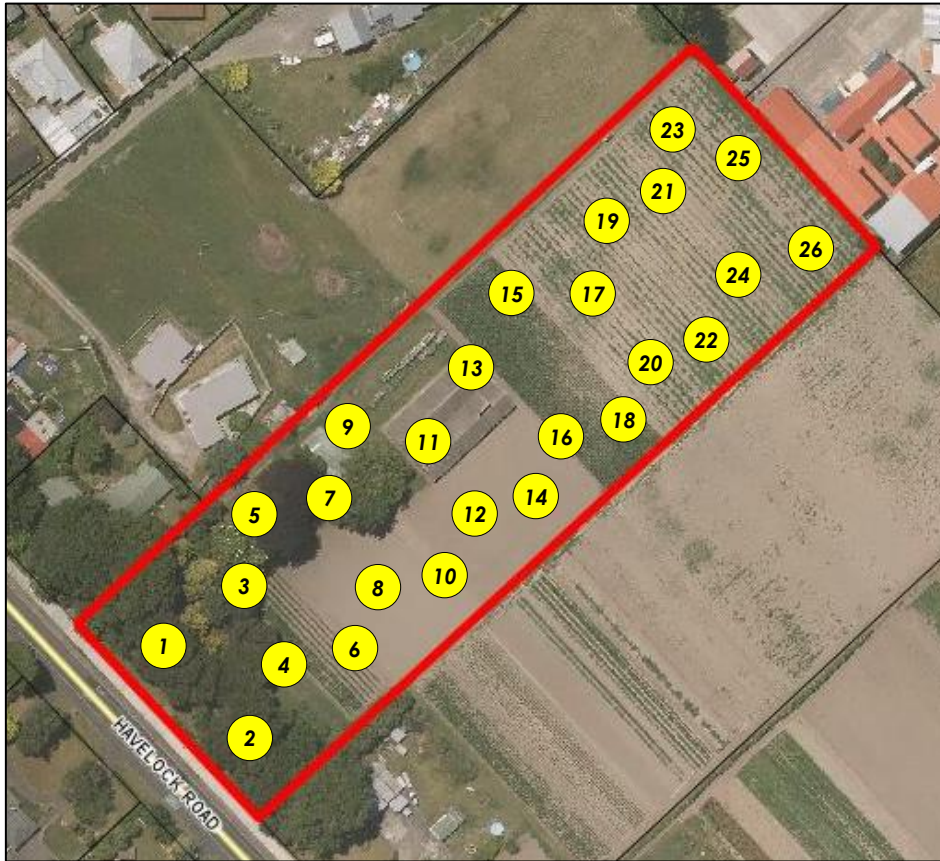


FIGURE 15: SAMPLE SITES AT 238 HAVELOCK STREET (PROPERTY NUMBER 55493)

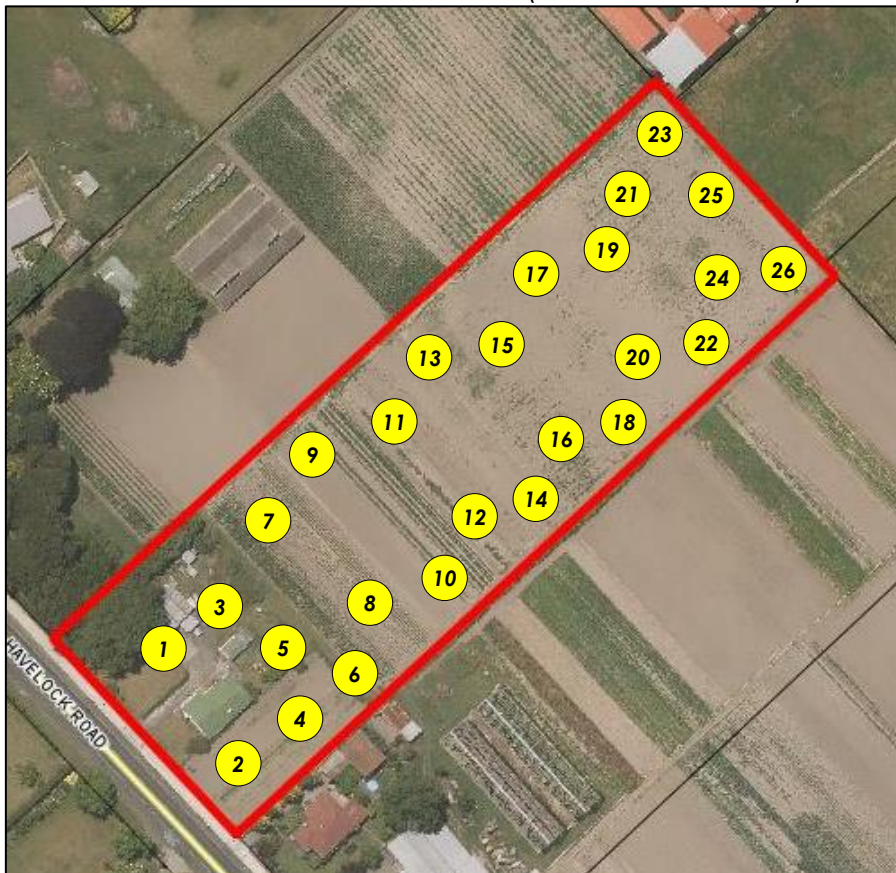


FIGURE 16: SAMPLE SITES AT 226 HAVELOCK STREET (PROPERTY NUMBER 55494)



FIGURE 17: SAMPLE SITES AT 214 HAVELOCK STREET (PROPERTY NUMBER 55497)



FIGURE 18: SAMPLE SITES AT 208 HAVELOCK STREET (PROPERTY NUMBER 55498)

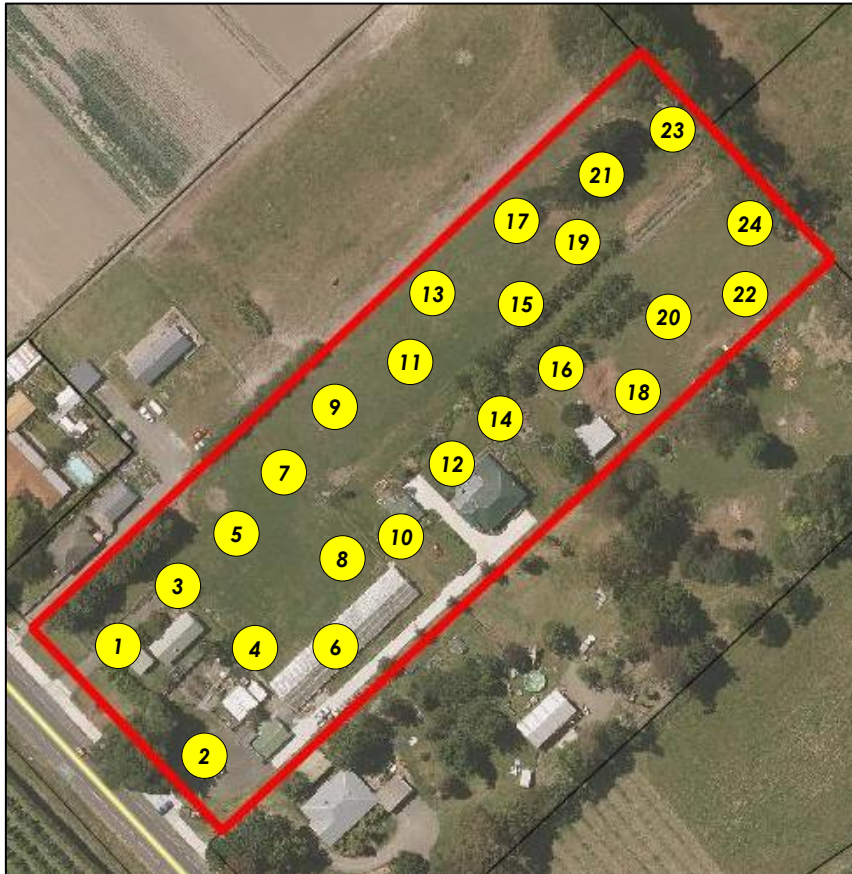


FIGURE 19: SAMPLE SITES AT 204 HAVELOCK STREET (PROPERTY NUMBER 55499)

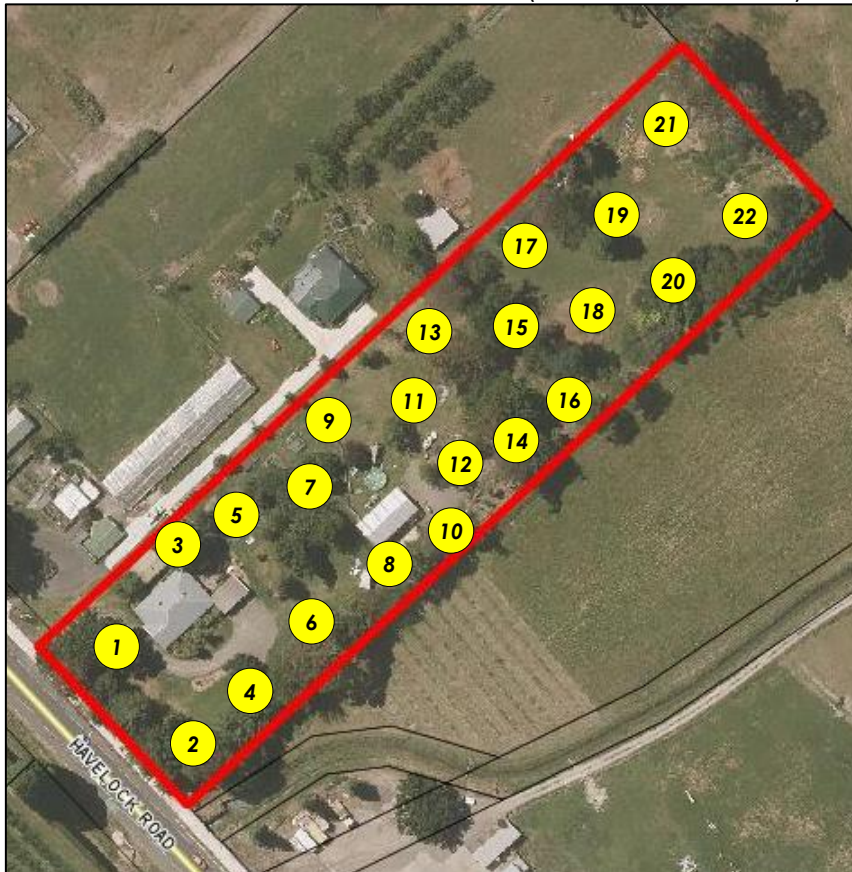


FIGURE 20: SAMPLE SITES AT 180 HAVELOCK STREET (PROPERTY NUMBER 94952)



FIGURE 21: SAMPLE SITES AT 1259 HOWARD STREET (PROPERTY NUMBER 101598)

