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Report

Summerset Lower Hutt - Civil Works Construction Management Plan

Prepared for

Prepared by Beca Limited

14 February 2018

Revision History

Revision Nº	Prepared By	Description	Date
1	**Kathryn Collie**	Draft for Client Review	13/07/2017
2	Kathryn Collie	For Consent	14/02/2018

Document Acceptance

Action	Name	Signed	Date
Prepared by	**Kathryn Collie**		14/02/2018
Reviewed by	**David Gardiner**		14/02/2018
Approved by	**Mark Sneddon**	PP	14/02/2018
on behalf of	Beca Limited		

Beca 2017 (unless Beca has expressly agreed otherwise with the Client in writing).

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Executive Summary

Summerset Management Group Limited (Summerset) intends to develop a retirement village on a 2.93ha site at Boulcott Street, Lower Hutt. This Construction Management Plan (CMP) has been prepared as a guideline for civil contractors to use in developing their own Contractors Environmental Management Plan (CEMP) for Summerset Lower Hutt development.

This CMP is intended to cover construction of civil site works only, including:

- Earthworks
- Installation of in-ground services
- Construction of a roading network

The Contractor will be responsible for preparing a comprehensive construction methodology prior to establishing on site. The Contractors plan will be reviewed and approved by the Engineer and Greater Wellington Regional Council (GWRC), prior to the commencement of any work on site, and thereafter if any significant changes to the plan are deemed necessary.

The CEMP shall include, but not be limited to the following:

- Description/staging and programme of works;
- Key contacts/roles and responsibilities;
- Communication protocols including complaints procedures;
- Onsite measures and controls;
- Incident response;
- Staff induction and training;
- Site monitoring, inspections and audits;
- Resource consents/Permits and Approvals Register; and
- Management Plan review procedure.

Onsite measures and controls to manage the following construction issues will be included in the CEMP. The following list outlined the minimum requirements and other procedures may be required as a result of the consenting, design and pre-construction consultation process.

- Erosion and sediment control
- Stockpile management
- Dust
- Dewatering
- Temporary traffic management
- Existing services management
- Spill management and emergency response
- Soils Contamination Management Plan
- Noise, vibration and light
- Waste management
- Flood management
- Environmental incidents

Contents

1 Introduction 1

1.1 Background 1

1.2 Purpose of this Document 1

1.3 Site Description 1

1.4 Project Description 3

2 Construction Methodology 5

2.1 Construction Programme 6

3 Construction Management Plan 7

3.1 Introduction 7

3.2 Construction Management Plan 7

Appendices

Appendix A

Earthworks Plans

Appendix B

Contaminated Soils – Detailed Site Investigation Report

Appendix C

Contaminated Soils Management Plan

1 Introduction

1.1 Background

Summerset Management Group Limited (Summerset) intends to develop a retirement village on a 2.93ha site at Boulcott Street, Lower Hutt. The Summerset Lower Hutt development (the development) will be constructed over multiple stages and will comprise of 42 villas, 109 apartments, 57 serviced apartments, a care facility and various village amenities.

1.2 Purpose of this Document

This Construction Management Plan (CMP) has been prepared in support of the resource consent application for the retirement village and is intended to cover construction of civil site works only.

This document provides background information about the proposed site works and outlines the minimum requirements to which the Contractor must adhere. The chosen Contractor(s) will be required to prepare a Contractors Environmental Management Plan (CEMP) which will be specific to the methodologies proposed, and to address specific activities, prior to physical works commencing.

1.3 Site Description

The site is located adjacent to the Boulcotts Farm Heritage Golf Course, Lower Hutt, and is accessed from Boulcott St and Military Road. The site is bound to the north, and separated from the golf course, by the recently constructed Hutt River stopbank. There is an historic stopbank that runs along the southern boundary from Boulcott St to Hathaway Ave and residential properties border the remainder of the southern boundary.

The site is comprised of two distinct blocks. The western block is currently unused and the site topography and stopbanks creates a hollow in which stormwater runoff from surrounding areas collects. The eastern block generally grades from east to west and currently houses the golf course clubrooms and car park. Refer Figure 1 to below for location plan.

Figure 1 Location Plan

1.3.1 Site Soils

The geology of the Boulcott area has been mapped and described in the 1:250,000 Geological Map, Sheet 10, Wellington (Begg, JG; Johnson MR, 2000). This map indicates that this site is underlain by alluvial deposits (Q1a): *well sorted flood plain gravels.*

Geotechnical investigations at the site conclude that the site is underlain by alternating layers of laterally discontinuous sands, silts and gravels overlying a more consistent layer of very dense gravels. The elevation of the contact between the discontinuous deposits (sands, silts and gravels) and the underlying very dense gravel stratum varies across the site but is typically present by -5m RL.

Fill materials overlie *in situ* soils in numerous locations across the site. Geotechnical investigations show that the fill material is typically less than 1m thick, although investigations undertaken in 2013 suggest that the thickness of this material may be up to 3.2m in discrete locations.

Groundwater was measured from 1.5m to 4.1m below ground level across the site.

1.3.2 Soil Contamination

Initial ground investigations found signs of potential soil contamination. A detailed site investigation (DSI) was undertaken in June 2017 including soil sampling and laboratory testing (refer Appendix B for DSI report).

The initial Preliminary Site Investigation, undertaken by Aurecon, identified historic natural drainage gullies that have since been filled and the landscape re-contoured. The gully fill material was considered a potential contamination risk. The historic use of the site by the golf course is also a potential risk due the use of herbicides and pesticides. Preliminary sampling by Aurecon in surface soils concluded that the site had low risk of soil contamination from both sources. Subsequent investigations discovered areas of buried waste that included contained liquids, brick, wires, ceramics and old pipework, however this apparent waste disposal area appears to be contained.

DSI soil testing largely showed that the soils on site were within background contaminant concentrations, with the exception of two areas that included the previous unexpected discovery, and an area to the south-central border of the site that contained elevated levels of lead and zinc. Results from both areas were within the human health soil contaminant standards, however the fill layer exceeded environmental criteria for zinc, and both areas exceeded the Class A Landfill criteria. The uncontrolled fill will be removed from site as part of the earthworks in a controlled manner according to the Contaminated Soils Management Plan (CSMP), refer Appendix C.

Should any other suspicious material be discovered during earthworks that will also be managed according to the Contaminated Soils Management Plan.

1.4 Project Description

1.4.1 Proposed Development

It is proposed to develop the site with new infrastructure, accommodation and facilities for 42 villas, 109 apartments, 57 serviced apartments, a care facility and village amenities including a café, salon, laundry, gym and swimming pool.

1.4.2 Bulk Earthworks

Preliminary design of bulk earthworks has been undertaken to set preliminary floor levels and to determine indicative earthworks volumes. Site levels have predominantly been set by minimum freeboard requirements (to building floor levels) and the flat grades required to provide mobility access to buildings and facilities.

The preliminary earthworks volumes are as follows:

Table 1 Preliminary Earthworks Volumes

Activity	Volume (m^3)
Topsoil / unsuitable strip	10,000
Topsoil respread	3,000
Excess topsoil / unsuitable removed from site	7,000
Cut to fill	5,000
Imported fill	29,000

Please note the imported fill volume is directly influenced by the amount of topsoil stripped from the site. The topsoil thickness is expected to vary because of the previous use as a golf course.

1.4.3 Staging

Civil construction works for the development will be undertaken in stages. Bulk earthworks of the western block will be completed first (Stage 1), with the remainder of the works completed in subsequent stages as follows:

- Earthworks, including stripping topsoil and cut and fill activities.
- Installation of water, wastewater and stormwater networks to service the development
- Alteration to the existing stormwater network
- Construction of a roading network

Figure 1 below shows the extent of the Stage 1 site works.

Figure 2 Staging Diagram

2 Construction Methodology

Table 2 below outlines the indicative construction methodology for completing the Stage 1 bulk earthworks. Works will generally include site establishment, topsoil strip, and cut, import and placement of fill material. The Contractor will be responsible for preparing a comprehensive construction methodology prior to establishing on site.

Table 2 Construction Activities and Methodology

General Activities	
Consultation	Notify relevant parties (GWRC, HCC, Boulcott Golf Club) at least 48 hours prior to works commencing on site or as required by resource consent conditions
Establish on site	The following activities are required prior to earthworks commencing: • Fence off construction site • Erect project signage • Set up project site office, storage and layout areas • Install erosion and sediment control measures as per Section 3.2.2 of this document. • Existing services to be located and marked out on site
Traffic management measures	Consult with all affected parties and ensure all properties have access and maintain functionality Traffic Management Plans will be competed and submitted for approval to HCC prior to works commencing
Earthwork Activities	
Topsoil Strip	An average topsoil depth of 300mm is anticipated across the site with the exception of historic golf course tee and green areas which are anticipated to have a maximum depth of 500mm The approximate topsoil volume to be stripped is expected to be up to 10,000m³, of which it is envisioned that approximately 30% (3,000m³) will be reused on site following the completion of bulk earthworks. The remainder will be removed from site, some may be able to be used on the adjacent golf course. The topsoil to be re-used on site will be stockpiled in designated areas.
Bulk Earthworks – Cut	Areas of cut will be excavated and material suitable for re-use stored on site in designated stockpile areas. Approximately 5,000m³ of cut will be generated during earthworks. It is proposed the cut be re-used on site, however unsuitable material will be removed from site by trucks. Access will be via the Boulcott Golf Club. The existing stopbanks on the perimeter of the site are to be retained and will assist in retaining sediment laden

General Activities	
	runoff within the site. They will also act as a screen for noise and visual disturbance. The maximum cut depth is approximately 1.5m
Bulk Earthworks – Fill	Fill will be placed using a scraper or digger/dumper operation. Fill will be placed and compacted in layers to meet compaction requirements. Compaction will be obtained by using a static roller. Compaction levels will be obtained and tested. The maximum depth to fill is approximately 2.5m
Bulk Earthworks – Importing material to site	Approximately 34,000m³ of fill will be required for the site. Provided the 5,000m³ of cut is suitable for re-use, approximately 29,000m³ will be required to be imported to site. Suitable fill material will be locally sourced. This material will be transported to site on trucks via Boulcott Golf Course. Material will be taken directly to fill areas or it will be stockpiled on site in designated areas. If stockpiled, it will be re-handled on site by earthmoving equipment.

2.1 Construction Programme

It is anticipated that construction work for Stage 1 of the bulk earthworks will be undertaken over the 2017/2018 school holiday period. Consent for this works will be applied for under a separate consent.

The programming of the construction of subsequent stages is unknown and will be dependent on the timing of granting of resource consent.

3 Contractors Environmental Management Plan

3.1 Introduction

The Contractor will prepare a Contractor's Environmental Management Plan (CEMP) for the project, which will identify how the contractor will manage construction, in respect of best practices, applicable consent conditions and regulations. The Contractor will submit this plan for approval to the Engineer and Greater Wellington Regional Council before work begins on the site. The Engineer will monitor the plan regularly for compliance with the consent conditions.

This section outlines minimum requirements for the content of the CEMP for the project.

3.2 Contractors Environmental Management Plan

3.2.1 Overview

The CEMP shall cover all issues addressed in this CMP and will include, but not be limited to the following:

- Description/staging and programme of works;
- Key contacts/roles and responsibilities;
- Communication protocols including complaints procedures;
- Onsite measures and controls;
- Incident response;
- Staff induction and training;
- Site monitoring, inspections and audits;
- Resource consents/Permits and Approvals Register; and
- Management Plan review procedure.

Onsite measures and controls to manage the following construction issues will be included in the CEMP. The following list outlined the minimum requirements and other procedures may be required as a result of the consenting, design and pre-construction consultation process.

- Erosion and sediment control
- Stockpile management
- Dust
- Dewatering
- Temporary traffic management
- Existing services management
- Spill management and emergency response
- Contaminated Soils Management Plan
- Noise, vibration and light
- Waste management
- Flood management
- Environmental incidents

3.2.2 Erosion and Sediment Control

The CEMP will include site-specific erosion and sediment control plan, designed in accordance with the Erosion and Sediment Control Guidelines for the Wellington Region (GWRC, 2002, reprinted 2006). Erosion and sediment control plan shall include, as a minimum, the following:

- A plan showing location of roads, property boundaries, surface waterways, direction of flows and erosion and sediment control devices;
- A site description including slope, soils, rainfall, vegetation and water bodies;
- A detailed programme of works identifying stages of construction, estimate of bare ground exposed at each stage, stockpile management and estimate of volume of earthworks;
- Detailed drawings and specifications of all erosion and sediment control measures selected, including dust control measures, from the appropriate guidelines;
- A schedule outlining frequency of inspection, monitoring and maintenance to achieve compliance with any consent conditions; and
- Details of site restoration including re-vegetating or sealing.

3.2.3 Dewatering

Groundwater at the site is likely to be encountered from 1.0m below ground and dewatering may be required while excavating for and construction of underground service trenches and pump stations. The CEMP is to include a dewatering plan which shall include, as a minimum, the following:

- Dewatering methodology
- Dewatering water treatment method
- Discharge rate and location
- Monitoring of settlement of adjacent structures

3.2.4 Temporary Traffic Management

Approximately 29,000m³ of imported fill will be required on site to achieve the proposed design levels. This equates to approximately 3,000 truck movements. All truck movements to the site will enter and exit the site from an existing vehicle crossing on Harcourt Werry Drive which leads to the site via an existing track traversing the golf course. The existing vehicle crossing on Harcourt Werry Drive has extensive sightlines across the road in both directions and is not located near any intersection. Harcourt Werry Drive directly connects to State Highway 2 via Fairway Drive and therefore truck movements to and from the site will not directly pass through any residential streets.

A Traffic Management Plan (TMP) will be submitted for approval to HCC prior to works commencing. Traffic control will be established on Harcourt Werry Drive in accordance with an approved TMP. The TMP is to cover the following as a minimum:

- Location plan and traffic details for haulage within the site;
- Location plan and traffic details for interface with external connecting roads;
- Plan for the provision of pedestrians and cyclists adjacent to the works, where existing paths have been temporarily discontinued;
- Description of expected external traffic volumes on surrounding roads as a result of each stage of the project;
- Description of work activities and schedule of works;
- Proposed traffic management methods including any temporary speed and access restrictions;
- Authorisations from HCC and/or New Zealand Transport Agency; Public notification and complaints procedure; and Site safety measures

Summerset have an agreement with the golf club to use the existing vehicle access through the golf course as a haul road for construction traffic. A TMP is to be prepared by the Contractor and approved by the golf course prior to construction. The TMP is to allow for the continued operation of the golf course and will include as a minimum:

- Communications plan including procedures for briefing club members and drivers

- Number of truck movements
- Hours of operation

3.2.5 Existing Services Management

The process for the identification of services through close consultation with relevant utility/service providers including Hutt City Council, and other services providers will be included.

3.2.6 Spill Management and Emergency Response

Spill management and emergency response procedures including, as a minimum, the following:

- Types and volumes of hazardous substance stored on site;
- Description of equipment and procedures used, including refuelling and maintenance activities, to minimise spills or leaks;
- Procedures for containing, cleaning and disposing of any spillage (e.g. spill kits);
- Reporting procedures to notify GWRC including a schedule of emergency contact names and numbers; and
- An inspection schedule for all storage containers, refuelling areas and plant.

3.2.7 Contaminated Soils Management Plan

Contaminated soils resulting from historical activities, including burial of waste, are present at the site. Contaminants of concern are heavy metals, SVOC's and petroleum hydrocarbons. Contaminated soils are to be managed in accordance with Contaminated Soils Management Plan (refer Appendix C).

3.2.8 Noise Vibration and Light

All noise generating activities during the period of site works for this project will be managed on site as far as is reasonably practicable with the controls set out in the relevant New Zealand Standard NZS 6803:1999 Acoustics – Construction Noise. The CEMP shall outline the following:

- Standard hours of work
- Notification procedures
- Construction methods

3.2.9 Waste Management

Procedures for the management of construction-related wastes including, as a minimum, the following:

- Storage and removal from site of construction and general wastes.
- Provision of recycling facilities to maximise the recovery of recyclable elements; and
- Provision of toilets on site and the removal of sanitary wastes and grey water.

3.2.10 Discovery of Cultural Artefacts, Taonga and Koiwi

In the event of the accidental discovery of an archaeological site, including cultural artefacts, taonga and koiwi the Heritage New Zealand Pouhere Taonga Archaeological Discovery Protocol shall be followed.

3.2.11 Flood Management Strategy

The CEMP is to outline the flood management strategy for the site and shall include the following:

- Weather monitoring procedures
- Strategies to adjust the construction programme and onsite procedures if a severe weather system is forecast
- Emergency contact details

3.2.12 Environmental Incidents

The CEMP should outline procedures to mitigate and manage environmental incidents.

Greater Wellington Regional Council have a 24 hour Environmental Protection hotline (0800 496 734) and should be used to report and pollution that occurs.

Appendix A

Earthworks Plans

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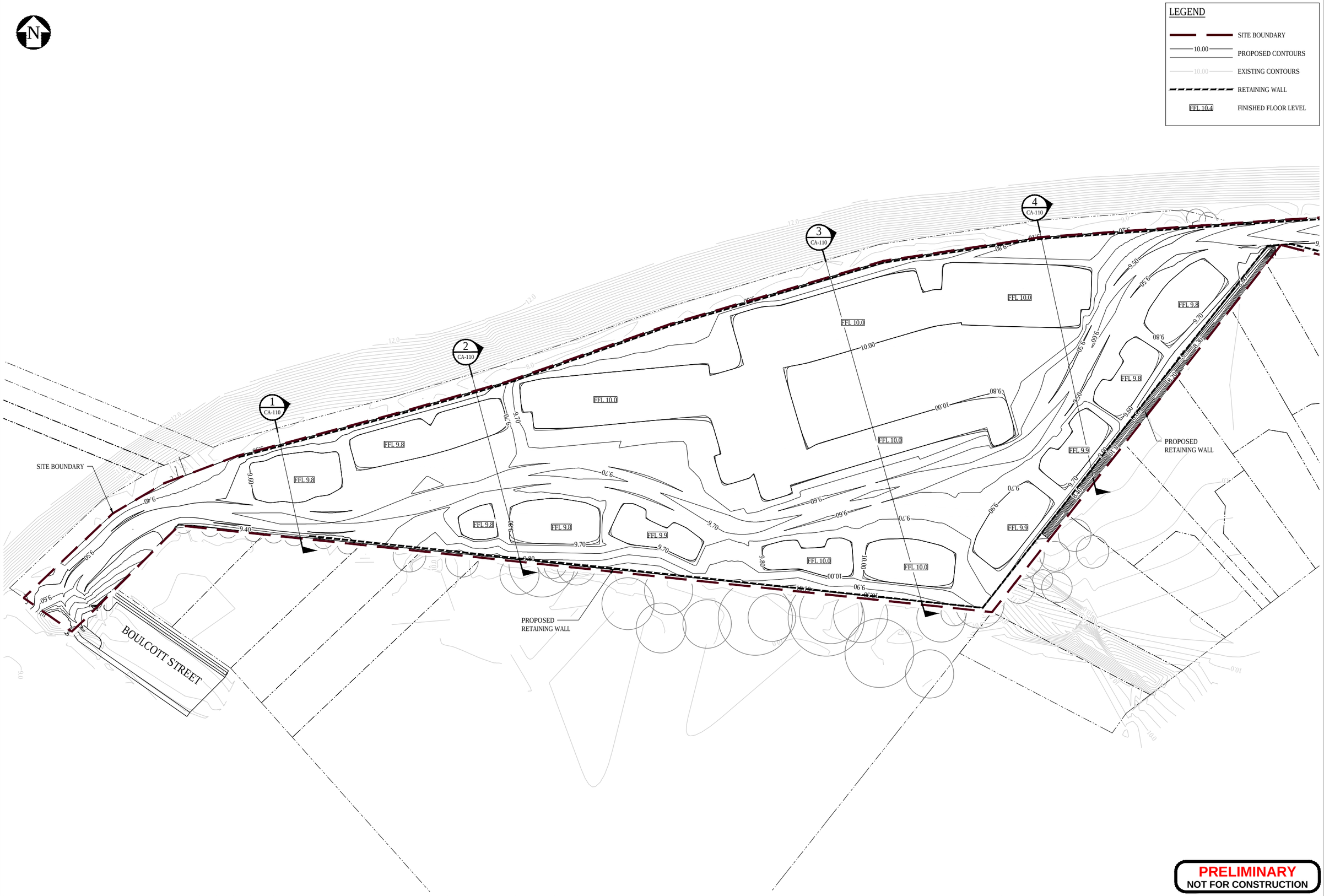

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NOT FOR CONSTRUCTION

No.	Revision	By	Chk	Appd	Date
C	FOR CONSENT	AKS	KC		16.02.18
B	PRELIMINARY DESIGN	KA	KC		28.06.17
A	FOR INFORMATION	SCK	DG		24.03.17

Drawing Originator: Beca

Original Scale (A1) 1:500
Reduced Scale (A3) 1:1000

Design	SCK	03.17
Drawn	SCK	03.17
Dsg Verifier	DG	03.17
Dwg Check	DG	03.17

Client: Summerset

Project: SUMMERSET BOULCOTT

Title: FINISHED SURFACE PLAN SHEET 1 OF 2

Discipline: CIVIL ENGINEERING

Drawing No. 3207650-CA-100

Rev. C

Document No. 3207650-CA-100.DWG

DO NOT SCALE

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Drawing Plotted: 15 Feb 2018 5:03 p.m.

