

PJ CAREY (CONTRACTORS) LTD

**Phase 1a Section 5
Graven Hill, Bicester**

**Land Contamination Verification Report for Earthworks Fill
(to assist with discharging original Planning Condition
No 58)**

Job No: 173044

Date of Report: 7th May 2019

Report Ref: 173044/VR/005



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Document Control

Report for

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**Phase 1a Section 5
Graven Hill
Bicester**

Prepared by

.....
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Reviewed by

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M J M Lawman MSc BSc (Hons)

Issue Date

7th May 2019

Issue

Draft

Document Reference

173044/VR/005

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Draft 07/05/19	For client review and comment

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1.0 INTRODUCTION

Overview of project

- 1.1 AA Environmental Limited (AAe) has been appointed by PJ Carey (Contractors) Limited (hereafter referred to as Careys) to assist with the management of the environmental aspects associated with the redevelopment of land at Graven Hill, London Road, Bicester OX26 6HF.
- 1.2 The site comprises a former Ministry of Defence (MOD) logistics and freight terminal located south of the A41 in Bicester. The site is currently being redeveloped for residential purposes, including associated infrastructure works and leisure/community facilities.
- 1.3 The following reports have been produced for the site by Waterman Infrastructure & Environment Limited (Waterman) and submitted for approval by the local authority to satisfy the associated planning conditions:
- 'Environmental Interpretative Report for Land Transfer Area 1' September 2015 (Report reference: WIB13983-104-R-1-1-7-GH).
 - 'Remediation Options Appraisal and Remedial Strategy Report - Land Transfer Area 1' January 2016 (Report reference: WIB13983-104-R-2-2-3-MA-MACF).
- 1.4 The site is being developed in different sections, as presented on Figure 1 (Careys drawing 3252-PJC/AAe-00S00).

Scope of report

- 1.5 AAe was instructed by Careys to verify chemical compliance of subsoil within areas of earthworks fill against the specification presented in the Waterman Remediation Strategy.
- 1.6 This Verification Report is one a series of documents that verify the land quality of the areas of soft landscaping. This plan specifically covers earthworks completed by Careys within Section 5, as presented on Figure 2.
- 1.7 The agreed Remedial Options Appraisal and Remedial Strategy report was developed following a series of site investigations and contamination assessments. The investigation identified that the majority of the site was uncontaminated and suitable for residential development. As part of the verification regime, Careys as the enabling and earthworks contractor had to test the excavated and imported materials to demonstrate that the material was of a suitable quality. The required quality standards were set out by Waterman¹.
- 1.8 The earthworks cut and fill plans have been provided by Careys. An inspection and testing regime has been undertaken by AAe within areas of earthworks fill to determine compliance against the site specification. Where non-conformances were recorded, corrective actions have been completed by Careys under the supervision of AAe in accordance with the 'Remedial Method Statement for Non-Conforming Works (RMS)' presented at Appendix A.
- 1.9 This report has been prepared to assist in discharging Planning Condition No 58 of 'new' outline consent 18/00325/OUT. In accordance with Planning Condition No 58 this report shall be submitted by Careys to the Local Planning Authority, and their approval in writing obtained. Planning Condition No. 58 states:

"58 The development of Graven Hill shall not be occupied until:

(a) In respect of Phase 0, Phase 1a and Phase 1b as shown on Drawing No: 1982-A-L-572-I, the remedial works have been carried out in accordance with the approved:

¹ Subsequent to the derivation of the standards, Waterman have advised Careys that asbestos chrysotile fibres are permitted at a level 0.001%.

- *Remediation Options Appraisal and Remediation Strategy Report for Land Transfer Area 1 (ref: WIB13983-104-R-2-2-3-MA-MACF dated January 2016) prepared by Waterman Infrastructure & Environment Ltd.*
- *A verification report that demonstrates the effectiveness of the remediation carried out must be submitted to and approved in writing by the Local Planning Authority.*

(b) In respect of all subsequent phases, if remedial works have been identified in condition 52, the remedial works have been carried out in accordance with the scheme approved under condition 52. A verification report that demonstrates the effectiveness of the remediation carried out must be submitted to and approved in writing by the Local Planning Authority."

Limitations and assumptions

- 1.10 All testing has been completed in line with quality control procedures. All information provided in this report is based on the ground encountered during the investigations. It should be recognised that during any investigation the conditions identified may not be fully representative of the wider conditions.
- 1.11 The purpose of this report is to verify chemical compliance of subsoil within areas of earthworks fill completed by Careys. Inspection and testing by AAe is therefore limited to the specified areas of earthworks fill. A reliance is placed on the provided cut and fill plans to accurately represent the earthworks undertaken by Careys. This report does not verify soil quality in areas of earthworks cut.
- 1.12 This report does not verify geotechnical suitability of materials used as earthworks fill.
- 1.13 It is understood that Careys are contracted to complete the enabling earthworks (including provision of subsoil) to 150 mm below finished level. This report does not verify works completed by third-party contractors or self-builders following handover by Careys. Where follow on contractors/self-builders have operated and/or imported materials this report cannot be relied upon to demonstrate the final land quality.

2.0 VERIFICATION OF EARTHWORKS FILL

Fieldwork

- 2.1 The section has been sub-divided into areas of cut and fill, as presented on Figure 2. To verify the chemical quality of subsoil, trial pits were constructed at locations made available by Careys to be representative of earthworks fill. The trial pits were marked out by the Careys Site Engineer and the ground levels recorded.
- 2.2 Table 2.1 presents the calculated fill volume for the soft landscaping in each sub-area and the required number of tests against the frequency specified within the approved remedial strategy (1 test per 250 m³ site-won fill).

Table 2.1 Section 5 Sub-Areas		
Sub-Area	Fill Volume (calculated by Careys) m ³	Minimum number of tests required to achieve 1 per 250 m ³ of fill.
5-1	2360	10
5-2	N/A Cut	N/A

- 2.3 Trial pits were completed on 26th March 2019. The location of the trial pits is presented on Figure 2.
- 2.4 AAe inspected the trial pits for any visual or olfactory evidence of contamination and collected representative samples of the subsoil for laboratory testing analysis in accordance with quality control requirements.
- 2.5 Photo plates of the trial pits are presented in Appendix B.
- 2.6 Careys advised that earthworks fill from Stockpile 0008 (SPHTP311/312) was also placed within area 5-1. This stockpile was tested on 25th June 2018.