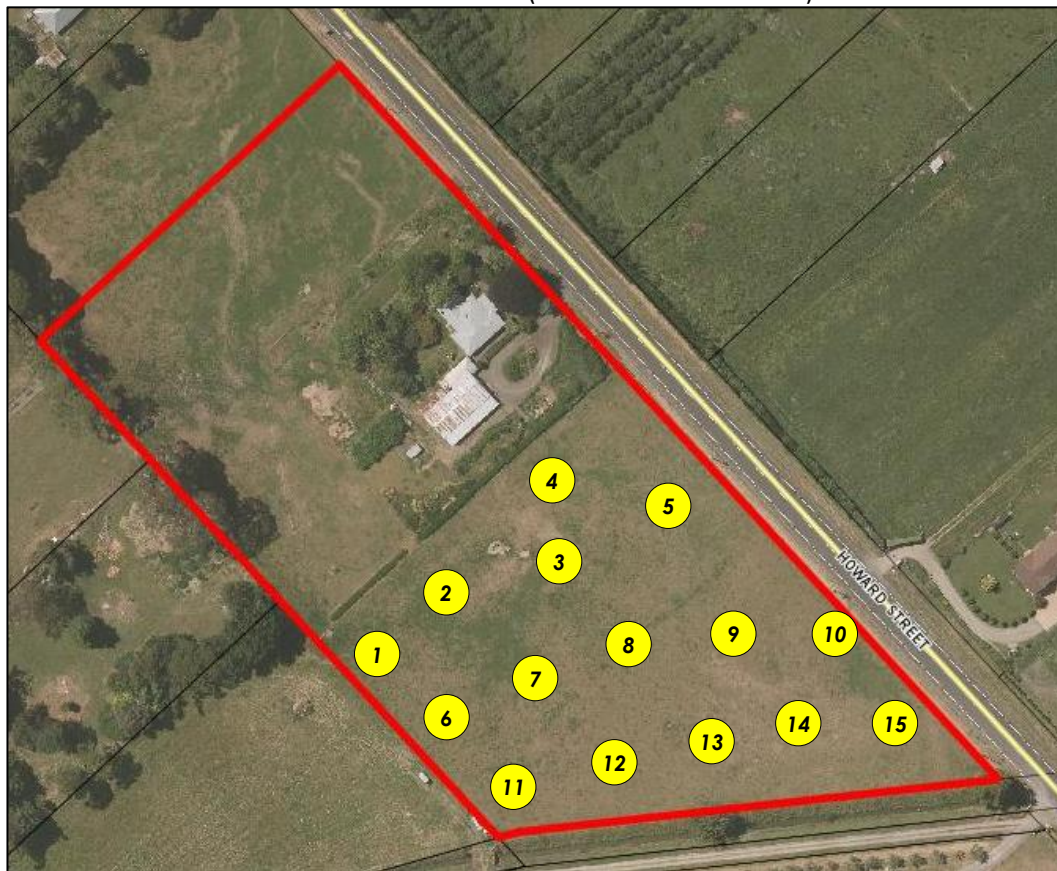


FIGURE 22: SAMPLE SITES AT 1217 HOWARD STREET (PROPERTY NUMBER 55506)



FIGURE 23: SAMPLE SITES AT 1239 HOWARD STREET (PROPERTY NUMBER 55505)

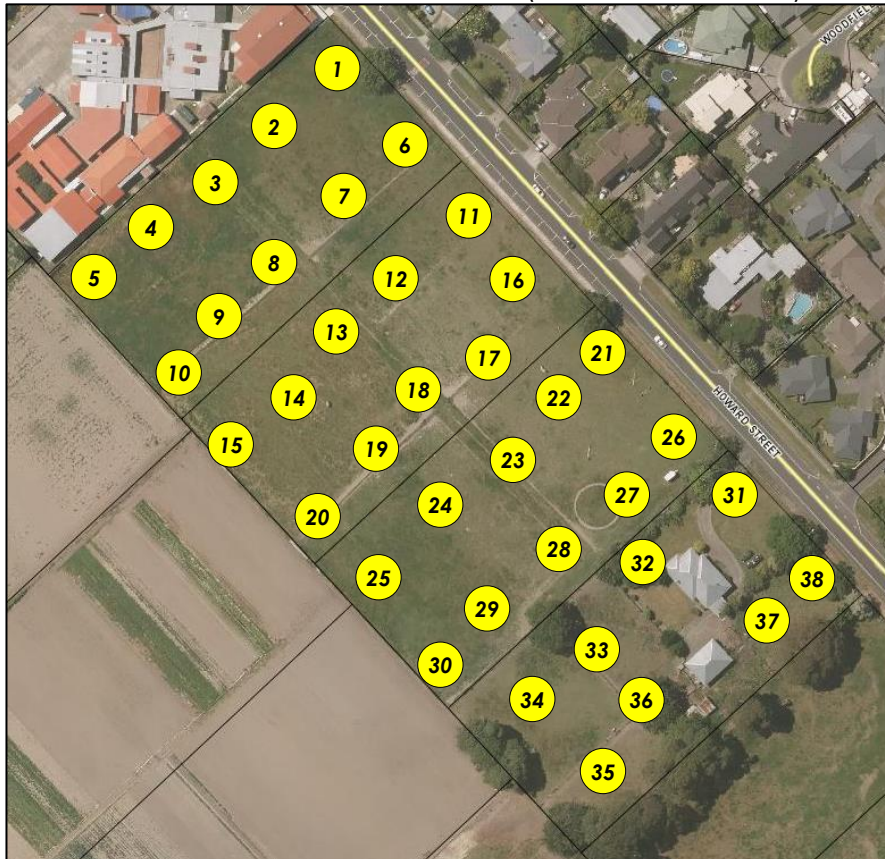
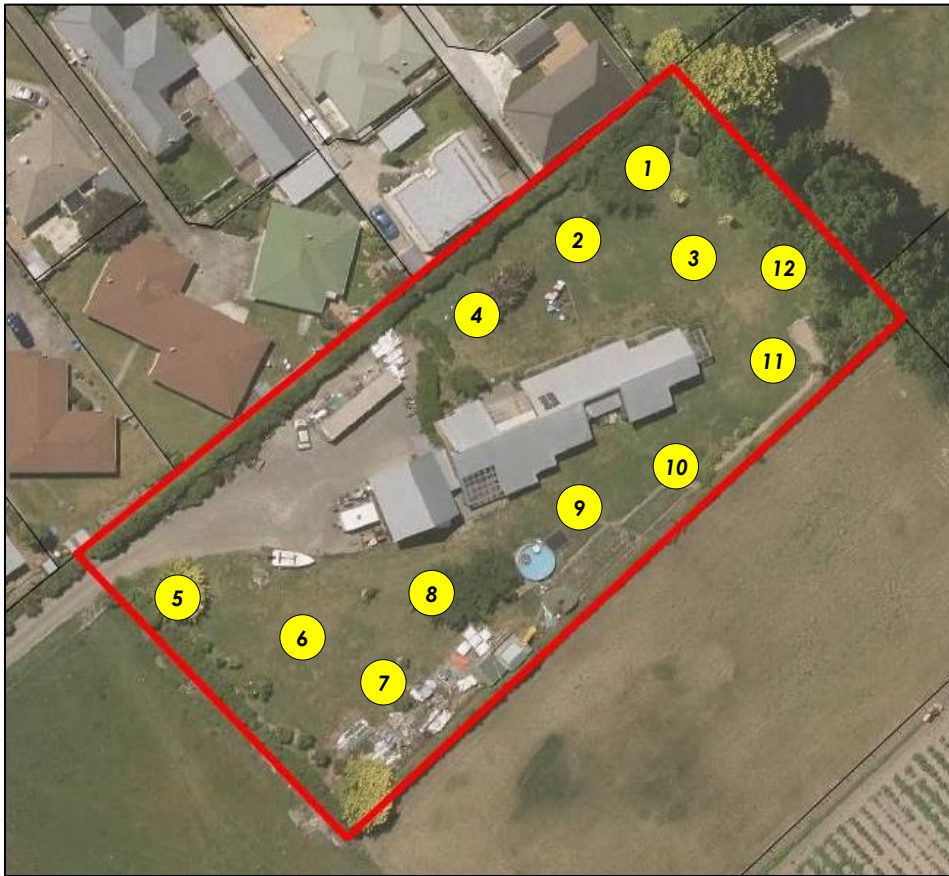


FIGURE 24: SAMPLE SITES AT 1217 HOWARD STREET (PROPERTY NUMBER 55506)



6.0 RESULTS OF ANALYSIS - DISCUSSION

6.1 METALS

A total of 287 soil samples have been collected and analysed for arsenic and lead (Table 2) for this assessment. Of these only sixteen samples recorded contaminants above the Soil Contaminant Standards (SCSs) from the NES Priority contaminants list (MfE, 2012). See Appendix 2 for the full laboratory report. The remainder of results indicate that soil arsenic and lead concentrations are similar to Hawke's Bay Background Soils of 9 mg/kg and 27 mg/kg respectively.

The non-compliant samples included;

- Composite of 55493/3 and 55493/4;
- Composite of 55493/5 and 55493/6;
- individual sample 55498/3;
- Composite of 55499/21 and 55499/22;
- Composite of 94952/1 and 94952/2;
- Composite of 94952/3 and 94952/4;
- Composite of 94952/9 and 94952/10;
- Composite of 94952/13 and 94952/14;
- Composite of 94952/15 and 94952/16;
- Composite of 94952/17 and 94952/18;
- Composite of 94952/19 and 94952/20;
- Composite of 94952/21 and 94952/11;
- Composite of 94952/23 and 94952/24;
- Composite of 94952/27 and 94952/28; and
- Composite of 94952/29 and 94952/30.

NOTE: The Sample identifiers e.g. 55493 represent the actual property numbers sampled (refer Table 1).

Of these, Composite samples 55493/3 and 55493/4 and 55493/5 and 55493/6 were located around sheds and a bore at one particular property (238 Havelock Road).

Composite sample 55499/21 and 55499/22 was located to the rear of 204 Havelock Road and was only marginally above the 20 mg/kg arsenic SCS of 20 mg/kg for the residential (10% produce) land use scenario.

The main area of arsenic and lead contamination above NES SCSs of 20 mg/kg and 210 mg/kg respectively were at the properties identified as 180 Havelock Road and 1259 Howard Street.

Figure 25 illustrates the areas of non compliance with the NES.