LEGEND

- SITE BOUNDARY
- 10.00 — PROPOSED CONTOURS
- 10.00 — EXISTING CONTOURS
- RETAINING WALL
- FFL 10.4 — FINISHED FLOOR LEVEL

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PRELIMINARY
NOT FOR CONSTRUCTION

No.	Revision	By	Chk	Appd	Date
C	FOR CONSENT	AKS	KC		16.02.18
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	Dsg Verifier	DG	03.17
	Dwg Check	DG	03.17

Client: Summerset

Project: SUMMERSET BOULCOTT

Title: FINISHED SURFACE PLAN SHEET 2 OF 2

Discipline: CIVIL ENGINEERING

Drawing No. 3207650-CA-101 Rev. C

Document No. 3207650-CA-101.DWG

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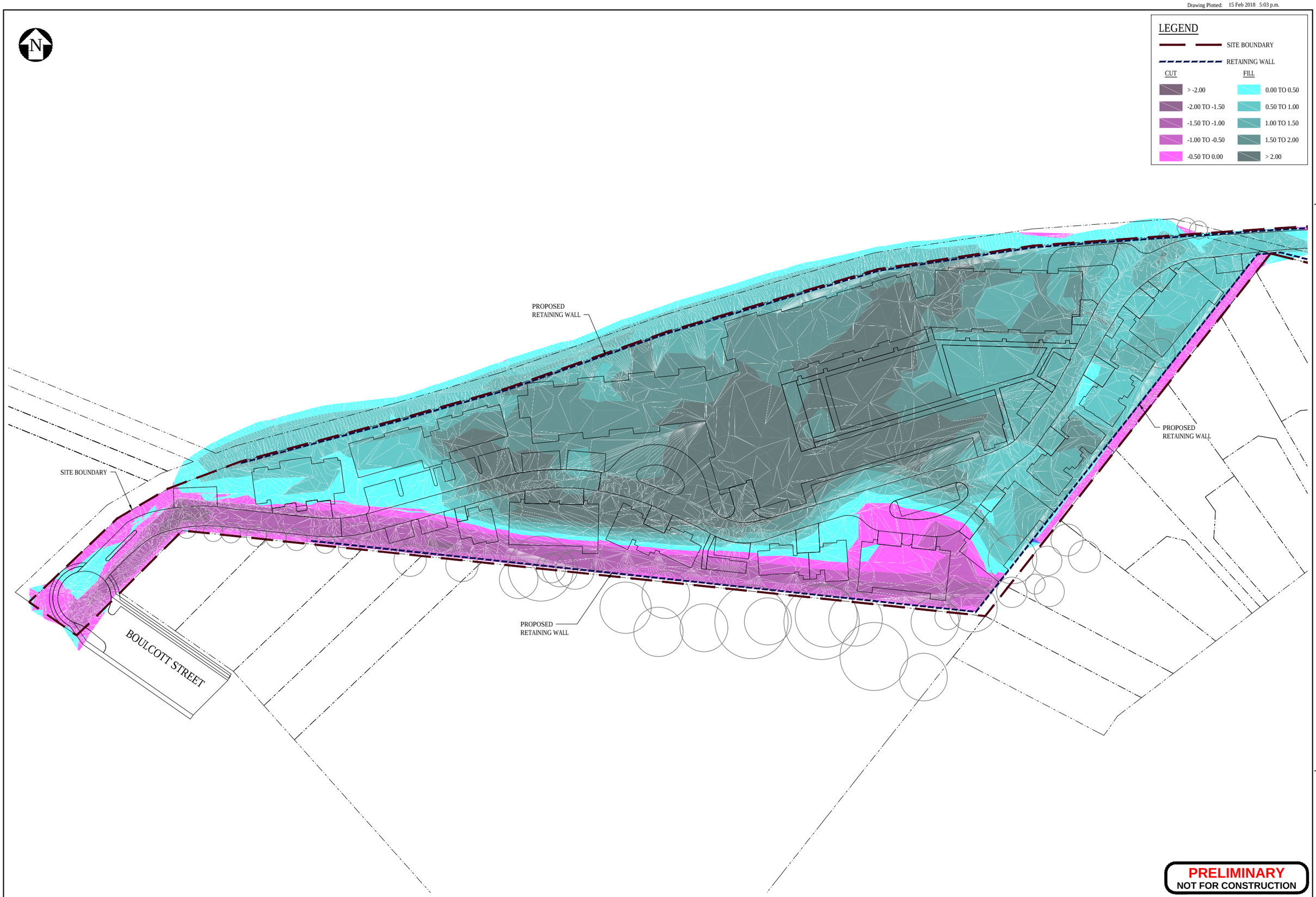

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B	PRELIMINARY DESIGN	KA	KC		28.06.17
A	FOR INFORMATION	SCK	DG		24.03.17

Drawing Originator: Beca

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Drawn	SCK	03.17
Dwg Verifier	DG	03.17
Dwg Check	DG	03.17

Client: Summerset

Project: SUMMERSET BOULCOTT

Title: CUT FILL PLAN SHEET 1 OF 2

Discipline: CIVIL ENGINEERING

Drawing No. 3207650-CA-102 Rev. C

Document No. 3207650-CA-102.DWG

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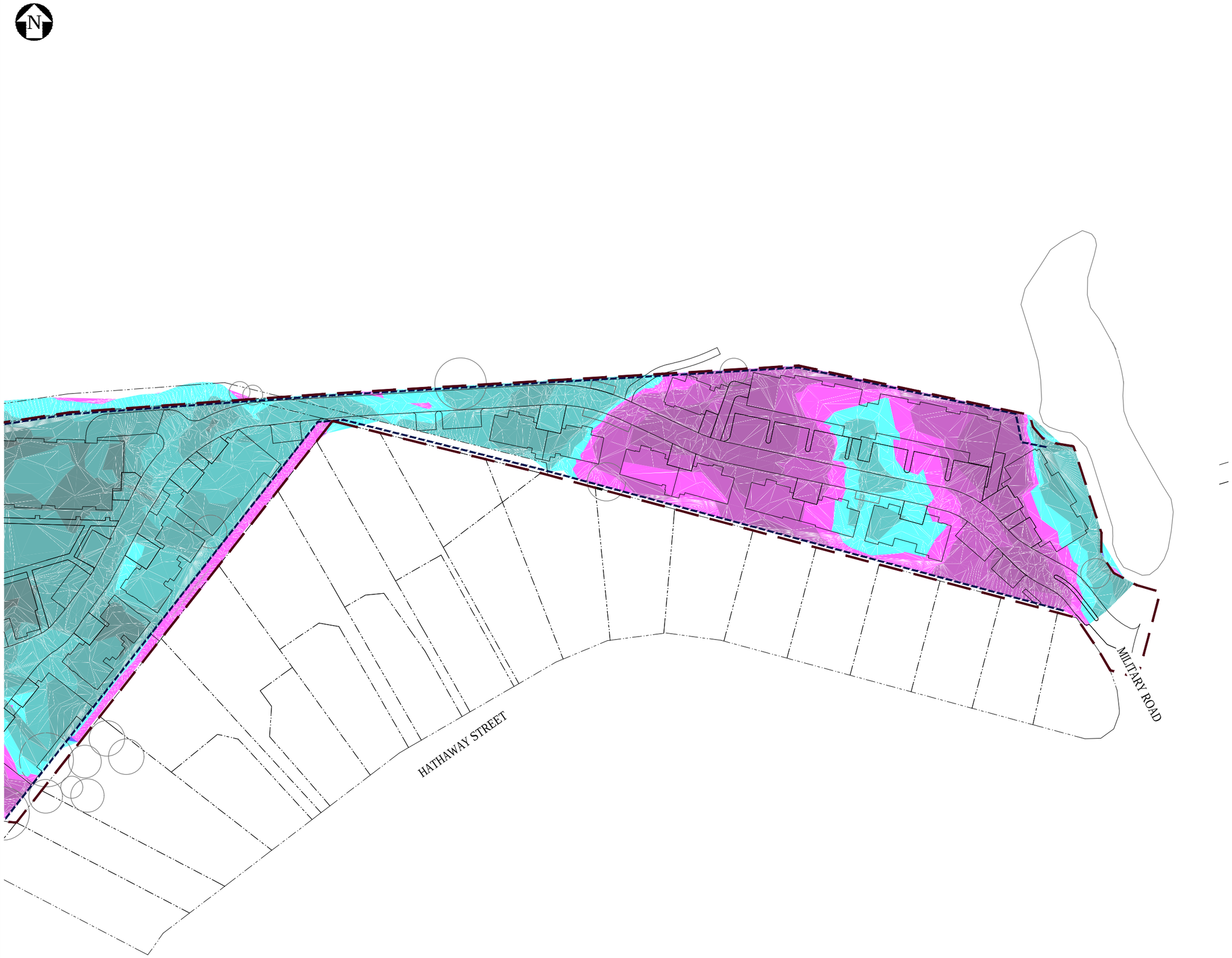

LEGEND

SITE BOUNDARY

RETAINING WALL

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-1.00 TO -0.50	1.50 TO 2.00
-0.50 TO 0.00	> 2.00

PRELIMINARY
NOT FOR CONSTRUCTION

No.	Revision	By	Chk	Appd	Date
C	FOR CONSENT	AKS	KC		16.02.18
B	PRELIMINARY DESIGN	KA	KC		28.06.17
A	FOR INFORMATION	SCK	DG		24.03.17

Drawing Originator: Beca

Original Scale (A1) 1:500
Reduced Scale (A3) 1:1000

Design	SCK	03.17
Drawn	SCK	03.17
Dsg Verifier	DG	03.17
Dwg Check	DG	03.17

Client: Summerset

Project: SUMMERSET BOULCOTT

Title: CUT FILL PLAN SHEET 2 OF 2

Discipline: CIVIL ENGINEERING

Drawing No. 3207650-CA-103 Rev. C

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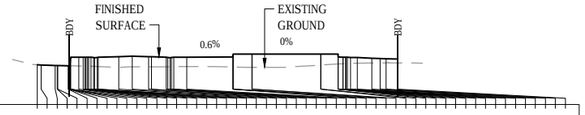
Document No. 3207650-CA-103.DWG



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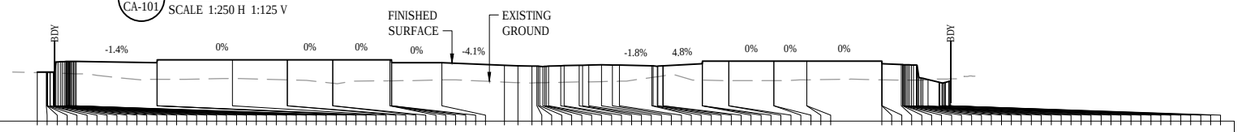

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Appendix B

Contaminated Soils – Detailed Site Investigation Report

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Report

Detailed Site Investigation - Boulcott Farm Heritage Golf Club, 33 Military Road, Lower Hutt

Prepared for Summerset Retirement Villages

Prepared by Beca Limited

10 August 2017

Revision History

Revision Nº	Prepared By	Description	Date
A	**Ben Waterhouse**	Final	10 August 2017

Document Acceptance

Action	Name	Signed	Date
Prepared by	**Ben Waterhouse**		10 August 2017
Reviewed by	**Phillip Ware**		10 August 2017
Approved by	**David Gardiner**		10 August 2017
on behalf of	Beca Limited		

Beca 2017 (unless Beca has expressly agreed otherwise with the Client in writing).

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Executive Summary

Beca Ltd (Beca) was commissioned by Summerset Retirement Villages (Summerset) to undertake a Detailed Site Investigation for the site at Boulcott Farm in Lower Hutt, Wellington, for work being undertaken to develop a new retirement village.

The scope of works for this investigation included a desk-based review of a Preliminary Site Investigation (PSI) previously undertaken by Aurecon (14 January 2013) and intrusive soil testing comprising the following:

- Excavation of 12 test pits/trenches to a maximum depth of 2 m below ground level and maximum length of 5 m.
- Collection of 25 soil samples across 12 test pits/trenches (including an area of uncontrolled fill)
- Screening analysis of 25 samples for:
  - Heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, zinc)
  - Total petroleum hydrocarbons
  - Semi-volatile organic compounds (SVOCs) including polychlorinated aromatic hydrocarbons (PAHs) and organochlorine pesticides.

The Aurecon PSI identified natural drainage gullies historically on site that have since been filled in and the landscape re-contoured. Waste in the fill material for gullies was considered a potential risk, in addition to contaminants associated with historical herbicide and pesticide use on the golf course. Preliminary sampling by Aurecon in surface soils led them to the conclusion that the site had low risk of soil contamination from both sources. Subsequently Beca geotechnical engineers discovered areas of uncontrolled fill on site that included containers of liquids, brick, wires, ceramics and old pipework.

Beca soil testing results largely showed that the soils on site were within background contaminant concentrations, with the exception of two areas that included the uncontrolled fill area, and an area to the south-central border of the site that contained elevated levels of lead and zinc. Results from both areas were within the human health soil contaminant standards, however the fill layer exceeded environmental criteria for zinc, and both areas exceeded the Class A Landfill criteria.

The uncontrolled fill area appeared to be contained within a ‘hummock’ close to the historical groundsman’s shed. The second area to the south did not appear to have a definitive contamination source, however may have been related to paint from historical cottages/buildings nearby, or reflect the use of the site as farmland with inconsistent areas of disposal to land.

The uncontrolled fill area will require removal of waste and disposal at an appropriately licensed facility. Additional toxic characteristic leaching procedure (TCLP) testing may be required prior to acceptance, depending on the nominated facility. Soil testing results will be required by the receiving facility. Soils directly surrounding the uncontrolled fill area will require validation sampling and testing prior to reuse on site.

Apart from the uncontrolled fill material, soils on site are generally considered suitable for reuse unless unexpected contamination is discovered. It should be noted that although 12 test pits/trenches were undertaken and soils were within the human health criteria, the historical land uses may lead to the presence of hotspots not identified during the investigation. Unexpected discovery of such areas can be managed with a Contaminated Soils Management Plan (CSMP).

Due to the contaminant status of soils on site, consent is required under the NESCS as a controlled activity, and potentially under the GWRC Operative Discharges to Land Plan, and the Hutt City Council District Plan.

It is recommended that a full planning review is undertaken as part of the development programme to confirm consent reqirements.

Overall it is considered that soil disposal and risks to environmental and human health receptors can be appropriately managed with a CSMP.

Contents

1 Introduction 1

1.1 Background 1

1.2 Purpose and Scope 1

2 Site Description 3

2.1 Site Location and Area 3

2.2 Proposed Works 3

3 Environmental Setting 5

3.1 Current Land Use 5

3.2 Surrounding Land Use 5

3.3 Topography 5

3.4 Sensitive Receptors/Hydrology 5

3.5 Geology 5

3.6 Hydrogeology 5

3.7 Archaeology 5

4 Information Search 6

4.1 Summary of Aurecon PSI 6

4.2 Discovery of Waste Disposal to Land 6

5 Site Investigation Scope and Rationale 8

5.1 Contaminants of Potential Concern and Investigation Rationale 8

5.2 Soil Sampling Methodology 8

6 Assessment Criteria 10

7 Results 11

7.1 Fieldwork Observations 11

7.2 Summary of Soil Analytical Results 11

8 Discussion and Risk Assessment 13

8.1 Exposure Pathway Assessment 14

8.2 Limitations of Site Characterisation 15

9 Development Implications 16

9.1 Consents 16

9.2 Contaminated Soil Management Plan (CSMP) 19

9.3 Soil Disposal 19

10 Conclusions 20

11 Limitations 21

Appendices

Appendix A

Test Pit/Trench Location Plan

Appendix B

Site Photographs

Appendix C

Soil Logs

Appendix D

Results Summary Table

Appendix E

Hill Laboratories Results

1 Introduction

1.1 Background

Beca Ltd (Beca) has been commissioned by Summerset Retirement Villages (Summerset) to undertake a Detailed Site Investigation for the site at Boulcott Farm in Lower Hutt, Wellington, for work being undertaken to develop a new retirement village.

A Preliminary Site Investigation (Contamination) (PSI) was undertaken by Aurecon[1] on 14 January 2013 for the site. It was determined by the PSI that the risk of contamination was low. Subsequently in on 1 May 2016, during geotechnical investigations being undertaken by Beca, areas of uncontrolled fill were encountered on site that contained a range of waste including a small number of bottles of unknown volatile chemicals. Beca responded to the incident by communicating with Summerset and the relevant authorities (Greater Wellington Regional Council and Hutt City Council) and setting in place relevant environmental and human health processes. One aspect of this was to undertake a Detailed Site Investigation (Contamination) (DSI) to inform management of contaminated materials on site and the consent requirements subsequent to the discovery of landfill materials.

1.2 Purpose and Scope

The purpose of this DSI was the following:

- Characterise potential contaminants in soils within the development area as a result of current or historical activities.
- Comment on contaminated land consent requirements for the proposed works under the following legislation
  - Greater Wellington Regional Council Regional Discharges to Land Plan, Proposed Natural Resources Plan
  - Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (NESCS).
- Identify areas of soil contamination which may require management with respect to risks to human health and to the environment.
- Provide advice regarding disposal of waste spoil.

The scope of works included a desk-based review of historical background information within the Aurecon PSI, plus a ground investigation to provide an indication of potential contaminant levels.

The following information sources were reviewed:

- Aurecon PSI

Beca did not independently verify the results of this report and does not offer any reliance over the contents of the Aurecon report that are incorporated, or any conclusions that are drawn directly from them. The

The ground investigation comprised the following:

[1] Aurecon. Boulcott Farm Heritage Golf Club, Lower Hutt – Stage 1 Preliminary Site Investigation Report. 14 January 2013

- Excavation of 12 test pits/trenches to a maximum depth of 2 m below ground level and maximum length of 5 m.
- Collection of 25 soil samples
- Screening analysis of 20 samples plus 2 QA/QC samples for:
  - Heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, zinc)
  - Total petroleum hydrocarbons
  - Semi-volatile organic compounds (SVOCs)
- Preparing a report presenting and assessing the results of the investigation.

A Contaminated Soils Management Plan (CSMP) has been prepared separately to this DSI.

This assessment has been undertaken and reported in general accordance with the *Ministry for the Environment* (MfE) *Contaminated Land Management Guidelines No. 1 – Reporting on Contaminated Sites in New Zealand* (2011) and *MfE Contaminated Land Management Guidelines No. 5 – Site Investigation and Analysis* (2011).

The scope of services excludes any advice or risk assessment relating to asbestos and asbestos containing materials (ACM). Given the presence of uncontrolled fill we recommend that Summerset approach an asbestos specialist for advice on what if any asbestos testing may be appropriate, and handling procedures during future works.

2 Site Description

2.1 Site Location and Area

The site is located at Boulcott Farm Heritage Golf Club at 33 Military Road, Lower Hutt, Wellington. It has an approximate area of 2 Ha. The legal description of the property is Lot 1 DP 477960. The location of the property is shown in **Figure 1** and **Figure 2** below.

Figure 1: Site location and surrounding area. Image: © Google Maps

2.2 Proposed Works

The proposed works include the development of the area into a retirement village of residential properties and associated landscaping and amenities.

Figure 2: Site area of investigation (blue). Image: © Google Earth.

3 Environmental Setting

3.1 Current Land Use

The site is a grassed area, previously forming a part of the Boulcott Farm Golf Course. The existing golf club house which occupies part of the site will be demolished to enable the development.

3.2 Surrounding Land Use

South of the site is a residential area of Lower Hutt. The north of the site is bounded by a stop bank, north of which is the main Boulcott Farm Golf Club course. Directly east of the site are further residential buildings.

3.3 Topography

The topography of the site is largely flat with a raised stop bank on the northern border. The site is slightly hummocky towards the western side.

3.4 Sensitive Receptors/Hydrology

The Hutt River is approximately 300 m north of the site. Running in a northeast to southwest direction.

3.5 Geology

The New Zealand Institute of Geological and Nuclear Sciences describes the underlying geology of the site as alluvial deposits of "*well sorted floodplain gravels*"[2]

3.6 Hydrogeology

A piezometer installed by Aurecon in 2013 on site has registered ground water at 2.3 m bgl (below ground level). For the proposed geotechnical design a groundwater level of 1.5 m bgl has been adopted. Therefore groundwater is expected to be in the range of 1.5 to 2.5 m bgl.

3.7 Archaeology

The site has been identified as a site of archaeological importance. The site excavations were undertaken under the supervision of an archaeologist.

[2] Heron D.W (custodian) 2014. Geological Map of New Zealand 1:250 000. Institute of Geological & Nuclear Sciences

4 Information Search

4.1 Summary of Aurecon PSI

The Aurecon PSI reviewed current and historical information regarding the site including:

- Certificates of Title
- New Zealand Post Office Listings
- Selected Land Use Register
- Historical aerial photographs from 1939 to 2010
- Previous reports and Boulcott Farm website information

In addition to the above, a site visit was undertaken by Aurecon to assess the site condition and surrounding environment.

The Aurecon information search concluded that the site historically contained drainage channels into the Hutt River. The site landscape was reshaped and the channels filled. Aurecon considered the fill used in the construction of the golf course and the northern stop bank have the potential to be sources of contamination form uncontrolled fill.

In addition the use of the site as a golf course indicated that herbicide and pesticide use could be a potential source of contamination.

During the site visit Aurecon collected surface soil samples for assessment of contaminants related to historical landfilling and herbicide and pesticide use. Samples were collected from 0.1 m to 0.2 m below ground level (bgl) and analysed for the following contaminants:

- 4 samples: Heavy metals (arsenic, cadmium, chromium, copper, lead, nickel and zinc) (for golf
- course)
- 2 samples: Total petroleum hydrocarbons (TPH) associated with fill
- 2 samples: Polycyclic aromatic hydrocarbons (PAHS), associate with fill
- 3 samples: Acid herbicides associated with golf course maintenance
- 3 samples: Organonitro/phosphorus pesticides (OPP) associated with golf course maintenance
- 3 samples: Organochlorine pesticides (OCP) associated with golf course maintenance

Aurecon stated that none of the samples tested exceeded human health (NESCS soil contaminant standards for 'Residential 10% produce') or ecological criteria for the contaminants tested.

The risk assessment summary provided by Aurecon stated: "*The qualitative risk assessment concluded that risks to critical receptors from potentially contaminating activities ranged from negligible to moderate and are not believed to represent a significant environmental concern to the site*."

4.2 Discovery of Uncontrolled Filling

On 1 May 2017, Beca Geotechnical Engineers were on site undertaking geotechnical investigations with test pit excavations. Among the areas of the site that were targeted was a grassy mound that appeared uncharacteristic of the general topography of the site. Two geotechnical test pits were undertaken on the mound, both of which discovered uncontrolled fill approximately 1 m beneath the surface. A chemical odour was observed from the fill layer of one of the test pits, which was assumed to be due to a glass bottle/vial being broken that contained a liquid. Other fill in the pit included ceramics, metals (wire, steel), concrete and greyish-black gravels. Forensic testing was undertaken on the contents of one of the glass bottles found,

however the liquid was determined to be water. No soils were tested for contaminants at the time of this discovery.

5 Site Investigation Scope and Rationale

5.1 Contaminants of Potential Concern and Investigation Rationale

Review of the Aurecon PSI has identified the following land use activities which may have resulted in the contamination of soil and/or groundwater at the site. Contaminants of potential concern associated with these activities have also been identified.

Table 1: Contaminants of Potential Concern

Activity	HAIL Code	Contaminants of Potential Concern
■ Unauthorised landfill activities	■ G5: Waste disposal to land (excluding where biosolids have been used as soil conditioners)	■ Heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, zinc) ■ Semi-volatile organic compounds (SVOCs) ■ Petroleum hydrocarbons ■ Asbestos (not included in scope for investigations)
■ Historical herbicide and pesticide use	■ A10: Persistent pesticide bulk storage or use including sports turfs, market gardens, orchards, glass houses or spray sheds	■ Organochlorine herbicides and pesticides ■ Heavy metals (arsenic, copper, lead, mercury)

For the DSI by Beca, sample locations were selected generally using a targeted approach, aiming for known areas of uncontrolled fill and historically filled drainage gullies/channels, additional samples locations were added to provide sufficient site coverage.

Test pits were extended into trenches typically 5 m in length but up to 20m x 2m x 2m (LxWxD) where buried waste material was found in order to delineate the extent of the waste areas.

Soil samples were collected from each sampling location at regular intervals based on visual observations and significant geological changes.

A soil sampling plan is provided in **Appendix A**.

5.2 Soil Sampling Methodology

5.2.1 Summary of Field Work

The soil investigation was undertaken on 20-21 June 2017 and soil samples were collected from 12 test pit/trench locations. Test pits were excavated using a 3.5 ton excavator. Photographs from site works are provided in **Appendix B**.

Soil samples were collected from two depths across the soil profile ranging from 0.2 m to 2.5 m bgl (typically 0.2 to 1.0 m bgl), and 2 samples were collected at each location.

Soil samples were collected directly by hand from excavated materials in the centre of the excavator bucket/placed at the side of the auger pit. A clean pair of nitrile gloves was worn for each sample to prevent cross-contamination. Samples were placed in laboratory supplied plastic or glass jars as appropriate and chilled prior to dispatch to R J Hill Laboratories Ltd (Hill Laboratories).

The soil profile was logged for each location and the logs are provided in **Appendix C**.

All sampling equipment was decontaminated between sampling locations using DECON 90.

Field sampling and relevant sampling management procedures were undertaken in general accordance with the MfE *Contaminated Land Management Guidelines No.5 – Site Investigation and Analysis (2011).*

All chemical laboratory analyses were undertaken by Hill Laboratories. All samples were accompanied with a Chain of Custody form which detail the required handling and testing instructions.

Selected soil samples were analysed for:

- Total petroleum hydrocarbons (TPH)
- SVOCs
- Heavy metals (arsenic, cadmium, chromium, lead, mercury, nickel, zinc)

Soil samples were selected for analysis based on spatial coverage and targeting fill waste areas. Soil samples not selected for analysis were held cold at the laboratory (and remain so at the time of report issue).

A data summary sheet of the results and comparisons with the relevant human health and environmental guidelines is presented in **Appendix D**. A copy of the Hill Laboratories reports are included in **Appendix E**.

6 Assessment Criteria

6.1.1 Assessment of Human Health Risk

The adopted assessment criteria for the investigation have been selected in accordance with the hierarchy defined by *Ministry for the Environment* (MfE) *Contaminated Land Management Guidelines No.*2 (MfE, 2002) and are summarised below. Assessment criteria for a Residential land use scenario have been adopted.

- *Resource Management (National Environment Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011.* Soil Contaminant Standards for a *'High-density residential'* land use scenario were used.
- *Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand (MfE, 1999).* Values applicable to a Residential land use scenario were used.
- *Regional Screening Levels, US Environmental Protection Agency (USEPA, 2012).* Values applicable to Residential land use scenario were used

6.1.2 Assessment of Environmental Risk

The risk posed by contaminants in soil to ecological receptors has been assessed against the standards contained in the following guidelines:

- *National Environmental Protection (Assessment of Site Contamination) Measure April 2011.* Values for 'Urban residential and open public space' were used.
- *Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health, CCME 1999.* Values applicable to 'Residential' land use have been used.