Chemical Results

- 2.7 Table 2.2 presents a summary of the scheduled environmental testing within the verification trial pits in fill areas.

Table 2.2 Summary of environmental testing		
Type of Test	Number	Laboratory Report
Full Environmental Suite (incl. metals, TPHs, PAHs and asbestos screen)	13	18-18546 19-11460

- 2.8 The results of the environmental laboratory testing are presented in Appendix C.

Assessment of Chemical Results

- 2.9 The soil results have been consolidated and compared against the specification provided in the Waterman Remediation Strategy. The consolidated data is presented in Appendix D. Where the testing suite includes determinants for which limiting values for the protection of human health are not included in the Waterman Remediation Strategy, the Soil Guidance Values (SGVs) presented in Appendix E have been adopted.
- 2.10 The results comply to the site specification. No corrective measures were required within the specified areas of earthworks fill.

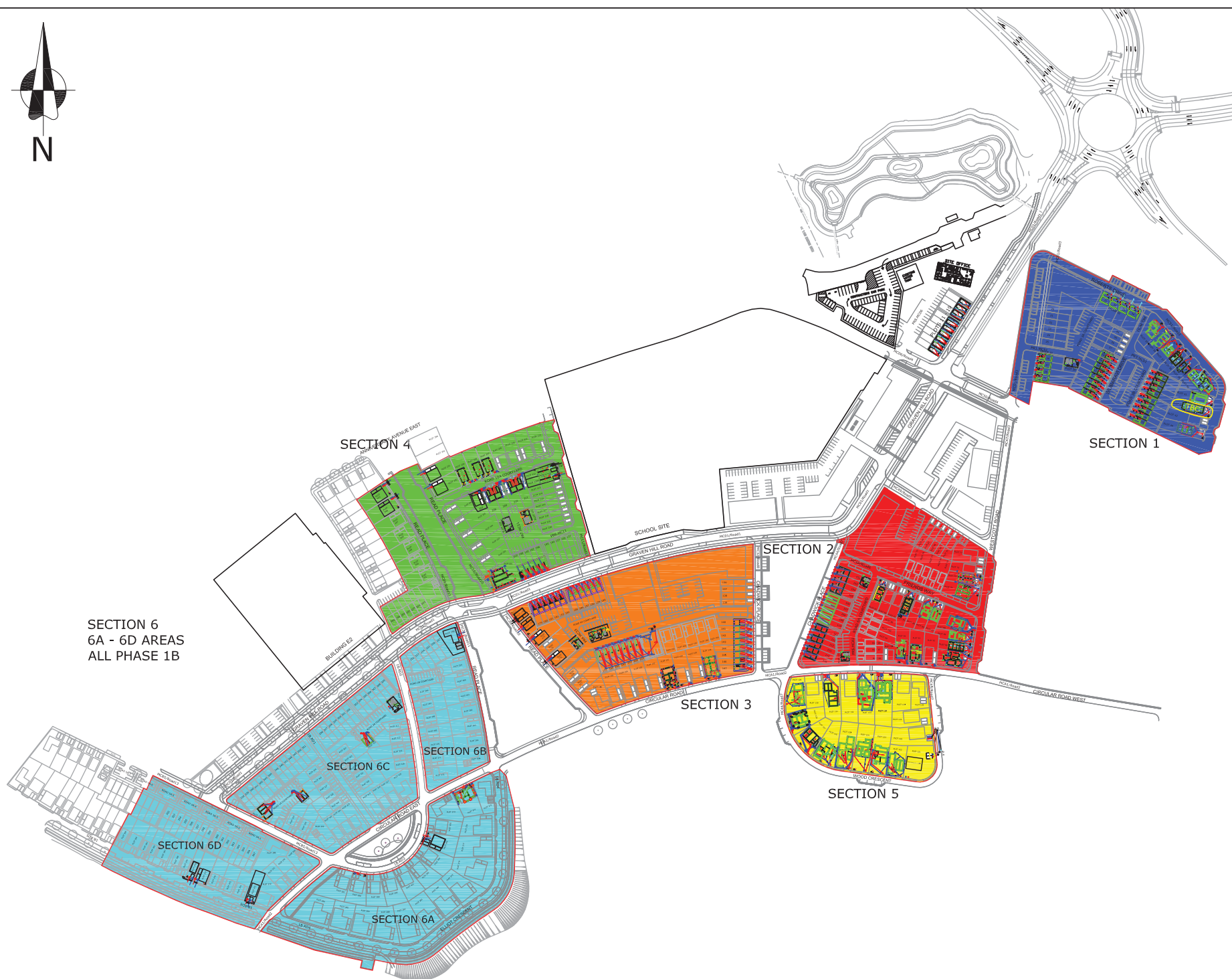
3.0 REMEDIATION OF NON-CONFORMING AREAS

[NOT REQUIRED]

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FIGURES

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WORKS INDICATED ON THIS DRAWING ARE TO BE MANAGED IN LINE WITH PJC-CE QUALITY ASSURANCE PROCEDURES. DO NOT SCALE FROM THIS DRAWING IN EITHER PAPER OR DIGITAL FORM. USE WRITTEN DIMENSIONS ONLY.