TABLE 2: SOIL ARSENIC AND LEAD RESULTS (ALL mg/kg)

Sample	As	Pb
Composite of 55490/1 and 55490/2	9	64
Composite of 55490/3 and 55490/4	9	64
Composite of 55490/5 and 55490/6	10	110
Composite of 55490/7 and 55490/8	9	99
Composite of 55490/9 and 55490/10	8	75
Composite of 55490/11 and 55490/12	9	99
Composite of 55490/13 and 55490/14	10	65
Composite of 55490/15 and 55490/16	6	37
Composite of 55490/17 and 55490/18	6	24
Composite of 55490/19 and 55490/20	6	24
Composite of 55490/21 and 55490/22	6	27
Composite of 55491/1 and 55491/2	12	135
Composite of 55491/3 and 55491/4	8	86
Composite of 55491/5 and 55491/6	8	43
Composite of 55491/7 and 55491/8	6	31
Composite of 55491/9 and 55491/10	7	27
Composite of 55491/11 and 55491/12	6	24
Composite of 55491/13 and 55491/14	6	28
Composite of 55491/15 and 55491/16	6	21
Composite of 55491/17 and 55491/18	6	27
Composite of 55491/19 and 55491/20	7	20
Composite of 55491/21 and 55491/22	6	22
Composite of 55491/23 and 55491/24	7	21
Composite of 55491/25 and 55491/26	6	24
Composite of 55493/1 and 55493/2	16	54
Composite of 55493/3 and 55493/4	32	95
Composite of 55493/5 and 55493/6	54	132
Individual sample 55493/8	10	28
Composite of 55493/9 and 55493/10	8	26
Composite of 55493/11 and 55493/12	7	23
Composite of 55493/13 and 55493/14	8	27
Composite of 55493/15 and 55493/16	8	26
Composite of 55493/17 and 55493/18	8	26
Composite of 55493/19 and 55493/20	9	28
Composite of 55493/21 and 55493/22	8	28
Composite of 55493/23 and 55493/24	8	27
Composite of 55493/25 and 55493/26	8	26
NES Residential (10% Produce)	20	210
Hawke's Bay Background soils	9	27

TABLE 2 (CONTINUED): SOIL ARSENIC AND LEAD RESULTS (ALL mg/kg)

Sample	As	Pb
Composite of 96427/1 and 96427/2	9	44
Composite of 96427/3 and 96427/4	10	45
Composite of 96427/5 and 96427/6	7	32
Composite of 96427/7 and 96427/8	6	21
Composite of 96427/9 and 96427/10	5	21
Composite of 96427/11 and 96427/12	6	24
Composite of 55505/1 and 55505/2	6	25
Composite of 55505/3 and 55505/4	4	17.9
Composite of 55505/5 and 55505/6	5	17.0
Composite of 55505/7 and 55505/8	5	17.6
Composite of 55505/9 and 55505/10	5	18.1
Composite of 55505/11 and 55505/12	5	18.5
Composite of 55505/13 and 55505/14	5	16.5
Composite of 55505/15 and 55505/16	6	19.1
Composite of 55505/17 and 55505/18	5	18.0
Composite of 55505/19 and 55505/20	5	19.2
Composite of 55505/21 and 55505/22	5	17.2
Composite of 55505/23 and 55505/24	4	16.9
Composite of 55505/25 and 55505/26	4	19.7
Composite of 55505/27 and 55505/28	5	16.4
Composite of 55505/29 and 55505/30	5	37
Composite of 55505/31 and 55505/32	5	22
Composite of 55505/33 and 55505/34	7	25
Composite of 55505/35 and 55505/36	7	24
Composite of 55505/37 and 55505/38	8	27
Composite of 55506/1 and 55506/2	7	34
Composite of 55506/3 and 55506/4	9	21
Composite of 55506/5 and 55506/6	10	22
Composite of 55506/7 and 55506/8	5	25
Composite of 55506/9 and 55506/10	5	36
Composite of 55506/11 and 55506/12	9	23
Composite of 55506/13 and 55506/14	8	37
Composite of 55506/15 and 55506/16	6	28
NES Residential (10% Produce)	20	210
Hawke's Bay Background soils	9	27

TABLE 2 (CONTINUED): SOIL ARSENIC AND LEAD RESULTS (ALL mg/kg)

Sample	As	Pb
Composite of 55494/1 and 55494/2	10	92
Composite of 55494/3 and 55494/4	14	53
Composite of 55494/5 and 55494/6	13	78
Composite of 55494/7 and 55494/8	9	29
Composite of 55494/9 and 55494/10	6	17
Composite of 55494/11 and 55494/12	8	32
Composite of 55494/13 and 55494/14	8	31
Composite of 55494/15 and 55494/16	6	24
Composite of 55494/17 and 55494/18	6	21
Composite of 55494/19 and 55494/20	6	22
Composite of 55494/21 and 55494/22	6	21
Composite of 55494/23 and 55494/24	6	23
Composite of 55494/25 and 55494/26	6	24
Composite of 55494/27 and 55494/28	6	26
Composite of 55494/29 and 55494/30	6	24
Composite of 55494/31 and 55494/32	7	27
Composite of 55494/33 and 55494/34	6	22
Composite of 55494/35 and 55494/36	6	24
Composite of 55494/37 and 55494/38	6	23
Composite of 55494/39 and 55494/40	7	26
Composite of 55494/41 and 55494/42	7	27
Composite of 55494/43 and 55494/44	7	28
Composite of 55494/45 and 55494/46	6	28
Composite of 55494/47 and 55494/48	6	27
Composite of 55494/49 and 55494/50	6	26
Composite of 55494/51 and 55494/52	5	26
Composite of 55497/1 and 55497/2	5	40
Composite of 55497/3 and 55497/4	6	46
Composite of 55497/5 and 55497/6	10	26
Composite of 55497/7 and 55497/8	7	25
Composite of 55497/9 and 55497/10	7	26
Composite of 55497/11 and 55497/12	5	40
Composite of 55497/13 and 55497/14	5	28
Composite of 55497/15 and 55497/16	5	25
Composite of 55497/17 and 55497/18	5	23
Composite of 55497/19 and 55497/20	5	27
NES Residential (10% Produce)	20	210
Hawke's Bay Background soils	9	27

DSI (NES), HAVELOCK ROAD/HOWARD STREET, HASTINGS

TABLE 2 (CONTINUED): SOIL ARSENIC AND LEAD RESULTS (ALL mg/kg)

Sample	As	Pb
Composite of 55498/1 and 55498/2	16	78
Individual sample 55498/3	39	51
Composite of 55498/4 and 55498/5	17	68
Individual sample 55498/6	9	59
Composite of 55498/7 and 55498/8	6	27
Composite of 55498/9 and 55498/10	7	36
Composite of 55498/11 and 55498/12	5	29
Composite of 55498/13 and 55498/14	6	29
Composite of 55498/15 and 55498/16	5	30
Composite of 55498/17 and 55498/18	6	27
Composite of 55498/19 and 55498/20	6	28
Composite of 55498/21 and 55498/22	5	29
Composite of 55498/23 and 55498/24	10	44
Composite of 55499/1 and 55499/2	8	40
Composite of 55499/3 and 55499/4	7	33
Composite of 55499/5 and 55499/6	7	28
Composite of 55499/7 and 55499/8	7	24
Composite of 55499/9 and 55499/10	8	31
Composite of 55499/11 and 55499/12	8	26
Composite of 55499/13 and 55499/14	6	32
Composite of 55499/15 and 55499/16	6	31
Composite of 55499/17 and 55499/18	6	29
Composite of 55499/19 and 55499/20	7	46
Composite of 55499/21 and 55499/22	27	80
Composite of 94952/1 and 94952/2	35	141
Composite of 94952/3 and 94952/4	33	127
Composite of 94952/5 and 94952/6	13	57
Composite of 94952/7 and 94952/8	16	69
Composite of 94952/9 and 94952/10	33	153
Composite of 94952/11 and 94952/12	44	220
Composite of 94952/13 and 94952/14	62	250
Composite of 94952/15 and 94952/16 (101598/1)	34	148
Composite of 94952/17 (101598/2) and 94952/18 (101598/3)	27	106
Composite of 94952/19 (101598/4) and 94952/20 (101598/5)	40	153
Composite of 94952/21 (101598/6) and 94952/22 (101598/7)	24	94
Composite of 94952/23 (101598/8) and 94952/24 (101598/9)	22	97
Composite of 94952/25 (101598/10) and 94952/26 (101598/11)	18	76
Composite of 94952/27 (101598/12) and 94952/28 (101598/13)	23	90
Composite of 94952/29 (101598/14) and 94952/30 (101598/15)	22	78
NES Residential (10% Produce)	20	210
Hawke's Bay Background soils	9	27

6.2 ORGANO-CHLORINE COMPOUNDS

A total of 16 Composite samples were analysed for organo-chlorine compounds. The only compounds recorded for all composites analysed were DDT isomers and ranged between <0.06 mg/kg Σ DDT isomers and 4.5 mg/kg Σ DDT isomers (Table 3).

These results are considered to be at trace concentrations and well below the soil contaminant standard value of 70 mg/kg allowed under the NES for the identified land use scenario of Residential (10% produce). This also holds true when compared against the adjusted value of 17.5 mg/kg Σ DDT isomers for composite samples. As such OCPs in soils under this assessment are considered low risk to human health.

TABLE 3: SUMMARY OF SOIL ORGANIC COMPOUND RESULTS (ALL RESULTS mgkg⁻¹ DRY WEIGHT)

Sample Name	Σ DDT
Composite of Samples 55490/5, 55490/13 & 55490/18	0.39
Composite of Samples 55491/8, 55491/15, 55491/22 & 55491/25	0.12
Composite of Samples 55491/11 & 55491/13	1.12
Composite of Samples 55493/12, 55493/17 & 55493/24	0.13
Composite of Samples 55493/3, 55493/17 & 55493/5	4.0
Composite of Samples 96427/1, 96427/5, 96427/7 & 96427/11	0.15
Composite of Samples 55506/1, 55506/7, 55506/8 & 55506/16	<0.06
Composite of Samples 55505/1, 55505/13, 55505/23 & 55505/38	0.08
Composite of Samples 55494/7, 55494/8, 55494/9 & 55494/10	0.13
Composite of Samples 55494/26, 55494/50, 55494/36	0.31
Composite of Samples 55497/2, 55497/6, 55497/19 & 55497/13	0.028
Composite of Samples 55498/7, 55498/11, 55498/14 & 55498/20	<0.06
Composite of Samples 55498/7, & 55498/6	<0.06
Composite of Samples 55499/1, 55499/8, 55499/13 & 55499/22	0.11
Composite of Samples 94952/1, 94952/6, 94952/10 & 94952/15	4.5
Composite of Samples 94952/22, 94952/27, 94952/29 & 94952/30	1.28
NES Rural Residential/lifestyle block 10% produce	70
Adjusted value* (for composited sample)	17.5

*Adjusted to compensate for composites i.e. four samples per composite therefore original standard value divided by four.

6.3 RISK ASSESSMENT

A hazard –pathway –receptor pollution linkage is considered to aid assessment of risk associated with results of the site investigation.

For contaminated soils to pose a risk to a receptor, a complete pathway must exist between the contamination source and the identified receptor(s). If there is an incomplete pathway then there is no risk.

In this instance, the large proportion of the site is considered low risk to human health however two isolated areas have been identified as having elevated arsenic and lead concentrations and therefore in these areas a risk to human health exists.

The possible pathways and receptors associated with this site and its end use are presented in Table 4.

6.3.1 END USERS

In terms of human health, a risk for exposure exists. Elevated concentrations of arsenic and lead have been confirmed within the shallow sub-surface soils. Therefore, ingestion, inhalation and dermal exposure could potentially occur. Remediation is required. This must be addressed in future site remediation/management plans.

6.3.2 SITE WORKERS

Normal precautions for development of the site will apply and should include dust suppression measures. Site workers will need to be made aware of the presence of arsenic and lead contamination within the soil and a programme of site working should be developed in accordance with relevant building guidelines. This must be addressed in future site remediation/management plans.

