



ŌMĀHU REMEDIAL ACTION PLAN

**224 Great South Road
Greenlane, Auckland**

CENTAURI MANAGEMENT LIMITED
September 2021 | V1



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DOCUMENT CONTROL RECORD

Client: Centauri Management Limited

Project Location: 224 Great South Road, Greenlane, Auckland

Job Number: J3217

Document: Ōmāhu | Remedial Action Plan

Version: V1

Document Status: Final - Approved for Issue

Date: September 2021

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Filename: W:\Active Projects\COM\Omahu Apartment Development-J2852_J3217\06-Contam\04-Reports\03_RAP (Sep 2021)\RENV02v1 FINAL-Ōmāhu-RAP.docx

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DOCUMENT STATUS

STATUS	DATE	DETAILS	AUTHOR	CHECKED	APPROVED
DRAFT	27/09/2021	Draft	DS	ET	ET
FINAL	07/10/2021	RENV02v1	DS	ET	ET

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1 INTRODUCTION

1.1 Preface

GWE Consulting Limited (GWE) was engaged by Centauri Management Limited to prepare a Remedial Action Plan (RAP) that is to be implemented during land disturbance activities associated with the proposed Ōmāhu Apartments (the site).

Specifically, the site encompasses the current properties at 224 Great South Road, 49-51 Ōmāhu Road, 53 Ōmāhu Road, and 53A Ōmāhu Road in Greenland, Auckland. The site location is presented in Figure 1.

GWE understands that a resource consent application is to be lodged with Auckland Council (AC) to authorise the above noted land disturbance works. The following RAP is provided in support of this application.



Figure 1: Site Location Plan¹

¹ Source: <https://geomapspublic.aucklandcouncil.govt.nz/viewer/index.html>

1.2 Summary of the Proposed Site Development

1.2.1 Summary

The proposed development will comprise seven medium-rise residential apartment buildings, approximately three to six stories high. The development will also incorporate commercial/hospitality areas and be constructed around a central park and two pocket parks, all interconnected by laneways and mews.

The development will be constructed over a large, single-level basement carpark to service the apartments above, with access to the basement via Ōmāhu Road. The basement carpark is planned to be approximately 1 hectare (ha) in size and will require excavations to approximately 3.7 to 3.85 m below the proposed ground floor level. Earthworks associated with the basement formation are likely to exceed a cut volume of 50,000 m³, requiring significant off-site disposal.

1.2.2 Demolition Works

It is understood that prior to commencement of the ground disturbance works all site buildings/structures will be demolished. Due to the known presence of asbestos containing materials and likely presence of lead-based paints these works will be undertaken by specialist contractors operating under separate management plans for their discipline.

1.3 Applicability

The provisions of this RAP extend to the disturbance and removal (stripping) of shallow topsoil materials (to 0.35 m below surface) only (the remediation works). Deeper cut activities can be completed under standard site management protocols.

This RAP should be read in conjunction with an Asbestos Control Plan (ACP) which will be prepared by the Principal Contractor for implementation during the targeted removal of asbestos in soil (refer Section 4).

1.4 Objective

The objective of this RAP is to provide contractors completing the ground disturbance works with an operational tool to manage and mitigate potential human health and environmental risks in an area of known soil contamination. This includes contingency procedures for the unexpected discovery of contamination not already identified.

1.5 Remediation Works Goals

The goal of the remediation works is to remove topsoil materials (to 0.35 m below surface) from the site in a responsible fashion that meets best practice and resource consent requirements.

1.6 Responsibilities

This RAP shall be readily available on site at all times and distributed by the consent holder to all relevant parties undertaking ground disturbance works during the site development.

The provisions of this RAP shall be outlined to and acknowledged (i.e., by signing the induction register) by all parties during the health and safety induction for the project.

Any amendments and variations to the RAP must be approved by the consent holder and the Contaminated Land Practitioner. Table 1 presents a summary of responsible parties associated with the remediation works.

Table 1: Summary of Responsible Parties

Responsible Party	Name	Role During Land Disturbance Works
Client / Consent Holder	Centauri Management Limited	<ul style="list-style-type: none"> Engagement of specialist contractors to complete the development works programme. Compliance with resource consent requirements, including this RAP.
Principal Contractor	To be confirmed	<ul style="list-style-type: none"> Completion of physical redevelopment works. Take on the full responsibilities of health and safety requirements including those required under the Health and Safety at Work Act 2015 and Health and Safety at Work (Asbestos) Regulations 2016. Compliance with resource consent requirements, including this RAP.
Regulator	Auckland Council	<ul style="list-style-type: none"> Monitoring compliance with resource consent requirements.
Contaminated Land Practitioner	GWE Consulting Limited	<ul style="list-style-type: none"> Oversight of contamination delineation and remediation works. Provide specialist contaminated land advice as required. Compliance with resource consent requirements.

1.7 Document Control

The RAP is provided in draft form and it is anticipated that this document will be updated and re-issued upon granting of the resource consent.

1.8 Regulatory Framework

In preparing this RAP, the following regulatory guidelines and good practice documents have been considered:

- Building Research Advisory Council New Zealand (BRANZ), New Zealand Guidelines for Managing and Assessing Asbestos in Soil (2017).
- Health and Safety at Work Act 2015.
- Health and Safety at Work (Asbestos) Regulations 2016.

- Ministry for the Environment, 2001 (revised 2021). Contaminated Land Management Guidelines No. 1. Reporting on Contaminated Sites in New Zealand.
- Ministry for the Environment, 2003 (revised 2011). Contaminated Land Management Guidelines No. 2. Hierarchy and Application in New Zealand of Environmental Guideline Values.
- Ministry for the Environment, 2004 (revised 2021). Contaminated Land Management Guidelines No. 5. Site Investigation and Analysis of Soils.
- Ministry for the Environment, 2011. Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health.
- WorkSafe New Zealand Approved Code of Practice: Management and Removal of Asbestos, November 2016.
- Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (hereinafter referred to as the NES-CS).