6.1.3 Disposal of soils

There are various classes of landfill criteria that includes cleanfill, landfill and managed fill. Soils were compared against the following guidelines (managed fill) for disposal because the soils on site intended for disposal are only those considered contaminated and unsuitable for reuse on site or elsewhere:

Module 2 Hazardous Waste Guidelines Landfill Waste Acceptance Criteria and Landfill Classification. Class A Landfill criteria were used. Ministry for the Environment May 2004.The above guideline is a screening value for total contaminants in soil. If these screening values are exceeded, either a facility that accepts the materials at the observed contaminant concentrations will be required for disposal; or further testing using Toxic Characteristic Leachate Procedure (TCLP) will be required to determine suitability for disposal to a Class A Landfill. If soils continue to exceed Class A Landfill criteria following TCLP testing, soils will require disposal at a suitable facility.

7 Results

7.1 Fieldwork Observations

Waste material was observed in two of the twelve test pits (TP5 and TP6). The remaining pits contained non-waste based fill or natural material such as alluvial gravels and aggregate with occasional fragments of ceramics and brick that were not considered to meet the definition of 'waste disposal to land'.

Waste material observed in TP5 and TP6 comprised ceramics, metals (wire, barbed wire, metal fragments), concrete, and greyish-black gravels. Pits TP5 and TP6 were extended to approximately 20 m coverage, the east and west extent of which delineated the fill material in those areas. The fill material all appeared to be located within a raised 'mound' areas of the site that had been grassed. It was anticipated that the whole raised area contained waste material, which could also be the reason for the elevated topography.

Groundwater was not encountered on site. Test pit logs are provided in **Appendix C**, site photographs are provided in **Appendix B**.

7.2 Summary of Soil Analytical Results

7.2.1 Metals

25 soil samples were analysed for metals. In summary:

- No samples exceeded the human health soils contaminant standards for high-density residential land use
- For zinc TP6 1.5 m bgl (550 mg/kg) exceeded the environmental soil screening criteria (200 mg/kg)
- Two samples exceeded the Class A Landfill acceptance criteria for lead (100 mg/kg) and zinc (200 mg/kg)
  - TP2 0.2 m bgl: lead 330 mg/kg; zinc 260 mg/kg
  - TP6 1.5 m bgl: lead 240 mg/kg; zinc 550 mg/kg
- Four samples exceeded predicted background levels in at least one metal analyte:
  - TP2 0.2 m bgl: lead, zinc
  - TP6 1.5 m bgl: arsenic, copper, lead, zinc
  - TP9 1.0 m bgl: lead
  - TP12 1.0 m bgl: lead, zinc

7.2.2 Semi-volatile Organic Compounds (SVOC)

All 25 samples were below the laboratory detection limit for SVOCs, and we within environmental, human health and Class A landfill acceptance criteria

7.2.3 Total Petroleum Hydrocarbons (TPH)

- All 25 samples were within the human health and environmental guidelines.
- 5 samples contained low levels of TPH above laboratory detection limit:
  - TP6 1.5 m bgl: 90 mg/kg
  - TP7 0.2 m bgl: 70 mg/kg
  - TP9 0.2 m bgl: 102 mg/kg
  - TP10 0.2 m bgl: 83 mg/kg
  - TP11 0.2 m bgl: 68 mg/kg

7.2.4 Polycyclic Aromatic Hydrocarbons (PAH)

All samples were tested for PAHs. In summary:

- One sample contained low levels of PAHs above the laboratory detection limit (TP10 0.2 m bgl: benzo(a)pyrene equivalent 0.108 mg/kg), all other samples were below laboratory detection limits, within the human health soil contaminant standard and within the adopted environmental protection guidelines.

7.2.5 Organochlorine Pesticides (OCP)

All samples were tested for OCP. All samples were below the laboratory detection limit, within the human health soil contaminant standard and within the adopted environmental protection guidelines.

8 Discussion and Risk Assessment

The results of soil testing largely reflected what was expected on site based on the historical information contained in the Aurecon PSI and the recent discovery of waste on site by Beca Geotechnical Engineers. Three samples were collected from the uncontrolled fill area (TP5 and TP6): one from above the fill layer, one from below and one from within the fill layer. The fill layer contained lead and zinc levels above the Class A Landfill Criteria and zinc levels above the environmental protection threshold. Given the contents of the uncontrolled fill in that area, these results are not unexpected and can be managed with an appropriately developed Contaminated Soils Management Plan (CSMP).

The samples collected above and below the uncontrolled fill contained contaminant concentrations within the published predicted background levels, indicating a low risk of contaminant leaching to soils not in direct contact with the waste material. Following removal of the waste material layer, soils on either side of the layer that have not been in contact with waste material will require validation testing for suitability to use in the development area prior to reuse on site.

SVOCs, usually associated with waste filling activities, in this area (and all other samples tested) were below laboratory detection limits.

The contaminated fill material will require disposal at an appropriate facility, however because lead and zinc levels exceed the soil screening criteria for Class A landfill further testing using toxic characteristic leaching procedure (TCLP) is likely to be required by a receiving Managed (Class A) Landfill. Alternatively, there may be authorised facilities in the Wellington Region which have site specific acceptance criteria based on the requirements of their resource consents that may differ from the Class A Landfill criteria. It is recommended that a copy of the soil analytical results be provided to the nominated disposal facilities for review.

Fill material by its very nature is highly variable and difficult to fully characterise. The level of sampling undertaken as part of this investigation provides contaminant concentrations at a limited number of discrete locations. All soil visibly containing waste material will need to be removed from site with the material in proximity to it tested to confirm suitability to remain onsite. The samples taken to date of soil outside the fill areas indicates that this soil maybe considered suitable for reuse as part of the proposed development.

The area of TP2 in soils at 0.2 m bgl contained lead and zinc concentrations above the Class A Landfill criteria, however are within the human health and adopted environmental criteria and are considered suitable for reuse on site from a human health and environmental protection perspective. The definitive causes of elevated lead levels in this area are unknown from the historical information reviewed, however could be present in relation paints from historical cottages visible in the historical aerial photographs in the Aurecon PSI. Elevated lead appears to be isolated to the TP2 area as lead levels elsewhere on site (apart from the waste fill area) were generally within predicted background concentrations.

The use of OCPs on site for pest and weed management historically is not considered a risk to human health or the environment as all samples tested were below laboratory detection limits and within the relevant human health and environmental guideline criteria.

Low levels of TPH were observed on site, however they were within the relevant guidelines and is not considered a significant risk to site users.

Overall, the Aurecon PSI indicated that the site has undergone various landscaping and ground levelling for the gullies previously on site, and the site was subsequently a farm, then golf course. Although test pits/trenches identified one area of waste fill and one additional area with elevated lead and zinc concentrations, there is the potential for further isolated hotspots of uncontrolled waste disposal to

land/uncontrolled fill that were not identified during ground investigations. Onsite risks from contaminated soils can be managed through development of a CSMP.

8.1 Exposure Pathway Assessment

The Conceptual Site Model (CSM) (see **Table 2** below) was refined post-investigation to describe the relationship between sources of contamination on site, the human and environmental receptors that may be exposed to those contaminants in the context of residential use of the site, and the pathways by which those receptors may be exposed with incorporated CSMP measures. **Table 2** is based on the contamination results from discreet sampling points (refer to Section 8.2 for investigation limitations).

Table 2: Conceptual Site Model incorporating CSMP measures.

Source	Receptor	Pathway	Completeness of Pathway
▪ Contaminants from uncontrolled fill	Construction workers	Exposure of workers to contaminants in soils and groundwater during site redevelopment – dermal contact, ingestion or inhalation of dust/vapours.	**Incomplete**: Contaminant levels were within the relevant human health criteria however due to the likely variability conservative measures in the CSMP will provide additional mitigation.
	Future site users	Exposure of future site users to contaminants in soils – dermal contact, ingestion or inhalation of dust/vapours.	**Incomplete**: Contaminant levels were within the relevant human health criteria. It is assumed that uncontrolled fill material in known areas will be removed. There remains potential that fill material is present elsewhere on the site in areas not investigated. Care will need to be taken during construction to report any other observations. Further mitigation measures have been presented in the Contaminated Soils Management Plan (CSMP).
	General public	Exposure of general public to contaminants in soils– dermal contact, ingestion or inhalation of dust/vapours.	**Incomplete**: As per the above with the addition of further limitation of exposure due to limited site contact.
	Groundwater resources for public consumption	Leaching and migration of soil contaminants into groundwater.	**Incomplete**: Contaminant levels were within the relevant human health criteria.
	Surface water	Sediment and runoff directly into surface water.	**Incomplete**: Zinc was observed above the environmental criteria in the uncontrolled fill location. Manageable by appropriate and controlled removal of uncontrolled fill

Source	Receptor	Pathway	Completeness of Pathway
			material, rendering the pathway incomplete.
		Migration of soil contaminants into surface water through shallow groundwater discharging into the Hutt River	**Incomplete**: Groundwater was not encountered on site. Zinc was observed above the environmental criteria in the uncontrolled fill location. Manageable by removal of uncontrolled fill material, rendering the pathway incomplete.

8.2 Limitations of Site Characterisation

Characterisation of subsurface conditions is dependent on the number of sample locations, methods of sampling and the uniformity of subsurface conditions. The accuracy of this characterisation is therefore limited by the Scope of works undertaken in accordance with the MfE Guidelines. There is the possibility that contamination present on the site has not been described. Whilst contaminant concentrations may be estimated at chosen sample locations, conditions at any location removed from the specific points of sampling can only be inferred on the basis of geological and hydrogeological conditions and the nature and the extent of identified contamination. Subsurface conditions can vary, resulting in uneven distribution of contaminants across a site which cannot be defined by these investigations. In addition, with time, the site conditions and environmental guidelines could change so that the reported assessments and conclusions are no longer valid. The conclusions of this report are made on the basis that the site conditions revealed by the investigation are representative of the actual conditions across the site at the time of sampling.

9 Development Implications

9.1 Consents

9.1.1 National Environmental Standard

The *Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011* (NESCS) applies to land as per clause 5(7):

"Land covered:
(7) The piece of land is a piece of land that is described by 1 of the following:
(a) an activity or industry described in the HAIL is being undertaken on it;
(b) an activity or industry described in the HAIL has been undertaken on it;
(c) it is more likely than not that an activity or industry described in the HAIL is being or has been undertaken on it."

The following HAIL activities have been identified for this site:

- G5: Waste disposal to land (excluding where biosolids have been used as soil conditioners)

The NESCS applies to certain activities taking place on HAIL land. The following activities are triggered for this site:

- Soil disturbance
- Land use change
- Subdivision

Soil Disturbance

Under Regulation 8(3) of the NESCS, soil disturbance of up to 25 m^3 per 500 m^2 and disposal of up to 5m^3 per 500 m^2 is allowed as a Permitted Activity. The site characterisation identified two areas of contaminated soils that would constitute land impacted by HAIL activity G5. Given the estimated extent of these areas the permitted activity volumes are likely to be small in comparison to the large volumes of earthworks that are anticipated (although exact estimates have not yet been produced) for the proposed works. Furthermore, the investigation suggests that there is the potential for other small areas of waste disposal to land as back fill for the gullies historically on site, which were not recovered through ground investigations.

It is therefore considered that consent for earthworks is required under the NESCS as a controlled activity for the proposed works on site. The NESCS consent will require a Contaminated Soils Management Plan (CSMP) (see Section 9.2) to support the application.

Land Use Change

The land use of the site is changing from vacant land to a residential retirement village. As such the human health soil criteria adopted was for a residential land use scenario. Soils in two areas of the site exceed the human health levels for a residential land use scenario, therefore consent is required under the NESCS as a restricted discretionary activity.

9.2 Local and Regional Authority

A full planning review is recommended to identify the necessary rules and consents applicable to the proposed development. Note that any Hutt City Council rules that relate to matters covered by the NESCS that are less stringent that the NESCS are considered to be superseded by the rules of the NESCS.

9.2.1 Greater Wellington Regional Council

Under the GWRC Operative Discharges to Land Plan a 'contaminated site' is defined as *a site at which hazardous substances occur at concentrations above background levels and where assessment indicates it poses or is likely to pose an immediate or long term hazard to human health or the environment.*

The area of material in the TP6 waste disposal to land areas was identified to be contaminated and meets the definition of a 'contaminated site' under this plan because hazardous substances have been detected that are above the environmental risk criteria. Other areas are not considered contaminated site as although there were areas above the predicted background concentrations, these areas did not exceed the environmental protection criteria.

Rules 21 and 22 of the Discharges to Land Plan are therefore applicable to this project.

Rule 21 Contaminated sites (onsite discharges)

The discharge of any contaminants:

(1) Into or onto land from a contaminated site, (and not from any activity located on the site) other than as provided in clause (1) of Rule 22; or

(2) Into or onto land which is, or is part of, a contaminated site, in association with the on-site remediation of a contaminated site;

Is a **Permitted Activity** provided:

(a) There shall be no noxious, dangerous or objectionable levels of contaminants in the air at or beyond the site boundary as a results of discharge;

(b) There shall be no contaminants from the contaminated site or from any discharge associated with site remediation (or any other contaminants emanating as a results of natural processes from those contaminants) beyond the boundary of the contaminated site at concentrations above the background levels for that location;

(c) The site owner shall undertake such monitoring as is necessary to ensure that the site complies with the conditions (a) and (b) above, and shall make the monitoring results available to the Wellington Regional Council, on request.

Rule 22 Contaminated sites (off-site discharges)

The discharge of any contaminants:

(1) Into or onto land from a contaminated site (and not from any activity located on the site); or

(2) Into or onto land which is, or is part of, a contaminated site, in association with the on-site remediation of the contaminated site;

if:

(3) The activity involves the removal of material from the contaminated site and the discharge of contaminated material at some other location (unless the material is discharged at landfill which holds resource consents which enable it to accept the discharge); or

(4) The discharge does not comply with any of the conditions in Rule 21;

Is a **Controlled Activity** and shall comply with the standards and terms.

As the site discharges cannot comply with the requirements of Rule 21, as per condition (4) of Rule 22, a Controlled Activity consent is required.

The rules of the Proposed Natural Resources Plan in relation to contaminated sites are also relevant to this project.

Rule R55: Discharges from contaminated land – permitted activity

The discharge of contaminants onto or into land from contaminated land where the discharge may enter water is a permitted activity provided the following conditions are met:

(a) a site investigation has been completed in accordance with Rule R54 with a copy of the report provided to the Wellington Regional Council within two years after the date of public notification of the Proposed Natural Resources Plan (31.07.2015), and

(b) the site investigation report concludes that:

(i) the concentration of contaminants in groundwater meets the *Drinking-Water Standards New Zealand 2005 (Revised 2008)* for potable water for 90% of species, and

(ii) the concentration of contaminants in groundwater, at the property boundary, or at the location of existing bores, or at any point where the groundwater exits to the surface meets the *Australian and New Zealand Environment and Conservation Council (ANZECC) Guidelines for Fresh and Marine Water Quality (2000)* for the protection of 95% of species.

Rule R56: Discharges from contaminated land – discretionary activity

The use the land, and discharge of contaminants onto or into land from contaminated land where the discharge may enter water that is not permitted by Rule R54 or Rule R55 is a discretionary activity.

No groundwater sampling has been undertaken for the site to enable comparison with the criteria mentioned in R55(b) above. Unless groundwater quality monitoring is undertaken, the discharge activity will require a Discretionary Activity consent under R56.

9.2.2 Hutt City Council

In addition to the GWRC and NESCS requirements, Hutt City Council has requirements around earthworks volumes and consent that are unrelated to land contamination. A full planning review is recommended to identify the necessary rules and consents applicable to the proposed development. Note that any Hutt City Council rules that relate to matters covered by the NESCS that are less stringent that the NESCS are considered to be superseded by the rules of the NESCS.

9.3 Contaminated Soil Management Plan (CSMP)

The exposure pathway assessment identified four potentially complete exposure pathways which could be mitigated and managed through the implementation of specialist controls (via the implementation of management plans) during proposed land disturbance works. Specialist controls can be implemented through the development of a CSMP and include:

- A summary of human health controls for health and safety planning/training requirements, personal protective equipment, and personal monitoring.
- A summary of responsible parties to the land disposal works.
- A summary of environmental controls for odour, dust, noise, spoil stockpiling, spoil disposal, groundwater disposal.
- Procedures for encountering unknown contamination.

9.4 Soil Disposal

Heavy metals impacted soils that require removal during construction will require disposal to a facility licenced to accept them. This will be managed by controls outlined in the CSMP.

Based on the results of the soil investigation the soils on site exceed the MfE soil screening acceptance criteria for managed fill in two areas. Soils in these areas will likely require TCLP testing showing samples are within the MfE TCLP criteria for Class A Landfill prior to acceptance at a managed facility.

There may be authorised facilities in the Wellington Region which have site specific acceptance criteria based on the requirements of their resource consents. It is recommended that a copy of the soil analytical results be provided to the nominated disposal facilities for review.

10 Conclusions

Beca was commissioned by Summerset to undertake a DSI on their proposed Boulcott Farm site in in Lower Hutt, Wellington due in part to unexpected discovery of waste material by Beca Geotechnical engineers during test pit ground investigations. The site is currently vacant, however has previously been used as a golf course and farm.

As part of the DSI Beca reviewed the information in a PSI undertaken by Aurecon. The PSI identified natural drainage gullies historically on site that has since been filled and the landscape re-contoured. Waste in the fill material for gullies was considered a potential risk, in addition to contaminants associated with historical herbicide and pesticide use on the golf course. Preliminary sampling by Aurecon in surface soils led them to the conclusion that the site had low risk of soil contamination at a level to impact human health or the environment. Subsequently Beca geotechnical engineers discovered areas of uncontrolled fill on site that included volatile liquids, brick, wires and old pipework.

Twelve test pits/trenches were undertaken by Beca targeting areas of contamination potential, including the area of unexpected waste discovery.

The soil testing results largely showed that the soils on site were within background contaminant concentrations, with the exception of two areas that included the uncontrolled fill area, and an area to the south-central border of the site that both contained elevated levels of lead and zinc. Results from both areas were within the human health soil contaminant standards, however the fill layer exceeded environmental criteria for zinc, and both areas exceeded the Class A Landfill criteria.

The uncontrolled fill area appeared to be contained within an area of raised topography (a ‘hummock’) close to the historical groundskeeper shed. The second area to the south did not appear to have a definitive contamination source, however may have been related to paint from historical cottages/buildings, or reflect the use of the site as farmland with inconsistent areas of disposal to land.

The uncontrolled fill area will require removal of waste and disposal at an appropriately licensed facility and the surrounding soils will require testing to determine validation for reuse on site. Additional TCLP testing may be required prior to acceptance, depending on the nominated facility. Soil testing results will likely be required by the receiving facility.

Although 12 test pits/trenches were undertaken and soils were within the human health criteria, the historical land uses may lead to the presence of hotspots not identified during the investigation.

Overall, soil disposal and risks to environmental and human health can be managed with an appropriately developed Contaminated Soils Management Plan.

Due to the contaminant status of soils on site, consent is required under the NESCS as a controlled activity, and potentially under the GWRC Operative Discharges to Land Plan, and the Hutt City Council District Plan. It is recommended that a full planning review is undertaken prior as part of the development programme.

11 Limitations

This report has been prepared by Beca Ltd (Beca) solely for Summerset Retirement Villages (Client). Beca has been requested by the Client to provide a Detailed Site Investigation (Contamination) for the proposed retirement village development on a southern section of Boulcott Farm Golf Course, Lower Hutt, Wellington. This report is prepared solely for the purpose of the assessment of potential soil contamination (Scope). The contents of this report may not be used by Summerset Retirement Villages for any purpose other than in accordance with the stated Scope.

This report is confidential and is prepared solely for the Client. Beca 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.

This report contains information obtained by inspection, sampling, testing or other means of investigation. Unless specifically stated otherwise in this report, Beca has relied on the accuracy, completeness, currency and sufficiency of all information provided to it by, or on behalf of, the Client or any third party, including the information listed above, and has not independently verified the information provided. Beca accepts no responsibility for errors or omissions in, or the currency or sufficiency of, the information provided. Publicly available records are frequently inaccurate or incomplete.

The contents of this report are based upon our understanding and interpretation of current legislation and guidelines ("Standards") as consulting professionals, and should not be construed as legal opinions or advice. Unless special arrangements are made, this report will not be updated to take account of subsequent changes to any such Standards.

In preparing the assessment Beca utilised information within the following Aurecon report:

- Boulcott Farm Heritage Golf Club, Lower Hutt. Stage 1 Preliminary Site Investigation Report. Aurecon. 14 January 2013

Beca did not independently verify the results of this report and does not offer any reliance over the contents of the Aurecon report that are incorporated, or any conclusions that are drawn directly from them.

This report should be read in full, having regard to all stated assumptions, limitations and disclaimers.

Appendix A

Test Pit/Trench Location Plan

Beca

Site Investigation Location Plan (Contamination)

Figure 1.

Appendix B

Site Photographs

TP1 – natural material

TP2 – stained cobbles/gravels

TP3 – test pit wall, natural soils

TP4 – excavated natural material

TP5 – some ceramics with natural material

TP6 – trench with waste fill material (dark layer)

TP6 – waste fill material (dark layer) and natural silts (base of pit)

TP6 – pipe across pit, waste fill was only on the south side of the pipe.

TP6 – waste fill layer in the pit (dark layer), natural layer beneath and above

TP6 – fill material with waste

TP9 – natural material

TP11 – natural materials

Appendix C

Soil Logs

TEST PIT No: TP01

TEST PIT LOG

PROJECT:	Summerset Boulcott Contamination Assessment	JOB NUMBER:	3207650
SITE LOCATION:	Boulcott, Lower Hutt	CLIENT:	Summerset

CIRCUIT:
COORDINATES: N
E

TEST PIT LOCATION: See Location Plan
R L:
DATUM:

DEPTH (m)	WATER LEVEL	GRAPHIC LOG	USCS	MOISTURE	SOIL / ROCK DESCRIPTION	GEOLOGICAL UNIT	Scala	SV	τ (kPa)	SAMPLES	DEPTH (m)
					Organic SILT, minor fine sand; brown; moist, non plastic.					S1	
0.5					Medium to coarse sandy, GRAVEL; grey; moist. Gravel: rounded, SW, greywacke.					S2	0.5
1.0					END OF LOG @ 1 m						1.0
1.5											1.5

DATE EXCAVATED:	19/6/17	CONTRACTOR:	Advanced Site Works
LOGGED BY:	MWP	EQUIPMENT:	9t Excavator
SHEAR VANE No:	N/A	METHOD:	Excavation

COMMENTS:
Terminated at target depth. Groundwater not encountered.

FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS SEE KEY SHEET

Revision A

A4 Scale 1:10

TEST PIT No: TP02

TEST PIT LOG

PROJECT:	Summerset Boulcott Contamination Assessment	JOB NUMBER:	3207650
SITE LOCATION:	Boulcott, Lower Hutt	CLIENT:	Summerset

CIRCUIT:
COORDINATES: N
E

TEST PIT LOCATION: See Location Plan
R L:
DATUM:

DEPTH (m)	WATER LEVEL	GRAPHIC LOG	USCS	MOISTURE	SOIL / ROCK DESCRIPTION	GEOLOGICAL UNIT	Scala	SV	τ (kPa)	SAMPLES	DEPTH (m)
					Organic SILT, minor fine sand; brown; moist, non plastic.						
										S1	
					0.4m: trace refuse: cermaic fragements and wire.						
0.5					Medium to coarse sandy, GRAVEL; grey; moist. Gravel: rounded, SW, greywacke.						0.5
					0.8m: FeO staining.						
										S2	
1.0					END OF LOG @ 1 m						1.0
1.5											1.5

DATE EXCAVATED:	19/6/17	CONTRACTOR:	Advanced Site Works
LOGGED BY:	MWP	EQUIPMENT:	9t Excavator
SHEAR VANE No:	N/A	METHOD:	Excavation

COMMENTS:
Terminated at target depth. Groundwater not encountered.

FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS SEE KEY SHEET

Revision A

A4 Scale 1:10

TEST PIT No: TP03

TEST PIT LOG

PROJECT:	Summerset Boulcott Contamination Assessment	JOB NUMBER:	3207650
SITE LOCATION:	Boulcott, Lower Hutt	CLIENT:	Summerset

CIRCUIT:
COORDINATES: N
E

TEST PIT LOCATION: See Location Plan
R L:
DATUM:

DEPTH (m)	WATER LEVEL	GRAPHIC LOG	USCS	MOISTURE	SOIL / ROCK DESCRIPTION	GEOLOGICAL UNIT	Scala	SV	τ (kPa)	SAMPLES	DEPTH (m)
					Organic SILT, minor fine sand, trace fine to coarse gravel; brown; moist, non plastic. Gravel: rounded, SW, greywacke.						
0.5					Medium to coarse sandy, GRAVEL; grey; moist. Gravel: rounded, SW, greywacke. Moderately widely interbedded with fine sandy SILT, minor clay; grey; moist, low plasticity.					S1	0.5
					0.9m: log.					S2	
1.0					END OF LOG @ 1 m						1.0
1.5											1.5

DATE EXCAVATED:	19/6/17	CONTRACTOR:	Advanced Site Works
LOGGED BY:	MWP	EQUIPMENT:	9t Excavator
SHEAR VANE No:	N/A	METHOD:	Excavation

COMMENTS:
Terminated at target depth. Groundwater not encountered.

FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS SEE KEY SHEET

Revision A

A4 Scale 1:10

TEST PIT No: TP04

TEST PIT LOG

SHEET 1 of 1

PROJECT:	Summerset Boulcott Contamination Assessment	JOB NUMBER:	3207650
SITE LOCATION:	Boulcott, Lower Hutt	CLIENT:	Summerset

CIRCUIT:
COORDINATES: N
E

TEST PIT LOCATION: See Location Plan
R L:
DATUM:

DEPTH (m)	WATER LEVEL	GRAPHIC LOG	USCS	MOISTURE	SOIL / ROCK DESCRIPTION	GEOLOGICAL UNIT	Scala	SV	τ (kPa)	SAMPLES	DEPTH (m)
					Organic SILT, minor fine sand, trace fine to coarse gravel; brown; moist, non plastic. Gravel: rounded, SW, greywacke.						
0.5					Medium to coarse sandy, GRAVEL; grey; moist. Gravel: rounded, SW, greywacke.					S1	0.5
1.0					END OF LOG @ 1 m					S2	1.0
1.5											1.5

DATE EXCAVATED:	19/6/17	CONTRACTOR:	Advanced Site Works
LOGGED BY:	MWP	EQUIPMENT:	9t Excavator
SHEAR VANE No:	N/A	METHOD:	Excavation

COMMENTS:
Terminated at target depth. Groundwater not encountered.

FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS SEE KEY SHEET

Revision A

A4 Scale 1:10

TEST_PIT C:\USERS\MWP\DESKTOP\SUMMERSET BOULCOTT LOGS.GPJ BECA.GDT 17/7/17

TEST PIT No: TP05

TEST PIT LOG

PROJECT:	Summerset Boulcott Contamination Assessment	JOB NUMBER:	3207650
SITE LOCATION:	Boulcott, Lower Hutt	CLIENT:	Summerset

CIRCUIT:
COORDINATES: N
E

TEST PIT LOCATION: See Location Plan
R L:
DATUM:

DEPTH (m)	WATER LEVEL	GRAPHIC LOG	USCS	MOISTURE	SOIL / ROCK DESCRIPTION	GEOLOGICAL UNIT	Scala	SV	τ (kPa)	SAMPLES	DEPTH (m)
					Organic SILT, some fine to coarse sand; brown; moist, non plastic.						
					Silty, fine to medium SAND; greyish brown; moist, non plastic.					S1	
0.5					0.55m: FeO staining.						0.5
					Clayey SILT; grey; moist, high plasticity.					S2	
1.0					END OF LOG @ 1 m						1.0
1.5											1.5

DATE EXCAVATED:	19/6/17	CONTRACTOR:	Advanced Site Works
LOGGED BY:	MWP	EQUIPMENT:	9t Excavator
SHEAR VANE No:	N/A	METHOD:	Excavation

COMMENTS:
Terminated at target depth. Groundwater not encountered.

FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS SEE KEY SHEET

Revision A

A4 Scale 1:10

TEST PIT No: TP06

TEST PIT LOG

PROJECT:	Summerset Boulcott Contamination Assessment	JOB NUMBER:	3207650
SITE LOCATION:	Boulcott, Lower Hutt	CLIENT:	Summerset

CIRCUIT:
COORDINATES: N
E

TEST PIT LOCATION: See Location Plan
R L:
DATUM:

DEPTH (m)	WATER LEVEL	GRAPHIC LOG	USCS	MOISTURE	SOIL / ROCK DESCRIPTION	GEOLOGICAL UNIT	Scala	SV	τ (kPa)	SAMPLES	DEPTH (m)
					Organic SILT, some fine to coarse sand; brown; moist, non plastic.						
					Fine sandy SILT; greyish brown; moist, non plastic.					S1	
0.5											0.5
					Fine to coarse sandy SILT, trace gravel, trace clay; brown; moist, low plasticity. Gravel: rounded, SW, greywacke.						
1.0											1.0
					Fine to coarse gravelly, medium to coarse SAND, minor refuse, minor organics; dark grey; moist, non plastic. Gravel: rounded, SW, greywacke. Refuse: wire, glass, bottles, plastic. Organics: fibrous.						
1.5										S2	1.5

DATE EXCAVATED:	19/6/17	CONTRACTOR:	Advanced Site Works
LOGGED BY:	MWP	EQUIPMENT:	9t Excavator
SHEAR VANE No:	N/A	METHOD:	Excavation

COMMENTS:
Terminated at target depth. Groundwater not encountered.

FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS SEE KEY SHEET

Revision A

A4 Scale 1:10

TEST PIT No: TP06

TEST PIT LOG

PROJECT:	Summerset Boulcott Contamination Assessment	JOB NUMBER:	3207650
SITE LOCATION:	Boulcott, Lower Hutt	CLIENT:	Summerset

CIRCUIT:
COORDINATES: N
E

TEST PIT LOCATION: See Location Plan
R L:
DATUM:

DEPTH (m)	WATER LEVEL	GRAPHIC LOG	USCS	MOISTURE	SOIL / ROCK DESCRIPTION	GEOLOGICAL UNIT	Scala	SV	τ (kPa)	SAMPLES	DEPTH (m)
					Clayey SILT, minor fine sand; grey; moist, high plasticity.					S3	
2.5					END OF LOG @ 2.5 m						2.5
3.0											3.0
3.5											3.5

DATE EXCAVATED:	19/6/17	CONTRACTOR:	Advanced Site Works
LOGGED BY:	MWP	EQUIPMENT:	9t Excavator
SHEAR VANE No:	N/A	METHOD:	Excavation

COMMENTS:
Terminated at target depth. Groundwater not encountered.

FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS SEE KEY SHEET

Revision A

A4 Scale 1:10

TEST PIT No: TP07

TEST PIT LOG

PROJECT:	Summerset Boulcott Contamination Assessment	JOB NUMBER:	3207650
SITE LOCATION:	Boulcott, Lower Hutt	CLIENT:	Summerset

CIRCUIT:
COORDINATES: N
E

TEST PIT LOCATION: See Location Plan
R L:
DATUM:

DEPTH (m)	WATER LEVEL	GRAPHIC LOG	USCS	MOISTURE	SOIL / ROCK DESCRIPTION	GEOLOGICAL UNIT	Scala	SV	τ (kPa)	SAMPLES	DEPTH (m)
					Organic SILT, minor fine sand; brown; moist, non plastic.						
0.5					Medium to coarse sandy, GRAVEL; grey; moist. Gravel: rounded, SW, greywacke.					S1	0.5
										S2	
1.0					END OF LOG @ 1 m						1.0
1.5											1.5

DATE EXCAVATED:	19/6/17	CONTRACTOR:	Advanced Site Works	COMMENTS: Terminated at target depth. Groundwater not encountered.
LOGGED BY:	MWP	EQUIPMENT:	9t Excavator	
SHEAR VANE No:	N/A	METHOD:	Excavation	

FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS SEE KEY SHEET

Revision A

A4 Scale 1:10

TEST PIT No: TP08

TEST PIT LOG

SHEET 1 of 1

PROJECT:	Summerset Boulcott Contamination Assessment	JOB NUMBER:	3207650
SITE LOCATION:	Boulcott, Lower Hutt	CLIENT:	Summerset

CIRCUIT:
COORDINATES: N
E

TEST PIT LOCATION: See Location Plan
R L:
DATUM:

DEPTH (m)	WATER LEVEL	GRAPHIC LOG	USCS	MOISTURE	SOIL / ROCK DESCRIPTION	GEOLOGICAL UNIT	Scala	SV	τ (kPa)	SAMPLES	DEPTH (m)
					Organic SILT, minor fine sand; brown; moist, non plastic.						
					Medium to coarse sandy, GRAVEL; grey; moist. Gravel: rounded, SW, greywacke.					S1	
0.5					0.6m: FeO stained bed.						0.5
										S2	
1.0					END OF LOG @ 1 m						1.0
1.5											1.5

DATE EXCAVATED:	19/6/17	CONTRACTOR:	Advanced Site Works
LOGGED BY:	MWP	EQUIPMENT:	9t Excavator
SHEAR VANE No:	N/A	METHOD:	Excavation

COMMENTS:
Terminated at target depth. Groundwater not encountered.

FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS SEE KEY SHEET

Revision A

A4 Scale 1:10

TEST_PIT C:\USERS\MWP\DESKTOP\SUMMERSET BOULCOTT LOGS.GPJ BECA.GDT 17/7/17

TEST PIT No: TP09

TEST PIT LOG

SHEET 1 of 1

PROJECT:	Summerset Boulcott Contamination Assessment	JOB NUMBER:	3207650
SITE LOCATION:	Boulcott, Lower Hutt	CLIENT:	Summerset

CIRCUIT:
COORDINATES: N
E

TEST PIT LOCATION: See Location Plan
R L:
DATUM:

DEPTH (m)	WATER LEVEL	GRAPHIC LOG	USCS	MOISTURE	SOIL / ROCK DESCRIPTION	GEOLOGICAL UNIT	Scala	SV	τ (kPa)	SAMPLES	DEPTH (m)
					Organic SILT, minor fine sand; brown; moist, non plastic.						
0.5					Medium to coarse sandy, GRAVEL; grey; moist. Gravel: rounded, SW, greywacke.					S1	0.5
										S2	
1.0					END OF LOG @ 1 m						1.0
1.5											1.5

DATE EXCAVATED:	19/6/17	CONTRACTOR:	Advanced Site Works
LOGGED BY:	MWP	EQUIPMENT:	9t Excavator
SHEAR VANE No:	N/A	METHOD:	Excavation

COMMENTS:
Terminated at target depth. Groundwater not encountered.

FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS SEE KEY SHEET

Revision A

A4 Scale 1:10

TEST PIT No: TP10

TEST PIT LOG

SHEET 1 of 1

PROJECT:	Summerset Boulcott Contamination Assessment	JOB NUMBER:	3207650
SITE LOCATION:	Boulcott, Lower Hutt	CLIENT:	Summerset

CIRCUIT:
COORDINATES: N
E

TEST PIT LOCATION: See Location Plan
R L:
DATUM:

DEPTH (m)	WATER LEVEL	GRAPHIC LOG	USCS	MOISTURE	SOIL / ROCK DESCRIPTION	GEOLOGICAL UNIT	Scala	SV	τ (kPa)	SAMPLES	DEPTH (m)
					Organic SILT, minor fine sand; brown; moist, non plastic.						
					Medium to coarse sandy, GRAVEL; grey; moist. Gravel: rounded, SW, greywacke.					S1	
0.5											0.5
					0.7m: trace refuse: broken terracotta					S2	
1.0					END OF LOG @ 1 m						1.0
1.5											1.5

DATE EXCAVATED:	20/6/17	CONTRACTOR:	Advanced Site Works
LOGGED BY:	MWP	EQUIPMENT:	9t Excavator
SHEAR VANE No:	N/A	METHOD:	Excavation

COMMENTS:
Terminated at target depth. Groundwater not encountered.

FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS SEE KEY SHEET

Revision A

A4 Scale 1:10

TEST PIT No: TP11

TEST PIT LOG

SHEET 1 of 1

PROJECT:	Summerset Boulcott Contamination Assessment	JOB NUMBER:	3207650
SITE LOCATION:	Boulcott, Lower Hutt	CLIENT:	Summerset

CIRCUIT:
COORDINATES: N
E

TEST PIT LOCATION: See Location Plan
R L:
DATUM:

DEPTH (m)	WATER LEVEL	GRAPHIC LOG	USCS	MOISTURE	SOIL / ROCK DESCRIPTION	GEOLOGICAL UNIT	Scala	SV	τ (kPa)	SAMPLES	DEPTH (m)
					Organic clayey SILT; brown; moist, high plasticity.					S1	
					Clayey SILT; grey; moist, high plasticity.						
0.5					Fine to coarse gravelly, medium to coarse SAND; grey; moist, non plastic.					S2	0.5
1.0					END OF LOG @ 1 m						1.0
1.5											1.5

DATE EXCAVATED:	20/6/17	CONTRACTOR:	Advanced Site Works
LOGGED BY:	MWP	EQUIPMENT:	9t Excavator
SHEAR VANE No:	N/A	METHOD:	Excavation

COMMENTS:
Terminated at target depth. Groundwater not encountered.

FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS SEE KEY SHEET

Revision A

A4 Scale 1:10

TEST_PIT C:\USERS\MWP\DESKTOP\SUMMERSET BOULCOTT LOGS.GPJ BECA.GDT 17/7/17

TEST PIT No: TP12

TEST PIT LOG

PROJECT:	Summerset Boulcott Contamination Assessment	JOB NUMBER:	3207650
SITE LOCATION:	Boulcott, Lower Hutt	CLIENT:	Summerset

CIRCUIT:
COORDINATES: N
E

TEST PIT LOCATION: See Location Plan
R L:
DATUM:

DEPTH (m)	WATER LEVEL	GRAPHIC LOG	USCS	MOISTURE	SOIL / ROCK DESCRIPTION	GEOLOGICAL UNIT	Scala	SV	τ (kPa)	SAMPLES	DEPTH (m)
					Organic SILT, minor fine sand; brown; moist, non plastic.						
					Fine to medium SAND; light brown; moist, non plastic.					S1	
					Fine sandy SILT; grey; moist, non plastic.						
0.5					Gravelly, medium to coarse SAND; grey; moist, non plastic.						0.5
					SILT, minor clay; grey; moist, low plasticity.					S2	
1.0					END OF LOG @ 1 m						1.0
1.5											1.5

DATE EXCAVATED:	20/6/17	CONTRACTOR:	Advanced Site Works
LOGGED BY:	MWP	EQUIPMENT:	9t Excavator
SHEAR VANE No:	N/A	METHOD:	Excavation

COMMENTS:
Terminated at target depth. Groundwater not encountered.

FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS SEE KEY SHEET

Revision A

A4 Scale 1:10

Appendix D

Results Summary Table

SOIL ANALYSIS RESULTS: Summerset, Lower Hutt																											Assessment Criteria		
Sample Date	19/06/2017	19/06/2017	19/06/2017	19/06/2017	19/06/2017	19/06/2017	19/06/2017	19/06/2017	19/06/2017	19/06/2017	19/06/2017	19/06/2017	19/06/2017	19/06/2017	19/06/2017	19/06/2017	19/06/2017	19/06/2017	19/06/2017	19/06/2017	10/06/2017	10/06/2017	10/06/2017	10/06/2017	10/06/2017	10/06/2017			
Sample ID	17:117	17:117	17:117	17:117	17:117	17:117	17:117	17:117	17:117	17:117	17:117	17:117	17:117	17:117	17:117	17:117	17:117	17:117	17:117	17:117	17:117	17:117	17:117	17:117	17:117	17:117			
Sample Location	**TP1**	**TP1**	**TP2**	**TP2**	**TP3**	**TP3**	**TP4**	**TP4**	**TP5**	**TP5**	**TP6**	**TP6**	**TP6**	**TP7**	**TP7**	**TP8**	**TP8**	**TP9**	**TP9**	**TP10**	**TP10**	**TP11**	**TP11**	**TP12**	**TP12**		**Background (mg/kg) [1]**	**Human Health (High-Density Residential) (mg/kg) [3]**	**Environmental Assessment Criteria (mg/kg) [6]**
Laboratory Number	1795426.1	1795426.2	1795426.3	1795426.4	1795426.5	1795426.6	1795426.7	1795426.8	1795426.9	1795426.10	1795426.11	1795426.12	1795426.13	1795426.14	1795426.25	1795426.15	1795426.16	1795426.17	1795426.18	1795426.19	1795426.20	1795426.21	1795426.22	1795426.23	1795426.24				
Sample Depth (m below ground level)	0.2	1	0.2	1	0.2	1	0.2	1	0.3	1	0.2	1.5	2.5	0.2	1	0.3	1	0.2	1	0.2	1	0.2	1	0.2	1				
Heavy Metals (mg/kg dry wt)																													
Arsenic	3	4	9	3	2	2	4	3	4	3	4	10	4	4	2	4	3	5	3	5	3	4	< 2	3	7		9.97	45	100 [7]
Cadmium	< 0.10	< 0.10	0.37	< 0.10	< 0.10	< 0.10	0.11	< 0.10	< 0.10	< 0.10	< 0.10	1.59	< 0.10	< 0.10	< 0.10	0.1	< 0.10	0.13	< 0.10	< 0.10	< 0.10	0.11	< 0.10	< 0.10	0.11		0.33	230	22
Chromium	15	14	22	14	13	14	15	14	14	18	14	23	15	15	15	14	14	16	15	14	13	14	4	6	16		56.88	1,500	60 [7]
Copper	8	8	37	10	8	8	9	8	10	10	10	54	9	11	7	11	7	14	8	10	8	11	3	6	15		48.14	>10,000	91
Lead	13.6	14.2	**330**	21	12.8	11.4	13.6	11.4	16.6	21	18.6	**240**	17.1	23	14	21	11.2	31	12.3	27	11.7	17.8	3.2	3.4	87		25.83	500	600
Mercury	0.10	0.11	0.15	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.11	< 0.10	0.23	0.28	< 0.10	< 0.10	< 0.10	0.14	< 0.10	0.18	< 0.10	0.10	< 0.10	0.12	< 0.10	< 0.10	0.12		2.6 [2]	1,000	50
Nickel	14	13	16	13	12	14	14	14	12	14	13	19	13	14	14	13	13	13	15	12	12	13	2	6	14		35.15	1,500 [4]	89
Zinc	53	52	**260**	87	47	49	57	51	63	72	54	**550**	62	66	50	60	49	78	53	67	47	57	18	22	106		97.97	23,000 [4]	360
Semi-Volatile Organic Compounds (SVOCs) (mg/kg dry wt)																													
38 Compounds	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD		-	-	-
Organochlorine Pesticides in SVOC (mg/kg dry wt)																													
17 Compounds	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD		-	-	-
Polycyclic Aromatic Hydrocarbons (mg/kg dry wt)																													
Acenaphthene	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5		-	-	-
Acenaphthylene	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5		-	-	-
Anthracene	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5		-	-	2.5
Benzo[a]anthracene	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5		-	-	-
Benzo[a]pyrene (BAP)	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5		-	-	0.7 [7]
Benzo[b]fluoranthene + Benzo[j]fluoranthene	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5		-	-	-
Benzo[g,h,i]perylene	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5		-	-	-
Benzo[k]fluoranthene	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5		-	-	-
1&2-Chloronaphthalene	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5		-	-	-
Chrysene	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5		-	-	-
Dibenzo[a,h]anthracene	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5		-	-	-
Fluoranthene	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5		-	-	50
Fluorene	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5		-	-	-
Indeno(1,2,3-c,d)pyrene	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5		-	-	-
2-Methylnaphthalene	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5		-	-	-
Naphthalene	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5		-	190 [5]	-
Phenanthrene	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5		-	-	-
Pyrene	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5		-	>25,000 [5]	-
B(a)P equivalent (incl. Fluoranthene)	< 0.0605	< 0.0605	< 0.0605	< 0.0605	< 0.0605	< 0.0605	< 0.0605	< 0.0605	< 0.0605	< 0.0605	< 0.0605	< 0.0605	< 0.0605	< 0.0605	< 0.0605	< 0.0605	< 0.0605	< 0.0605	< 0.0605	0.108	< 0.0605	< 0.0605	< 0.0605	< 0.0605	< 0.0605		-	35	-
B(a)P equivalent (Not incl. Fluoranthene)	< 0.0603	< 0.0603	< 0.0603	< 0.0603	< 0.0603	< 0.0603	< 0.0603	< 0.0603	< 0.0603	< 0.0603	< 0.0603	< 0.0603	< 0.0603	< 0.0603	< 0.0603	< 0.0603	< 0.0603	< 0.0603	< 0.0603	0.108	< 0.0603	< 0.0603	< 0.0603	< 0.0603	< 0.0603		-	-	-
Total Petroleum Hydrocarbons (mg/kg dry wt)																													
C7 - C9	< 8	< 8	< 8	< 8	< 8	< 8	< 8	< 8	< 8	< 8	< 8	< 8	< 8	< 8	< 8	< 8	< 8	< 8	< 8	< 8	< 8	< 9	< 8	< 8	< 8		-	120 [5]	180 [7]
C10 - C14	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20		-	1,500 [5]	120 [7]
C15 - C36	< 40	< 40	< 40	< 40	< 40	< 40	< 40	< 40	< 40	< 40	< 40	90	< 40	70	< 40	< 40	< 40	102	< 40	83	< 40	68	< 40	< 40	< 40		-	>20,000 [5]	300 [7]
Total hydrocarbons (C7 - C36)	< 70	< 70	< 70	< 70	< 70	< 70	< 70	< 70	< 70	< 70	< 70	90	< 70	70	< 70	< 70	< 70	102	< 70	83	< 70	< 70	< 70	< 70	< 70		-	-	-

Annotations:
BD = Below laboratory detection limits

[1] Background soil concentrations of selected trace elements and organic contaminants in New Zealand. Envirolink Tools Grant: C09X1402. Landcare Research November 2015. 95th percentile values were used for Pakihi mudstone.
[2] Determinarion of Common Pollutant Background Soil Concentrations for the Wellington Region. Prepared for Greater Wellington Regional Council by URS Ltd. August 2003. Upper levels of the range were used.
[3] Resource Management (National Environmental Standards for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011. Values applicable to High-density residential have been used.
[4] USEPA Regional Screening Level (RSL) Summary Table (TR=1E-06, HQ=1) June 2017
[5] Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealanad (Revised 2011), criteria for 'Commercial/industrial' in Sandy Silt soils
[6] Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health, CCME 1999. Values applicable to 'Industrial' land use have been used.
[7] National Environmental Protection (Assessment of Site Contamination) Measure April 2011. Values for 'Urban residential and open public space' were used.
[8] Module 2 Hazardous Waste Guidelines Landfill Waste Acceptance Criteria and Landfill Classification. Class A Landfill criteria were used. Ministry for the Environment May 2004

Underlining indicates result exceeds background range
Light grey indicates result exceeds Environmental protection criteria
Dark grey shading indicates result exceeds Human Health assessment criteria
Bold indicates result exceeds Class A Landfill criteria

Appendix E

Hill Laboratories Results

Hill Laboratories
TRIED, TESTED AND TRUSTED

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ANALYSIS REPORT

Client:	Beca Limited	**Lab No:**	1795426	SUPv1
Contact:	Ben Waterhouse	**Date Received:**	21-Jun-2017	
	C/- Beca Limited	**Date Reported:**	05-Jul-2017	
	PO Box 13960	**Quote No:**	86268	
	Christchurch 8141	**Order No:**	17:117	
		Client Reference:	17:117	
		Submitted By:	Matt Paterson	