6.3.3 ADJACENT SITES

Heavy metals are generally immobile and therefore the potential for lateral migration in the soil profile is considered low. There is a possibility that dust may be generated at the site during excavation and construction works, hence a small risk is associated with airborne contaminants. Dust suppression measures such as keeping the soil wet/moist during earthworks are considered appropriate. This must be addressed in future site remediation/management plans.

6.3.4 RISK TO SURFACE WATER & GROUNDWATER

Although not specifically covered under the NES the potential risk to surface water and groundwater resources were considered during this assessment. With regards to surface water there are no significant waterways on or adjacent to the assessment site.

The risk of ground water contamination is considered to be low as these metals (the only elevated contaminant recorded) are largely immobile in soil.

TABLE 4: PATHWAYS AND POTENTIAL RECEPTORS

Contaminants	Receptor	Pathway
Arsenic & lead	End Users	Oral Ingestion of soil or dust, dermal absorption or inhalation where soil is exposed
		Oral ingestion of soil through uptake by vegetables and by soil attached to vegetables where soil is exposed in garden areas
	Site workers	Dermal absorption and Inhalation, oral ingestion of soil.
	Adjacent Sites	Dermal absorption and Inhalation, oral ingestion of soil.

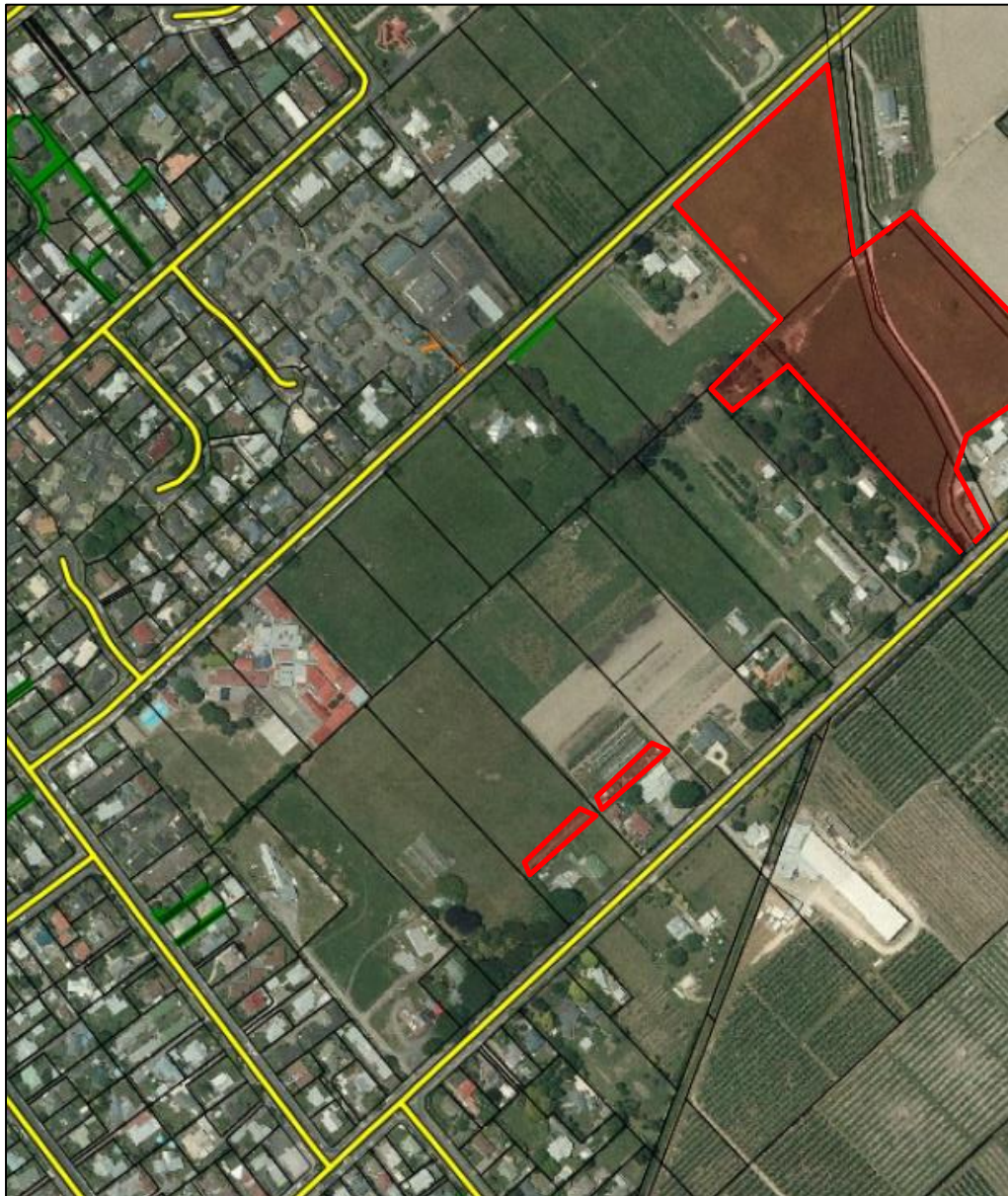
7.0 CONCLUSIONS

On the basis of the findings of this report:

- A review of the Site history was carried out that indicated a requirement for Site sampling due to historic activities including orchards and market gardens, both of which are listed on the NES HAIL;
- Appropriate Site sampling and preliminary laboratory soil analysis was then carried out;
- Fourteen composite samples exceeded the NES soil standard values for arsenic (20 mg/kg) for the land use scenario of residential (10% produce). The majority of these samples were located towards the southern end of the Site on properties identified as 180 Havelock Road and 1259 Howard Street. This is not surprising as these two properties were shown to have had orchards on them for many decades going back to at least the 1950s;
- Two samples exceeded the NES SCS value of 210 mg/kg for lead;
- The remainder of results indicate that soil arsenic and lead concentrations are similar to Hawke's Bay Background Soils of 9 mg/kg and 27 mg/kg respectively and therefore do not represent a health risk to humans under the NES land use scenario of residential (10% produce);
- A total of 16 Composite samples were analysed for organo-chlorine compounds. The only compounds recorded for all composites analysed were DDT isomers and ranged between <0.06 mg/kg Σ DDT isomers and 4.5 mg/kg Σ DDT isomers. These results are considered to be at trace concentrations and well below the soil contaminant standard value of 45 mg/kg allowed under the NES for the identified land use scenario of Residential (10% produce). As such OCPs in soils under this assessment are considered low risk to human health.

In summary, it is apparent that the majority of the Site is compliant with the NES with regards to human health under the land use scenario of Residential (10% produce). Two areas identified with elevated levels of arsenic and/or lead will require further investigation and likely remedial works if they are to be developed into Residential subdivision.

FIGURE 25: AREAS (IN RED) OF ELEVATED ARSENIC AND/OR LEAD FROM THIS ASSESSMENT)



APPENDIX 1

LORENTZ AGRONOMY DSI REPORT FOR 1259 HOWARD STREET

APPENDIX 2

LABORATORY REPORT OF ANALYSIS



Hill Laboratories
BETTER TESTING BETTER RESULTS

R J Hill Laboratories Limited
1 Clyde Street
Private Bag 3205
Hamilton 3240, New Zealand
Tel +64 7 858 2000
Fax +64 7 858 2001
Email mail@hill-labs.co.nz
Web www.hill-labs.co.nz

ANALYSIS REPORT Page 1 of 5

Client: EAM NZ Limited	Lab No: 1591573	SPV1
Contact: J Strong	Date Registered: 28-May-2016	
C/- EAM NZ Limited	Date Reported: 10-Jun-2016	
PO Box 1154	Quote No: 72316	
Napier 4140	Order No:	
	Client Reference: 55404, 55497, 55498 & 55499	
	Submitted By: J Strong	

Sample Type: Soil						
Sample Name:	55498 #3	55498 #6	Composite of 55494 #1 and 55494 #2	Composite of 55494 #3 and 55494 #4	Composite of 55494 #5 and 55494 #6	
Lab Number:	1591573.75	1591573.78	1591573.119	1591573.120	1591573.121	
Individual Tests						
Total Recoverable Arsenic	mg/kg dry wt	39	9	10	14	13
Total Recoverable Lead	mg/kg dry wt	51	59	92	53	78
Sample Name:	Composite of 55494 #7 and 55494 #8	Composite of 55494 #9 and 55494 #10	Composite of 55494 #11 and 55494 #12	Composite of 55494 #13 and 55494 #14	Composite of 55494 #15 and 55494 #16	
Lab Number:	1591573.122	1591573.123	1591573.124	1591573.125	1591573.126	
Individual Tests						
Total Recoverable Arsenic	mg/kg dry wt	9	6	8	8	6
Total Recoverable Lead	mg/kg dry wt	29	17.0	32	31	24
Sample Name:	Composite of 55494 #17 and 55494 #18	Composite of 55494 #19 and 55494 #20	Composite of 55494 #21 and 55494 #22	Composite of 55494 #23 and 55494 #24	Composite of 55494 #25 and 55494 #26	
Lab Number:	1591573.127	1591573.128	1591573.129	1591573.130	1591573.131	
Individual Tests						
Total Recoverable Arsenic	mg/kg dry wt	6	6	6	6	6
Total Recoverable Lead	mg/kg dry wt	21	22	21	23	24
Sample Name:	Composite of 55494 #27 and 55494 #28	Composite of 55494 #29 and 55494 #30	Composite of 55494 #31 and 55494 #32	Composite of 55494 #33 and 55494 #34	Composite of 55494 #35 and 55494 #36	
Lab Number:	1591573.132	1591573.133	1591573.134	1591573.135	1591573.136	
Individual Tests						
Total Recoverable Arsenic	mg/kg dry wt	6	6	7	6	6
Total Recoverable Lead	mg/kg dry wt	26	24	27	22	24
Sample Name:	Composite of 55494 #37 and 55494 #38	Composite of 55494 #39 and 55494 #40	Composite of 55494 #41 and 55494 #42	Composite of 55494 #43 and 55494 #44	Composite of 55494 #45 and 55494 #46	
Lab Number:	1591573.137	1591573.138	1591573.139	1591573.140	1591573.141	
Individual Tests						
Total Recoverable Arsenic	mg/kg dry wt	6	7	7	7	6
Total Recoverable Lead	mg/kg dry wt	23	26	27	28	28
Sample Name:	Composite of 55494 #47 and 55494 #48	Composite of 55494 #49 and 55494 #50	Composite of 55494 #51 and 55494 #52	Composite of 55494 #7, 55494 #8, 55494 #9 and 55494 #10	Composite of 55494 #17, 55494 #26, 55494 #50 and 55494 #36	
Lab Number:	1591573.142	1591573.143	1591573.144	1591573.145	1591573.146	



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 *, which are not accredited.