2 SUMMARY OF KNOWN CONTAMINANT CONDITIONS

2.1 Terms of Reference

The following reports have been reviewed in the development of this RAP. Copies of these reports are not appended but can be provided upon request.

- GWE Consulting Limited, 2021. Ōmāhu, Combined Preliminary and Details Site Investigation, 224 Great South Road, Greenlane, Auckland. Report in draft, dated 27 September 2021.
- ENGEO Limited, 2018. Asbestos Demolition Survey reports, issued 6 December 2018 (ref: 15627.000.000). Thirteen separate reports covering different buildings at the site: CNU and 53a; Dining and Recreation Centre; Green House; Maintenance Workshop; Rehab Centre; Residential Units 1-12, L2, 46; Residential Units 13-25; Residential Units 26-33; Residential units 34-43, L3; Unit 44 (OT Kitchen) and Unit 45; White House; Wood Workshop; MCR Farrell.
- ENGEO Limited, 2019. Due Diligence Geotechnical Investigation, 224 Great South Road, Remuera, Auckland (report ref. 15627.000.000_02), dated 11 January 2019.
- ENGEO Limited, 2019. Combined Preliminary and Detailed Site Investigation, 224 Great South Road, Greenlane, Auckland (Ref. 15627.000.000_04), dated 7 February 2019.

2.2 Summary of Known Contaminant Conditions

The site was developed for residential landuse in the 1920's, with horticultural activities (plant nursery) undertaken in the northern portion of the property at 224 Great South Road.

The commencement of nursery operations is unknown but appears to have been undertaken since at least the early 1930s and continued until 1968. The nursery operations included some structures, with the possibility of greenhouses being present.

In the mid 1960's, construction of the existing Laura Fergusson Trust rehabilitation facility began, with the main facility complex constructed at 224 Great South Road from 1968. The properties at 49 to 53 Ōmāhu Road were progressively developed as part of the LFT facility from the early 1970's onwards.

Site ground conditions generally comprise a hardstand/gravel basecourse fill layer to 0.5 m bgl or a 0.2 m thick topsoil layer, with some underlying fill up to 1.2 m bgl in the southern portion of 224 Great South Road. Underlying the topsoil/fill layers are Auckland Volcanic Field soils (silty clay and clayey silt with trace basaltic gravel) to 2.8 m in thickness. Beneath the volcanic soils are alluvial silts and clays, underlain by East Coast Bays Formation soils (primarily silty clay).

Groundwater has been encountered between approximately 2.8 to 3.6 m bgl under summertime conditions (generally within the volcanic soil layer).

Refer to Appendix A for a plan presenting historic soil sample locations and Appendix B for a tabulated set of soil analytical results collected from the site. In summary:

- Shallow soil materials (topsoil) across the site have been impacted as a consequence of historical landuse activity. However, significant lead and asbestos in soil impact is limited to soil materials adjacent to older former residential buildings within Zone B (refer Table 2 and Appendix A figures).
- The results collected for the deeper soils underlying the topsoil/hardstand across the site indicate these soils are representative of natural conditions and not impacted by historical landuse activities.

Table 2: Summary of Areas of Concern

Zone	Identifier	Discussion	Summary of Analytical Results
A	Great South Road	Incorporating the property at 224 Great South Road, which includes the former horticultural area.	Topsoil materials impacted by heavy metals. Exceedances of background concentrations recorded for metals and organochlorine pesticides. No exceedances of human health guidelines.
B	Ōmāhu Road	Incorporating the properties at 49 through 51, 53, and 53A Ōmāhu Road. These properties were originally residential landuse commencing in the 1920's and the original dwellings are still present on-site.	Topsoil materials impacted by heavy metals and asbestos. Exceedances of human health and environmental guidelines recorded.

3 CONTAMINATION DELINEATION STRATEGY

Following the demolishing and removal of the site's buildings and structures but prior to the commencement of ground disturbance works a soil contamination delineation investigation is to be undertaken within Zone B. The focus of the delineation will be to confirm the extent of NES-CS and BRANZ Guidelines exceedances and allow for targeted removal of these materials to landfill (Section 4).

The purpose of this investigation is to delineate the extent of elevated concentrations of heavy metals and asbestos recorded as part of previous investigations heavy metals and asbestos in soil contaminants in previously identified 'hotspot' areas, as well as to confirm site soil contaminant conditions following the demolition/removal works.

4 REMEDIATION WORKS METHODOLOGY

The Principal Contractor shall cut and dispose of topsoil materials from the site as per Table 3 and highlighted on Figure 702 in Appendix C (noting that the extent of the works areas and associated volumes will be redefined upon the completion of delineation sampling outlined in Section 3).

Table 3: Remediation Works Sequence

Sequence of Works	Zone	Identifier	Volume (pre delineation)	Discussion	Proposed Disposal Location
1	B	Area 1	408.5 m ³	Targeted removal of asbestos in soil. Implementation of additional asbestos control measures during this phase of works.	Landfill.
	B	Area 2	822.5 m ³		
2	B	Area 3	85.5 m ³	Targeted removal of elevated metals concentrations.	Landfill.
3	B	Remaining portions of Zone B	1,447 m ³	General topsoil removal.	Managed fill.
4	A	-	3,232 m ³	General topsoil removal.	Clean fill or managed fill*

Note: *Depending on waste acceptance criteria of the nominated facility.

5 SITE MANAGEMENT REQUIREMENTS

5.1 Notification

The Contractor will be responsible for notifying AC of works commencement of the remediation works accordance with resource consent Requirements.