Sample Type: Soil

Sample Name:		TP1 0.2 19-Jun-2017	TP1 1.0 19-Jun-2017	TP2 0.2 19-Jun-2017	TP2 1.0 19-Jun-2017
Lab Number:		1795426.1	1795426.2	1795426.3	1795426.4
Individual Tests					
Dry Matter	g/100g as rcvd	95.4 ± 5.0	91.1 ± 5.0	83.1 ± 5.0	95.4 ± 5.0
Heavy Metals with Mercury, Screen Level					
Total Recoverable Arsenic	mg/kg dry wt	3.2 ± 1.4	3.6 ± 1.5	9.4 ± 2.0	2.6 ± 1.4
Total Recoverable Cadmium	mg/kg dry wt	< 0.10 ± 0.067	< 0.10 ± 0.067	0.370 ± 0.083	< 0.10 ± 0.067
Total Recoverable Chromium	mg/kg dry wt	14.9 ± 2.7	14.4 ± 2.6	21.6 ± 3.6	14.1 ± 2.6
Total Recoverable Copper	mg/kg dry wt	8.1 ± 1.8	8.5 ± 1.8	37.1 ± 5.3	9.5 ± 1.9
Total Recoverable Lead	mg/kg dry wt	13.6 ± 2.1	14.2 ± 2.2	329 ± 50	21.1 ± 3.2
Total Recoverable Mercury	mg/kg dry wt	0.102 ± 0.067	0.111 ± 0.068	0.153 ± 0.070	< 0.10 ± 0.067
Total Recoverable Nickel	mg/kg dry wt	13.7 ± 2.2	13.3 ± 2.2	15.9 ± 2.5	12.7 ± 2.1
Total Recoverable Zinc	mg/kg dry wt	53.4 ± 4.6	51.8 ± 4.6	256 ± 19	87.4 ± 6.7
Haloethers in SVOC Soil Samples by GC-MS					
Bis(2-chloroethoxy) methane	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Bis(2-chloroethyl)ether	mg/kg dry wt	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35
Bis(2-chloroisopropyl)ether	mg/kg dry wt	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35
4-Bromophenyl phenyl ether	mg/kg dry wt	< 0.4 ± 0.20	< 0.4 ± 0.20	< 0.4 ± 0.21	< 0.4 ± 0.20
4-Chlorophenyl phenyl ether	mg/kg dry wt	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35
Nitrogen containing compounds in SVOC Soil Samples by GC-MS					
2,4-Dinitrotoluene	mg/kg dry wt	< 1.0 ± 0.68	< 1.0 ± 0.68	< 1.0 ± 0.68	< 1.0 ± 0.68
2,6-Dinitrotoluene	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67
Nitrobenzene	mg/kg dry wt	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33
N-Nitrosodi-n-propylamine	mg/kg dry wt	< 0.7 ± 0.35	< 0.7 ± 0.35	< 0.7 ± 0.36	< 0.7 ± 0.35
N-Nitrosodiphenylamine + Diphenylamine	mg/kg dry wt	< 0.7 ± 0.42	< 0.7 ± 0.43	< 0.7 ± 0.46	< 0.7 ± 0.41
Organochlorine Pesticides in SVOC Soil Samples by GC-MS					
Aldrin	mg/kg dry wt	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33
alpha-BHC	mg/kg dry wt	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33
beta-BHC	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
delta-BHC	mg/kg dry wt	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33
gamma-BHC (Lindane)	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
4,4'-DDD	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
4,4'-DDE	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
4,4'-DDT	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67
Dieldrin	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Endosulfan I	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67
Endosulfan II	mg/kg dry wt	< 2 ± 1.4	< 2 ± 1.4	< 2 ± 1.4	< 2 ± 1.4
Endosulfan sulphate	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67
Endrin	mg/kg dry wt	< 0.7 ± 0.39	< 0.7 ± 0.39	< 0.7 ± 0.41	< 0.7 ± 0.38
Endrin ketone	mg/kg dry wt	< 1.0 ± 0.68	< 1.0 ± 0.68	< 1.0 ± 0.68	< 1.0 ± 0.68

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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:		TP1 0.2 19-Jun-2017	TP1 1.0 19-Jun-2017	TP2 0.2 19-Jun-2017	TP2 1.0 19-Jun-2017
Lab Number:		1795426.1	1795426.2	1795426.3	1795426.4
Organochlorine Pesticides in SVOC Soil Samples by GC-MS					
Heptachlor	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Heptachlor epoxide	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Hexachlorobenzene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Polycyclic Aromatic Hydrocarbons in SVOC Soil Samples by GC-MS					
Acenaphthene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Acenaphthylene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Anthracene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Benzo[a]anthracene	mg/kg dry wt	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Benzo[k]fluoranthene	mg/kg dry wt	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35
1&2-Chloronaphthalene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Chrysene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Fluoranthene	mg/kg dry wt	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33
Fluorene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
2-Methylnaphthalene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Naphthalene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Phenanthrene	mg/kg dry wt	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33
Pyrene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Phenols in SVOC Soil Samples by GC-MS					
4-Chloro-3-methylphenol	mg/kg dry wt	< 5 ± 3.4	< 5 ± 3.4	< 5 ± 3.4	< 5 ± 3.4
2-Chlorophenol	mg/kg dry wt	< 1.0 ± 0.66	< 1.0 ± 0.66	< 1.0 ± 0.66	< 1.0 ± 0.66
2,4-Dichlorophenol	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67
2,4-Dimethylphenol	mg/kg dry wt	< 3 ± 1.2	< 3 ± 1.2	< 3 ± 1.2	< 3 ± 1.2
3 & 4-Methylphenol (m- + p-cresol)	mg/kg dry wt	< 3 ± 1.2	< 3 ± 1.2	< 3 ± 1.2	< 3 ± 1.2
2-Methylphenol (o-Cresol)	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67
2-Nitrophenol	mg/kg dry wt	< 5 ± 3.4	< 5 ± 3.4	< 5 ± 3.4	< 5 ± 3.4
Pentachlorophenol (PCP)	mg/kg dry wt	< 30 ± 68	< 30 ± 68	< 30 ± 68	< 30 ± 68
Phenol	mg/kg dry wt	< 1.0 ± 0.68	< 1.0 ± 0.68	< 1.0 ± 0.68	< 1.0 ± 0.68
2,4,5-Trichlorophenol	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67
2,4,6-Trichlorophenol	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67
Plasticisers in SVOC Soil Samples by GC-MS					
Bis(2-ethylhexyl)phthalate	mg/kg dry wt	< 5 ± 3.4	< 5 ± 3.4	< 5 ± 3.4	< 5 ± 3.4
Butylbenzylphthalate	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67
Di(2-ethylhexyl)adipate	mg/kg dry wt	< 1.0 ± 5.1	< 1.0 ± 5.1	< 1.0 ± 5.1	< 1.0 ± 5.1
Diethylphthalate	mg/kg dry wt	< 1.0 ± 0.66	< 1.0 ± 0.66	< 1.0 ± 0.66	< 1.0 ± 0.66
Dimethylphthalate	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67
Di-n-butylphthalate	mg/kg dry wt	< 1.0 ± 0.68	< 1.0 ± 0.68	< 1.0 ± 0.68	< 1.0 ± 0.68
Di-n-octylphthalate	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67
Other Halogenated compounds in SVOC Soil Samples by GC-MS					
1,2-Dichlorobenzene	mg/kg dry wt	< 0.7 ± 0.35	< 0.7 ± 0.35	< 0.7 ± 0.36	< 0.7 ± 0.35
1,3-Dichlorobenzene	mg/kg dry wt	< 0.7 ± 0.36	< 0.7 ± 0.36	< 0.7 ± 0.37	< 0.7 ± 0.36
1,4-Dichlorobenzene	mg/kg dry wt	< 0.7 ± 0.35	< 0.7 ± 0.35	< 0.7 ± 0.35	< 0.7 ± 0.35
Hexachlorobutadiene	mg/kg dry wt	< 0.7 ± 0.36	< 0.7 ± 0.36	< 0.7 ± 0.37	< 0.7 ± 0.36
Hexachloroethane	mg/kg dry wt	< 0.7 ± 0.37	< 0.7 ± 0.37	< 0.7 ± 0.38	< 0.7 ± 0.36
1,2,4-Trichlorobenzene	mg/kg dry wt	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35
Other compounds in SVOC Soil Samples by GC-MS					
Benzyl alcohol	mg/kg dry wt	< 10 ± 6.7	< 10 ± 6.7	< 10 ± 6.7	< 10 ± 6.7
Carbazole	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Dibenzofuran	mg/kg dry wt	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33

Sample Type: Soil					
	Sample Name:	TP1 0.2 19-Jun-2017	TP1 1.0 19-Jun-2017	TP2 0.2 19-Jun-2017	TP2 1.0 19-Jun-2017
	Lab Number:	1795426.1	1795426.2	1795426.3	1795426.4
Other compounds in SVOC Soil Samples by GC-MS					
Isophorone	mg/kg dry wt	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35
Total Petroleum Hydrocarbons in Soil					
C7 - C9	mg/kg dry wt	< 8 ± 5.4	< 8 ± 5.4	< 8 ± 5.4	< 8 ± 5.4
C10 - C14	mg/kg dry wt	< 20 ± 7.6	< 20 ± 7.6	< 20 ± 7.6	< 20 ± 7.6
C15 - C36	mg/kg dry wt	< 40 ± 9.3	< 40 ± 9.3	< 40 ± 9.3	< 40 ± 9.3
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 70 ± 14	< 70 ± 14	< 70 ± 14	< 70 ± 14

	Sample Name:	TP3 0.2	TP3 1.0	TP4 0.2 19-Jun-2017	TP4 1.0
	Lab Number:	1795426.5	1795426.6	1795426.7	1795426.8
Individual Tests					
Dry Matter	g/100g as rcvd	89.5 ± 5.0	93.8 ± 5.0	88.6 ± 5.0	96.1 ± 5.0
Heavy Metals with Mercury, Screen Level					
Total Recoverable Arsenic	mg/kg dry wt	2.3 ± 1.4	2.3 ± 1.4	3.8 ± 1.5	3.5 ± 1.4
Total Recoverable Cadmium	mg/kg dry wt	< 0.10 ± 0.067	< 0.10 ± 0.067	0.108 ± 0.067	< 0.10 ± 0.067
Total Recoverable Chromium	mg/kg dry wt	12.5 ± 2.4	14.4 ± 2.6	14.8 ± 2.7	14.2 ± 2.6
Total Recoverable Copper	mg/kg dry wt	7.6 ± 1.7	7.7 ± 1.7	9.0 ± 1.8	7.8 ± 1.7
Total Recoverable Lead	mg/kg dry wt	12.8 ± 2.0	11.4 ± 1.8	13.6 ± 2.1	11.4 ± 1.8
Total Recoverable Mercury	mg/kg dry wt	< 0.10 ± 0.067	< 0.10 ± 0.067	< 0.10 ± 0.067	< 0.10 ± 0.067
Total Recoverable Nickel	mg/kg dry wt	11.8 ± 2.1	13.8 ± 2.3	13.6 ± 2.2	14.2 ± 2.3
Total Recoverable Zinc	mg/kg dry wt	47.3 ± 4.3	49.2 ± 4.4	56.5 ± 4.8	51.3 ± 4.5
Haloethers in SVOC Soil Samples by GC-MS					
Bis(2-chloroethoxy) methane	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Bis(2-chloroethyl)ether	mg/kg dry wt	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35
Bis(2-chloroisopropyl)ether	mg/kg dry wt	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35
4-Bromophenyl phenyl ether	mg/kg dry wt	< 0.4 ± 0.20	< 0.4 ± 0.20	< 0.4 ± 0.21	< 0.4 ± 0.20
4-Chlorophenyl phenyl ether	mg/kg dry wt	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35
Nitrogen containing compounds in SVOC Soil Samples by GC-MS					
2,4-Dinitrotoluene	mg/kg dry wt	< 1.0 ± 0.68	< 1.0 ± 0.68	< 1.0 ± 0.68	< 1.0 ± 0.68
2,6-Dinitrotoluene	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67
Nitrobenzene	mg/kg dry wt	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33
N-Nitrosodi-n-propylamine	mg/kg dry wt	< 0.7 ± 0.36	< 0.7 ± 0.35	< 0.7 ± 0.36	< 0.7 ± 0.35
N-Nitrosodiphenylamine + Diphenylamine	mg/kg dry wt	< 0.7 ± 0.44	< 0.7 ± 0.42	< 0.7 ± 0.45	< 0.7 ± 0.40
Organochlorine Pesticides in SVOC Soil Samples by GC-MS					
Aldrin	mg/kg dry wt	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33
alpha-BHC	mg/kg dry wt	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33
beta-BHC	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
delta-BHC	mg/kg dry wt	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33
gamma-BHC (Lindane)	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
4,4'-DDD	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
4,4'-DDE	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
4,4'-DDT	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67
Dieldrin	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Endosulfan I	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67
Endosulfan II	mg/kg dry wt	< 2 ± 1.4	< 2 ± 1.4	< 2 ± 1.4	< 2 ± 1.4
Endosulfan sulphate	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67
Endrin	mg/kg dry wt	< 0.7 ± 0.40	< 0.7 ± 0.39	< 0.7 ± 0.41	< 0.7 ± 0.38
Endrin ketone	mg/kg dry wt	< 1.0 ± 0.68	< 1.0 ± 0.68	< 1.0 ± 0.68	< 1.0 ± 0.68
Heptachlor	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Heptachlor epoxide	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Hexachlorobenzene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Polycyclic Aromatic Hydrocarbons in SVOC Soil Samples by GC-MS					
Acenaphthene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Acenaphthylene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Anthracene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34

Sample Type: Soil					
	Sample Name:	TP3 0.2	TP3 1.0	TP4 0.2 19-Jun-2017	TP4 1.0
	Lab Number:	1795426.5	1795426.6	1795426.7	1795426.8
Polycyclic Aromatic Hydrocarbons in SVOC Soil Samples by GC-MS					
Benzo[a]anthracene	mg/kg dry wt	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Benzo[k]fluoranthene	mg/kg dry wt	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35
1&2-Chloronaphthalene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Chrysene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Fluoranthene	mg/kg dry wt	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33
Fluorene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
2-Methylnaphthalene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Naphthalene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Phenanthrene	mg/kg dry wt	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33
Pyrene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Phenols in SVOC Soil Samples by GC-MS					
4-Chloro-3-methylphenol	mg/kg dry wt	< 5 ± 3.4	< 5 ± 3.4	< 5 ± 3.4	< 5 ± 3.4
2-Chlorophenol	mg/kg dry wt	< 1.0 ± 0.66	< 1.0 ± 0.66	< 1.0 ± 0.66	< 1.0 ± 0.66
2,4-Dichlorophenol	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67
2,4-Dimethylphenol	mg/kg dry wt	< 3 ± 1.2	< 3 ± 1.2	< 3 ± 1.2	< 3 ± 1.2
3 & 4-Methylphenol (m- + p-cresol)	mg/kg dry wt	< 3 ± 1.2	< 3 ± 1.2	< 3 ± 1.2	< 3 ± 1.2
2-Methylphenol (o-Cresol)	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67
2-Nitrophenol	mg/kg dry wt	< 5 ± 3.4	< 5 ± 3.4	< 5 ± 3.4	< 5 ± 3.4
Pentachlorophenol (PCP)	mg/kg dry wt	< 30 ± 68	< 30 ± 68	< 30 ± 68	< 30 ± 68
Phenol	mg/kg dry wt	< 1.0 ± 0.68	< 1.0 ± 0.68	< 1.0 ± 0.68	< 1.0 ± 0.68
2,4,5-Trichlorophenol	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67
2,4,6-Trichlorophenol	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67
Plasticisers in SVOC Soil Samples by GC-MS					
Bis(2-ethylhexyl)phthalate	mg/kg dry wt	< 5 ± 3.4	< 5 ± 3.4	< 5 ± 3.4	< 5 ± 3.4
Butylbenzylphthalate	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67
Di(2-ethylhexyl)adipate	mg/kg dry wt	< 1.0 ± 5.1	< 1.0 ± 5.1	< 1.0 ± 5.1	< 1.0 ± 5.1
Diethylphthalate	mg/kg dry wt	< 1.0 ± 0.66	< 1.0 ± 0.66	< 1.0 ± 0.66	< 1.0 ± 0.66
Dimethylphthalate	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67
Di-n-butylphthalate	mg/kg dry wt	< 1.0 ± 0.68	< 1.0 ± 0.68	< 1.0 ± 0.68	< 1.0 ± 0.68
Di-n-octylphthalate	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67
Other Halogenated compounds in SVOC Soil Samples by GC-MS					
1,2-Dichlorobenzene	mg/kg dry wt	< 0.7 ± 0.36	< 0.7 ± 0.35	< 0.7 ± 0.36	< 0.7 ± 0.35
1,3-Dichlorobenzene	mg/kg dry wt	< 0.7 ± 0.36	< 0.7 ± 0.36	< 0.7 ± 0.36	< 0.7 ± 0.36
1,4-Dichlorobenzene	mg/kg dry wt	< 0.7 ± 0.35	< 0.7 ± 0.35	< 0.7 ± 0.35	< 0.7 ± 0.35
Hexachlorobutadiene	mg/kg dry wt	< 0.7 ± 0.36	< 0.7 ± 0.36	< 0.7 ± 0.36	< 0.7 ± 0.36
Hexachloroethane	mg/kg dry wt	< 0.7 ± 0.37	< 0.7 ± 0.37	< 0.7 ± 0.37	< 0.7 ± 0.36
1,2,4-Trichlorobenzene	mg/kg dry wt	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35
Other compounds in SVOC Soil Samples by GC-MS					
Benzyl alcohol	mg/kg dry wt	< 10 ± 6.7	< 10 ± 6.7	< 10 ± 6.7	< 10 ± 6.7
Carbazole	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Dibenzofuran	mg/kg dry wt	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33
Isophorone	mg/kg dry wt	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35
Total Petroleum Hydrocarbons in Soil					
C7 - C9	mg/kg dry wt	< 8 ± 5.4	< 8 ± 5.4	< 8 ± 5.4	< 8 ± 5.4
C10 - C14	mg/kg dry wt	< 20 ± 7.6	< 20 ± 7.6	< 20 ± 7.6	< 20 ± 7.6
C15 - C36	mg/kg dry wt	< 40 ± 9.3	< 40 ± 9.3	< 40 ± 9.3	< 40 ± 9.3
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 70 ± 14	< 70 ± 14	< 70 ± 14	< 70 ± 14

Sample Type: Soil					
	Sample Name:	TP5 0.2	TP5 1.0	TP6 0.2	TP6 1.5
	Lab Number:	1795426.9	1795426.10	1795426.11	1795426.12
Individual Tests					
Dry Matter	g/100g as rcvd	80.8 ± 5.0	75.2 ± 5.0	81.6 ± 5.0	80.9 ± 5.0
Heavy Metals with Mercury, Screen Level					
Total Recoverable Arsenic	mg/kg dry wt	3.6 ± 1.5	3.1 ± 1.4	4.3 ± 1.5	9.7 ± 2.0
Total Recoverable Cadmium	mg/kg dry wt	< 0.10 ± 0.067	< 0.10 ± 0.067	< 0.10 ± 0.067	1.59 ± 0.23
Total Recoverable Chromium	mg/kg dry wt	14.3 ± 2.6	18.1 ± 3.1	13.9 ± 2.6	22.8 ± 3.8
Total Recoverable Copper	mg/kg dry wt	10.0 ± 1.9	9.9 ± 1.9	10.3 ± 2.0	54.0 ± 7.5
Total Recoverable Lead	mg/kg dry wt	16.6 ± 2.5	20.6 ± 3.1	18.6 ± 2.8	243 ± 37
Total Recoverable Mercury	mg/kg dry wt	0.109 ± 0.068	< 0.10 ± 0.067	0.234 ± 0.075	0.284 ± 0.079
Total Recoverable Nickel	mg/kg dry wt	12.2 ± 2.1	13.9 ± 2.3	12.7 ± 2.1	18.8 ± 2.8
Total Recoverable Zinc	mg/kg dry wt	63.1 ± 5.2	71.7 ± 5.7	53.9 ± 4.7	545 ± 39
Haloethers in SVOC Soil Samples by GC-MS					
Bis(2-chloroethoxy) methane	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Bis(2-chloroethyl)ether	mg/kg dry wt	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35
Bis(2-chloroisopropyl)ether	mg/kg dry wt	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35
4-Bromophenyl phenyl ether	mg/kg dry wt	< 0.4 ± 0.21	< 0.4 ± 0.21	< 0.4 ± 0.21	< 0.4 ± 0.21
4-Chlorophenyl phenyl ether	mg/kg dry wt	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35
Nitrogen containing compounds in SVOC Soil Samples by GC-MS					
2,4-Dinitrotoluene	mg/kg dry wt	< 1.0 ± 0.68	< 1.0 ± 0.68	< 1.0 ± 0.68	< 1.0 ± 0.68
2,6-Dinitrotoluene	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67
Nitrobenzene	mg/kg dry wt	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33
N-Nitrosodi-n-propylamine	mg/kg dry wt	< 0.8 ± 0.36	< 0.8 ± 0.37	< 0.8 ± 0.36	< 0.8 ± 0.36
N-Nitrosodiphenylamine + Diphenylamine	mg/kg dry wt	< 0.8 ± 0.47	< 0.8 ± 0.50	< 0.8 ± 0.48	< 0.8 ± 0.49
Organochlorine Pesticides in SVOC Soil Samples by GC-MS					
Aldrin	mg/kg dry wt	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33
alpha-BHC	mg/kg dry wt	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33
beta-BHC	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
delta-BHC	mg/kg dry wt	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33
gamma-BHC (Lindane)	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
4,4'-DDD	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
4,4'-DDE	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
4,4'-DDT	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67
Dieldrin	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Endosulfan I	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67
Endosulfan II	mg/kg dry wt	< 2 ± 1.4	< 2 ± 1.4	< 2 ± 1.4	< 2 ± 1.4
Endosulfan sulphate	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67
Endrin	mg/kg dry wt	< 0.8 ± 0.42	< 0.8 ± 0.45	< 0.8 ± 0.43	< 0.8 ± 0.44
Endrin ketone	mg/kg dry wt	< 1.0 ± 0.68	< 1.0 ± 0.68	< 1.0 ± 0.68	< 1.0 ± 0.68
Heptachlor	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Heptachlor epoxide	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Hexachlorobenzene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Polycyclic Aromatic Hydrocarbons in SVOC Soil Samples by GC-MS					
Acenaphthene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Acenaphthylene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Anthracene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Benzo[a]anthracene	mg/kg dry wt	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Benzo[k]fluoranthene	mg/kg dry wt	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35
1&2-Chloronaphthalene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Chrysene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Fluoranthene	mg/kg dry wt	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33