DSI (NES), HAVELOCK ROAD/HOWARD STREET, HASTINGS

Sample Type: Soil						
Sample Name:	Composite of 55494 #47 and 55494 #48	Composite of 55494 #49 and 55494 #50	Composite of 55494 #51 and 55494 #52	Composite of 55494 #7, 55494 #8, 55494 #9 and 55494 #10	Composite of 55494 #17, 55494 #28, 55494 #50 and 55494 #36	
Lab Number:	1591573.142	1591573.143	1591573.144	1591573.145	1591573.146	
Individual Tests						
Total Recoverable Arsenic	mg/kg dry wt	6	6	5	-	-
Total Recoverable Lead	mg/kg dry wt	27	26	26	-	-
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	-	-	-	< 0.010	< 0.010
alpha-BHC	mg/kg dry wt	-	-	-	< 0.010	< 0.010
beta-BHC	mg/kg dry wt	-	-	-	< 0.010	< 0.010
delta-BHC	mg/kg dry wt	-	-	-	< 0.010	< 0.010
gamma-BHC (Lindane)	mg/kg dry wt	-	-	-	< 0.010	< 0.010
cis-Chlordane	mg/kg dry wt	-	-	-	< 0.010	< 0.010
trans-Chlordane	mg/kg dry wt	-	-	-	< 0.010	< 0.010
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	-	-	-	< 0.04	< 0.04
2,4'-DDD	mg/kg dry wt	-	-	-	< 0.010	< 0.010
4,4'-DDD	mg/kg dry wt	-	-	-	< 0.010	< 0.010
2,4'-DDE	mg/kg dry wt	-	-	-	< 0.010	< 0.010
4,4'-DDE	mg/kg dry wt	-	-	-	0.043	0.136
2,4'-DDT	mg/kg dry wt	-	-	-	0.010	0.012
4,4'-DDT	mg/kg dry wt	-	-	-	0.076	0.159
Total DDT Isomers	mg/kg dry wt	-	-	-	0.13	0.31
Dieldrin	mg/kg dry wt	-	-	-	< 0.010	< 0.010
Endosulfan I	mg/kg dry wt	-	-	-	< 0.010	< 0.010
Endosulfan II	mg/kg dry wt	-	-	-	< 0.010	< 0.010
Endosulfan sulphate	mg/kg dry wt	-	-	-	< 0.010	0.019
Endrin	mg/kg dry wt	-	-	-	< 0.010	< 0.010
Endrin aldehyde	mg/kg dry wt	-	-	-	< 0.010	< 0.010
Endrin ketone	mg/kg dry wt	-	-	-	< 0.010	< 0.010
Heptachlor	mg/kg dry wt	-	-	-	< 0.010	< 0.010
Heptachlor epoxide	mg/kg dry wt	-	-	-	< 0.010	< 0.010
Hexachlorobenzene	mg/kg dry wt	-	-	-	< 0.010	< 0.010
Methoxychlor	mg/kg dry wt	-	-	-	< 0.010	< 0.010
Sample Name:	Composite of 55497 #1 and 55497 #2	Composite of 55497 #3 and 55497 #4	Composite of 55497 #5 and 55497 #6	Composite of 55497 #7 and 55497 #8	Composite of 55497 #9 and 55497 #10	
Lab Number:	1591573.147	1591573.148	1591573.149	1591573.150	1591573.151	
Individual Tests						
Total Recoverable Arsenic	mg/kg dry wt	5	6	10	7	7
Total Recoverable Lead	mg/kg dry wt	40	46	26	25	26
Sample Name:	Composite of 55497 #11 and 55497 #12	Composite of 55497 #13 and 55497 #14	Composite of 55497 #15 and 55497 #16	Composite of 55497 #17 and 55497 #18	Composite of 55497 #19 and 55497 #20	
Lab Number:	1591573.152	1591573.153	1591573.154	1591573.155	1591573.156	
Individual Tests						
Total Recoverable Arsenic	mg/kg dry wt	5	5	5	5	5
Total Recoverable Lead	mg/kg dry wt	40	28	25	23	27
Sample Name:	Composite of 55498 #2, 55498 #8, 55498 #19 and 55498 #13	Composite of 55498 #1 and 55498 #2	Composite of 55498 #4 and 55498 #5	Composite of 55498 #7 and 55498 #8	Composite of 55498 #9 and 55498 #10	
Lab Number:	1591573.157	1591573.158	1591573.159	1591573.160	1591573.161	
Individual Tests						
Total Recoverable Arsenic	mg/kg dry wt	-	16	17	6	7
Total Recoverable Lead	mg/kg dry wt	-	78	68	27	36
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	< 0.010	-	-	-	-

DSI (NES), HAVELOCK ROAD/HOWARD STREET, HASTINGS

Sample Type: Soil						
Sample Name:	Composite of 55497 #2, 55497 #8, 55497 #19 and 55497 #13	Composite of 55498 #1 and 55498 #2	Composite of 55498 #4 and 55498 #5	Composite of 55498 #7 and 55498 #8	Composite of 55498 #9 and 55498 #10	
Lab Number:	1591573.157	1591573.158	1591573.159	1591573.160	1591573.161	
Organochlorine Pesticides Screening in Soil						
alpha-BHC	mg/kg dry wt	< 0.010	-	-	-	-
beta-BHC	mg/kg dry wt	< 0.010	-	-	-	-
delta-BHC	mg/kg dry wt	< 0.010	-	-	-	-
gamma-BHC (Lindane)	mg/kg dry wt	< 0.010	-	-	-	-
cis-Chlordane	mg/kg dry wt	< 0.010	-	-	-	-
trans-Chlordane	mg/kg dry wt	< 0.010	-	-	-	-
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	< 0.04	-	-	-	-
2,4'-DDD	mg/kg dry wt	< 0.010	-	-	-	-
4,4'-DDD	mg/kg dry wt	0.018	-	-	-	-
2,4'-DDE	mg/kg dry wt	< 0.010	-	-	-	-
4,4'-DDE	mg/kg dry wt	0.091	-	-	-	-
2,4'-DDT	mg/kg dry wt	< 0.010	-	-	-	-
4,4'-DDT	mg/kg dry wt	0.049	-	-	-	-
Total DDT Isomers	mg/kg dry wt	0.16	-	-	-	-
Dieldrin	mg/kg dry wt	0.028	-	-	-	-
Endosulfan I	mg/kg dry wt	< 0.010	-	-	-	-
Endosulfan II	mg/kg dry wt	< 0.010	-	-	-	-
Endosulfan sulphate	mg/kg dry wt	< 0.010	-	-	-	-
Endrin	mg/kg dry wt	< 0.010	-	-	-	-
Endrin aldehyde	mg/kg dry wt	< 0.010	-	-	-	-
Endrin ketone	mg/kg dry wt	< 0.010	-	-	-	-
Heptachlor	mg/kg dry wt	< 0.010	-	-	-	-
Heptachlor epoxide	mg/kg dry wt	< 0.010	-	-	-	-
Hexachlorobenzene	mg/kg dry wt	< 0.010	-	-	-	-
Methoxychlor	mg/kg dry wt	< 0.010	-	-	-	-
Sample Name:	Composite of 55498 #11 and 55498 #12	Composite of 55498 #13 and 55498 #14	Composite of 55498 #15 and 55498 #16	Composite of 55498 #17 and 55498 #18	Composite of 55498 #19 and 55498 #20	
Lab Number:	1591573.162	1591573.163	1591573.164	1591573.165	1591573.166	
Individual Tests						
Total Recoverable Arsenic	mg/kg dry wt	5	6	5	6	6
Total Recoverable Lead	mg/kg dry wt	29	29	30	27	28
Sample Name:	Composite of 55498 #21 and 55498 #22	Composite of 55498 #23 and 55498 #24	Composite of 55498 #7, 55498 #11, 55498 #14 and 55498 #20	Composite of 55498 #3 and 55498 #6	Composite of 55498 #1 and 55498 #2	
Lab Number:	1591573.167	1591573.168	1591573.169	1591573.170	1591573.171	
Individual Tests						
Total Recoverable Arsenic	mg/kg dry wt	5	10	-	-	8
Total Recoverable Lead	mg/kg dry wt	29	44	-	-	40
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	-	-	< 0.010	< 0.010	-
alpha-BHC	mg/kg dry wt	-	-	< 0.010	< 0.010	-
beta-BHC	mg/kg dry wt	-	-	< 0.010	< 0.010	-
delta-BHC	mg/kg dry wt	-	-	< 0.010	< 0.010	-
gamma-BHC (Lindane)	mg/kg dry wt	-	-	< 0.010	< 0.010	-
cis-Chlordane	mg/kg dry wt	-	-	< 0.010	< 0.010	-
trans-Chlordane	mg/kg dry wt	-	-	< 0.010	< 0.010	-
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	-	-	< 0.04	< 0.04	-
2,4'-DDD	mg/kg dry wt	-	-	< 0.010	< 0.010	-
4,4'-DDD	mg/kg dry wt	-	-	< 0.010	< 0.010	-
2,4'-DDE	mg/kg dry wt	-	-	< 0.010	< 0.010	-
4,4'-DDE	mg/kg dry wt	-	-	< 0.010	0.013	-
Lab No:	1591573 v 1	Hill Laboratories			Page 3 of 5	

DSI (NES), HAVELOCK ROAD/HOWARD STREET, HASTINGS

Sample Type: Soil						
Sample Name:	Composite of 55498 #21 and 55498 #22	Composite of 55498 #23 and 55498 #24	Composite of 55498 #7, 55498 #11, 55498 #14 and 55498 #20	Composite of 55498 #3 and 55498 #6	Composite of 55499 #1 and 55499 #2	
Lab Number:	1591573.167	1591573.168	1591573.169	1591573.170	1591573.171	
Organochlorine Pesticides Screening in Soil						
2,4'-DDT	mg/kg dry wt	-	-	< 0.010	< 0.010	-
4,4'-DDT	mg/kg dry wt	-	-	0.010	0.011	-
Total DDT Isomers	mg/kg dry wt	-	-	< 0.06	< 0.06	-
Dieldrin	mg/kg dry wt	-	-	< 0.010	< 0.010	-
Endosulfan I	mg/kg dry wt	-	-	< 0.010	< 0.010	-
Endosulfan II	mg/kg dry wt	-	-	< 0.010	< 0.010	-
Endosulfan sulphate	mg/kg dry wt	-	-	< 0.010	< 0.010	-
Endrin	mg/kg dry wt	-	-	< 0.010	< 0.010	-
Endrin aldehyde	mg/kg dry wt	-	-	< 0.010	< 0.010	-
Endrin ketone	mg/kg dry wt	-	-	< 0.010	< 0.010	-
Heptachlor	mg/kg dry wt	-	-	< 0.010	< 0.010	-
Heptachlor epoxide	mg/kg dry wt	-	-	< 0.010	< 0.010	-
Hexachlorobenzene	mg/kg dry wt	-	-	< 0.010	< 0.010	-
Methoxychlor	mg/kg dry wt	-	-	< 0.010	< 0.010	-
Sample Name:	Composite of 55499 #3 and 55499 #4	Composite of 55499 #5 and 55499 #6	Composite of 55499 #7 and 55499 #8	Composite of 55499 #9 and 55499 #10	Composite of 55499 #11 and 55499 #12	
Lab Number:	1591573.172	1591573.173	1591573.174	1591573.175	1591573.176	
Individual Tests						
Total Recoverable Arsenic	mg/kg dry wt	7	7	7	8	8
Total Recoverable Lead	mg/kg dry wt	33	28	24	31	26
Sample Name:	Composite of 55499 #13 and 55499 #14	Composite of 55499 #15 and 55499 #16	Composite of 55499 #17 and 55499 #18	Composite of 55499 #19 and 55499 #20	Composite of 55499 #21 and 55499 #22	
Lab Number:	1591573.177	1591573.178	1591573.179	1591573.180	1591573.181	
Individual Tests						
Total Recoverable Arsenic	mg/kg dry wt	6	6	6	7	27
Total Recoverable Lead	mg/kg dry wt	32	31	29	46	80
Sample Name:	Composite of 55499 #1, 55499 #8, 55499 #13 and 55499 #22					
Lab Number:	1591573.182					
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	< 0.010	-	-	-	-
alpha-BHC	mg/kg dry wt	< 0.010	-	-	-	-
beta-BHC	mg/kg dry wt	< 0.010	-	-	-	-
delta-BHC	mg/kg dry wt	< 0.010	-	-	-	-
gamma-BHC (Lindane)	mg/kg dry wt	< 0.010	-	-	-	-
cis-Chlordane	mg/kg dry wt	< 0.010	-	-	-	-
trans-Chlordane	mg/kg dry wt	< 0.010	-	-	-	-
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	< 0.04	-	-	-	-
2,4'-DDD	mg/kg dry wt	< 0.010	-	-	-	-
4,4'-DDD	mg/kg dry wt	< 0.010	-	-	-	-
2,4'-DDE	mg/kg dry wt	< 0.010	-	-	-	-
4,4'-DDE	mg/kg dry wt	0.086	-	-	-	-
2,4'-DDT	mg/kg dry wt	< 0.010	-	-	-	-
4,4'-DDT	mg/kg dry wt	0.024	-	-	-	-
Total DDT Isomers	mg/kg dry wt	0.11	-	-	-	-
Dieldrin	mg/kg dry wt	< 0.010	-	-	-	-
Endosulfan I	mg/kg dry wt	< 0.010	-	-	-	-
Endosulfan II	mg/kg dry wt	< 0.010	-	-	-	-
Endosulfan sulphate	mg/kg dry wt	< 0.010	-	-	-	-
Endrin	mg/kg dry wt	< 0.010	-	-	-	-