5.2 General Requirements

The Principal Contractor will be required to conduct the remediation works in a safe manner in conformity with the requirements of their companies' occupational health and safety management system and the following regulatory bodies:

- Ministry of Business, Innovation and Employment
- WorkSafe New Zealand.
- Ministry for the Environment.
- Ministry of Health.
- Auckland Council.
- Any other relevant body or authority.

All personnel required to work on the site must have attended a project safety induction and site-specific inductions prior to commencing remediation works at the Site.

5.3 Health and Safety Planning

It is expected that the Principal Contractor will have a project specific Health, Safety and Environment Plan in place for the remediation works.

This RAP and the ACP should be appended to that plan and its contents shared during project inductions.

All relevant staff should be made aware of the anticipated contamination hazards and controls prior to commencing remediation works, including:

- Safe working procedures and what to look for when carrying out the remediation works.
- Safety equipment and personal protection requirements.
- Personal hygiene and decontamination requirements.
- Unexpected materials discovery protocols.

These points are discussed further in the following sections.

5.4 Awareness Training

All relevant staff shall be required to undergo contaminated soil and asbestos awareness training before commencing work. The purpose of training is to make sure the workers are aware of the hazards related to working on a contaminated site, what to

look for when carrying out soil disturbance works, safe working procedures, safety equipment and requirements, and the action plan in case of an emergency.

5.5 Personal Protective Equipment

The Principal Contractor will have available and supply personal protective equipment (PPE) as detailed below. The ACP may include additional requirements.

- Safety boots.
- Long sleeved cotton shirts and long pants, or disposable coveralls (asbestos in soil works).
- Nitrile gloves (to be used at a minimum whenever handling potentially contaminated soil).
- Safety glasses.
- Hard hat (as required).
- P3 respirator (asbestos in soil works).

5.6 Personal Decontamination and Hygiene

The Principal Contractor will provide a 'clean work area' in which workers can rest, eat, and drink. This should include an area to clean hands.

The following shall be observed during land disturbance activities:

- Hand to mouth and face contact shall be avoided.
- Hands shall be washed before eating, drinking, and smoking.
- Eating, drinking, and smoking shall be undertaken in the designated 'clean work area'.

5.7 Site Security and Signage

Temporary fencing shall be erected on the property boundaries to prevent third party access to the site.

5.8 Record Keeping

Records will be kept during the completion remediation works in order to capture the following information:

- Description of daily work activities including volumes and locations of soil disturbed and/or removed.
- Unexpected discoveries of additional contamination (refer to Section 7).
- Copies of all receipts relating to offsite materials disposal.
- Any non-conformances to this RAP and any corrective actions taken.
- Photographic record to support documented evidence of remediation works.

6 OPERATIONAL SITE MANAGEMENT

6.1 Stripping and Removal of Topsoil Materials

The following measures shall be implemented during the remediation works in order to minimise the potential for dust generation and/or runoff of sediment/contaminant laden water. Additional requirements will be likely be recommended as part of the ACP.

- Where practical, carry out remediation works during periods of settled weather in order to minimise the generation of dust and stormwater runoff.
- Preference would be for any excavated soils to be placed directly into trucks. If temporary stockpiling is required refer to Section 6.2.
- Minimise the duration of works.
- Minimise stormwater run-on by diversion around excavation areas.
- No debris or suspended solids shall be allowed to discharge to the reticulated stormwater network or be tracked onto roadways.

6.2 Stockpile Management

Any stockpiles should be temporary in nature, covered in plastic sheeting and secured to prevent uncontrolled discharges due to wind rain or on-site activity.

6.3 Spoil Disposal

Stripped topsoil materials shall be carted and disposed to a licensed facility authorised to accept such materials.

Trucks designated for the transportation of asbestos in soil materials should be double lined and sealed with 200 micron plastic and sealed.

Acceptance of site materials is at the sole discretion of the nominated disposal facility. A contract for acceptance shall be established prior to transportation.

The Principal Contractor shall retain copies of disposal receipts for inclusion in post works reporting (refer Section 8).

7 UNEXPECTED MATERIALS DISCOVERY

If any significant unexpected contamination is encountered, the following actions shall be taken by the Principal Contractor:

- Cease earth works and notify the Consent Holder.
- Contact the Contaminated Land Practitioner who will provide advice with respect to the management of the observations and communications with the AC compliance officer.

- Activities completed by the Contaminated Land Practitioner may include:
 - A visual appraisal.
 - Sampling and laboratory analysis.
 - Advice with respect to suitable handling, disposal, or mitigation.
 - Update to this RAP.

8 REPORTING REQUIREMENTS

Within one month of the completion of remediation works at the site, a site validation report (SVR) will be prepared by the Contaminated Land Practitioner for issue to AC.

The SVR shall be prepared in accordance with resource consent requirements and include as a minimum:

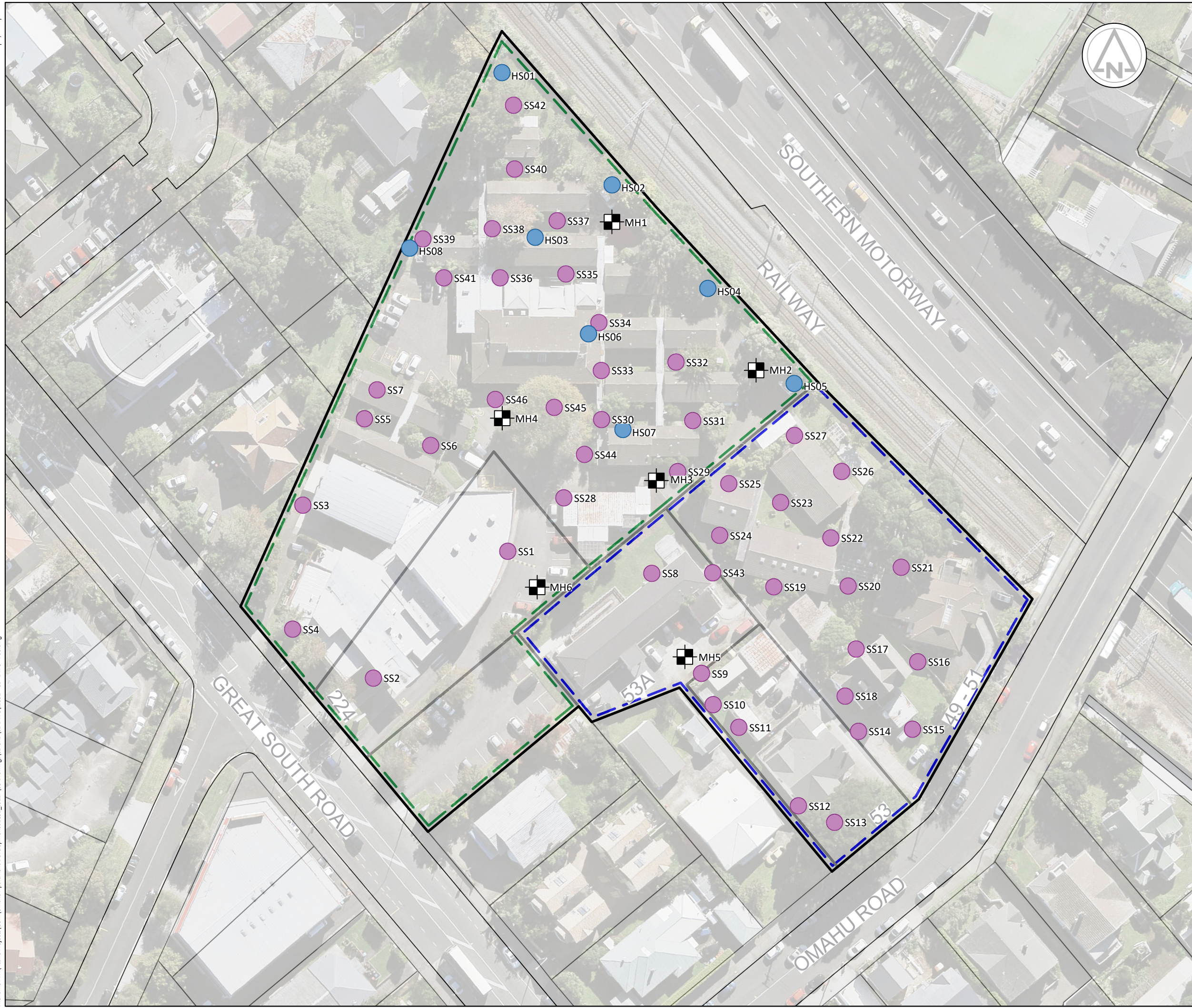
- A summary of delineation sampling results.
- A summary of remediation works completed including an as-built plan outlining the extent of excavation.
- A summary of off-site disposal of soil materials including copies of disposal facility receipts.
- Details of any unexpected materials discoveries and how these were managed (if required).

9 LIMITATIONS

This report has been prepared for the sole benefit of **Centauri Management Limited** as our client, and their appointed representatives, according to their instructions, for the specific objectives described herein. It is not to be relied upon or used out of context by any other party for any other objective without reference to GWE Consulting Limited. The reliance by other parties on the information or opinions contained in the report shall, without prior review and agreement in writing, be at such parties' sole risk.

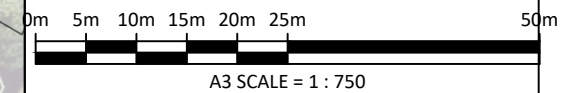
APPENDIX A

SAMPLING LOCATION PLAN



NOTES:

1. DRAWING IS BASED ON DATA FROM AUCKLAND COUNCIL GEOMAPS (ACCESSED: 15/09/2021).
2. ENGEO SAMPLES ARE INDICATIVE ONLY (ENGEO PROJECT NO.: 15627.000.000, DATED DEC-18).
3. DO NOT SCALE FROM THIS DRAWING.



LEGEND

- SITE BOUNDARY
- ZONE A
- ZONE B
- APPROX. LOCATION OF GWE SAMPLES AT DEPTH USING MACHINE BORE (2021)
- ENGEO SOIL SAMPLES (2018)
- FORMER HORTICULTURAL AREA HS01
 - OCPs AND METALS
 - GENERAL SITE - ASBESTOS AND LEAD SS1

PLOT STATUS:					
0	FIRST ISSUE	EJC	DS	ET	21/09/21
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PROJECT:			224 GREAT SOUTH ROAD GREENLANE AUCKLAND		
TITLE:			SAMPLING LOCATION PLAN		
CLIENT NAME:			CENTAURI MANAGEMENT LTD		
SCALE:		1:750		A3	
PROJECT No:		J3217		DRAWING No:	701
				REV	0

APPENDIX B

SOIL ANALYTICAL RESULTS

Table C1:
Soil Analytical Results (2018 and 2021)