DRAWING STATUS: CONSTRUCTION

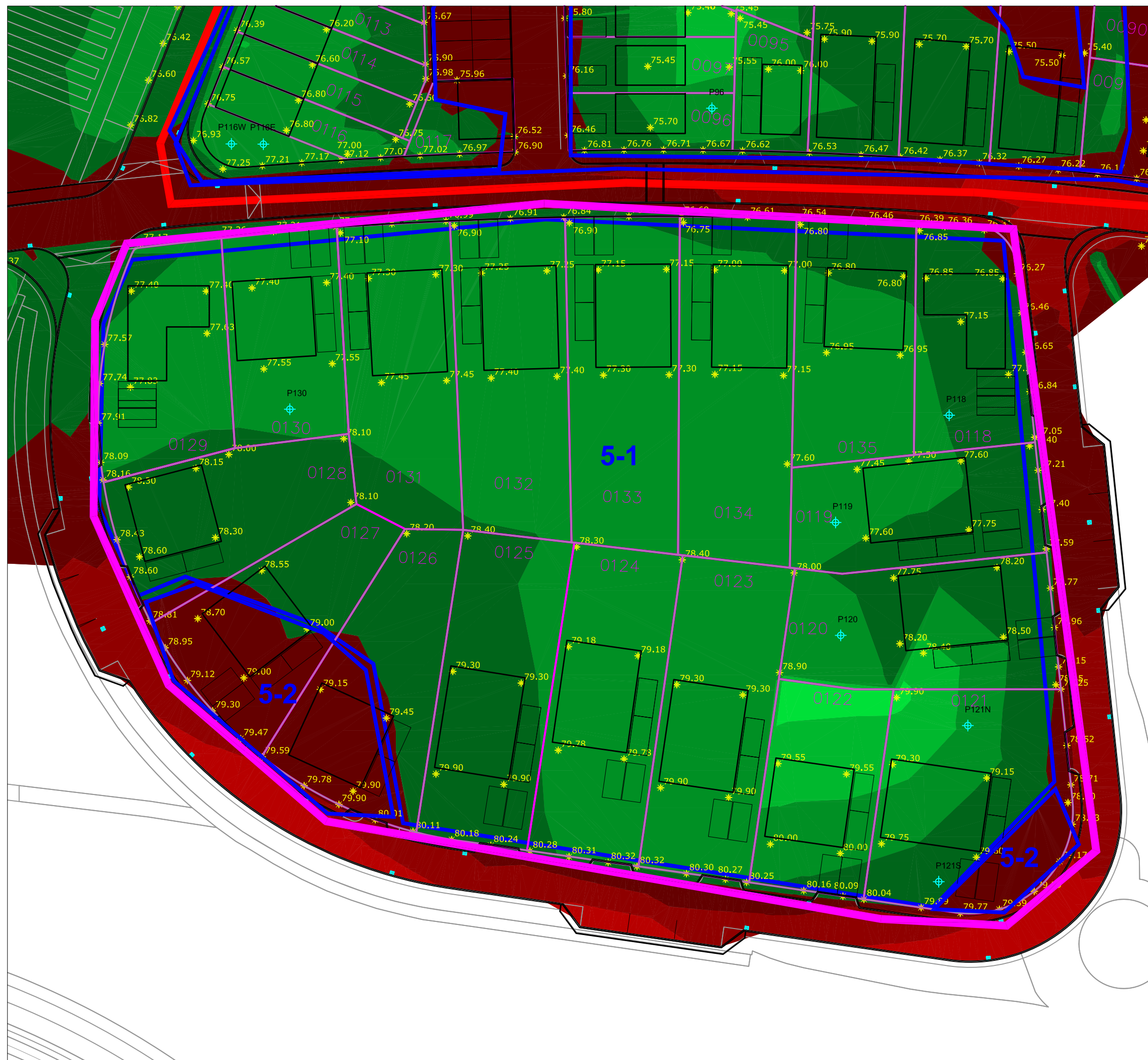
GRAVEN HILL DEVELOPMENT
ANNIVERSARY AVENUE
BICESTER
OX26 6HF

SITE REMEDIATION
STRATEGY - WHOLE SITE,
ALL SECTIONS & AREAS FOR
VALIDATION WITH RED LINE
BOUNDARIES

[illegible]

DRAWN BY:	DESIGNED BY:	CHECKED BY:	DATE:	SCALE (A3):
CR	CR	KD	27.06.18	N/A

CR	CR	RD	27.00.10	N/A
DRAWING NUMBER:				REV
3252-PJC/AAE - 00S000				A1



Key:

Approximate Section Boundary

E458000
N220000
GL 73.726
2 B

PJC Sample location



Rev.	Details	Drawn Chkd.	Date
Project 173044 Graven Hill, Bicester			
Title Earthworks Fill Verification Plan - Section 5			
		AA Environmental Ltd Units 4-8 Cholswell Court Shippon Abingdon Oxon OX13 6HX T: (01235) 536042 F: (01235) 523849 info@aae-llp.com www.aae-llp.com	
Scale 1:500(A3)	Date Apr'19	Drawn RH	Chkd. JNT
Drg. No. Figure 2			Rev. A

APPENDIX A

Remedial Method Statement for Non-Conforming Works

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REMEDIAL METHOD STATEMENT FOR NON-CONFORMING EARTHWORKS

**Graven Hill (Land Transfer Area 1)
Bicester. Oxfordshire.**

PJ Carey (Contractors) Limited
Carey House
Great Central Way
Wembley
London
HA9 0HR

Report ref 173044/RMS/001(REV A)

September 2018 (REV A)

1. OVERVIEW

AA Environmental Limited (AAe) were instructed by PJ Carey (Contractors) Limited (Careys) to verify chemical compliance of the top 450 mm of soils within areas of completed soft landscaping against the specification presented in the Waterman Infrastructure & Environment Limited (Waterman) 'Remediation Options Appraisal and Remedial Strategy Report - Land Transfer Area 1'.

This RMS sets out the corrective measures to be adopted to remediate areas of soft landscaping where non-conformances have been identified.

2. REMEDIAL STRATEGY AND CORRECTIVE MEASURES

2.1 Removal of impacted soils from non-conforming areas

Within the specified areas, soils must be fully excavated to 450 mm below finished formation level. The non-conforming soils should be transferred to the designated materials management area and placed in a standalone quarantine stockpile on impermeable sheeting.

The stockpile will be subject to further assessment/testing to determine the suitability for re-use elsewhere on the site and/or for off-site transfer.

The volume of soil transferred and quarantine stockpile location will be recorded by the Careys Site Engineer in accordance with the Careys Materials Management Plan.

2.2 Inspection of excavated areas

Careys Site Engineer will survey the reduced level to verify that soils have been fully removed to 450 mm below finished formation level.

AAe will undertake a visual inspection of the excavated areas to verify that the non-conforming soils have been removed. Photographs of the inspections will be maintained.

In the event any suspected significant contamination is observed within the residual soils below 450 mm, then further testing will be undertaken to determine any additional controls that may be required within the affected area.

2.3 Placement of geotextile marker layer

A permeable geotextile marker layer will be placed over the residual soils. The geotextile should fully cover all residual soils and be installed up the sides of the batters/excavations.

The Careys Site Engineer should maintain photographs of the geotextile placement within each area.

2.4 Reinstatement of soils

The specified areas will be reinstated with acceptable soils (topsoil and/or subsoil) from pre-approved stockpiles only. Stockpiles of site-won or imported soil will be tested in accordance with the Waterman Remediation Strategy. All soils placed within the top 450 mm of soft landscaping areas should comply with the chemical specification presented in Appendix A.

2.5 Inspection of remediated areas

AAe will undertake a final inspection of the areas to verify that the reinstated soil has been constructed to a minimum depth of 450 mm above the geotextile marker layer. Photographs of the completed areas will be maintained.