Lab No: 1591573 v 1

Hill Laboratories

Page 4 of 5

Sample Type: Soil						
Sample Name:	Composite of 55499 #1, 55499 #8, 55499 #13 and 55499 #22					
Lab Number:	1591573.182					
Organochlorine Pesticides Screening in Soil						
Endrin aldehyde	mg/kg dry wt	< 0.010	-	-	-	-
Endrin ketone	mg/kg dry wt	< 0.010	-	-	-	-
Heptachlor	mg/kg dry wt	< 0.010	-	-	-	-
Heptachlor epoxide	mg/kg dry wt	< 0.010	-	-	-	-
Hexachlorobenzene	mg/kg dry wt	< 0.010	-	-	-	-
Methoxychlor	mg/kg dry wt	< 0.010	-	-	-	-

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.

Sample Type: Soil			
Test	Method Description	Default Detection Limit	Sample No
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%.	-	75, 78, 119-144, 147-156, 158-168, 171-181
Organochlorine Pesticides Screening in Soil	Sonication extraction, SPE cleanup, dual column GC-ECD analysis (modified US EPA 8082).. Tested on dried sample	0.010 - 0.06 mg/kg dry wt	145-146, 157, 169-170, 182
Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	75, 78, 119-144, 147-156, 158-168, 171-181
Composite Environmental Solid Samples*	Individual sample fractions mixed together to form a composite fraction.	-	1-118
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	75, 78, 119-144, 147-156, 158-168, 171-181
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	75, 78, 119-144, 147-156, 158-168, 171-181

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 report must not be reproduced, except in full, without the written consent of the signatory.



Peter Robinson MSc (Hons), PhD, FNZIC
Client Services Manager - Environmental



Hill Laboratories
BETTER TESTING BETTER RESULTS

R J Hill Laboratories Limited
1 Clyde Street
Private Bag 3205
Hamilton 3240, New Zealand

Tel +64 7 858 2000
Fax +64 7 858 2001
Email mail@hill-labs.co.nz
Web www.hill-labs.co.nz

ANALYSIS REPORT

Page 1 of 7

Client: EAM NZ Limited	Lab No: 1588491	SPV1
Contact: J Strong	Date Registered: 26-May-2016	
C/- EAM NZ Limited	Date Reported: 01-Jun-2016	
PO Box 1154	Quote No: 72316	
Napier 4140	Order No:	
	Client Reference:	
	Submitted By: J Strong	

Sample Type: Soil					
Sample Name:	55493/8	Composite of 55490/1 & 55490/2	Composite of 55490/3 & 55490/4	Composite of 55490/5 & 55490/6	Composite of 55490/7 & 55490/8
Lab Number:	1588491.55	1588491.140	1588491.141	1588491.142	1588491.143
Individual Tests					
Total Recoverable Arsenic	mg/kg dry wt	10	9	9	10
Total Recoverable Lead	mg/kg dry wt	28	64	64	110
				99	
Sample Name:	Composite of 55490/9 & 55490/10	Composite of 55490/11 & 55490/12	Composite of 55490/13 & 55490/14	Composite of 55490/15 & 55490/16	Composite of 55490/17 & 55490/18
Lab Number:	1588491.144	1588491.145	1588491.146	1588491.147	1588491.148
Individual Tests					
Total Recoverable Arsenic	mg/kg dry wt	8	9	10	6
Total Recoverable Lead	mg/kg dry wt	75	99	65	37
				24	
Sample Name:	Composite of 55490/19 & 55490/20	Composite of 55490/21 & 55490/22	Composite of 55490/5, 55490/13 & 55490/18	Composite of 55491/1 & 55491/2	Composite of 55491/3 & 55491/4
Lab Number:	1588491.149	1588491.150	1588491.151	1588491.152	1588491.153
Individual Tests					
Total Recoverable Arsenic	mg/kg dry wt	6	6	-	12
Total Recoverable Lead	mg/kg dry wt	24	27	-	135
				86	
Organochlorine Pesticides Screening in Soil					
Aldrin	mg/kg dry wt	-	-	< 0.010	-
alpha-BHC	mg/kg dry wt	-	-	< 0.010	-
beta-BHC	mg/kg dry wt	-	-	< 0.010	-
delta-BHC	mg/kg dry wt	-	-	< 0.010	-
gamma-BHC (Lindane)	mg/kg dry wt	-	-	< 0.010	-
cis-Chlordane	mg/kg dry wt	-	-	< 0.010	-
trans-Chlordane	mg/kg dry wt	-	-	< 0.010	-
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	-	-	< 0.04	-
2,4'-DDD	mg/kg dry wt	-	-	< 0.010	-
4,4'-DDD	mg/kg dry wt	-	-	0.014	-
2,4'-DDE	mg/kg dry wt	-	-	< 0.010	-
4,4'-DDE	mg/kg dry wt	-	-	0.26	-
2,4'-DDT	mg/kg dry wt	-	-	< 0.010	-
4,4'-DDT	mg/kg dry wt	-	-	0.111	-
Total DDT Isomers	mg/kg dry wt	-	-	0.39	-
Dieldrin	mg/kg dry wt	-	-	< 0.010	-
Endosulfan I	mg/kg dry wt	-	-	< 0.010	-
Endosulfan II	mg/kg dry wt	-	-	< 0.010	-
Endosulfan sulphate	mg/kg dry wt	-	-	< 0.010	-



IANZ
ACCREDITED LABORATORY

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 *, which are not accredited.

DSI (NES), HAVELOCK ROAD/HOWARD STREET, HASTINGS

Sample Type: Soil					
Sample Name:	Composite of 55490/19 & 55490/20	Composite of 55490/21 & 55490/22	Composite of 55490/5, 55490/13 & 55490/18	Composite of 55491/1 & 55491/2	Composite of 55491/3 & 55491/4
Lab Number:	1588491.149	1588491.150	1588491.151	1588491.152	1588491.153
Organochlorine Pesticides Screening in Soil					
Endrin	mg/kg dry wt	-	-	< 0.010	-
Endrin aldehyde	mg/kg dry wt	-	-	< 0.010	-
Endrin ketone	mg/kg dry wt	-	-	< 0.010	-
Heptachlor	mg/kg dry wt	-	-	< 0.010	-
Heptachlor epoxide	mg/kg dry wt	-	-	< 0.010	-
Hexachlorobenzene	mg/kg dry wt	-	-	< 0.010	-
Methoxychlor	mg/kg dry wt	-	-	< 0.010	-
Sample Name:	Composite of 55491/5 & 55491/6	Composite of 55491/7 & 55491/8	Composite of 55491/9 & 55491/10	Composite of 55491/11 & 55491/12	Composite of 55491/13 & 55491/14
Lab Number:	1588491.154	1588491.155	1588491.156	1588491.157	1588491.158
Individual Tests					
Total Recoverable Arsenic	mg/kg dry wt	8	6	7	6
Total Recoverable Lead	mg/kg dry wt	43	31	27	24
Sample Name:	Composite of 55491/15 & 55491/16	Composite of 55491/17 & 55491/18	Composite of 55491/19 & 55491/20	Composite of 55491/21 & 55491/22	Composite of 55491/23 & 55491/24
Lab Number:	1588491.159	1588491.160	1588491.161	1588491.162	1588491.163
Individual Tests					
Total Recoverable Arsenic	mg/kg dry wt	6	6	7	6
Total Recoverable Lead	mg/kg dry wt	21	27	20	22
Sample Name:	Composite of 55491/25 & 55491/26	Composite of 55491/8, 55491/15, 55491/22 & 55491/25	Composite of 55491/11 & 55491/13	Composite of 55493/1 & 55493/2	Composite of 55493/3 & 55493/4
Lab Number:	1588491.164	1588491.165	1588491.166	1588491.167	1588491.168
Individual Tests					
Total Recoverable Arsenic	mg/kg dry wt	6	-	-	16
Total Recoverable Lead	mg/kg dry wt	24	-	-	54
Organochlorine Pesticides Screening in Soil					
Aldrin	mg/kg dry wt	-	< 0.010	< 0.010	-
alpha-BHC	mg/kg dry wt	-	< 0.010	< 0.010	-
beta-BHC	mg/kg dry wt	-	< 0.010	< 0.010	-
delta-BHC	mg/kg dry wt	-	< 0.010	< 0.010	-
gamma-BHC (Lindane)	mg/kg dry wt	-	< 0.010	< 0.010	-
cis-Chlordane	mg/kg dry wt	-	< 0.010	< 0.010	-
trans-Chlordane	mg/kg dry wt	-	< 0.010	< 0.010	-
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	-	< 0.04	< 0.04	-
2,4'-DDD	mg/kg dry wt	-	< 0.010	< 0.010	-
4,4'-DDD	mg/kg dry wt	-	< 0.010	0.018	-
2,4'-DDE	mg/kg dry wt	-	< 0.010	< 0.010	-
4,4'-DDE	mg/kg dry wt	-	0.081	0.47	-
2,4'-DDT	mg/kg dry wt	-	< 0.010	0.033	-
4,4'-DDT	mg/kg dry wt	-	0.040	0.60	-
Total DDT Isomers	mg/kg dry wt	-	0.12	1.12	-
Dieldrin	mg/kg dry wt	-	< 0.010	< 0.010	-
Endosulfan I	mg/kg dry wt	-	< 0.010	< 0.010	-
Endosulfan II	mg/kg dry wt	-	< 0.010	< 0.010	-
Endosulfan sulphate	mg/kg dry wt	-	< 0.010	< 0.010	-
Endrin	mg/kg dry wt	-	< 0.010	< 0.010	-
Endrin aldehyde	mg/kg dry wt	-	< 0.010	< 0.010	-
Endrin ketone	mg/kg dry wt	-	< 0.010	< 0.010	-
Heptachlor	mg/kg dry wt	-	< 0.010	< 0.010	-
Lab No:	1588491 v 1		Hill Laboratories		Page 2 of 7