Adopted Acceptance Criteria						Heavy Metals								Organochlorine Pesticides*				Polycyclic Aromatic Hydrocarbons^										Asbestos		
						Arsenic	Cadmium	Chromium (total)	Copper	Lead	Mercury (inorganic)	Nickel	Zinc	Aldrin	Dieldrin	Total DDT [#]	Endosulfan I	Benzo(a)anthracene	Benzo(b)fluoranthene + Benzo(j)fluoranthene	Benzo(k)fluoranthene	Benzo(a)pyrene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Indeno(1,2,3-c,d)pyrene	Benzo(a)pyrene Equivalency	Asbestos Presence / Absence	Friable Asbestos / Asbestos Fines (%w/w)	Asbestos Containing Materials (% w/w)	
Background Concentrations ¹			Volcanic Soils Upper Range			12	0.65	125	90	65	0.45	320	1,160	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Auckland Permitted Activity Soil Acceptance Criteria ²						100	7.5	400	325	250	0.75	105	400	-	-	12	-	-	-	-	-	-	-	20	-	-	-			
NES SCS (health) ³			High-Density Residential			45	230	1,500	>10,000	500	1,000	-	-	45	45	240	-	-	-	-	-	-	-	24	-	-	-			
NEPM ⁴			High-Density Residential ⁵			-	-	-	-	-	-	900	60,000	-	-	-	460	-	-	-	-	-	-	-	-	-	-			
BRANZ Guidelines ⁶			FA and/or AF (% w/w) All site Users			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.001	-				
			ACM (bonded) (% w/w) High-Density Residential			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.04			
Area of the Site	Sampler	Sample Reference	Sample Date	Laboratory Sample Reference	Sample Depth (m bgl)																									
Zone A (224 Great South Road)	ENGEO	HS01	6-Dec-2018	K18-De07178	0.0-0.05	12	< 0.4	80	42	87	0.1	88	160	< 0.01	< 0.01	< 0.06	< 0.01	-	-	-	-	-	-	-	-	-	-			
		HS02	6-Dec-2018	K18-De07179	0.0-0.05	5.7	< 0.4	93	41	75	0.1	130	110	< 0.01	< 0.01	< 0.06	< 0.01	-	-	-	-	-	-	-	-	-				
		HS03	6-Dec-2018	K18-De07180	0.0-0.05	13	< 0.4	88	62	360	0.2	90	180	< 0.01	< 0.01	< 0.06	0.03	-	-	-	-	-	-	-	-	-				
		HS04	6-Dec-2018	K18-De07181	0.0-0.05	8.5	< 0.4	85	40	100	0.1	100	140	< 0.01	< 0.01	< 0.06	0.02	-	-	-	-	-	-	-	-	-				
		HS05	6-Dec-2018	K18-De07182	0.0-0.05	11	< 0.4	71	41	91	0.2	79	170	< 0.01	< 0.01	< 0.06	0.02	-	-	-	-	-	-	-	-	-				
		HS06	6-Dec-2018	K18-De07183	0.0-0.05	9.2	< 0.4	30	18	19	< 0.1	15	80	< 0.01	< 0.01	< 0.06	< 0.01	-	-	-	-	-	-	-	-	-				
		HS07	6-Dec-2018	K18-De07184	0.0-0.05	15	< 0.4	78	43	90	0.2	76	190	< 0.01	< 0.01	< 0.06	0.02	-	-	-	-	-	-	-	-	-				
		HS08	6-Dec-2018	K18-De07185	0.0-0.05	16	< 0.4	83	43	230	0.1	83	210	< 0.01	< 0.01	< 0.06	0.03	-	-	-	-	-	-	-	-	-				
		SS1	6-Dec-2018	K18-De07186	0.0-0.05	-	-	-	-	27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Not detected	< 0.001	< 0.001		
		SS2	6-Dec-2018	K18-De07187	0.0-0.05	-	-	-	-	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Not detected	< 0.001	< 0.001		
		SS3	6-Dec-2018	K18-De07188	0.0-0.05	-	-	-	-	47	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Not detected	< 0.001	< 0.001		
		SS4	6-Dec-2018	K18-De07189	0.0-0.05	-	-	-	-	27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Not detected	< 0.001	< 0.001		
		SS5	6-Dec-2018	K18-De07190	0.0-0.05	-	-	-	-	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Not detected	< 0.001	< 0.001		
		SS6	6-Dec-2018	K18-De07191	0.0-0.05	-	-	-	-	130	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Not detected	< 0.001	< 0.001		
		SS7	6-Dec-2018	K18-De07192	0.0-0.05	-	-	-	-	130	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Not detected	< 0.001	< 0.001		
		SS28	6-Dec-2018	K18-De07213	0.0-0.05	-	-	-	-	82	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Not detected	< 0.001	< 0.001		