3. VERIFICATION REQUIREMENTS

The following information and data should be maintained for inclusion within the final verification report:

- Plans showing areas of chemical non-conformance and supporting test results;
- Plans showing areas that have been subject to corrective works and remediation;
- Inspection reports from AAe presenting observations/photographs of the remedial works and any additional testing;
- Survey levels, material tracking forms and photographs of the geotextile placement from Careys; and
- Details of the stockpiles/soils used to reinstate the areas and associated certificates of analysis.

4. HEALTH AND SAFETY

Careys should undertake a health and safety risk assessment in accordance with their standard procedures to ensure that the remedial works do not pose a risk to site operatives and surrounding receptors from the recorded contaminants. Appropriate working controls (such as damping down, dust suppression), respiratory protective equipment (RPE), personal protective equipment (PPE) and quantitative air/dust monitoring should be implemented as necessary.

Author: Matthew Lawman MSc BSc (Hons)
Director

Reviewer: Jack Taylor BSc (Hons)
Principal Consultant

Date: 2nd September 2018 (REV A)

Report produced by:
AA Environmental Limited

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Appendix A **Remedial Criteria** **Extract from Watermans Remedial Plan**

Table B1 : Import Criteria for Hardstanding and Landscaping / Private Garden Soils

Determinant	Hardstanding Criteria, mg/kg	Landscaping and Residential Garden Soils Criteria, mg/kg	Source of Value
Arsenic	640	37	DEFRA C4SLs
Beryllium	12	1.7	LQM S4ULs 2015
Cadmium	410	22	DEFRA C4SLs
Chromium (Total)	8,600	910	LQM S4ULs 2015
Copper	68,000	2,400	LQM S4ULs 2015
Lead	2,330	200	LQM S4ULs 2015
Mercury	58	1.2	LQM S4ULs 2015
Nickel	980	180	LQM S4ULs 2015
Selenium	12,000	250	LQM S4ULs 2015
Zinc	730,000	3,700	LQM S4ULs 2015
Free Cyanide	16,000	26	Waterman GAC-CLEA v1.06
Aliphatic EC ₅ -EC ₆	5,900	78	LQM S4ULs 2015
Aliphatic EC ₆ -EC ₈	17,000	230	LQM S4ULs 2015
Aliphatic EC ₈ -EC ₁₀	4,800	230	LQM S4ULs 2015
Aliphatic EC ₁₀ -EC ₁₂	23,000	330	LQM S4ULs 2015
Aliphatic EC ₁₂ -EC ₁₆	8,200	2,400	LQM S4ULs 2015
Aliphatic EC ₁₆ -EC ₃₅	1,000,000	92,000	LQM S4ULs 2015
Aromatic EC ₅ -EC ₇	46,000	140	LQM S4ULs 2015
Aromatic EC ₇ -EC ₈ (Toluene)	110,000	290	LQM S4ULs 2015
Aromatic EC ₈ -EC ₁₀	8,100	83	LQM S4ULs 2015
Aromatic EC ₁₀ -EC ₁₂	28,000	180	LQM S4ULs 2015
Aromatic EC ₁₂ -EC ₁₆	37,000	330	LQM S4ULs 2015
Aromatic EC ₁₆ -EC ₂₁	28,000	540	LQM S4ULs 2015
Aromatic EC ₂₁ -EC ₃₅	28,000	1500	LQM S4ULs 2015
Benzene	47	0.17	LQM S4ULs 2015
Benzo (a) pyrene	35	2.7	LQM S4ULs 2015
Benzo(b)fluoranthene	44	3.3	LQM S4ULs 2015
Benzo(a)anthracene	170	11	LQM S4ULs 2015
Di-benzo(a,h.)anthracene	0.28	3.6	LQM S4ULs 2015
Asbestos	No visible asbestos containing materials (ACMs) and <0.001% fibres	No visible ACM and <0.001% fibres	

Note: Assume a Soil Organic Matter content (SOM) of 2.5%

APPENDIX B

Photo Plates - Verification Trial Pits

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Comment <u>Strata comprises:</u> 0.00-0.30m Dark greyish brown sandy gravelly CLAY. Gravel is subangular fine of brick, concrete and hardcore. (MADE GROUND) 0.30-0.45m: Dark blackish brown silty CLAY. (PETERBOROUGH MEMBER)	Project 173044
	Reference 5 Plot 118
	Date 25/03/19
	Originator Richard Heath
	AA Environmental Limited Units 4-8 Cholswell Court Shippon, Abingdon OX13 6HX T: (01235) 536042 F: (01235) 523849 info@aae-llp.com www.aae-llp.com



Comment	Project 173044
	Reference 5 Plot 118 arisings
	Date 26/03/19
	Originator Richard Heath
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Comment	Project 173044
<u>Strata comprises:</u>	Reference 5 Plot 119
0.00-0.45m:	Date 25/03/19
Dark greyish brown silty CLAY.	Originator Richard Heath
(PETERBOROUGH MEMBER)	 AA Environmental Limited Units 4-8 Cholswell Court Shippon, Abingdon OX13 6HX T: (01235) 536042 F: (01235) 523849 info@aae-llp.com www.aae-llp.com



Comment	Project 173044
	Reference 5 Plot 119 arisings
	Date 26/03/19
	Originator Richard Heath
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Comment <u>Strata comprises:</u> 0.00-0.45m: Dark greyish brown silty CLAY. (PETERBOROUGH MEMBER)	Project 173044
	Reference 5 Plot 120
	Date 25/03/19
	Originator Richard Heath
	 Environmental Consultants AA Environmental Limited Units 4-8 Cholswell Court Shippon, Abingdon OX13 6HX T: (01235) 536042 F: (01235) 523849 info@aae-llp.com www.aae-llp.com