DSI (NES), HAVELOCK ROAD/HOWARD STREET, HASTINGS

Sample Type: Soil					
Sample Name:	Composite of 55491/25 & 55491/26	Composite of 55491/8, 55491/15, 55491/22 & 55491/25	Composite of 55491/11 & 55491/13	Composite of 55493/1 & 55493/2	Composite of 55493/3 & 55493/4
Lab Number:	1588491.164	1588491.165	1588491.166	1588491.167	1588491.168
Organochlorine Pesticides Screening in Soil					
Heptachlor epoxide	mg/kg dry wt	-	< 0.010	< 0.010	-
Hexachlorobenzene	mg/kg dry wt	-	< 0.010	< 0.010	-
Methoxychlor	mg/kg dry wt	-	< 0.010	< 0.010	-
Sample Name:	Composite of 55493/5 & 55493/6	Composite of 55493/9 & 55493/10	Composite of 55493/11 & 55493/12	Composite of 55493/13 & 55493/14	Composite of 55493/15 & 55493/16
Lab Number:	1588491.169	1588491.170	1588491.171	1588491.172	1588491.173
Individual Tests					
Total Recoverable Arsenic	mg/kg dry wt	54	8	7	8
Total Recoverable Lead	mg/kg dry wt	132	26	23	26
Sample Name:	Composite of 55493/17 & 55493/18	Composite of 55493/19 & 55493/20	Composite of 55493/21 & 55493/22	Composite of 55493/23 & 55493/24	Composite of 55493/25 & 55493/26
Lab Number:	1588491.174	1588491.175	1588491.176	1588491.177	1588491.178
Individual Tests					
Total Recoverable Arsenic	mg/kg dry wt	8	9	8	8
Total Recoverable Lead	mg/kg dry wt	26	28	28	26
Sample Name:	Composite of 55493/12, 55493/17 & 55493/24	Composite of 55493/3 & 55493/5	Composite of 96427/1 & 96427/2	Composite of 96427/3 & 96427/4	Composite of 96427/5 & 96427/6
Lab Number:	1588491.179	1588491.180	1588491.181	1588491.182	1588491.183
Individual Tests					
Total Recoverable Arsenic	mg/kg dry wt	-	-	9	10
Total Recoverable Lead	mg/kg dry wt	-	-	44	45
Organochlorine Pesticides Screening in Soil					
Aldrin	mg/kg dry wt	< 0.010	< 0.010	-	-
alpha-BHC	mg/kg dry wt	< 0.010	< 0.010	-	-
beta-BHC	mg/kg dry wt	< 0.010	< 0.010	-	-
delta-BHC	mg/kg dry wt	< 0.010	< 0.010	-	-
gamma-BHC (Lindane)	mg/kg dry wt	< 0.010	< 0.010	-	-
cis-Chlordane	mg/kg dry wt	< 0.010	< 0.010	-	-
trans-Chlordane	mg/kg dry wt	< 0.010	< 0.010	-	-
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	< 0.04	< 0.04	-	-
2,4'-DDD	mg/kg dry wt	< 0.010	< 0.010	-	-
4,4'-DDD	mg/kg dry wt	< 0.010	0.034	-	-
2,4'-DDE	mg/kg dry wt	< 0.010	< 0.010	-	-
4,4'-DDE	mg/kg dry wt	0.061	2.2	-	-
2,4'-DDT	mg/kg dry wt	< 0.010	0.157	-	-
4,4'-DDT	mg/kg dry wt	0.069	1.58	-	-
Total DDT Isomers	mg/kg dry wt	0.13	4.0	-	-
Dieldrin	mg/kg dry wt	< 0.010	< 0.010	-	-
Endosulfan I	mg/kg dry wt	< 0.010	< 0.010	-	-
Endosulfan II	mg/kg dry wt	< 0.010	< 0.010	-	-
Endosulfan sulphate	mg/kg dry wt	< 0.010	< 0.010	-	-
Endrin	mg/kg dry wt	< 0.010	< 0.010	-	-
Endrin aldehyde	mg/kg dry wt	< 0.010	< 0.010	-	-
Endrin ketone	mg/kg dry wt	< 0.010	< 0.010	-	-
Heptachlor	mg/kg dry wt	< 0.010	< 0.010	-	-
Heptachlor epoxide	mg/kg dry wt	< 0.010	< 0.010	-	-
Hexachlorobenzene	mg/kg dry wt	< 0.010	< 0.010	-	-
Methoxychlor	mg/kg dry wt	< 0.010	< 0.010	-	-

DSI (NES), HAVELOCK ROAD/HOWARD STREET, HASTINGS

Sample Type: Soil						
Sample Name:	Composite of 96427/7 & 96427/8	Composite of 96427/9 & 96427/10	Composite of 96427/11 & 96427/12	Composite of 96427/1, 96427/5, 96427/7 & 96427/11	Composite of 55506/1 & 55506/2	
Lab Number:	1588491.184	1588491.185	1588491.186	1588491.187	1588491.188	
Individual Tests						
Total Recoverable Arsenic	mg/kg dry wt	6	5	6	-	7
Total Recoverable Lead	mg/kg dry wt	21	21	24	-	34
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	-	-	-	< 0.010	-
alpha-BHC	mg/kg dry wt	-	-	-	< 0.010	-
beta-BHC	mg/kg dry wt	-	-	-	< 0.010	-
delta-BHC	mg/kg dry wt	-	-	-	< 0.010	-
gamma-BHC (Lindane)	mg/kg dry wt	-	-	-	< 0.010	-
cis-Chlordane	mg/kg dry wt	-	-	-	< 0.010	-
trans-Chlordane	mg/kg dry wt	-	-	-	< 0.010	-
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	-	-	-	< 0.04	-
2,4'-DDD	mg/kg dry wt	-	-	-	< 0.010	-
4,4'-DDD	mg/kg dry wt	-	-	-	< 0.010	-
2,4'-DDE	mg/kg dry wt	-	-	-	< 0.010	-
4,4'-DDE	mg/kg dry wt	-	-	-	0.098	-
2,4'-DDT	mg/kg dry wt	-	-	-	< 0.010	-
4,4'-DDT	mg/kg dry wt	-	-	-	0.052	-
Total DDT Isomers	mg/kg dry wt	-	-	-	0.15	-
Dieldrin	mg/kg dry wt	-	-	-	< 0.010	-
Endosulfan I	mg/kg dry wt	-	-	-	< 0.010	-
Endosulfan II	mg/kg dry wt	-	-	-	< 0.010	-
Endosulfan sulphate	mg/kg dry wt	-	-	-	< 0.010	-
Endrin	mg/kg dry wt	-	-	-	< 0.010	-
Endrin aldehyde	mg/kg dry wt	-	-	-	< 0.010	-
Endrin ketone	mg/kg dry wt	-	-	-	< 0.010	-
Heptachlor	mg/kg dry wt	-	-	-	< 0.010	-
Heptachlor epoxide	mg/kg dry wt	-	-	-	< 0.010	-
Hexachlorobenzene	mg/kg dry wt	-	-	-	< 0.010	-
Methoxychlor	mg/kg dry wt	-	-	-	< 0.010	-
Sample Name:	Composite of 55506/3 & 55506/4	Composite of 55506/5 & 55506/6	Composite of 55506/7 & 55506/8	Composite of 55506/9 & 55506/10	Composite of 55506/11 & 55506/12	
Lab Number:	1588491.189	1588491.190	1588491.191	1588491.192	1588491.193	
Individual Tests						
Total Recoverable Arsenic	mg/kg dry wt	9	10	5	5	9
Total Recoverable Lead	mg/kg dry wt	21	22	25	36	23
Sample Name:	Composite of 55506/13 & 55506/14	Composite of 55506/15 & 55506/16	Composite of 55506/1, 55506/7, 55506/8 & 55506/16	Composite of 55505/1 & 55505/2	Composite of 55505/3 & 55505/4	
Lab Number:	1588491.194	1588491.195	1588491.196	1588491.197	1588491.198	
Individual Tests						
Total Recoverable Arsenic	mg/kg dry wt	8	6	-	6	4
Total Recoverable Lead	mg/kg dry wt	37	28	-	25	17.9
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	-	-	< 0.010	-	-
alpha-BHC	mg/kg dry wt	-	-	< 0.010	-	-
beta-BHC	mg/kg dry wt	-	-	< 0.010	-	-
delta-BHC	mg/kg dry wt	-	-	< 0.010	-	-
gamma-BHC (Lindane)	mg/kg dry wt	-	-	< 0.010	-	-
cis-Chlordane	mg/kg dry wt	-	-	< 0.010	-	-
trans-Chlordane	mg/kg dry wt	-	-	< 0.010	-	-
Lab No: 1588491 v 1						
Hill Laboratories						
Page 4 of 7						