		SS29	6-Dec-2018	K18-De07214	0.0-0.05	-	-	-	-	120	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Not detected	< 0.001	< 0.001		
		SS30	6-Dec-2018	K18-De07215	0.0-0.05	-	-	-	-	110	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Not detected	< 0.001	< 0.001		
		SS31	6-Dec-2018	K18-De07216	0.0-0.05	-	-	-	-	94	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Not detected	< 0.001	< 0.001		
		SS32	6-Dec-2018	K18-De07217	0.0-0.05	-	-	-	-	57	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Not detected	< 0.001	< 0.001		
		SS33	6-Dec-2018	K18-De07218	0.0-0.05	-	-	-	-	93	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Not detected	< 0.001	< 0.001		
		SS34	6-Dec-2018	K18-De07219	0.0-0.05	-	-	-	-	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Not detected	< 0.001	< 0.001		
		SS35	6-Dec-2018	K18-De07220	0.0-0.05	-	-	-	-	64	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Not detected	< 0.001	< 0.001		
		SS36	6-Dec-2018	K18-De07221	0.0-0.05	-	-	-	-	38	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Not detected	< 0.001	< 0.001		
		SS37	6-Dec-2018	K18-De07222	0.0-0.05	-	-	-	-	250	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Not detected	< 0.001	< 0.001		
		SS38	6-Dec-2018	K18-De07223	0.0-0.05	-	-	-	-	150	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Not detected	< 0.001	< 0.001		
		SS39	6-Dec-2018	K18-De07224	0.0-0.05	-	-	-	-	370	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Not detected	< 0.001	< 0.001		
		SS40	6-Dec-2018	K18-De07225	0.0-0.05	-	-	-	-	160	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Not detected	< 0.001	< 0.001		
		SS41	6-Dec-2018	K18-De07226	0.0-0.05	-	-	-	-	200	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Not detected	< 0.001	< 0.001		
		SS42	6-Dec-2018	K18-De07227	0.0-0.05	-	-	-	-	140	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Not detected	< 0.001	< 0.001		
		SS44	6-Dec-2018	K18-De07229	0.0-0.05	-	-	-	-	120	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Not detected	< 0.001	< 0.001		
		SS45	6-Dec-2018	K18-De07230	0.0-0.05	-	-	-	-	150	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Not detected	< 0.001	< 0.001		
		SS46	6-Dec-2018	K18-De07231	0.0-0.05	-	-	-	-	190	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Not detected	< 0.001	< 0.001		
	GWE	MH01, 0.5	9-Sep-2021	2679253_1	0.5	2	< 0.1	44	16	7.8	< 0.1	31	42	< 0.016	< 0.016	< 0.1	< 0.016	< 0.016	< 0.016	< 0.016	< 0.016	< 0.016	< 0.016	< 0.016	< 0.04	Not detected	< 0.001	< 0.001		
		MH01, 1.5	9-Sep-2021	2679253_3	1.5	< 0.1	53	18	6.5	5	0.11	26	23	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
		MH02, 0.5	9-Sep-2021	2679253_6	0.5	2	< 0.1	56	19	7.7	< 0.1	51	69	< 0.014	< 0.014	< 0.09	< 0.014	< 0.014	< 0.014	< 0.014	< 0.014	< 0.014	< 0.014	< 0.04	Not detected	< 0.001	< 0.001			
		MH02, 2.0	9-Sep-2021	2679253_9	2.0	0.11	32	31	6.2	3	< 0.1	52	82	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
		MH03, 0.5	9-Sep-2021	2679253_21	0.5	< 2	< 0.1	56	26	7.7	< 0.1	51	67	< 0.014	< 0.014	< 0.09	< 0.014	< 0.014	< 0.014	< 0.014	< 0.014	< 0.014	< 0.014	< 0.04	Not detected	< 0.001	< 0.001			
		MH04, 0.6	9-Sep-2021	2679253_11	0.6	< 2	< 0.1	45	29	13.3	< 0.1	68	66	< 0.014	< 0.014	< 0.09	< 0.014	< 0.014	< 0.014	0.017	< 0.014	< 0.014	0.025	< 0.014	< 0.04	Not detected	< 0.001	< 0.001		
		MH04, 1.0	9-Sep-2021	2679253_12	1.0	< 0.1	57	32	15.7	2	< 0.1	109	92	-	-	-	-	< 0.014	<											