Sample Type: Soil					
	Sample Name:	TP5 0.2	TP5 1.0	TP6 0.2	TP6 1.5
	Lab Number:	1795426.9	1795426.10	1795426.11	1795426.12
Polycyclic Aromatic Hydrocarbons in SVOC Soil Samples by GC-MS					
Fluorene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
2-Methylnaphthalene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Naphthalene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Phenanthrene	mg/kg dry wt	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33
Pyrene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Phenols in SVOC Soil Samples by GC-MS					
4-Chloro-3-methylphenol	mg/kg dry wt	< 5 ± 3.4	< 5 ± 3.4	< 5 ± 3.4	< 5 ± 3.4
2-Chlorophenol	mg/kg dry wt	< 1.0 ± 0.66	< 1.0 ± 0.66	< 1.0 ± 0.66	< 1.0 ± 0.66
2,4-Dichlorophenol	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67
2,4-Dimethylphenol	mg/kg dry wt	< 3 ± 1.2	< 3 ± 1.2	< 3 ± 1.2	< 3 ± 1.2
3 & 4-Methylphenol (m- + p-cresol)	mg/kg dry wt	< 3 ± 1.2	< 3 ± 1.2	< 3 ± 1.2	< 3 ± 1.2
2-Methylphenol (o-Cresol)	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67
2-Nitrophenol	mg/kg dry wt	< 5 ± 3.4	< 5 ± 3.4	< 5 ± 3.4	< 5 ± 3.4
Pentachlorophenol (PCP)	mg/kg dry wt	< 30 ± 68	< 30 ± 68	< 30 ± 68	< 30 ± 68
Phenol	mg/kg dry wt	< 1.0 ± 0.68	< 1.0 ± 0.68	< 1.0 ± 0.68	< 1.0 ± 0.68
2,4,5-Trichlorophenol	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67
2,4,6-Trichlorophenol	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67
Plasticisers in SVOC Soil Samples by GC-MS					
Bis(2-ethylhexyl)phthalate	mg/kg dry wt	< 5 ± 3.4	< 5 ± 3.4	< 5 ± 3.4	< 5 ± 3.4
Butylbenzylphthalate	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67
Di(2-ethylhexyl)adipate	mg/kg dry wt	< 1.0 ± 5.1	< 1.0 ± 5.1	< 1.0 ± 5.1	< 1.0 ± 5.1
Diethylphthalate	mg/kg dry wt	< 1.0 ± 0.66	< 1.0 ± 0.66	< 1.0 ± 0.66	< 1.0 ± 0.66
Dimethylphthalate	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67
Di-n-butylphthalate	mg/kg dry wt	< 1.0 ± 0.68	< 1.0 ± 0.68	< 1.0 ± 0.68	< 1.0 ± 0.68
Di-n-octylphthalate	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67
Other Halogenated compounds in SVOC Soil Samples by GC-MS					
1,2-Dichlorobenzene	mg/kg dry wt	< 0.8 ± 0.36	< 0.8 ± 0.37	< 0.8 ± 0.36	< 0.8 ± 0.36
1,3-Dichlorobenzene	mg/kg dry wt	< 0.8 ± 0.37	< 0.8 ± 0.37	< 0.8 ± 0.37	< 0.8 ± 0.37
1,4-Dichlorobenzene	mg/kg dry wt	< 0.8 ± 0.35	< 0.8 ± 0.36	< 0.8 ± 0.36	< 0.8 ± 0.36
Hexachlorobutadiene	mg/kg dry wt	< 0.8 ± 0.37	< 0.8 ± 0.37	< 0.8 ± 0.37	< 0.8 ± 0.37
Hexachloroethane	mg/kg dry wt	< 0.8 ± 0.38	< 0.8 ± 0.39	< 0.8 ± 0.39	< 0.8 ± 0.39
1,2,4-Trichlorobenzene	mg/kg dry wt	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35
Other compounds in SVOC Soil Samples by GC-MS					
Benzyl alcohol	mg/kg dry wt	< 10 ± 6.7	< 10 ± 6.7	< 10 ± 6.7	< 10 ± 6.7
Carbazole	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Dibenzofuran	mg/kg dry wt	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33
Isophorone	mg/kg dry wt	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35
Total Petroleum Hydrocarbons in Soil					
C7 - C9	mg/kg dry wt	< 8 ± 5.4	< 8 ± 5.4	< 8 ± 5.4	< 8 ± 5.4
C10 - C14	mg/kg dry wt	< 20 ± 7.6	< 20 ± 7.6	< 20 ± 7.6	< 20 ± 7.6
C15 - C36	mg/kg dry wt	< 40 ± 9.3	< 40 ± 9.3	< 40 ± 9.3	90 ± 11
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 70 ± 14	< 70 ± 14	< 70 ± 14	90 ± 14

	Sample Name:	TP6 2.5	TP7 0.2	TP8 0.2	TP8 1.0
	Lab Number:	1795426.13	1795426.14	1795426.15	1795426.16
Individual Tests					
Dry Matter	g/100g as rcvd	80.0 ± 5.0	82.0 ± 5.0	80.2 ± 5.0	95.2 ± 5.0
Heavy Metals with Mercury, Screen Level					
Total Recoverable Arsenic	mg/kg dry wt	3.7 ± 1.5	4.3 ± 1.5	4.4 ± 1.5	3.1 ± 1.4
Total Recoverable Cadmium	mg/kg dry wt	< 0.10 ± 0.067	< 0.10 ± 0.067	0.105 ± 0.067	< 0.10 ± 0.067
Total Recoverable Chromium	mg/kg dry wt	14.6 ± 2.7	14.9 ± 2.7	14.2 ± 2.6	14.2 ± 2.6
Total Recoverable Copper	mg/kg dry wt	9.5 ± 1.9	10.7 ± 2.0	11.0 ± 2.0	7.1 ± 1.7
Total Recoverable Lead	mg/kg dry wt	17.1 ± 2.6	22.6 ± 3.4	20.8 ± 3.2	11.2 ± 1.7

Sample Type: Soil					
	Sample Name:	TP6 2.5	TP7 0.2	TP8 0.2	TP8 1.0
	Lab Number:	1795426.13	1795426.14	1795426.15	1795426.16
Heavy Metals with Mercury, Screen Level					
Total Recoverable Mercury	mg/kg dry wt	< 0.10 ± 0.067	< 0.10 ± 0.067	0.142 ± 0.069	< 0.10 ± 0.067
Total Recoverable Nickel	mg/kg dry wt	13.0 ± 2.2	13.8 ± 2.2	13.2 ± 2.2	13.0 ± 2.2
Total Recoverable Zinc	mg/kg dry wt	62.3 ± 5.2	65.8 ± 5.4	60.2 ± 5.0	48.8 ± 4.4
Haloethers in SVOC Soil Samples by GC-MS					
Bis(2-chloroethoxy) methane	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Bis(2-chloroethyl)ether	mg/kg dry wt	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35
Bis(2-chloroisopropyl)ether	mg/kg dry wt	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35
4-Bromophenyl phenyl ether	mg/kg dry wt	< 0.4 ± 0.21	< 0.4 ± 0.21	< 0.4 ± 0.21	< 0.4 ± 0.20
4-Chlorophenyl phenyl ether	mg/kg dry wt	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35
Nitrogen containing compounds in SVOC Soil Samples by GC-MS					
2,4-Dinitrotoluene	mg/kg dry wt	< 1.0 ± 0.68	< 1.0 ± 0.68	< 1.0 ± 0.68	< 1.0 ± 0.68
2,6-Dinitrotoluene	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67
Nitrobenzene	mg/kg dry wt	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33
N-Nitrosodi-n-propylamine	mg/kg dry wt	< 0.8 ± 0.36	< 0.7 ± 0.36	< 0.8 ± 0.36	< 0.7 ± 0.35
N-Nitrosodiphenylamine + Diphenylamine	mg/kg dry wt	< 0.8 ± 0.49	< 0.7 ± 0.46	< 0.8 ± 0.48	< 0.7 ± 0.40
Organochlorine Pesticides in SVOC Soil Samples by GC-MS					
Aldrin	mg/kg dry wt	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33
alpha-BHC	mg/kg dry wt	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33
beta-BHC	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
delta-BHC	mg/kg dry wt	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33
gamma-BHC (Lindane)	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
4,4'-DDD	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
4,4'-DDE	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
4,4'-DDT	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67
Dieldrin	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Endosulfan I	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67
Endosulfan II	mg/kg dry wt	< 2 ± 1.4	< 2 ± 1.4	< 2 ± 1.4	< 2 ± 1.4
Endosulfan sulphate	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67
Endrin	mg/kg dry wt	< 0.8 ± 0.44	< 0.7 ± 0.42	< 0.8 ± 0.43	< 0.7 ± 0.38
Endrin ketone	mg/kg dry wt	< 1.0 ± 0.68	< 1.0 ± 0.68	< 1.0 ± 0.68	< 1.0 ± 0.68
Heptachlor	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Heptachlor epoxide	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Hexachlorobenzene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Polycyclic Aromatic Hydrocarbons in SVOC Soil Samples by GC-MS					
Acenaphthene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Acenaphthylene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Anthracene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Benzo[a]anthracene	mg/kg dry wt	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Benzo[k]fluoranthene	mg/kg dry wt	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35
1&2-Chloronaphthalene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Chrysene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Fluoranthene	mg/kg dry wt	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33
Fluorene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
2-Methylnaphthalene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Naphthalene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Phenanthrene	mg/kg dry wt	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33
Pyrene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34

Sample Type: Soil					
	Sample Name:	TP6 2.5	TP7 0.2	TP8 0.2	TP8 1.0
	Lab Number:	1795426.13	1795426.14	1795426.15	1795426.16
Phenols in SVOC Soil Samples by GC-MS					
4-Chloro-3-methylphenol	mg/kg dry wt	< 5 ± 3.4	< 5 ± 3.4	< 5 ± 3.4	< 5 ± 3.4
2-Chlorophenol	mg/kg dry wt	< 1.0 ± 0.66	< 1.0 ± 0.66	< 1.0 ± 0.66	< 1.0 ± 0.66
2,4-Dichlorophenol	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67
2,4-Dimethylphenol	mg/kg dry wt	< 3 ± 1.2	< 3 ± 1.2	< 3 ± 1.2	< 3 ± 1.2
3 & 4-Methylphenol (m- + p-cresol)	mg/kg dry wt	< 3 ± 1.2	< 3 ± 1.2	< 3 ± 1.2	< 3 ± 1.2
2-Methylphenol (o-Cresol)	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67
2-Nitrophenol	mg/kg dry wt	< 5 ± 3.4	< 5 ± 3.4	< 5 ± 3.4	< 5 ± 3.4
Pentachlorophenol (PCP)	mg/kg dry wt	< 30 ± 68	< 30 ± 68	< 30 ± 68	< 30 ± 68
Phenol	mg/kg dry wt	< 1.0 ± 0.68	< 1.0 ± 0.68	< 1.0 ± 0.68	< 1.0 ± 0.68
2,4,5-Trichlorophenol	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67
2,4,6-Trichlorophenol	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67
Plasticisers in SVOC Soil Samples by GC-MS					
Bis(2-ethylhexyl)phthalate	mg/kg dry wt	< 5 ± 3.4	< 5 ± 3.4	< 5 ± 3.4	< 5 ± 3.4
Butylbenzylphthalate	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67
Di(2-ethylhexyl)adipate	mg/kg dry wt	< 1.0 ± 5.1	< 1.0 ± 5.1	< 1.0 ± 5.1	< 1.0 ± 5.1
Diethylphthalate	mg/kg dry wt	< 1.0 ± 0.66	< 1.0 ± 0.66	< 1.0 ± 0.66	< 1.0 ± 0.66
Dimethylphthalate	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67
Di-n-butylphthalate	mg/kg dry wt	< 1.0 ± 0.68	< 1.0 ± 0.68	< 1.0 ± 0.68	< 1.0 ± 0.68
Di-n-octylphthalate	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67
Other Halogenated compounds in SVOC Soil Samples by GC-MS					
1,2-Dichlorobenzene	mg/kg dry wt	< 0.8 ± 0.36	< 0.7 ± 0.36	< 0.8 ± 0.36	< 0.7 ± 0.35
1,3-Dichlorobenzene	mg/kg dry wt	< 0.8 ± 0.37	< 0.7 ± 0.37	< 0.8 ± 0.37	< 0.7 ± 0.36
1,4-Dichlorobenzene	mg/kg dry wt	< 0.8 ± 0.36	< 0.7 ± 0.35	< 0.8 ± 0.36	< 0.7 ± 0.35
Hexachlorobutadiene	mg/kg dry wt	< 0.8 ± 0.37	< 0.7 ± 0.37	< 0.8 ± 0.37	< 0.7 ± 0.36
Hexachloroethane	mg/kg dry wt	< 0.8 ± 0.39	< 0.7 ± 0.38	< 0.8 ± 0.38	< 0.7 ± 0.36
1,2,4-Trichlorobenzene	mg/kg dry wt	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35
Other compounds in SVOC Soil Samples by GC-MS					
Benzyl alcohol	mg/kg dry wt	< 10 ± 6.7	< 10 ± 6.7	< 10 ± 6.7	< 10 ± 6.7
Carbazole	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Dibenzofuran	mg/kg dry wt	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33
Isophorone	mg/kg dry wt	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35
Total Petroleum Hydrocarbons in Soil					
C7 - C9	mg/kg dry wt	< 8 ± 5.4	< 8 ± 5.4	< 8 ± 5.4	< 8 ± 5.4
C10 - C14	mg/kg dry wt	< 20 ± 7.6	< 20 ± 7.6	< 20 ± 7.6	< 20 ± 7.6
C15 - C36	mg/kg dry wt	< 40 ± 9.3	70.3 ± 9.8	< 40 ± 9.3	< 40 ± 9.3
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 70 ± 14	70 ± 14	< 70 ± 14	< 70 ± 14

	Sample Name:	TP9 0.2	TP9 1.0	TP10 0.2 20-Jun-2017	TP10 1.0
	Lab Number:	1795426.17	1795426.18	1795426.19	1795426.20
Individual Tests					
Dry Matter	g/100g as rcvd	79.9 ± 5.0	94.4 ± 5.0	76.5 ± 5.0	94.6 ± 5.0
Heavy Metals with Mercury, Screen Level					
Total Recoverable Arsenic	mg/kg dry wt	5.1 ± 1.6	3.3 ± 1.4	4.7 ± 1.5	2.9 ± 1.4
Total Recoverable Cadmium	mg/kg dry wt	0.131 ± 0.068	< 0.10 ± 0.067	< 0.10 ± 0.067	< 0.10 ± 0.067
Total Recoverable Chromium	mg/kg dry wt	16.4 ± 2.9	15.0 ± 2.7	13.8 ± 2.5	12.6 ± 2.4
Total Recoverable Copper	mg/kg dry wt	14.1 ± 2.4	8.3 ± 1.8	10.4 ± 2.0	7.8 ± 1.7
Total Recoverable Lead	mg/kg dry wt	31.2 ± 4.7	12.3 ± 1.9	26.6 ± 4.0	11.7 ± 1.8
Total Recoverable Mercury	mg/kg dry wt	0.184 ± 0.071	< 0.10 ± 0.067	0.104 ± 0.067	< 0.10 ± 0.067
Total Recoverable Nickel	mg/kg dry wt	13.3 ± 2.2	14.7 ± 2.3	12.3 ± 2.1	11.7 ± 2.0
Total Recoverable Zinc	mg/kg dry wt	78.5 ± 6.2	52.8 ± 4.6	66.9 ± 5.4	46.6 ± 4.3
Haloethers in SVOC Soil Samples by GC-MS					
Bis(2-chloroethoxy) methane	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Bis(2-chloroethyl)ether	mg/kg dry wt	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35
Bis(2-chloroisopropyl)ether	mg/kg dry wt	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35

Sample Type: Soil					
Sample Name:		TP9 0.2	TP9 1.0	TP10 0.2 20-Jun-2017	TP10 1.0
Lab Number:		1795426.17	1795426.18	1795426.19	1795426.20
Haloethers in SVOC Soil Samples by GC-MS					
4-Bromophenyl phenyl ether	mg/kg dry wt	< 0.4 ± 0.21	< 0.4 ± 0.20	< 0.4 ± 0.21	< 0.4 ± 0.20
4-Chlorophenyl phenyl ether	mg/kg dry wt	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35
Nitrogen containing compounds in SVOC Soil Samples by GC-MS					
2,4-Dinitrotoluene	mg/kg dry wt	< 1.0 ± 0.68	< 1.0 ± 0.68	< 1.0 ± 0.68	< 1.0 ± 0.68
2,6-Dinitrotoluene	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67
Nitrobenzene	mg/kg dry wt	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33
N-Nitrosodi-n-propylamine	mg/kg dry wt	< 0.8 ± 0.36	< 0.7 ± 0.35	< 0.8 ± 0.37	< 0.7 ± 0.35
N-Nitrosodiphenylamine + Diphenylamine	mg/kg dry wt	< 0.8 ± 0.49	< 0.7 ± 0.41	< 0.8 ± 0.50	< 0.7 ± 0.41
Organochlorine Pesticides in SVOC Soil Samples by GC-MS					
Aldrin	mg/kg dry wt	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33
alpha-BHC	mg/kg dry wt	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33
beta-BHC	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
delta-BHC	mg/kg dry wt	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33
gamma-BHC (Lindane)	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
4,4'-DDD	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
4,4'-DDE	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
4,4'-DDT	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67
Dieldrin	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Endosulfan I	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67
Endosulfan II	mg/kg dry wt	< 2 ± 1.4	< 2 ± 1.4	< 2 ± 1.4	< 2 ± 1.4
Endosulfan sulphate	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67
Endrin	mg/kg dry wt	< 0.8 ± 0.44	< 0.7 ± 0.38	< 0.8 ± 0.45	< 0.7 ± 0.38
Endrin ketone	mg/kg dry wt	< 1.0 ± 0.68	< 1.0 ± 0.68	< 1.0 ± 0.68	< 1.0 ± 0.68
Heptachlor	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Heptachlor epoxide	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Hexachlorobenzene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Polycyclic Aromatic Hydrocarbons in SVOC Soil Samples by GC-MS					
Acenaphthene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Acenaphthylene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Anthracene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Benzo[a]anthracene	mg/kg dry wt	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Benzo[k]fluoranthene	mg/kg dry wt	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35
1&2-Chloronaphthalene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Chrysene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Fluoranthene	mg/kg dry wt	< 0.5 ± 0.33	< 0.5 ± 0.33	0.55 ± 0.34	< 0.5 ± 0.33
Fluorene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
2-Methylnaphthalene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Naphthalene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Phenanthrene	mg/kg dry wt	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33
Pyrene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	0.53 ± 0.35	< 0.5 ± 0.34
Phenols in SVOC Soil Samples by GC-MS					
4-Chloro-3-methylphenol	mg/kg dry wt	< 5 ± 3.4	< 5 ± 3.4	< 5 ± 3.4	< 5 ± 3.4
2-Chlorophenol	mg/kg dry wt	< 1.0 ± 0.66	< 1.0 ± 0.66	< 1.0 ± 0.66	< 1.0 ± 0.66
2,4-Dichlorophenol	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67
2,4-Dimethylphenol	mg/kg dry wt	< 3 ± 1.2	< 3 ± 1.2	< 3 ± 1.2	< 3 ± 1.2
3 & 4-Methylphenol (m- + p-cresol)	mg/kg dry wt	< 3 ± 1.2	< 3 ± 1.2	< 3 ± 1.2	< 3 ± 1.2
2-Methylphenol (o-Cresol)	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67
2-Nitrophenol	mg/kg dry wt	< 5 ± 3.4	< 5 ± 3.4	< 5 ± 3.4	< 5 ± 3.4

Sample Type: Soil					
	Sample Name:	TP9 0.2	TP9 1.0	TP10 0.2 20-Jun-2017	TP10 1.0
	Lab Number:	1795426.17	1795426.18	1795426.19	1795426.20
Phenols in SVOC Soil Samples by GC-MS					
Pentachlorophenol (PCP)	mg/kg dry wt	< 30 ± 68	< 30 ± 68	< 30 ± 68	< 30 ± 68
Phenol	mg/kg dry wt	< 1.0 ± 0.68	< 1.0 ± 0.68	< 1.0 ± 0.68	< 1.0 ± 0.68
2,4,5-Trichlorophenol	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67
2,4,6-Trichlorophenol	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67
Plasticisers in SVOC Soil Samples by GC-MS					
Bis(2-ethylhexyl)phthalate	mg/kg dry wt	< 5 ± 3.4	< 5 ± 3.4	< 5 ± 3.4	< 5 ± 3.4
Butylbenzylphthalate	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67
Di(2-ethylhexyl)adipate	mg/kg dry wt	< 1.0 ± 5.1	< 1.0 ± 5.1	< 1.0 ± 5.1	< 1.0 ± 5.1
Diethylphthalate	mg/kg dry wt	< 1.0 ± 0.66	< 1.0 ± 0.66	< 1.0 ± 0.66	< 1.0 ± 0.66
Dimethylphthalate	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67
Di-n-butylphthalate	mg/kg dry wt	< 1.0 ± 0.68	< 1.0 ± 0.68	< 1.0 ± 0.68	< 1.0 ± 0.68
Di-n-octylphthalate	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67
Other Halogenated compounds in SVOC Soil Samples by GC-MS					
1,2-Dichlorobenzene	mg/kg dry wt	< 0.8 ± 0.36	< 0.7 ± 0.35	< 0.8 ± 0.37	< 0.7 ± 0.35
1,3-Dichlorobenzene	mg/kg dry wt	< 0.8 ± 0.37	< 0.7 ± 0.36	< 0.8 ± 0.37	< 0.7 ± 0.36
1,4-Dichlorobenzene	mg/kg dry wt	< 0.8 ± 0.36	< 0.7 ± 0.35	< 0.8 ± 0.36	< 0.7 ± 0.35
Hexachlorobutadiene	mg/kg dry wt	< 0.8 ± 0.37	< 0.7 ± 0.36	< 0.8 ± 0.37	< 0.7 ± 0.36
Hexachloroethane	mg/kg dry wt	< 0.8 ± 0.39	< 0.7 ± 0.36	< 0.8 ± 0.39	< 0.7 ± 0.36
1,2,4-Trichlorobenzene	mg/kg dry wt	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35
Other compounds in SVOC Soil Samples by GC-MS					
Benzyl alcohol	mg/kg dry wt	< 10 ± 6.7	< 10 ± 6.7	< 10 ± 6.7	< 10 ± 6.7
Carbazole	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Dibenzofuran	mg/kg dry wt	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33
Isophorone	mg/kg dry wt	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35
Total Petroleum Hydrocarbons in Soil					
C7 - C9	mg/kg dry wt	< 8 ± 5.4	< 8 ± 5.4	< 8 ± 5.4	< 8 ± 5.4
C10 - C14	mg/kg dry wt	< 20 ± 7.6	< 20 ± 7.6	< 20 ± 7.6	< 20 ± 7.6
C15 - C36	mg/kg dry wt	102 ± 12	< 40 ± 9.3	83 ± 11	< 40 ± 9.3
Total hydrocarbons (C7 - C36)	mg/kg dry wt	102 ± 15	< 70 ± 14	83 ± 14	< 70 ± 14

	Sample Name:	TP11 0.2	TP11 1.0 20-Jun-2017	TP12 0.2	TP12 1.0
	Lab Number:	1795426.21	1795426.22	1795426.23	1795426.24
Individual Tests					
Dry Matter	g/100g as rcvd	74.3 ± 5.0	89.0 ± 5.0	90.4 ± 5.0	79.0 ± 5.0
Heavy Metals with Mercury, Screen Level					
Total Recoverable Arsenic	mg/kg dry wt	4.2 ± 1.5	< 2 ± 1.4	3.3 ± 1.4	6.7 ± 1.7
Total Recoverable Cadmium	mg/kg dry wt	0.108 ± 0.067	< 0.10 ± 0.067	< 0.10 ± 0.067	0.114 ± 0.068
Total Recoverable Chromium	mg/kg dry wt	14.3 ± 2.6	3.6 ± 1.5	6.2 ± 1.7	15.8 ± 2.8
Total Recoverable Copper	mg/kg dry wt	10.6 ± 2.0	3.1 ± 1.4	5.9 ± 1.6	15.2 ± 2.5
Total Recoverable Lead	mg/kg dry wt	17.8 ± 2.7	3.18 ± 0.55	3.42 ± 0.58	87 ± 13
Total Recoverable Mercury	mg/kg dry wt	0.115 ± 0.068	< 0.10 ± 0.067	< 0.10 ± 0.067	0.124 ± 0.068
Total Recoverable Nickel	mg/kg dry wt	12.7 ± 2.1	2.1 ± 1.4	5.9 ± 1.6	14.1 ± 2.3
Total Recoverable Zinc	mg/kg dry wt	57.4 ± 4.9	17.5 ± 3.0	22.0 ± 3.1	105.7 ± 7.9
Haloethers in SVOC Soil Samples by GC-MS					
Bis(2-chloroethoxy) methane	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Bis(2-chloroethyl)ether	mg/kg dry wt	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35
Bis(2-chloroisopropyl)ether	mg/kg dry wt	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35
4-Bromophenyl phenyl ether	mg/kg dry wt	< 0.4 ± 0.21	< 0.4 ± 0.21	< 0.4 ± 0.20	< 0.4 ± 0.21
4-Chlorophenyl phenyl ether	mg/kg dry wt	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35
Nitrogen containing compounds in SVOC Soil Samples by GC-MS					
2,4-Dinitrotoluene	mg/kg dry wt	< 1.0 ± 0.68	< 1.0 ± 0.68	< 1.0 ± 0.68	< 1.0 ± 0.68
2,6-Dinitrotoluene	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67
Nitrobenzene	mg/kg dry wt	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33
N-Nitrosodi-n-propylamine	mg/kg dry wt	< 0.8 ± 0.37	< 0.7 ± 0.36	< 0.7 ± 0.36	< 0.8 ± 0.36