Comment	Project 173044
	Reference 5 Plot 120 arisings
	Date 26/03/19
	Originator Richard Heath
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Comment <u>Strata comprises:</u> 0.00-0.45m: Dark greyish brown silty CLAY. (PETERBOROUGH MEMBER)	Project 173044 Reference 5 Plot 121 N Date 25/03/19 Originator Richard Heath  AA Environmental Limited Units 4-8 Cholswell Court Shippon, Abingdon OX13 6HX T: (01235) 536042 F: (01235) 523849 info@aae-llp.com www.aae-llp.com
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Comment	Project 173044
	Reference 5 Plot 121 N arisings
	Date 26/03/19
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Comment <u>Strata comprises:</u> 0.00-0.45m: Dark greyish brown silty CLAY. (PETERBOROUGH MEMBER)	Project 173044 Reference 5 Plot 121 S Date 25/03/19 Originator Richard Heath  AA Environmental Limited Units 4-8 Cholswell Court Shippon, Abingdon OX13 6HX T: (01235) 536042 F: (01235) 523849 info@aae-llp.com www.aae-llp.com
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Comment	Project 173044
	Reference 5 Plot 121 S arisings
	Date 26/03/19
	Originator Richard Heath
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Comment <u>Strata comprises:</u> 0.00-0.30m Dark greyish brown sandy gravelly CLAY. Gravel is subangular fine of brick, concrete and hardcore. (MADE GROUND) 0.30-0.45m: Dark blackish brown silty CLAY. (PETERBOROUGH MEMBER)	Project 173044
	Reference 5 Plot 130
	Date 25/03/19
	Originator Richard Heath
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Comment	Project 173044
	Reference 5 Plot 130 arisings
	Date 26/03/19
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APPENDIX C

Certificates of Analysis – Verification Trial Pits & Stockpile Testing

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Amended Report

Report No.: 18-18546-3

Initial Date of Issue: 30-Jun-2018 **Date of Re-Issue:** 07-May-2019

Client AA Environmental Ltd

Client Address: Units 4 to 8
Cholswell Court
Shippon
Abingdon
Oxfordshire
OX136HX

Contact(s): Carrie Lorton
Ed Brown
Henry Austin
Jack Taylor
John McCusker
Mark Anderson
Matthew Lawman
Richard Heath
Sam Muir

Project 173044 - Careys Graven Hill

Quotation No.: **Date Received:** 27-Jun-2018

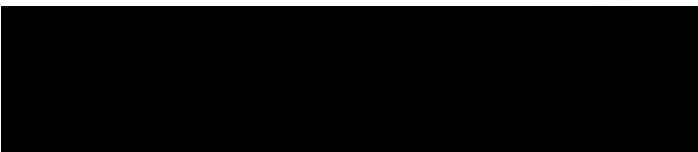
Order No.: 173044 **Date Instructed:** 27-Jun-2018

No. of Samples: 7

Turnaround (Wkdays): 7 **Results Due:** 05-Jul-2018

Date Approved: 03-Jul-2018

Approved By:



Details: Martin Dyer, Laboratory Manager

Project: 173044 - Careys Graven Hill

Client: AA Environmental Ltd	Chemtest Job No.:		18-18546	18-18546	18-18546	18-18546	18-18546	18-18546	18-18546	18-18546
Quotation No.:	Chemtest Sample ID.:		645215	645216	645217	645218	645219	645220	645221	645221
	Client Sample ID.:		SPHTP311	SPHTP311	SPHTP311	SPHTP312	SPHTP312	SPHTP312	SPHTP312	SPHTP312
	Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	Top Depth (m):		0.00	1.00	2.00	0.00	0.75	1.50	2.25	2.25
	Bottom Depth (m):		1.00	2.00	3.00	0.75	1.50	2.25	3.50	3.50
	Date Sampled:		25-Jun-2018	25-Jun-2018	25-Jun-2018	25-Jun-2018	25-Jun-2018	25-Jun-2018	25-Jun-2018	25-Jun-2018
	Asbestos Lab:		COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	Accred.	SOP	Units	LOD						
ACM Type	U	2192		N/A	-	-	-	-	-	-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
Moisture	N	2030	%	0.020	19	17	20	19	19	20
Soil Colour	N	2040		N/A	Brown	Brown	Brown	Brown	Brown	Brown
Other Material	N	2040		N/A	Stones	Stones	Stones	Stones	Stones	Stones
Soil Texture	N	2040		N/A	Clay	Clay	Clay	Clay	Clay	Sand,
pH	M	2010		N/A	8.4	7.9	8.0	7.7	7.8	7.8
Boron (Hot Water Soluble)	M	2120	mg/kg	0.40	1.6	1.5	1.5	1.5	1.3	1.3
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010	0.65	0.59	0.66	0.67	0.74	0.68
Cyanide (Total)	M	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Sulphide (Easily Liberatable)	N	2325	mg/kg	0.50	4.7	7.3	5.2	3.5	19	9.5
Arsenic	M	2450	mg/kg	1.0	27	24	26	23	19	21
Beryllium	U	2450	mg/kg	1.0	1.3	1.2	1.3	1.3	1.7	1.3
Cadmium	M	2450	mg/kg	0.10	0.39	0.36	0.37	0.35	0.35	0.31
Chromium	M	2450	mg/kg	1.0	40	39	48	42	42	40
Copper	M	2450	mg/kg	0.50	28	25	30	25	28	24
Mercury	M	2450	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Nickel	M	2450	mg/kg	0.50	37	35	41	35	34	33
Lead	M	2450	mg/kg	0.50	37	30	29	27	24	25
Selenium	M	2450	mg/kg	0.20	< 0.20	< 0.20	< 0.20	0.29	0.57	0.47
Vanadium	U	2450	mg/kg	5.0	54	50	64	48	44	44
Zinc	M	2450	mg/kg	0.50	96	110	94	85	78	80
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Total Organic Carbon	M	2625	%	0.20	1.5	1.7	1.5	1.4	1.2	1.4
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0	13	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	13	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Results - Soil