Table continued on page 2

Table C1:
Soil Analytical Results (2018 and 2021)



Adopted Acceptance Criteria						Heavy Metals								Organochlorine Pesticides*				Polycyclic Aromatic Hydrocarbons^										Asbestos		
						Arsenic	Cadmium	Chromium (total)	Copper	Lead	Mercury (inorganic)	Nickel	Zinc	Aldrin	Dieldrin	Total DDT [#]	Endosulfan I	Benzo(a)anthracene	Benzo(b)fluoranthene + Benzo(j)fluoranthene	Benzo(k)fluoranthene	Benzo(a)pyrene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Indeno(1,2,3-c,d)pyrene	Benzo(a)pyrene Equivalency	Asbestos Presence / Absence	Friable Asbestos / Asbestos Fines (%w/w)	Asbestos Containing Materials (% w/w)	
Background Concentrations ¹			Volcanic Soils Upper Range			12	0.65	125	90	65	0.45	320	1,160	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Auckland Permitted Activity Soil Acceptance Criteria ²						100	7.5	400	325	250	0.75	105	400	-	-	12	-	-	-	-	-	-	-	20	-	-	-			
NES SCS (health) ³			High-Density Residential			45	230	1,500	>10,000	500	1,000	-	-	45	45	240	-	-	-	-	-	-	-	24	-	-	-			
NEPM ⁴			High-Density Residential ⁵			-	-	-	-	-	-	900	60,000	-	-	-	460	-	-	-	-	-	-	-	-	-	-			
BRANZ Guidelines ⁶			FA and/or AF (% w/w) All site Users			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.001	-			
			ACM (bonded) (% w/w) High-Density Residential			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.04		
Area of the Site		Sample Reference	Sample Date	Laboratory Sample Reference	Sample Depth (m bgl)																									
Zone B (Omāhu Road Properties)	ENGEO	SS8	6-Dec-2018	K18-De07193	0.0-0.05	-	-	-	-	120	-	-	-	-	-	-	-	-	-	-	-	-	-	Detected	0.0015	< 0.001				
		SS9	6-Dec-2018	K18-De07194	0.0-0.05	-	-	-	-	150	-	-	-	-	-	-	-	-	-	-	-	-	-	Not detected	< 0.001	< 0.001				
		SS10	6-Dec-2018	K18-De07195	0.0-0.05	-	-	-	-	230	-	-	-	-	-	-	-	-	-	-	-	-	-	Not detected	< 0.001	< 0.001				
		SS11	6-Dec-2018	K18-De07196	0.0-0.05	-	-	-	-	57	-	-	-	-	-	-	-	-	-	-	-	-	-	Not detected	< 0.001	< 0.001				
		SS12	6-Dec-2018	K18-De07197	0.0-0.05	-	-	-	-	3,700	-	-	-	-	-	-	-	-	-	-	-	-	-	Not detected	< 0.001	< 0.001				
		SS13	6-Dec-2018	K18-De07198	0.0-0.05	-	-	-	-	1,100	-	-	-	-	-	-	-	-	-	-	-	-	-	Not detected	< 0.001	< 0.001				
		SS14	6-Dec-2018	K18-De07199	0.0-0.05	-	-	-	-	1,800	-	-	-	-	-	-	-	-	-	-	-	-	-	Not detected	< 0.001	< 0.001				
		SS15	6-Dec-2018	K18-De07200	0.0-0.05	-	-	-	-	210	-	-	-	-	-	-	-	-	-	-	-	-	-	Not detected	< 0.001	< 0.001				
		SS16	6-Dec-2018	K18-De07201	0.0-0.05	-	-	-	-	2,100	-	-	-	-	-	-	-	-	-	-	-	-	-	Not detected	< 0.001	< 0.001				
		SS17	6-Dec-2018	K18-De07202	0.0-0.05	-	-	-	-	840	-	-	-	-	-	-	-	-	-	-	-	-	-	Not detected	< 0.001	< 0.001				
		SS18	6-Dec-2018	K18-De07203	0.0-0.05	-	-	-	-	1,100	-	-	-	-	-	-	-	-	-	-	-	-	-	Detected	0.00047	< 0.001				
		SS19	6-Dec-2018	K18-De07204	0.0-0.05	-	-	-	-	96	-	-	-	-	-	-	-	-	-	-	-	-	-	Not detected	< 0.001	< 0.001				
		SS20	6-Dec-2018	K18-De07205	0.0-0.05	-	-	-	-	100	-	-	-	-	-	-	-	-	-	-	-	-	-	Detected	< 0.001	0.24				
		SS21	6-Dec-2018	K18-De07206	0.0-0.05	-	-	-	-	110	-	-	-	-	-	-	-	-	-	-	-	-	-	Not detected	< 0.001	< 0.001				
		SS22	6-Dec-2018	K18-De07207	0.0-0.05	-	-	-	-	150	-	-	-	-	-	-	-	-	-	-	-	-	-	Not detected	< 0.001	< 0.001				
		SS23	6-Dec-2018	K18-De07208	0.0-0.05	-	-	-	-	120	-	-	-	-	-	-	-	-	-	-	-	-	-	Not detected	< 0.001	< 0.001				
		SS24	6-Dec-2018	K18-De07209	0.0-0.05	-	-	-	-	73	-	-	-	-	-	-	-	-	-	-	-	-	-	Not detected	< 0.001	< 0.001				
		SS25	6-Dec-2018	K18-De07210	0.0-0.05	-	-	-	-	210	-	-	-	-	-	-	-	-	-	-	-	-	-	Not detected	< 0.001	< 0.001				
		SS26	6-Dec-2018	K18-De07211	0.0-0.05	-	-	-	-	140	-	-	-	-	-	-	-	-	-	-	-	-	-	Not detected	< 0.001	< 0.001				
		SS27	6-Dec-2018	K18-De07212	0.0-0.05	-	-	-	-	830	-	-	-	-	-	-	-	-	-	-	-	-	-	Not detected	< 0.001	< 0.001				
		SS43	6-Dec-2018	K18-De07228	0.0-0.05	-	-	-	-	56	-	-	-	-	-	-	-	-	-	-	-	-	-	Not detected	< 0.001	< 0.001				
	GWE	MH05, 0.5	9-Sep-2021	2679253_25	0.5	2	0.1	75	17	13.5	0.15	73	68	< 0.016	< 0.016	< 0.1	< 0.016	< 0.016	< 0.016	< 0.016	< 0.016	< 0.016	< 0.016	< 0.04	Not detected	< 0.001	< 0.001			
		MH05, 2.0	9-Sep-2021	2679253_27	2.0	0.15	36	28	5.7	< 2	< 0.1	111	87	-	-	-	-	-	-	-	-	-	-	-	-	-				
		MH06, 0.5	9-Sep-2021	2679253_16	0.5	< 2	< 0.1	12	7	4.9	< 0.1	8	6	< 0.014	< 0.014	< 0.09	< 0.014	< 0.014	< 0.014	< 0.014	< 0.014	< 0.014	< 0.014	< 0.04	Not detected	< 0.001	< 0.001			

NOTES:

* Only selected organochlorine pesticides have been presented, based on compounds with relevant soil quality guideline values or those recorded above laboratory limits of reporting. Refer to laboratory reports in Appendix H for full analytical results.

^ Only PAH compounds used to calculate benzo(a)pyrene potency equivalency factor (PEF) concentrations have been shown (refer to Ministry for the Environment, 2011. Methodology for Deriving Standards for Contaminants in Soil. Table 40). Refer to laboratory reports in Appendix H for full results (almost all were below laboratory limits of reporting).

Total DDT includes the sum of DDT, DDD, and DDE.

All units measured in mg/kg unless otherwise stated.

m bgl - metres below ground level

- Sample not analysed for compound and/no criteria adopted.

Bolded and/or coloured text represents exceedances of adopted acceptance criteria.

1) Auckland Regional Council, 2001. Technical Publication Background Concentrations of inorganic elements in soils from the Auckland Region. Table 3, Volcanic Range (Auckland Background Concentrations).

2) Auckland Council Unitary Plan Operative in part, 2016 (updated 10 September 2021). Values taken from Table E30.6.1.4.1 Permitted Activity Soil Acceptance Criteria.

3) Ministry for the Environment, 2012. User's Guide National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health. Values taken from Appendix B Soil Contaminant Standards, Table B2 and B3.