DSI (NES), HAVELOCK ROAD/HOWARD STREET, HASTINGS

Sample Type: Soil						
Sample Name:	Composite of 55506/13 & 55506/14	Composite of 55506/15 & 55506/16	Composite of 55506/1, 55506/7, 55506/8 & 55506/16	Composite of 55505/1 & 55505/2	Composite of 55505/3 & 55505/4	
Lab Number:	1588491.194	1588491.195	1588491.196	1588491.197	1588491.198	
Organochlorine Pesticides Screening in Soil						
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	-	-	< 0.04	-	-
2,4'-DDD	mg/kg dry wt	-	-	< 0.010	-	-
4,4'-DDD	mg/kg dry wt	-	-	< 0.010	-	-
2,4'-DDE	mg/kg dry wt	-	-	< 0.010	-	-
4,4'-DDE	mg/kg dry wt	-	-	< 0.010	-	-
2,4'-DDT	mg/kg dry wt	-	-	< 0.010	-	-
4,4'-DDT	mg/kg dry wt	-	-	< 0.010	-	-
Total DDT Isomers	mg/kg dry wt	-	-	< 0.06	-	-
Dieldrin	mg/kg dry wt	-	-	< 0.010	-	-
Endosulfan I	mg/kg dry wt	-	-	< 0.010	-	-
Endosulfan II	mg/kg dry wt	-	-	< 0.010	-	-
Endosulfan sulphate	mg/kg dry wt	-	-	< 0.010	-	-
Endrin	mg/kg dry wt	-	-	< 0.010	-	-
Endrin aldehyde	mg/kg dry wt	-	-	< 0.010	-	-
Endrin ketone	mg/kg dry wt	-	-	< 0.010	-	-
Heptachlor	mg/kg dry wt	-	-	< 0.010	-	-
Heptachlor epoxide	mg/kg dry wt	-	-	< 0.010	-	-
Hexachlorobenzene	mg/kg dry wt	-	-	< 0.010	-	-
Methoxychlor	mg/kg dry wt	-	-	< 0.010	-	-
Sample Name:	Composite of 55505/5 & 55505/6	Composite of 55505/7 & 55505/8	Composite of 55505/9 & 55505/10	Composite of 55505/11 & 55505/12	Composite of 55505/13 & 55505/14	
Lab Number:	1588491.199	1588491.200	1588491.201	1588491.202	1588491.203	
Individual Tests						
Total Recoverable Arsenic	mg/kg dry wt	5	5	5	5	5
Total Recoverable Lead	mg/kg dry wt	17.0	17.6	18.1	18.5	16.5
Sample Name:	Composite of 55505/15 & 55505/16	Composite of 55505/17 & 55505/18	Composite of 55505/19 & 55505/20	Composite of 55505/21 & 55505/22	Composite of 55505/23 & 55505/24	
Lab Number:	1588491.204	1588491.205	1588491.206	1588491.207	1588491.208	
Individual Tests						
Total Recoverable Arsenic	mg/kg dry wt	6	5	5	5	4
Total Recoverable Lead	mg/kg dry wt	19.1	18.0	19.2	17.2	16.9
Sample Name:	Composite of 55505/25 & 55505/26	Composite of 55505/27 & 55505/28	Composite of 55505/29 & 55505/30	Composite of 55505/31 & 55505/32	Composite of 55505/33 & 55505/34	
Lab Number:	1588491.209	1588491.210	1588491.211	1588491.212	1588491.213	
Individual Tests						
Total Recoverable Arsenic	mg/kg dry wt	4	5	5	5	7
Total Recoverable Lead	mg/kg dry wt	19.7	16.4	37	22	25
Sample Name:	Composite of 55505/35 & 55505/36	Composite of 55505/37 & 55505/38	Composite of 55505/1, 55505/13, 55505/23 & 55505/38			
Lab Number:	1588491.214	1588491.215	1588491.216			
Individual Tests						
Total Recoverable Arsenic	mg/kg dry wt	7	8	-	-	-
Total Recoverable Lead	mg/kg dry wt	24	27	-	-	-
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	-	-	< 0.010	-	-
alpha-BHC	mg/kg dry wt	-	-	< 0.010	-	-
beta-BHC	mg/kg dry wt	-	-	< 0.010	-	-
delta-BHC	mg/kg dry wt	-	-	< 0.010	-	-
Lab No:	1588491 v 1		Hill Laboratories		Page 5 of 7	

Sample Type: Soil						
Sample Name:	Composite of 55505/35 & 55505/36	Composite of 55505/37 & 55505/38	Composite of 55505/1, 55505/13, 55505/23 & 55505/38			
Lab Number:	1588491.214	1588491.215	1588491.216			
Organochlorine Pesticides Screening in Soil						
gamma-BHC (Lindane)	mg/kg dry wt	-	-	< 0.010	-	-
cis-Chlordane	mg/kg dry wt	-	-	< 0.010	-	-
trans-Chlordane	mg/kg dry wt	-	-	< 0.010	-	-
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	-	-	< 0.04	-	-
2,4'-DDD	mg/kg dry wt	-	-	< 0.010	-	-
4,4'-DDD	mg/kg dry wt	-	-	< 0.010	-	-
2,4'-DDE	mg/kg dry wt	-	-	< 0.010	-	-
4,4'-DDE	mg/kg dry wt	-	-	0.035	-	-
2,4'-DDT	mg/kg dry wt	-	-	< 0.010	-	-
4,4'-DDT	mg/kg dry wt	-	-	0.041	-	-
Total DDT Isomers	mg/kg dry wt	-	-	0.08	-	-
Dieldrin	mg/kg dry wt	-	-	< 0.010	-	-
Endosulfan I	mg/kg dry wt	-	-	< 0.010	-	-
Endosulfan II	mg/kg dry wt	-	-	< 0.010	-	-
Endosulfan sulphate	mg/kg dry wt	-	-	< 0.010	-	-
Endrin	mg/kg dry wt	-	-	< 0.010	-	-
Endrin aldehyde	mg/kg dry wt	-	-	< 0.010	-	-
Endrin ketone	mg/kg dry wt	-	-	< 0.010	-	-
Heptachlor	mg/kg dry wt	-	-	< 0.010	-	-
Heptachlor epoxide	mg/kg dry wt	-	-	< 0.010	-	-
Hexachlorobenzene	mg/kg dry wt	-	-	< 0.010	-	-
Methoxychlor	mg/kg dry wt	-	-	< 0.010	-	-

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.

Sample Type: Soil			
Test	Method Description	Default Detection Limit	Sample No
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%.	-	55, 140-150, 152-164, 167-178, 181-186, 188-195, 197-215
Organochlorine Pesticides Screening in Soil	Sonication extraction, SPE cleanup, dual column GC-ECD analysis (modified US EPA 8082). Tested on dried sample	0.010 - 0.06 mg/kg dry wt	151, 165-166, 179-180, 187, 196, 216
Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	55, 140-150, 152-164, 167-178, 181-186, 188-195, 197-215
Composite Environmental Solid Samples*	Individual sample fractions mixed together to form a composite fraction.	-	1-54, 56-139
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	55, 140-150, 152-164, 167-178, 181-186, 188-195, 197-215

Sample Type: Soil			
Test	Method Description	Default Detection Limit	Sample No
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	55, 140-150, 152-164, 167-178, 181-186, 188-195, 197-215

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 report must not be reproduced, except in full, without the written consent of the signatory.



Ara Heron BSc (Tech)
Client Services Manager - Environmental



Hill Laboratories
BETTER TESTING BETTER RESULTS

R J Hill Laboratories Limited
1 Clyde Street
Private Bag 3205
Hamilton 3240, New Zealand

Tel +64 7 858 2000
Fax +64 7 858 2001
Email mail@hill-labs.co.nz
Web www.hill-labs.co.nz

ANALYSIS REPORT

Page 1 of 2

Client: EAM NZ Limited	Lab No: 1595582	SPV1
Contact: J Strong	Date Registered: 04-Jun-2016	
C/- EAM NZ Limited	Date Reported: 15-Jun-2016	
PO Box 1154	Quote No: 72316	
Napier 4140	Order No:	
	Client Reference: Duncan St	
	Submitted By: J Strong	

Sample Type: Soil

Sample Name:	Composite of 94952/1 & 94952/2	Composite of 94952/3 & 94952/4	Composite of 94952/5 & 94952/6	Composite of 94952/7 & 94952/8	Composite of 94952/9 & 94952/10
Lab Number:	1595582.31	1595582.32	1595582.33	1595582.34	1595582.35

Individual Tests

Total Recoverable Arsenic	mg/kg dry wt	35	33	13	16	33
Total Recoverable Lead	mg/kg dry wt	141	127	57	69	153

Sample Name:	Composite of 94952/11 & 94952/12	Composite of 94952/13 & 94952/14	Composite of 94952/15 & 94952/16	Composite of 94952/17 & 94952/18	Composite of 94952/19 & 94952/20
Lab Number:	1595582.36	1595582.37	1595582.38	1595582.39	1595582.40

Individual Tests

Total Recoverable Arsenic	mg/kg dry wt	44	62	34	27	40
Total Recoverable Lead	mg/kg dry wt	220	250	148	106	153

Sample Name:	Composite of 94952/21 & 94952/22	Composite of 94952/23 & 94952/24	Composite of 94952/25 & 94952/26	Composite of 94952/27 & 94952/28	Composite of 94952/29 & 94952/30
Lab Number:	1595582.41	1595582.42	1595582.43	1595582.44	1595582.45

Individual Tests

Total Recoverable Arsenic	mg/kg dry wt	24	22	18	23	22
Total Recoverable Lead	mg/kg dry wt	94	97	76	90	78

Sample Name:	Composite of 94952/1, 94952/6, 94952/10 & 94952/15	Composite of 94952/22, 94952/27, 94952/29 & 94952/30			
Lab Number:	1595582.46	1595582.47			

Organochlorine Pesticides Screening in Soil

Aldrin	mg/kg dry wt	< 0.010	< 0.010	-	-	-
alpha-BHC	mg/kg dry wt	< 0.010	< 0.010	-	-	-
beta-BHC	mg/kg dry wt	< 0.010	< 0.010	-	-	-
delta-BHC	mg/kg dry wt	< 0.010	< 0.010	-	-	-
gamma-BHC (Lindane)	mg/kg dry wt	< 0.010	< 0.010	-	-	-
cis-Chlordane	mg/kg dry wt	< 0.010	< 0.010	-	-	-
trans-Chlordane	mg/kg dry wt	< 0.010	< 0.010	-	-	-
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	< 0.04	< 0.04	-	-	-
2,4'-DDD	mg/kg dry wt	0.058	0.016	-	-	-
4,4'-DDD	mg/kg dry wt	0.123	0.044	-	-	-
2,4'-DDE	mg/kg dry wt	0.023	< 0.010	-	-	-
4,4'-DDE	mg/kg dry wt	2.7	0.85	-	-	-
2,4'-DDT	mg/kg dry wt	0.086	0.019	-	-	-
4,4'-DDT	mg/kg dry wt	1.53	0.35	-	-	-



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 *, which are not accredited.

Sample Type: Soil						
Sample Name:	Composite of 94952/1, 94952/6, 94952/10 & 94952/15	Composite of 94952/22, 94952/27, 94952/29 & 94952/30				
Lab Number:	1595582.46	1595582.47				
Organochlorine Pesticides Screening in Soil						
Total DDT Isomers	mg/kg dry wt	4.5	1.28	-	-	-
Dieldrin	mg/kg dry wt	< 0.010	< 0.010	-	-	-
Endosulfan I	mg/kg dry wt	< 0.010	< 0.010	-	-	-
Endosulfan II	mg/kg dry wt	< 0.010	< 0.010	-	-	-
Endosulfan sulphate	mg/kg dry wt	< 0.010	< 0.010	-	-	-
Endrin	mg/kg dry wt	< 0.010	< 0.010	-	-	-
Endrin aldehyde	mg/kg dry wt	< 0.010	< 0.010	-	-	-
Endrin ketone	mg/kg dry wt	< 0.010	< 0.010	-	-	-
Heptachlor	mg/kg dry wt	< 0.010	< 0.010	-	-	-
Heptachlor epoxide	mg/kg dry wt	< 0.010	< 0.010	-	-	-
Hexachlorobenzene	mg/kg dry wt	< 0.010	< 0.010	-	-	-
Methoxychlor	mg/kg dry wt	< 0.010	< 0.010	-	-	-

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.

Sample Type: Soil			
Test	Method Description	Default Detection Limit	Sample No
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%.	-	31-45
Organochlorine Pesticides Screening in Soil	Sonication extraction, SPE cleanup, dual column GC-ECD analysis (modified US EPA 8082). Tested on dried sample	0.010 - 0.06 mg/kg dry wt	46-47
Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	31-45
Composite Environmental Solid Samples*	Individual sample fractions mixed together to form a composite fraction.	-	1-30
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	31-45
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	31-45

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 report must not be reproduced, except in full, without the written consent of the signatory.



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