Project: 173044 - Careys Graven Hill

Client: AA Environmental Ltd	Chemtest Job No.:		18-18546	18-18546	18-18546	18-18546	18-18546	18-18546	18-18546
Quotation No.:	Chemtest Sample ID.:		645215	645216	645217	645218	645219	645220	645221
	Client Sample ID.:		SPHTP311	SPHTP311	SPHTP311	SPHTP312	SPHTP312	SPHTP312	SPHTP312
	Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	Top Depth (m):		0.00	1.00	2.00	0.00	0.75	1.50	2.25
	Bottom Depth (m):		1.00	2.00	3.00	0.75	1.50	2.25	3.50
	Date Sampled:		25-Jun-2018	25-Jun-2018	25-Jun-2018	25-Jun-2018	25-Jun-2018	25-Jun-2018	25-Jun-2018
	Asbestos Lab:		COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	Accred.	SOP	Units	LOD					
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	6.5	3.4	< 1.0	< 1.0	< 1.0
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0	20	9.2	< 1.0	< 1.0	< 1.0
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	28	13	< 5.0	< 5.0	< 5.0
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	40	13	< 10	< 10	< 10
Naphthalene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthylene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluorene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	M	2700	mg/kg	0.10	1.6	1.1	< 0.10	1.4	1.0
Anthracene	M	2700	mg/kg	0.10	0.65	0.42	< 0.10	0.71	0.44
Fluoranthene	M	2700	mg/kg	0.10	4.0	2.7	1.9	2.4	1.3
Pyrene	M	2700	mg/kg	0.10	2.7	1.8	1.5	1.6	0.76
Benzo[a]anthracene	M	2700	mg/kg	0.10	1.7	1.2	< 0.10	< 0.10	< 0.10
Chrysene	M	2700	mg/kg	0.10	2.7	2.3	< 0.10	< 0.10	< 0.10
Benzo[b]fluoranthene	M	2700	mg/kg	0.10	2.4	1.7	< 0.10	< 0.10	< 0.10
Benzo[k]fluoranthene	M	2700	mg/kg	0.10	1.9	1.1	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene	M	2700	mg/kg	0.10	1.9	1.2	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Dibenz(a,h)Anthracene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Of 16 PAH's	M	2700	mg/kg	2.0	20	14	3.4	6.1	3.5
Total Phenols	M	2920	mg/kg	0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Alkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2325	Sulphide in Soils	Sulphide	Steam distillation with sulphuric acid / analysis by 'Aquakem 600' Discrete Analyser, using N,N-dimethyl-p-phenylenediamine.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2680	TPH A/A Split	Aliphatics: >C5–C6, >C6–C8,>C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44	Dichloromethane extraction / GCxGC FID detection
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenzo[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID (GC-FID detection is non-selective and can be subject to interference from co-eluting compounds)
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.

Report Information

Key

- U UKAS accredited
- M MCERTS and UKAS accredited
- N Unaccredited
- S This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
- SN This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
- T This analysis has been subcontracted to an unaccredited laboratory
- I/S Insufficient Sample
- U/S Unsuitable Sample
- N/E not evaluated
- < "less than"
- > "greater than"

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

- A - Date of sampling not supplied
- B - Sample age exceeds stability time (sampling to extraction)
- C - Sample not received in appropriate containers
- D - Broken Container
- E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

customerservices@chemtest.com



Amended Report

Report No.: 19-11460-3

Initial Date of Issue: 05-Apr-2019 **Date of Re-Issue:** 17-Apr-2019

Client AA Environmental Ltd

Client Address: Units 4 to 8
Cholswell Court
Shippon
Abingdon
Oxfordshire
OX136HX

Contact(s): Ed Brown
Henry Austin
Ioannis Markidis
Jack Taylor
John McCusker
Mark Anderson
Matthew Lawman
Richard Heath
Sam Muir
Tomos Eaves

Project 173044 - Graven Hill

Quotation No.: **Date Received:** 03-Apr-2019

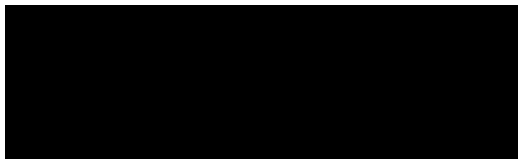
Order No.: 173044 **Date Instructed:** 03-Apr-2019

No. of Samples: 6

Turnaround (Wkdays): 5 **Results Due:** 09-Apr-2019

Date Approved: 09-Apr-2019

Approved By:



Details: Glynn Harvey, Laboratory Manager

Project: 173044 - Graven Hill

Client: AA Environmental Ltd	Chemtest Job No.:				19-11460	19-11460	19-11460	19-11460	19-11460	19-11460
Quotation No.:	Chemtest Sample ID.:				804247	804248	804249	804250	804251	804252
	Client Sample ID.:				P118	P119	P120	P121S	P121N	P130
	Sample Location:				S5	S5	S5	S5	S5	S5
	Sample Type:				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	Date Sampled:				26-Mar-2019	26-Mar-2019	26-Mar-2019	26-Mar-2019	26-Mar-2019	26-Mar-2019
	Asbestos Lab:				COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	Accred.	SOP	Units	LOD						
ACM Type	U	2192		N/A	-	-	-	-	-	-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
ACM Detection Stage	U	2192		N/A	-	-	-	-	-	-
Moisture	N	2030	%	0.020	22	21	19	19	23	22
pH	U	2010		N/A	7.9	7.9	7.8	8.0	8.0	8.2
Boron (Hot Water Soluble)	U	2120	mg/kg	0.40	1.4	1.1	1.6	1.2	1.2	1.5
Sulphate (2:1 Water Soluble) as SO ₄	U	2120	g/l	0.010	0.38	0.59	0.83	0.63	0.30	0.16
Cyanide (Total)	U	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Sulphide (Easily Liberatable)	N	2325	mg/kg	0.50	5.5	2.4	4.3	3.0	3.7	5.3
Arsenic	U	2450	mg/kg	1.0	25	27	20	22	19	16
Beryllium	U	2450	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	1.2
Cadmium	U	2450	mg/kg	0.10	0.32	< 0.10	0.16	< 0.10	< 0.10	< 0.10
Chromium	U	2450	mg/kg	1.0	40	37	41	30	46	48
Copper	U	2450	mg/kg	0.50	26	19	27	18	20	26
Mercury	U	2450	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Nickel	U	2450	mg/kg	0.50	43	45	43	36	48	52
Lead	U	2450	mg/kg	0.50	37	20	23	19	23	23
Selenium	U	2450	mg/kg	0.20	0.32	< 0.20	< 0.20	< 0.20	< 0.20	0.21
Vanadium	U	2450	mg/kg	5.0	48	46	44	36	50	44
Zinc	U	2450	mg/kg	0.50	100	70	85	130	77	89
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Total Organic Carbon	U	2625	%	0.20	2.0	0.63	0.87	0.58	1.0	0.69
Florisil Cleanup	N		-	N/A	Done	Done	Done	Done	Done	Done
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C8-C10	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C10-C12	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C12-C16	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C21-C35	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C8-C10	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C10-C12	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C12-C16	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Project: 173044 - Graven Hill