Sample Type: Soil					
Sample Name:		TP11 0.2	TP11 1.0 20-Jun-2017	TP12 0.2	TP12 1.0
Lab Number:		1795426.21	1795426.22	1795426.23	1795426.24
Nitrogen containing compounds in SVOC Soil Samples by GC-MS					
N-Nitrosodiphenylamine + Diphenylamine	mg/kg dry wt	< 0.8 ± 0.52	< 0.7 ± 0.45	< 0.7 ± 0.44	< 0.8 ± 0.49
Organochlorine Pesticides in SVOC Soil Samples by GC-MS					
Aldrin	mg/kg dry wt	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33
alpha-BHC	mg/kg dry wt	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33
beta-BHC	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
delta-BHC	mg/kg dry wt	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33
gamma-BHC (Lindane)	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
4,4'-DDD	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
4,4'-DDE	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
4,4'-DDT	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67
Dieldrin	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Endosulfan I	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67
Endosulfan II	mg/kg dry wt	< 2 ± 1.4	< 2 ± 1.4	< 2 ± 1.4	< 2 ± 1.4
Endosulfan sulphate	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67
Endrin	mg/kg dry wt	< 0.8 ± 0.46	< 0.7 ± 0.41	< 0.7 ± 0.40	< 0.8 ± 0.44
Endrin ketone	mg/kg dry wt	< 1.0 ± 0.68	< 1.0 ± 0.68	< 1.0 ± 0.68	< 1.0 ± 0.68
Heptachlor	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Heptachlor epoxide	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Hexachlorobenzene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Polycyclic Aromatic Hydrocarbons in SVOC Soil Samples by GC-MS					
Acenaphthene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Acenaphthylene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Anthracene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Benzo[a]anthracene	mg/kg dry wt	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Benzo[k]fluoranthene	mg/kg dry wt	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35
1&2-Chloronaphthalene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Chrysene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Fluoranthene	mg/kg dry wt	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33
Fluorene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
2-Methylnaphthalene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Naphthalene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Phenanthrene	mg/kg dry wt	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33
Pyrene	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Phenols in SVOC Soil Samples by GC-MS					
4-Chloro-3-methylphenol	mg/kg dry wt	< 5 ± 3.4	< 5 ± 3.4	< 5 ± 3.4	< 5 ± 3.4
2-Chlorophenol	mg/kg dry wt	< 1.0 ± 0.66	< 1.0 ± 0.66	< 1.0 ± 0.66	< 1.0 ± 0.66
2,4-Dichlorophenol	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67
2,4-Dimethylphenol	mg/kg dry wt	< 3 ± 1.2	< 3 ± 1.2	< 3 ± 1.2	< 3 ± 1.2
3 & 4-Methylphenol (m- + p-cresol)	mg/kg dry wt	< 3 ± 1.2	< 3 ± 1.2	< 3 ± 1.2	< 3 ± 1.2
2-Methylphenol (o-Cresol)	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67
2-Nitrophenol	mg/kg dry wt	< 5 ± 3.4	< 5 ± 3.4	< 5 ± 3.4	< 5 ± 3.4
Pentachlorophenol (PCP)	mg/kg dry wt	< 30 ± 68	< 30 ± 68	< 30 ± 68	< 30 ± 68
Phenol	mg/kg dry wt	< 1.0 ± 0.68	< 1.0 ± 0.68	< 1.0 ± 0.68	< 1.0 ± 0.68
2,4,5-Trichlorophenol	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67
2,4,6-Trichlorophenol	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67
Plasticisers in SVOC Soil Samples by GC-MS					
Bis(2-ethylhexyl)phthalate	mg/kg dry wt	< 5 ± 3.4	< 5 ± 3.4	< 5 ± 3.4	< 5 ± 3.4
Butylbenzylphthalate	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67

Sample Type: Soil					
Sample Name:		TP11 0.2	TP11 1.0 20-Jun-2017	TP12 0.2	TP12 1.0
Lab Number:		1795426.21	1795426.22	1795426.23	1795426.24
Plasticisers in SVOC Soil Samples by GC-MS					
Di(2-ethylhexyl)adipate	mg/kg dry wt	< 1.0 ± 5.1	< 1.0 ± 5.1	< 1.0 ± 5.1	< 1.0 ± 5.1
Diethylphthalate	mg/kg dry wt	< 1.0 ± 0.66	< 1.0 ± 0.66	< 1.0 ± 0.66	< 1.0 ± 0.66
Dimethylphthalate	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67
Di-n-butylphthalate	mg/kg dry wt	< 1.0 ± 0.68	< 1.0 ± 0.68	< 1.0 ± 0.68	< 1.0 ± 0.68
Di-n-octylphthalate	mg/kg dry wt	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67	< 1.0 ± 0.67
Other Halogenated compounds in SVOC Soil Samples by GC-MS					
1,2-Dichlorobenzene	mg/kg dry wt	< 0.8 ± 0.37	< 0.7 ± 0.36	< 0.7 ± 0.36	< 0.8 ± 0.36
1,3-Dichlorobenzene	mg/kg dry wt	< 0.8 ± 0.38	< 0.7 ± 0.36	< 0.7 ± 0.36	< 0.8 ± 0.37
1,4-Dichlorobenzene	mg/kg dry wt	< 0.8 ± 0.36	< 0.7 ± 0.35	< 0.7 ± 0.35	< 0.8 ± 0.36
Hexachlorobutadiene	mg/kg dry wt	< 0.8 ± 0.38	< 0.7 ± 0.36	< 0.7 ± 0.36	< 0.8 ± 0.37
Hexachloroethane	mg/kg dry wt	< 0.8 ± 0.40	< 0.7 ± 0.37	< 0.7 ± 0.37	< 0.8 ± 0.39
1,2,4-Trichlorobenzene	mg/kg dry wt	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35
Other compounds in SVOC Soil Samples by GC-MS					
Benzyl alcohol	mg/kg dry wt	< 10 ± 6.7	< 10 ± 6.7	< 10 ± 6.7	< 10 ± 6.7
Carbazole	mg/kg dry wt	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34	< 0.5 ± 0.34
Dibenzofuran	mg/kg dry wt	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33	< 0.5 ± 0.33
Isophorone	mg/kg dry wt	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35	< 0.5 ± 0.35
Total Petroleum Hydrocarbons in Soil					
C7 - C9	mg/kg dry wt	< 9 ± 5.4	< 8 ± 5.4	< 8 ± 5.4	< 8 ± 5.4
C10 - C14	mg/kg dry wt	< 20 ± 7.6	< 20 ± 7.6	< 20 ± 7.6	< 20 ± 7.6
C15 - C36	mg/kg dry wt	68 ± 11	< 40 ± 9.3	< 40 ± 9.3	< 40 ± 9.3
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 70 ± 14	< 70 ± 14	< 70 ± 14	< 70 ± 14

Sample Name:		Unlabeled sample			
Lab Number:		1795426.25			
Individual Tests					
Dry Matter	g/100g as rcvd	92.4 ± 5.0	-	-	-
Heavy Metals with Mercury, Screen Level					
Total Recoverable Arsenic	mg/kg dry wt	2.5 ± 1.4	-	-	-
Total Recoverable Cadmium	mg/kg dry wt	< 0.10 ± 0.067	-	-	-
Total Recoverable Chromium	mg/kg dry wt	15.5 ± 2.8	-	-	-
Total Recoverable Copper	mg/kg dry wt	7.1 ± 1.7	-	-	-
Total Recoverable Lead	mg/kg dry wt	14.0 ± 2.2	-	-	-
Total Recoverable Mercury	mg/kg dry wt	< 0.10 ± 0.067	-	-	-
Total Recoverable Nickel	mg/kg dry wt	14.0 ± 2.3	-	-	-
Total Recoverable Zinc	mg/kg dry wt	50.2 ± 4.5	-	-	-
Haloethers in SVOC Soil Samples by GC-MS					
Bis(2-chloroethoxy) methane	mg/kg dry wt	< 0.5 ± 0.34	-	-	-
Bis(2-chloroethyl)ether	mg/kg dry wt	< 0.5 ± 0.35	-	-	-
Bis(2-chloroisopropyl)ether	mg/kg dry wt	< 0.5 ± 0.35	-	-	-
4-Bromophenyl phenyl ether	mg/kg dry wt	< 0.4 ± 0.20	-	-	-
4-Chlorophenyl phenyl ether	mg/kg dry wt	< 0.5 ± 0.35	-	-	-
Nitrogen containing compounds in SVOC Soil Samples by GC-MS					
2,4-Dinitrotoluene	mg/kg dry wt	< 1.0 ± 0.68	-	-	-
2,6-Dinitrotoluene	mg/kg dry wt	< 1.0 ± 0.67	-	-	-
Nitrobenzene	mg/kg dry wt	< 0.5 ± 0.33	-	-	-
N-Nitrosodi-n-propylamine	mg/kg dry wt	< 0.7 ± 0.35	-	-	-
N-Nitrosodiphenylamine + Diphenylamine	mg/kg dry wt	< 0.7 ± 0.42	-	-	-
Organochlorine Pesticides in SVOC Soil Samples by GC-MS					
Aldrin	mg/kg dry wt	< 0.5 ± 0.33	-	-	-
alpha-BHC	mg/kg dry wt	< 0.5 ± 0.33	-	-	-
beta-BHC	mg/kg dry wt	< 0.5 ± 0.34	-	-	-
delta-BHC	mg/kg dry wt	< 0.5 ± 0.33	-	-	-
gamma-BHC (Lindane)	mg/kg dry wt	< 0.5 ± 0.34	-	-	-

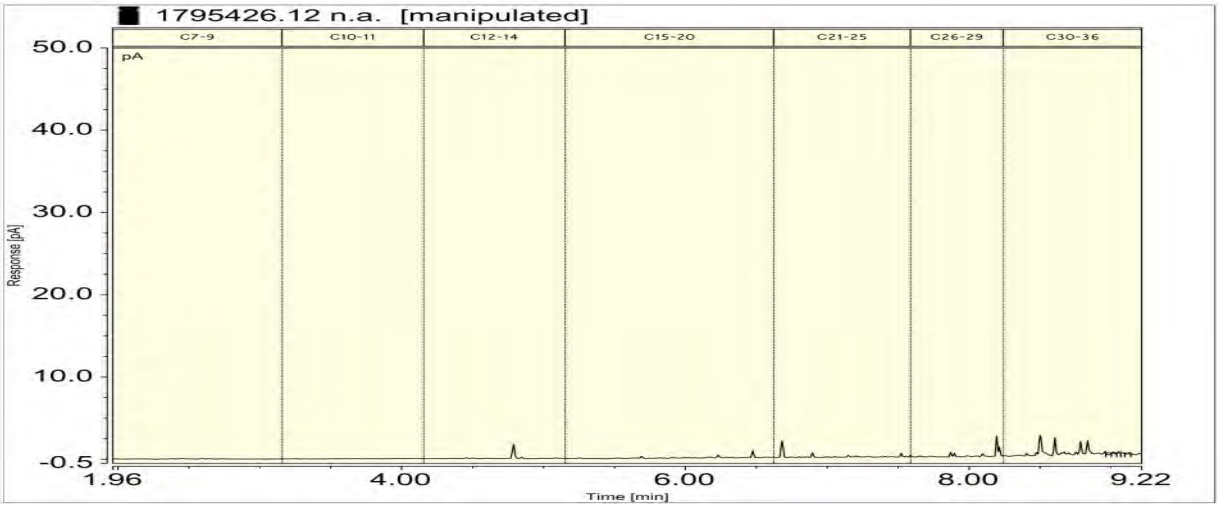
Sample Type: Soil					
	Sample Name:	Unlabeled sample			
	Lab Number:	1795426.25			
Organochlorine Pesticides in SVOC Soil Samples by GC-MS					
4,4'-DDD	mg/kg dry wt	< 0.5 ± 0.34	-	-	-
4,4'-DDE	mg/kg dry wt	< 0.5 ± 0.34	-	-	-
4,4'-DDT	mg/kg dry wt	< 1.0 ± 0.67	-	-	-
Dieldrin	mg/kg dry wt	< 0.5 ± 0.34	-	-	-
Endosulfan I	mg/kg dry wt	< 1.0 ± 0.67	-	-	-
Endosulfan II	mg/kg dry wt	< 2 ± 1.4	-	-	-
Endosulfan sulphate	mg/kg dry wt	< 1.0 ± 0.67	-	-	-
Endrin	mg/kg dry wt	< 0.7 ± 0.39	-	-	-
Endrin ketone	mg/kg dry wt	< 1.0 ± 0.68	-	-	-
Heptachlor	mg/kg dry wt	< 0.5 ± 0.34	-	-	-
Heptachlor epoxide	mg/kg dry wt	< 0.5 ± 0.34	-	-	-
Hexachlorobenzene	mg/kg dry wt	< 0.5 ± 0.34	-	-	-
Polycyclic Aromatic Hydrocarbons in SVOC Soil Samples by GC-MS					
Acenaphthene	mg/kg dry wt	< 0.5 ± 0.34	-	-	-
Acenaphthylene	mg/kg dry wt	< 0.5 ± 0.34	-	-	-
Anthracene	mg/kg dry wt	< 0.5 ± 0.34	-	-	-
Benzo[a]anthracene	mg/kg dry wt	< 0.5 ± 0.33	-	-	-
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.5 ± 0.34	-	-	-
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.5 ± 0.33	-	-	-
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.5 ± 0.34	-	-	-
Benzo[k]fluoranthene	mg/kg dry wt	< 0.5 ± 0.35	-	-	-
1&2-Chloronaphthalene	mg/kg dry wt	< 0.5 ± 0.34	-	-	-
Chrysene	mg/kg dry wt	< 0.5 ± 0.34	-	-	-
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.5 ± 0.34	-	-	-
Fluoranthene	mg/kg dry wt	< 0.5 ± 0.33	-	-	-
Fluorene	mg/kg dry wt	< 0.5 ± 0.34	-	-	-
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.5 ± 0.34	-	-	-
2-Methylnaphthalene	mg/kg dry wt	< 0.5 ± 0.34	-	-	-
Naphthalene	mg/kg dry wt	< 0.5 ± 0.34	-	-	-
Phenanthrene	mg/kg dry wt	< 0.5 ± 0.33	-	-	-
Pyrene	mg/kg dry wt	< 0.5 ± 0.34	-	-	-
Phenols in SVOC Soil Samples by GC-MS					
4-Chloro-3-methylphenol	mg/kg dry wt	< 5 ± 3.4	-	-	-
2-Chlorophenol	mg/kg dry wt	< 1.0 ± 0.66	-	-	-
2,4-Dichlorophenol	mg/kg dry wt	< 1.0 ± 0.67	-	-	-
2,4-Dimethylphenol	mg/kg dry wt	< 3 ± 1.2	-	-	-
3 & 4-Methylphenol (m- + p-cresol)	mg/kg dry wt	< 3 ± 1.2	-	-	-
2-Methylphenol (o-Cresol)	mg/kg dry wt	< 1.0 ± 0.67	-	-	-
2-Nitrophenol	mg/kg dry wt	< 5 ± 3.4	-	-	-
Pentachlorophenol (PCP)	mg/kg dry wt	< 30 ± 68	-	-	-
Phenol	mg/kg dry wt	< 1.0 ± 0.68	-	-	-
2,4,5-Trichlorophenol	mg/kg dry wt	< 1.0 ± 0.67	-	-	-
2,4,6-Trichlorophenol	mg/kg dry wt	< 1.0 ± 0.67	-	-	-
Plasticisers in SVOC Soil Samples by GC-MS					
Bis(2-ethylhexyl)phthalate	mg/kg dry wt	< 5 ± 3.4	-	-	-
Butylbenzylphthalate	mg/kg dry wt	< 1.0 ± 0.67	-	-	-
Di(2-ethylhexyl)adipate	mg/kg dry wt	< 1.0 ± 5.1	-	-	-
Diethylphthalate	mg/kg dry wt	< 1.0 ± 0.66	-	-	-
Dimethylphthalate	mg/kg dry wt	< 1.0 ± 0.67	-	-	-
Di-n-butylphthalate	mg/kg dry wt	< 1.0 ± 0.68	-	-	-
Di-n-octylphthalate	mg/kg dry wt	< 1.0 ± 0.67	-	-	-
Other Halogenated compounds in SVOC Soil Samples by GC-MS					
1,2-Dichlorobenzene	mg/kg dry wt	< 0.7 ± 0.35	-	-	-
1,3-Dichlorobenzene	mg/kg dry wt	< 0.7 ± 0.36	-	-	-

Sample Type: Soil					
Sample Name:		Unlabeled sample			
Lab Number:		1795426.25			
Other Halogenated compounds in SVOC Soil Samples by GC-MS					
1,4-Dichlorobenzene	mg/kg dry wt	< 0.7 ± 0.35	-	-	-
Hexachlorobutadiene	mg/kg dry wt	< 0.7 ± 0.36	-	-	-
Hexachloroethane	mg/kg dry wt	< 0.7 ± 0.37	-	-	-
1,2,4-Trichlorobenzene	mg/kg dry wt	< 0.5 ± 0.35	-	-	-
Other compounds in SVOC Soil Samples by GC-MS					
Benzyl alcohol	mg/kg dry wt	< 10 ± 6.7	-	-	-
Carbazole	mg/kg dry wt	< 0.5 ± 0.34	-	-	-
Dibenzofuran	mg/kg dry wt	< 0.5 ± 0.33	-	-	-
Isophorone	mg/kg dry wt	< 0.5 ± 0.35	-	-	-
Total Petroleum Hydrocarbons in Soil					
C7 - C9	mg/kg dry wt	< 8 ± 5.4	-	-	-
C10 - C14	mg/kg dry wt	< 20 ± 7.6	-	-	-
C15 - C36	mg/kg dry wt	< 40 ± 9.3	-	-	-
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 70 ± 14	-	-	-

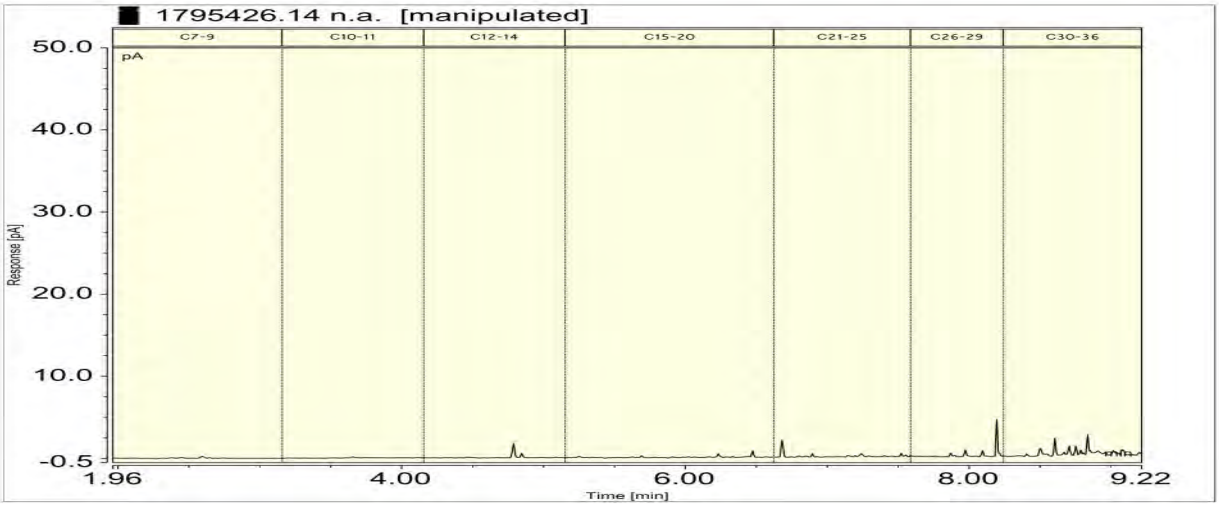
The reported uncertainty is an expanded uncertainty with a level of confidence of approximately 95 percent (i.e. two standard deviations, calculated using a coverage factor of 2). Reported uncertainties are calculated from the performance of typical matrices, and do not include variation due to sampling.

For further information on uncertainty of measurement at Hill Laboratories, refer to the technical note on our website: www.hill-laboratories.com/files/Intro_To_UOM.pdf, or contact the laboratory.

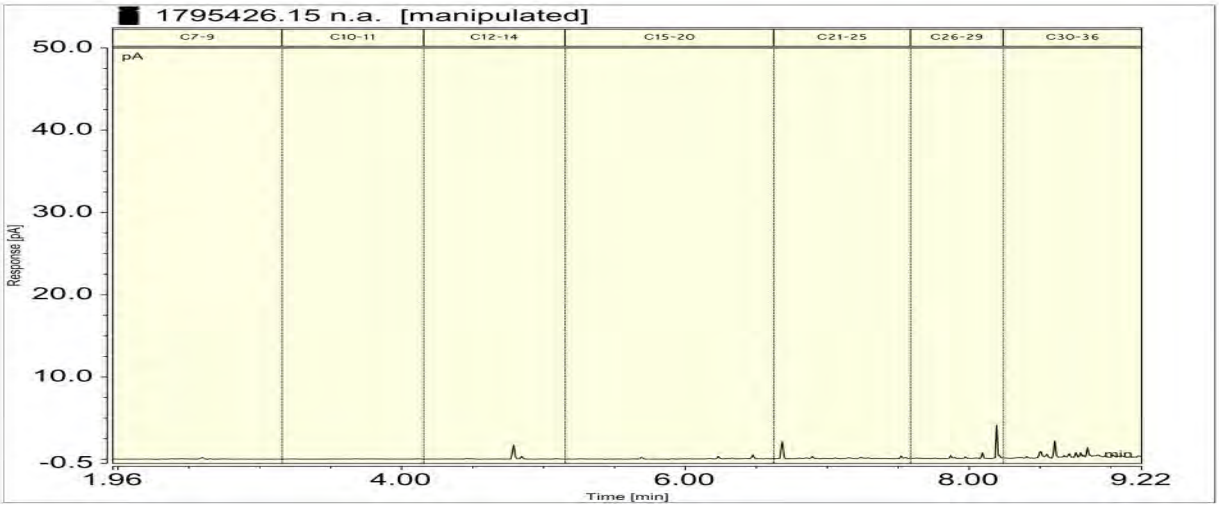
1795426.12
TP6 1.5
Client Chromatogram for TPH by FID



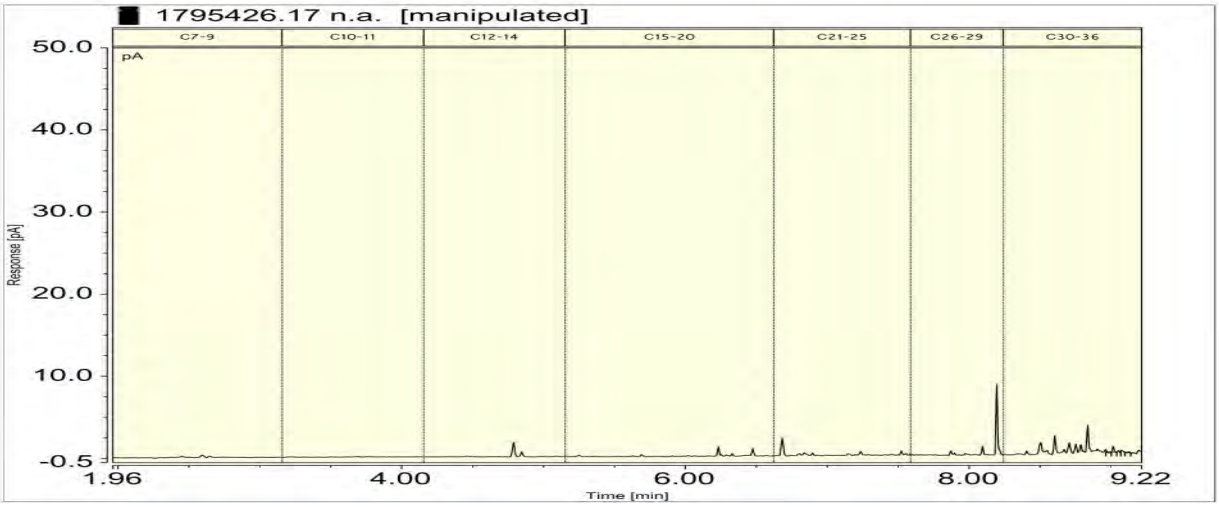
1795426.14
TP7 0.2
Client Chromatogram for TPH by FID