4) Australian Government, 1999 (revised 2013). National Environment Protection (Assessment of Site Contamination) Measure (NEPM).

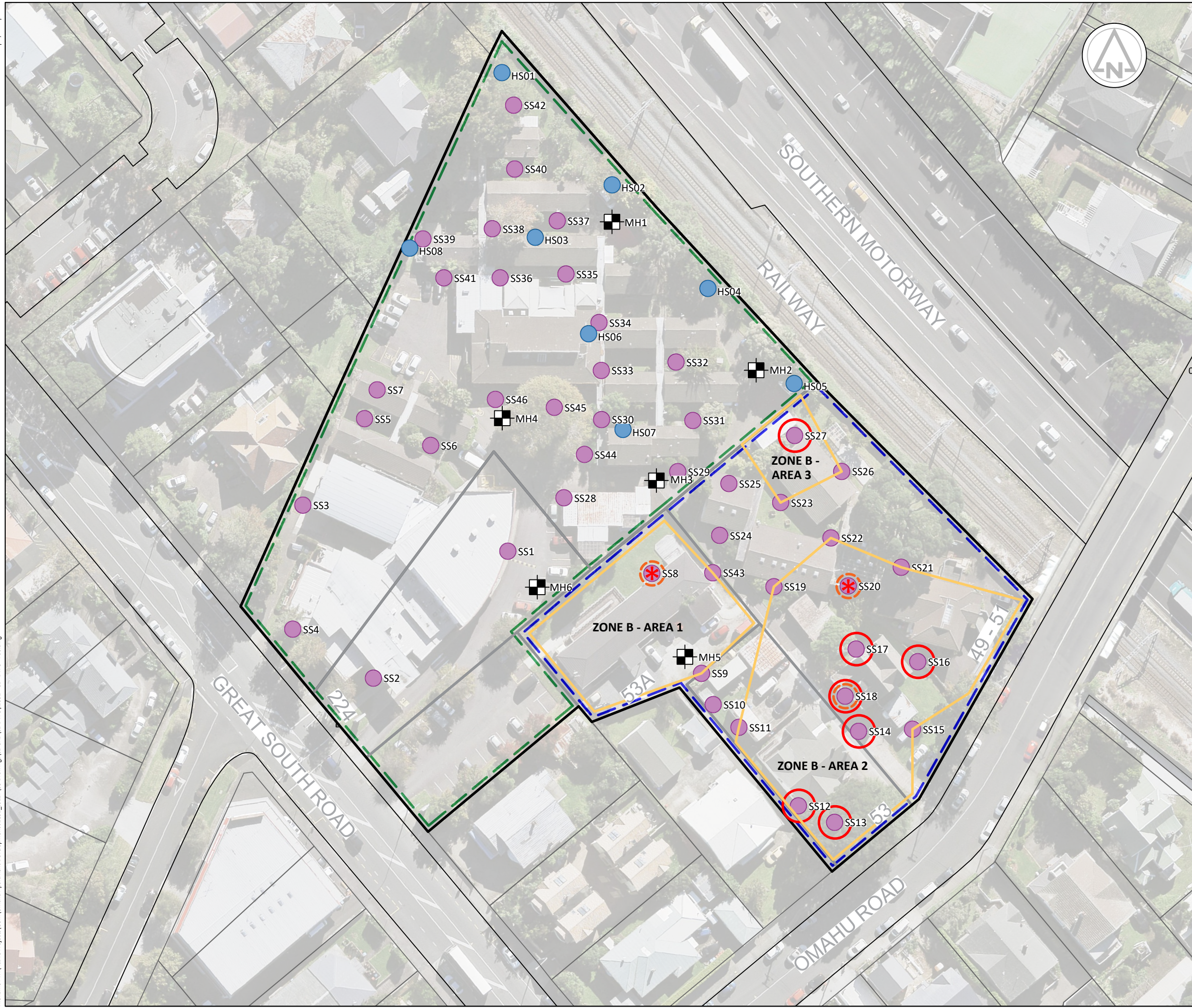
5) Health Investigation Level (HIL) values for soil taken from Schedule B1, Guideline on Investigation Levels for Soil and Groundwater, Table 1A(1). Only values for contaminants recorded above laboratory LOR and which are not included as part of the NES SCS have been shown.

6) Building Research Advisory Council New Zealand, 2017. New Zealand Guidelines for Managing and Assessing Asbestos in Soil (referred to as BRANZ Guidelines).

APPENDIX C

REMEDIATION WORKS PLAN

Plot Date : 03:01 pm, 22 Sep 2021
Filename : W:\Active Projects\COM\Omahu Apartment Developments\2852_3217\08 Drawings\01-CAD\01-DWG\2852_CL-DWG-700.dwg






NOTES:

1. DRAWING IS BASED ON DATA FROM AUCKLAND COUNCIL GEOMAPS (ACCESSED: 15/09/2021).
2. ENGEO SAMPLES ARE INDICATIVE ONLY (ENGEO PROJECT NO.: 15627.000.000, DATED DEC-18).
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A3 SCALE = 1 : 750

LEGEND

- ASBESTOS DETECTED 
- BRANZ EXCEEDANCE (ASBESTOS) 
- NES-CS EXCEEDANCE (LEAD) 

PLOT STATUS:

0	FIRST ISSUE	EJC	DS	ET	21/09/21
REV	AMENDMENT	CAD	ENG	APPD	DATE

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PROJECT:
224 GREAT SOUTH ROAD
GREENLANE
AUCKLAND

TITLE:
REMEDIATION WORKS PLAN

CLIENT NAME:
CENTAURI MANAGEMENT LTD

SCALE:	1:750	A3
PROJECT No:	DRAWING No:	REV
J3217	702	0