Client: AA Environmental Ltd	Chemtest Job No.:		19-11460	19-11460	19-11460	19-11460	19-11460	19-11460
Quotation No.:	Chemtest Sample ID.:		804247	804248	804249	804250	804251	804252
	Client Sample ID.:		P118	P119	P120	P121S	P121N	P130
	Sample Location:		S5	S5	S5	S5	S5	S5
	Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	Date Sampled:		26-Mar-2019	26-Mar-2019	26-Mar-2019	26-Mar-2019	26-Mar-2019	26-Mar-2019
	Asbestos Lab:		COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	Accred.	SOP	Units	LOD				
Aromatic TPH >C21-C35	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0	< 5.0	< 5.0
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	< 10	< 10	< 10	< 10
Naphthalene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthylene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluorene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	U	2700	mg/kg	0.10	0.60	0.12	< 0.10	< 0.10
Anthracene	U	2700	mg/kg	0.10	0.17	< 0.10	< 0.10	< 0.10
Fluoranthene	U	2700	mg/kg	0.10	1.2	0.22	0.36	0.10
Pyrene	U	2700	mg/kg	0.10	1.2	0.17	0.34	0.11
Benzo[a]anthracene	U	2700	mg/kg	0.10	0.87	< 0.10	< 0.10	< 0.10
Chrysene	U	2700	mg/kg	0.10	1.1	< 0.10	< 0.10	< 0.10
Benzo[b]fluoranthene	U	2700	mg/kg	0.10	0.94	< 0.10	< 0.10	< 0.10
Benzo[k]fluoranthene	U	2700	mg/kg	0.10	0.43	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene	U	2700	mg/kg	0.10	0.51	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene	U	2700	mg/kg	0.10	0.64	< 0.10	< 0.10	< 0.10
Dibenz(a,h)Anthracene	U	2700	mg/kg	0.10	0.15	< 0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene	U	2700	mg/kg	0.10	0.47	< 0.10	< 0.10	< 0.10
Total Of 16 PAH's	U	2700	mg/kg	2.0	8.3	< 2.0	< 2.0	< 2.0
Benzene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
m & p-Xylene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-Xylene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Phenols	U	2920	mg/kg	0.30	< 0.30	< 0.30	< 0.30	< 0.30

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Alkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2325	Sulphide in Soils	Sulphide	Steam distillation with sulphuric acid / analysis by 'Aquakem 600' Discrete Analyser, using N,N–dimethyl-p-phenylenediamine.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2680	TPH A/A Split	Aliphatics: >C5–C6, >C6–C8,>C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44	Dichloromethane extraction / GCxGC FID detection
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenzo[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID (GC-FID detection is non-selective and can be subject to interference from co-eluting compounds)
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.

Report Information

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- > "greater than"

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Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

- A - Date of sampling not supplied
- B - Sample age exceeds stability time (sampling to extraction)
- C - Sample not received in appropriate containers
- D - Broken Container
- E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

customerservices@chemtest.com

APPENDIX D
Consolidated Results - Section 5 Fill

DRAFT

Project: 173044 - Careys Graven Hill - PHASE 1 Section 5

Determinand	Waterman Landscaping and Residential Gardens Criteria mg/kg	Tier 1 Residential with homegrown produce SGV mg/kg	Chemtest Job No.:				18-18546	18-18546	18-18546	18-18546	18-18546	18-18546	18-18546	19-11460	19-11460	19-11460	19-11460	19-11460	19-11460		
			Chemtest Sample ID.:				645215	645216	645217	645218	645219	645220	645221	804247	804248	804249	804250	804251	804252		
			Client Sample Ref.:				SPHTP311	SPHTP311	SPHTP311	SPHTP312	SPHTP312	SPHTP312	SPHTP312	P118	P119	P120	P121S	P121N	P130		
			Section				5	5	5	5	5	5	5	5	5	5	5	5	5	5	
			Sample Type:																		
			Top Depth (m):				0.00	1.00	2.00	0.00	0.75	1.50	2.25	2.25							
			Bottom Depth (m):				1.00	2.00	3.00	0.75	1.50	2.25	3.50								
			Date Sampled:				25-Jun-2018	25-Jun-2018	25-Jun-2018	25-Jun-2018	25-Jun-2018	25-Jun-2018	25-Jun-2018	25-Jun-2018	26-Mar-2019	26-Mar-2019	26-Mar-2019	26-Mar-2019	26-Mar-2019	26-Mar-2019	26-Mar-2019
			Strata																		
			Accred.				SOP	Units	LOD												
ACM Type			U	2192		N/A	-	-	-	-	-	-	-	-	-	-	-	-			
Asbestos Identification	No visible, <0.001%		U	2192	%	0.001	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected			
Asbestos by Gravimetry		U	2192	%	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-			
Total Asbestos		N	2192	%	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-			
Moisture		N	2030	%	0.020	19	17	20	19	19	19	20	22	21	19	19	23	22			
pH		NR	M	2010		N/A	8.4	7.9	8.0	7.7	7.8	7.7	7.8	7.9	7.9	7.8	8.0	8.0	8.2		
Boron (Hot Water Soluble)		290	M	2120	mg/kg	0.40	1.6	1.5	1.5	1.5	1.3	1.3	1.5	1.4	1.1	1.6	1.2	1.2	1.5		
Sulphate (2:1 Water Soluble) as SO4		NR	M	2120	g/l	0.010	0.65	0.59	0.66	0.67	0.74	0.68	0.85	0.38	0.59	0.83	0.63	0.30	0.16		
Cyanide (Total)	26		M	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50		
Sulphide (Easily Liberatable)		NR	N	2325	mg/kg	0.50	4.7	7.3	5.2	3.5	19	9.5	6.7	5.5	2.4	4.3	3.0	3.7	5.3		
Arsenic	37		M	2450	mg/kg	1.0	27	24	26	23	19	21	23	25	27	20	22	19	16		
Beryllium	1.7													< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	1.2		
Cadmium	22		M	2450	mg/kg	0.10	0.39	0.36	0.37	0.35	0.35	0.31	0.35	0.32	< 0.10	0.16	< 0.10	< 0.10	< 0.10		
Chromium	910		M	2450	mg/kg	1.0	40	39	48	42	42	40	42	40	37	41	30	46	48		
Copper	2400		M	2450	mg/kg	0.50	28	25	30	25	28	24	27	26	19	27	18	20	26		
Mercury	1.2		M	2450	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10		
Nickel	180		M	2450	mg/kg	0.50	37	35	41	35	34	33	35	43	45	43	36	48	52		
Lead	200		M	2450	mg/kg	0.50	37	30	29	27	24	25	28	37	20	23	19	23	23		
Selenium	250		M	2450	mg/kg	0.20	< 0.20	< 0.20	< 0.20	0.29	0.57	0.47	0.45	0.32	< 0.20	< 0.20	< 0.20	< 0.20	0.21		
Vanadium			U	2450	mg/kg	5.0	54	50	64	48	44	44	47	48	46	44	36	50	44		
Zinc	3700		M	2450	mg/kg	0.50	96	110	94	85	78	80	85	100	70	85	130	77	89		
Chromium (Hexavalent)		6	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50		
Total Organic Carbon			M	2625	%	0.20	1.5	1.7	1.5	1.4	1.2	1.4	1.2	2.0	0.63	0.87	0.58	1.0	0.69		
Aliphatic TPH >C5-C6	78		N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0		
Aliphatic TPH >C6-C8	230		N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0		
Aliphatic TPH >C8-C10	230		M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0		
Aliphatic TPH >C10-C12	330		M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0		
Aliphatic TPH >C12-C16	2400		M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0		
Aliphatic TPH >C16-C21	92000		M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0		
Aliphatic TPH >C21-C35	92000		M	2680	mg/kg	1.0	13	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0		
Aliphatic TPH >C35-C44		92000	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0		
Total Aliphatic Hydrocarbons		NR	N	2680	mg/kg	5.0	13	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0		
Aromatic TPH >C5-C7	140		N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0		
Aromatic TPH >C7-C8	290		N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0		
Aromatic TPH >C8-C10	83		M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0		
Aromatic TPH >C10-C12	180		M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0		
Aromatic TPH >C12-C16	330		M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0		
Aromatic TPH >C16-C21	540		U	2680	mg/kg	1.0	6.5	3.4	< 1.0	< 1.0	< 1.0	< 1.0	2.9	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0		
Aromatic TPH >C21-C35	1500		M	2680	mg/kg	1.0	20	9.2	< 1.0	< 1.0	< 1.0	< 1.0	11	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0		
Aromatic TPH >C35-C44		1500	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0		
Total Aromatic Hydrocarbons		NR	N	2680	mg/kg	5.0	28	13	< 5.0	< 5.0	< 5.0	< 5.0	14	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0		
Total Petroleum Hydrocarbons		NR	N	2680	mg/kg	10.0	40	13	< 10	< 10	< 10	< 10	14	< 10	< 10	< 10	< 10	< 10	< 10		
Naphthalene	5.6		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10		
Acenaphthylene	420		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10		
Acenaphthene	510		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10		
Fluorene	400		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10		
Phenanthrene	220		M	2700	mg/kg	0.10	1.6	1.1	< 0.10	1.4	1.0	1.6	1.9	0.60	0.12	< 0.10	< 0.10	< 0.10	< 0.10		
Anthracene	5400		M	2700	mg/kg	0.10	0.65	0.42	< 0.10	0.71	0.44	0.58	0.79	0.17	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10		
Fluoranthene	560		M	2700	mg/kg	0.10	4.0	2.7	1.9	2.4	1										