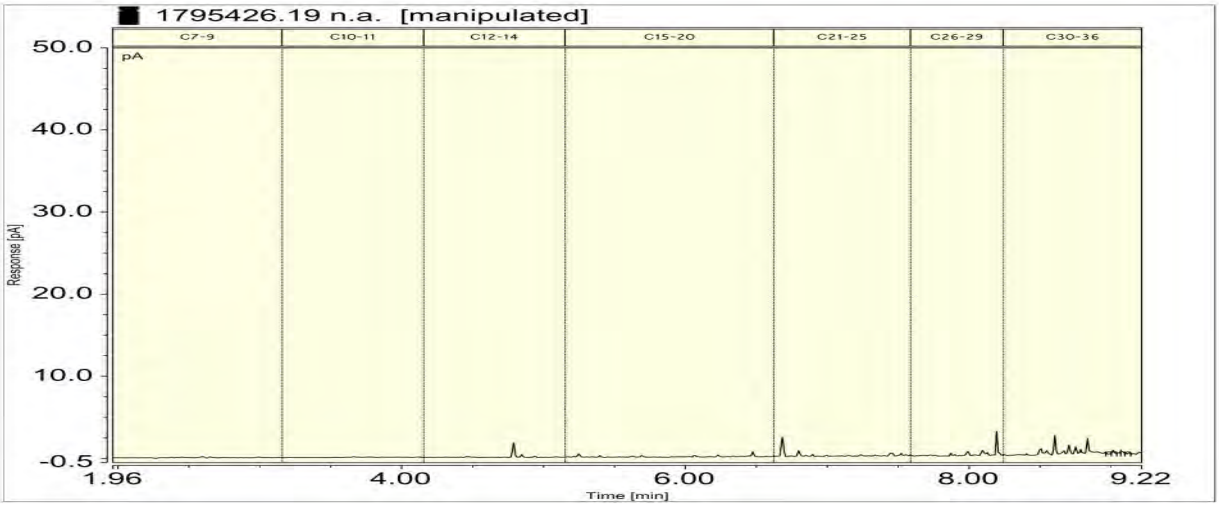
1795426.15
TP8 0.2
Client Chromatogram for TPH by FID



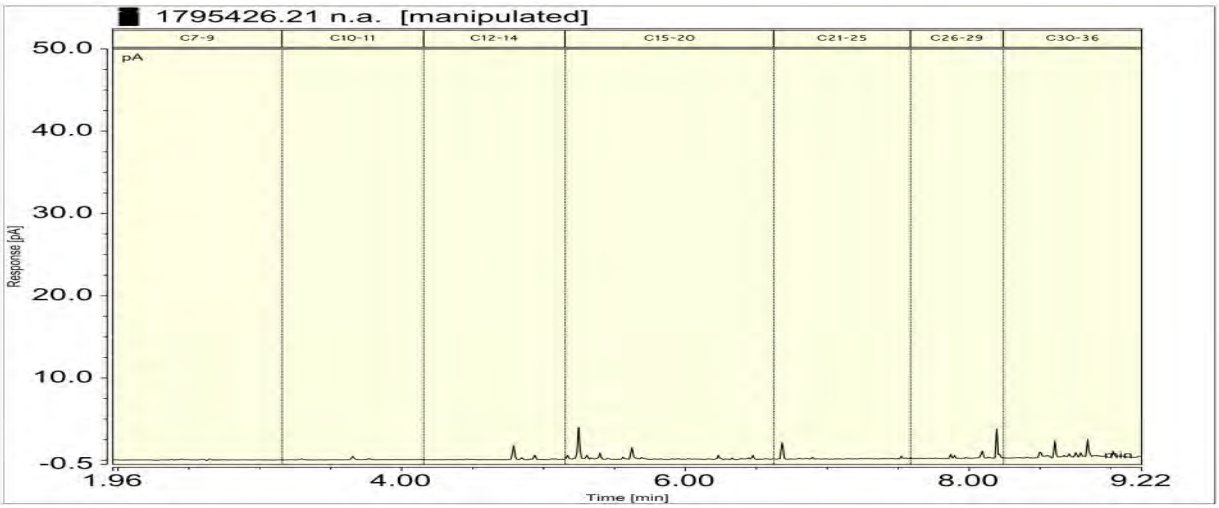
1795426.17
TP9 0.2
Client Chromatogram for TPH by FID



1795426.19
TP10 0.2 20-Jun-2017
Client Chromatogram for TPH by FID



1795426.21
TP11 0.2
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 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
Heavy Metals with Mercury, 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	1-25
Semivolatile Organic Compounds Screening in Soil by GC-MS	Sonication extraction, GC-MS FS analysis. Tested on as received sample	0.3 - 30 mg/kg dry wt	1-25
Total Petroleum Hydrocarbons in Soil	Sonication extraction in DCM, Silica cleanup, GC-FID analysis US EPA 8015B/MfE Petroleum Industry Guidelines. Tested on as received sample [KBIs:5786,2805,10734]	8 - 60 mg/kg dry wt	1-25
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	1-25

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.

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Kim Harrison MSc
Client Services Manager - Environmental

Appendix C

Contaminated Soils Management Plan

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Report

Contaminated Soils Management Plan – Summerset, Boulcott Farm, Lower Hutt

Prepared for Summerset Retirement Villages

Prepared by (Beca)

10 August 2017

Revision History

Revision Nº	Prepared By	Description	Date
1	**Ben Waterhouse**	Final	10 August 2017

Document Acceptance

Action	Name	Signed	Date
Prepared by	**Ben Waterhouse**		10 August 2017
Reviewed by	**Phillip Ware**		10 August 2017
Approved by	**David Gardiner**		10 August 2017
on behalf of			

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Contents

1 Introduction 1

1.1 Site Location and Description 1

1.2 Summary of Geology and Hydrogeology 1

1.3 Proposed Works 1

1.4 Summary of Site History 2

1.5 Contamination Status of Site Soils and Identified Hazards 2

2 Management Procedures 4

3 Site Management 5

3.1 Pre-development Site Set-up 5

3.1 Soil Excavation/Disturbance Procedures 7

3.2 Post-Earthworks Procedures 8

3.3 Imported Materials 9

3.4 Groundwater Procedures 9

4 Health and Safety Procedures 10

5 Limitations 11

Appendices

Appendix A

Sample Location Plan

1 Introduction

1.1 Background

Summerset Retirement Villages (Summerset) proposes to undertake works to construct a retirement village on an area of Boulcott Farm Golf Course in Lower Hutt located at 33 Military Road. Works include the construction of retirement villas, apartments, and care buildings.

A Detailed Site Investigation (Contamination) (DSI) was undertaken by Beca Ltd (Beca) in July 2017 due in part to an incidental discovery of uncontrolled fill containing waste material in a northwestern area of the site (see **Figure 1** and the Beca DSI). The DSI identified elevated contaminant levels in the uncontrolled fill area around TP5 and TP6 (see **Appendix A**). The waste material in these areas requires removal and the surrounding soils require validation through further soil testing to determine their suitability for reuse on site.

Due to historical activities on site including filling of natural drainage gullies, farming and its use as a golf course, discovery of further contaminant sources on site cannot be ruled out.

The purpose of this Contaminated Soils Management Plan (CSMP) is to identify procedures that shall be undertaken during site redevelopment to control the disturbance and movement of soils, including any identified contaminated soils.

The planning controls of the National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health (2012) (NESCS), Greater Wellington Regional Council (GWRC) and Hutt City Council (HCC) are applicable. Consent will be required to undertake earthworks as part of the site redevelopment. This CSMP will support the consent application for earthworks under the NESCS, GWRC Operative Discharges to Land Plan, and the HCC District Plan earthwork requirements.

1.2 Site Location and Description

The site is located at Boulcott Farm Heritage Golf Club at 33 Military Road, Lower Hutt, Wellington. It has an approximate area of 2 Ha. The legal description of the property is Lot 1 DP 477960. The location of the property is shown in **Figure 1** below.

1.3 Summary of Geology and Hydrogeology

The New Zealand Institute of Geological and Nuclear Sciences describes the underlying geology of the site as alluvial deposits of "*well sorted floodplain gravels*"[1]

A piezometer installed by Aurecon in 2013 has registered ground water at 2.3 m bgl. For the proposed geotechnical design a groundwater level of 1.5 m bgl has been adopted. Therefore groundwater is expected to be in the range of 1.5 to 2.5 m bgl.

1.4 Proposed Works

The proposed works include the development of the area into a retirement village of residential villas and apartments with associated gardens, communal space, care facilities and amenities.

[1] Heron D.W (custodian) 2014. Geological Map of New Zealand 1:250 000. Institute of Geological & Nuclear Sciences

Figure 1: Site area of investigation (blue). Image: © Google Earth

1.5 Summary of Site History

As part of the DSI, historical information from a Preliminary Site Investigation (PSI) undertaken by Aurecon (2013) was reviewed. In summary, the Aurecon information search concluded that the site historically contained natural drainage channels into the Hutt River. The site landscape was reshaped and the channels filled. Aurecon considered the fill used in the construction of the golf course and the northern stop bank have the potential to be sources of contamination form uncontrolled fill.

In addition the use of the site as a golf course indicated that herbicide and pesticide use could be a potential source of contamination.

1.6 Contamination Status of Site Soils and Identified Hazards

Following discovery of uncontrolled fill on site, the DSI identified two areas (one of which included the uncontrolled fill area around TP5 and TP6, see **Appendix A**) of the site where lead and zinc concentrations in soils were elevated. The lead and zinc concentrations were within the human health soil contaminant standards.

The fill material in the area TP5 and TP6 appeared to be located within a mound that was uncharacteristic of the site general topography. The waste material will require removal, and the surrounding soils tested to determine suitability for reuse on site after the fill material has been removed.

Given the unknown source of the underlying imported fill material for filling of gullies, and typical heterogeneous nature of fill, coupled with the former use of the site as a farm, heavy metals, semi-volatile

organic compounds (SVOCs) and petroleum hydrocarbon contaminated soils may be still encountered during the site development works.

Key contaminants of concern for historical activities on site including burial of waste from filling and levelling of land found on the site are as follows:

- Heavy metals
- SVOCs
- Petroleum hydrocarbons

Potential contamination exposure routes have been identified for this site as follows:

- Soil ingestion, dermal contact, and inhalation of dust by personnel involved in the site development works.
- Soil ingestion and dermal contact by future site users.

Implementation of this CSMP plans to mitigate potential human health risks for site works personnel and future site users, reduce adverse contamination impacts upon the receiving environment (generation of dusts and off-site migration) and provide guidance for disposal options for the removal of surplus soil, groundwater or stormwater during the development works.

2 Management Procedures

This section sets out general management procedures and requirements.

1. It is recommended that implementation of this CSMP is contractually enforced throughout the duration of the site construction works.

2. This CSMP applies to the site that is the subject of consent application, which includes the area of land owned by Summerset and legally described as Lot 1 DP 477960 covering an area of approximately 2 hectares.

3. All personnel involved in the site construction works are to be familiar with this CSMP and ensure that the requirements of this CSMP have been followed.

4. A copy of this CSMP is to remain available onsite at all times so that reference can be made to it when undertaking any site works.

5. The CSMP is intended to assist the site Contractor in meeting their legal obligations related to potentially contaminated soils with respect to health, safety and the environment. It is not intended to cover the general site safety procedures required for typical excavation and construction activities at the site. The CSMP is not intended to relieve the Contractor of their legal responsibilities.

6. Excavation, demolition and construction activities at the site may be subject to other controls/rules/policies under the relevant district and regional plans, including but not limited to, the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011. Any conditions imposed by the regulatory authorities must be adhered to. However, it is expected that this CSMP will be incorporated into any consent/permit involving excavation/disturbance work at the site to ensure the risks associated with contaminated soils are managed appropriately.

7. Overall responsibility for the implementation of this CSMP shall be held by Summerset. However, the specific requirements and provisions of the management plan will be under the control of the site Contractor.

3 Site Management

The below management procedures apply to the handling and removal of material from two area (see **Appendix A** for locations):

- The area of uncontrolled fill material around sample locations TP5 and TP6 of the DSI. The area is a raised, grassy mound that generally differs from the general topography of the site. Waste was discovered approximately 1 m below ground level.
- The area to the south of the site around TP2.

If further waste or obvious signs of contamination are discovered beyond the above described, the procedures in **Section 3.2.3** must be followed.

For the area of uncontrolled fill around TP5 and TP6, the fill layer requires removal and the surrounding soils validated through testing for reuse on site.

3.1 Pre-development Site Set-up

A site meeting shall be held and attended by the Client, the Contractor, the Engineer and personnel involved with the earthworks (e.g. sub-contractor, if any) to discuss the risks and site procedures for handling any identified contaminated soils at the site. The Contractor shall prepare a site specific Contractor's Health & Safety Plan (CHSP) for the earthworks which shall cover potential exposure to contaminated soil.

Procedures relating to the management of noise, dust, stormwater, stockpiling and the site working hours shall be detailed in the Contractor's Construction Management Plan (CMP) and shall be implemented by the Contractor. All procedures shall comply with the relevant Council bylaws and conditions of applicable consents.

Prior to works commencing, the Contractor shall establish the following controls to aid in the management of aspects of site safety and environmental compliance:

- Restriction of access to the earthworks areas to authorised personnel (such as warning tape and barriers), following appropriate site induction procedures;
- Signage, including site works information, health and safety requirements, site reporting requirements;
- Health and safety facilities such as personal protection equipment;
- Stormwater (surface runoff) diversion and collection systems; and
- Dust control systems.

Procedures relating to the management of dust, sediment, stormwater and stockpiling are detailed below and shall be implemented by the Contractor. All procedures shall comply with the relevant Council bylaws and conditions of any applicable consents.

3.1.1 Site Contacts

The following contact details shall be included in this CSMP prior to works commencing:

Engineer to Contract for civil works: ……

Engineer's Representative: ……

Environmental Scientist/Engineer: ……

3.1.2 Dust Control Procedures

Standard good practice for dust controls shall be implemented by the Contractor including the following, as determined in conjunction with the Engineer:

- Timing of works including prevalent wind direction.
- Dampening any exposed soils during dry and windy conditions through use of a water truck or portable water sprays.
- Covering any stockpiles.
- Reduction of vehicle speeds on site.
- Minimising drop heights from loaders.

3.1.3 Stormwater and Sediment Control Procedures

Erosion and sediment controls shall be installed by the Contractor prior to earthworks / excavations commencing and shall be designed for the treatment of surface water runoff in accordance with the Erosion and Sediment Control Guidelines for the Wellington Region (September 2002, reprinted June 2006).

The stop bank on the north border of the site will limit the extent of potential surface water flows in the direction of the Hutt River.

Cesspit protection measures such as filter socks and sand bags should be used to trap any sediment from collected runoff.

Sediment captured from the excavation of potentially contaminated material shall be managed in the same manner as soils requiring off-site disposal, as described in Section 3.2.2.

Refer to Section 3.4 for groundwater control procedures.

3.1.4 Stockpile Procedure

Stockpiling shall be minimised for the removal of the waste materials around TP5 and TP6. Where stockpiles are required they shall be maintained at a low level (no more than 3 m in height). Stockpiles shall not be placed in an area where runoff cannot be controlled.

The stockpiling of this contaminated soil may be necessary for these works. The stockpiles shall be managed by the Contractor as follows:

- Stockpiles shall be sited within an area away from the main working area to minimise potential contact by site workers;
- Stockpiled materials shall be placed on suitable material (i.e. polythene sheet) to prevent contaminants leaching into clean soils; and
- Where adverse weather is forecast, the stockpiled material shall be covered by a suitable material (such as polythene) to prevent the ingress of rainwater into the material and therefore minimise the potential for generation of leachate or sediment in stormwater.
- Dust limiting measures such as those described in Section 3.1.2 should be adopted.

3.2 Soil Excavation/Disturbance Procedures

3.2.1 Onsite Soil Management and Movement

Except for the waste material and contaminated soils located in the area of sample location TP5 and TP6, all remaining soils are suitable for reuse at the site unless unexpected discovery of soils is found (Section 3.2.3). Surplus soils can be dispersed across the site where they are not required for backfilling in the same location.

The procedures for off-site disposal are outlined in Section 3.2.2.

The Contractor shall ensure that records are kept of all excavations and soil movements on-site. These shall include the location and dimensions of the excavation, ground conditions, soil movement on site, and whether waste materials, unusual staining and/or odour were observed.

3.2.2 Off-Site Disposal

The area of contaminated soil at TP5-TP6 (**Appendix A**) shall be disposed of to a licenced facility. This area encompasses all works in the proximity of the TP5 and TP6 sample site at an approximate depth range of approximately 0.3 m to 2.5 m.

Excavations of the material will be required to start in the centre of the identified mound and worked outwards until the fill material is no longer present/visible. Material will be managed according to the below procedures.

Following removal of all waste material, the surrounding soils must be sampled and tested for contaminants to determine their suitability for reuse on site.

If materials excavated from this area are required to be temporarily stockpiled then procedures outlined in Section 3.1.4 shall be followed.

Landfill acceptance of excavated materials to be disposed offsite shall be obtained prior to works commencing. Offsite disposal of contaminated soil must be to a facility licensed to accept such material and approval shall be obtained by the Contractor prior to transportation. The Contractor must retain copies of all disposal receipts/documentation and provide these to Summerset within 5 days of receipt.

The excavation, handling and off-site removal of the material shall be managed by the Contractor as follows:

- Materials requiring excavation for disposal to a licensed landfill or reuse at another commercial location shall be excavated and loaded directly into trucks where possible (limiting stockpiling), subject to the necessary approvals being obtained as outlined above.
- All trucks shall be covered before leaving site and any soils brushed off wheels to avoid tracking onto public roads. Should the site become wet and material adheres to wheels a wheel wash facility shall be installed and truck wheels washed before exiting the site.
- The Contractor shall maintain a register of soil movements and records such as location of excavation, disposal location, quantity of material and off site weighbridge documents.

3.2.3 Unexpected Contamination Discovery

The procedures outlined below provide the Contractor with protocols to identify potential contamination if suspected contaminated soils or hazardous materials are discovered during the excavation works other than contaminated soils already identified in this CSMP. These protocols will enable the appropriate action to

avoid exposure of contaminants to site workers or the dispersion of contaminants into the surrounding environment.

Contamination indicators or hazardous materials may include but are not limited to the following:

- Unusual odours
- Discoloured or stained water seeps and soils
- Petroleum hydrocarbon contaminated soil and/or free product
- Liquid waste, putrescible waste, household refuse and any material that normally would be sent to a licensed landfill
- Suspected Asbestos Containing Material (ACM)
- Intact or broken drums and containers.

During the earthworks on site, the Contractor shall actively monitor for the conditions/materials specified above. In the event that one of these is identified, the Contractor should take the following actions:

- Stop all earthworks within a 5 m radius of the area where the suspected material/emission/discharge has been recorded
- Immediately notify the site supervisor
- Cordon off the area as practicable with a suitable barrier.
- Work shall not resume or commence within a 5 m radius of the area unless authorised by the Engineer's Representative.

The site supervisor shall contact the Engineer's Representative who will consult with the suitably qualified and experienced practitioner and advise on the appropriate course of action. The suitably qualified and experienced practitioner shall:

- Notify the regulatory authorities (Hutt City Council and the Greater Wellington Regional Council), if required, that contamination has been discovered and contingency action is being implemented.
- Characterise the contamination by collecting samples for chemical laboratory analysis.
- If appropriate, advise the Contractor to excavate the suspected contaminated material and stockpile (as detailed in Section 3.1.4) or place in a covered container to allow works to continue with minimum delay.
- If stockpiling/containerising is inappropriate, advice construction work to proceed to an area clear of contamination indicators until material testing, as necessary, defines the material characteristics.
- When the material characteristics have been established, advise the site supervisor as to whether the materials may remain on site or what remedial measures are required to manage this material on-site, or the options available to disposal of this material off-site (as per Section 3.2.2).
- Instruct relevant staff so that all appropriate information such as location and quantity of material and off-site weighbridge dockets are recorded.

Should asbestos be observed or suspected during the earthworks, all work shall cease and Health & Safety at Work (Asbestos) Regulations (2016) will be followed. Works can recommence once all asbestos has been removed safely. Any such asbestos works (assessment, delineation, removal and verification) shall be undertaken by a specialist asbestos contractor.

3.3 Post-Earthworks Procedures

Upon completion of earthworks for waste material disposal, all plant and equipment shall be cleaned and decontaminated prior to leaving site. If the site is to have garden spaces there should be a minimum of 0.5m of soil present that has either been earth worked and observations made to confirm it is free of any fill material, and/or clean fill imported to make up this depth.

3.4 Imported Materials

Material imported to the site for the purposes of filling and landscaping shall be certified cleanfill. Records must be provided by the Contractor to demonstrate that any imported material is obtained from a quarry or other certified source or confirmed as cleanfill through testing. Material shall not be imported from any site that is, or would be considered, a Hazardous Activities and Industries List (HAIL) site (MfE, 2011), unless sampled by a suitably qualified environmental scientist/engineer to show that it is suitable for the intended land use and is acceptable to the client.

3.5 Groundwater Procedures

Groundwater levels are expected to be in the region of 1.5-2.5 m bgl, and therefore have the potential to intercept groundwater.

If groundwater is encountered during the excavation works, the Contractor shall:

- Contain groundwater within the excavation and not allow it to discharge across the site surface.
- If dewatering is required in contaminated areas, the pumped groundwater discharge shall be diverted into a retention tank for testing. The groundwater may be disposed to stormwater only if laboratory testing of water indicates it is appropriate. Sampling must be undertaken by a suitably qualified environmental scientist/engineer.

4 Health and Safety Procedures

Given the land use activities that have occurred at the site, there is the potential to encounter contaminated soils and/or groundwater as part of the proposed site works. Prior to work being undertaken, a Job Safety and Environment Analysis (JSEA) will be carried out by the Contractor that will identify the appropriate personal protective equipment (PPE) and behaviours to reduce the exposure risk. Note the known contaminants identified at this site are considered to pose a low health risk to construction workers.

Workers may be exposed to contaminants via the accidental ingestion of, or skin contact with soil and/or groundwater and/or surface water should unexpected contamination be found. To prevent this exposure, procedures should be followed by workers who are likely to come in contact with contaminated soil and/or water in the areas identified or unexpected discovery areas that may occur. Procedures include the following:

- Wear cloth overalls.
- All staff physically involved in works likely to result in hand contact with contaminated materials should wear gloves.
- Wear a P2 dust mask if conditions generate dust.
- Minimise hand to mouth contact.
- Wash hands and face prior to eating, drinking or smoking.
- No eating or drinking within the excavation area.
- Wash any skin abrasions immediately and treat to prevent infections.
- Follow any additional requirements in the Contractor (Site Specific) Health and Safety Plan.

Further hazards may be identified during the course of the works. The Contractor is responsible for reviewing any new work element and assessing whether there are any new associated hazards, and whether these can be eliminated, isolated or minimised. The Contractor shall then instruct all staff on the health and safety procedures associated with the new hazard and update the site CHSP.

5 Limitations

This report has been prepared by Beca Ltd solely for Summerset Retirement Villages (Client). Beca has been requested by the Client to provide a Contaminated Soils Management Plan (CSMP) in relation to the retirement village development at Boulcott Farm Golf Course, 33 Military Road, Lowe Hutt, Wellington, legal description Lot 1 DP 477960. This report is prepared solely for the purpose of the management of contaminated soils encountered during this project. The contents of this report may not be used by the Client for any purpose other than in accordance with the stated scope.

This report is prepared solely for the Client. Beca 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.

Unless specifically stated otherwise in this report, Beca has relied on the accuracy, completeness, currency and sufficiency of all information provided to it by, or on behalf of, the Client or any third party, and has not independently verified the information provided. Beca accepts no responsibility for errors or omissions in, or the currency or sufficiency of, the information provided.

The contents of this report are based upon our understanding and interpretation of current legislation and guidelines (“Standards”) as consulting professionals, and should not be construed as legal opinions or advice. Unless special arrangements are made, this report will not be updated to take account of subsequent changes to any such Standards.

This report should be read in full, having regard to all stated assumptions, limitations and disclaimers.

Appendix A

Sample Location Plan

Beca

Site Investigation Location Plan (Contamination)

Figure 1.

Australia

Fiji

Indonesia

Myanmar

New Caledonia

New Zealand

Singapore

Thailand