APPENDIX E
Soil Guidance Values

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Soil Guidance Values for Landscaping and Residential Gardens

The following table presents the adopted combined Soil Guidance Values (SGVs) based on limiting values presented within the Waterman Remedial Strategy and LQM/CIEH Suitable 2 Use Levels (S4UL) for Human Health Assessment (unless stated otherwise).

Determinant	Waterman Landscaping and Residential Gardens Criteria	Tier 1 Residential with Homegrown Produce	Source
Arsenic	37		
Boron		290	LQM S4UL 2015
Beryllium	1.7		
Cadmium	22		
Chromium (Hexavalent)		6	LQM S4UL 2015
Chromium	910		
Copper	2400		
Lead	200		
Elemental Mercury	1.2		
Nickel	180		
Selenium	250		
Vanadium		410	LQM S4UL 2015
Zinc	3700		
Asbestos	No visible and <0.001% fibres		
Cyanide	26		
Phenol (Total)		550	LQM S4UL 2015
Aliphatic (5-6)	78		
Aliphatic (6-8)	230		
Aliphatic (8-10)	230		
Aliphatic (10-12)	330		
Aliphatic (12-16)	2400		
Aliphatic (16-35)	92000		
Aliphatic (35-44)		92000	LQM S4UL 2015
Aromatic (5-7)	140		
Aromatic (7-8 toluene)	290		
Aromatic (8-10)	83		
Aromatic (10-12)	180		
Aromatic (12-16)	330		
Aromatic (16-21)	540		
Aromatic (21-35)	1500		
Aromatic (35-44)		1500	LQM S4UL 2015
Benzene	0.17		
Toluene		290	LQM S4UL 2015
Ethylbenzene		110	LQM S4UL 2015
m-Xylene		140	LQM S4UL 2015
p-Xylene		130	LQM S4UL 2015
o-Xylene		140	LQM S4UL 2015

All values in mg/kg unless stated otherwise.
Based on 2.5% SOM.

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Soil Guidance Values for Landscaping and Residential Gardens (cont.)

Determinant	Waterman Landscaping and Residential Gardens Criteria (1)	Tier 1 Residential with Homegrown Produce (2)	Source
Naphthalene		5.6	LQM S4UL 2015
Acenaphthene		510	LQM S4UL 2015
Acenaphthylene		420	LQM S4UL 2015
Fluorene		400	LQM S4UL 2015
Anthracene		5400	LQM S4UL 2015
Fluoranthene		560	LQM S4UL 2015
Phenanthrene		220	LQM S4UL 2015
Pyrene		1200	LQM S4UL 2015
Benzo(a)anthracene	11		
Chrysene		22	LQM S4UL 2015
Benzo(b)fluoranthene	3.3		
Benzo(k)fluoranthene		93	LQM S4UL 2015
Benzo(ghi)perylene		340	LQM S4UL 2015
Benzo(a)pyrene	2.7		
Dibenzo(ah)anthracene	0.28		
Indeno(123-cd)pyrene		36	LQM S4UL 2015

All values in mg/kg unless stated otherwise
Based on 2.5% SOM.

References

(1) Waterman Remediation Options Appraisal and Remedial Strategy Report - Land Transfer Area 1' January 2016 (Report reference: WIB13983-104-R-2-2-3-MA-MACF).

(2) LQM/CIEH Suitable 2 Use Levels (S4UL) for Human Health Assessment – Land Quality Management Limited (LQM) and Chartered Institute of Environmental Health (CIEH) Land Quality Press (2015)