RADNOR HILLS MINERAL WATER COMPANY - HEARTSEASE

INTERPRETATIVE REPORT ON GROUND INVESTIGATION

Prepared for RADNOR HILLS MINERAL WATER COMPANY LIMITED

Report Ref: 32861

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PROJECT: BASELINE SURVEY

CONSULTANT: SUSTAINABLE DIRECTION LIMITED

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ORIGINATOR	APPROVER
	
DAVID MARSHALL SENIOR GEOENVIRONMENTAL ENGINEER	NEIL PARRY DIRECTOR

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CONTENTS

REPORT **PAGE**

FIGURES **Nos.**

APPENDICES

1. INTRODUCTION

It is understood that the Client, Radnor Hills Mineral Water Company Limited, has applied to Cyfoeth Naturoil Cymru / Natural Resources Wales (NRW) for an environmental permit for the operation of their Heartsease bottling facility. As part of the permitting process, the Client would like to establish baseline soil and groundwater conditions at the commencement of the permit.

Geotechnical Engineering Limited (GEL) was instructed by Radnor Hills Mineral Water Company Limited to carry out an investigation to determine the ground conditions under the direction of the Consultant, Sustainable Direction Limited and their appointed hydrogeologist Rukhydro Limited. No desk study was carried out prior to the investigation in accordance with the Client's instructions.

The scope of works and terms and conditions of appointment were specified by the Consultant, Client and Rukhydro Limited and GEL correspondence reference T25548/02, dated 21st February 2017. The investigation was carried out under direction and supervision of the Client in conjunction with the Consultant and Rukhydro Limited.

This report describes the investigation, presents the findings and comments accordingly. The comments given in this report and the opinions expressed assume that ground conditions do not vary beyond the range revealed by this investigation. There may however, be conditions at or adjacent to the site, which have not been disclosed by the investigation and which, therefore, have not been considered in this report. Accordingly, a careful watch should be maintained during any future groundworks and the recommendations of this report reviewed as necessary.

The recommendations given in this report should not be used for any other schemes on or adjacent to this site without further reference to GEL.

2. SITE LOCATION AND GEOLOGY

The site is situated at the Radnor Hills Mineral Water Company site, Heartsease, Knighton, Powys, LD7 1LU and may be located by its National Grid co-ordinates SO ^{3}3441 ^{2}7245, as shown in Figure 1.

British Geological Survey (BGS) online geology (1:625,000) indicate the site is underlain by superficial Alluvium deposits, comprising clay, silt and sand overly the solid geology of the Pridoli Rocks, comprising mudstone, siltstone and sandstone. A previous investigation completed at the site by Rukhydro Limited (Ref: 00058/RP210/Issue 2, dated 18th October 2016) indicates a surface covering of 'clay with fine gravel' extending to approximately 1.0m below ground level (bgl) over 'fine gravels in a sand/clay mix'.

3. PROPOSED WORKS

It is understood that the Client, in the process of applying for an environmental permit for the site, wants to establish baseline conditions at selected locations across the Heartsease bottling facility. Investigation locations were specified by the Client and the Consultant. It is understood that the location of BH01 was selected to target an area deemed most likely to be impacted by previous agricultural activities; specifically the storage of chicken manure. Borehole BH02 was located in the proposed location of a treatment plant, the location therefore deemed to be most at risk of soil contamination due to the operation of the proposed treatment activities.

It is understood that the information derived from this report will be utilised in progressing the application process for the above permit, assessment of the hydrogeological conditions and any implications of this report will be addressed by others.

The results of the investigation and subsequent laboratory testing will be compared with generic assessment criteria to provide a frame of reference for 'baseline' readings.

4. GROUND INVESTIGATION

4.1 Fieldwork

The fieldwork was carried out in general accordance with BS5930:2015 on the 9th and 10th March 2017 and comprised two dynamic sampled boreholes.

The exploratory hole locations were selected by the Client and Consultant and set out by this Company and are shown on Figure 2.

The boreholes, referenced BH01 and BH02 (Appendix A), were formed using a track-mounted Geotechnical Pioneer Rig. Initially, an inspection pit was hand excavated at each borehole location to a depth of 1.20m to check for buried services. Disturbed samples were taken and retained in a combination of plastic tubs, bags and amber glass jars and vials. Heavy duty dynamic sampling techniques were then employed to produce a continuous disturbed sample of 112mm nominal diameter. The samples were recovered in semi-rigid plastic liner.

The dynamic samples were extracted horizontally from the sampler and the semi-rigid liner was cut to length and caps placed at each end to retain moisture content. All samples were retained in sequence in labelled, wooden coreboxes.

Boreholes were monitored for groundwater ingress as dynamic sampling proceeded, prior to the introduction of flush water to the holes. Borehole BH01 was purged of flush water at the end of drilling operations on the 9th March 2017, and was found to be dry at the commencement of drilling operations on the 10th March 2017. No record of groundwater

ingress was recorded during the drilling of BH02, although it should be noted that the addition of water to the hole and use of casing may have masked minor strikes.

The Consultant advises that the boreholes were primarily designed to check for perched groundwater and were not advanced into the main gravel aquifer water table to ensure no impact on Radnor Hills' spring water supply operations.

On completion, BH01 and BH02 were backfilled with bentonite pellets and the surface reinstated.

Samples for chemical analyses were dispatched to i2 Analytical Limited under a Chain of Custody. The remaining samples were brought to this Company's laboratory for storage.

4.2 Logging

The logging of soils and rocks was carried out by an Engineering Geologist in general accordance with BS5930:2015. A key to the exploratory hole logs is presented in Appendix A.

Detailed descriptions of the samples are given in the borehole logs, Appendix A, along with details of sampling, groundwater observations and relevant comments on drilling techniques.

4.3 Chemical Testing

A partially targeted schedule of laboratory tests was prepared by this company and chemical analyses were carried out by i2 Analytical to in-house methods for a suite of contaminants specified by the Consultant and Rukhydro Limited.

The suite contained analysis targeted at general soil contaminants, including heavy metals, Poly-cyclic Aromatic Hydrocarbons (PAH's), Petroleum Hydrocarbons and associated

compounds together with Volatile and Semi-Volatile Organic Compounds (VOC's & SVOC's). In addition, analysis of selected determinands was requested by Rukhydro to check for impact by farm manures and to characterise the host nature of the soils. The results are presented in Appendix B.

5. DISCUSSION AND CONCLUSIONS

5.1 Ground Conditions

The ground conditions revealed by the investigation generally confirm the strata anticipated based upon previous works on site (Rukhydro Limited report ref: 00058/RP210/Issue 2) and by the geological records.

Surface hardstanding comprising taramacadam was encountered at both exploratory locations to a depth of 0.10m bgl in BH01 and 0.05m bgl in BH02. Underlying the hardstanding a grey, slightly silty sandy fine to coarse crystalline gravel (Made Ground) was encountered in both locations, to a depth of 0.50m bgl in BH01 and 0.10m bgl in BH02.

Natural strata was encountered under the gravel, initially comprised a stiff reddish brown and brown sandy gravelly clay, recorded as silty within BH02. The gravel component comprised fine to coarse sandstone, siltstone and crystalline. Frequent rootlets were observed between 0.10m and 0.30m bgl in BH02.

Beneath 1.40m bgl (BH01) and 1.50m (BH02) a greyish brown and reddish brown slightly silty sandy fine to coarse sandstone, siltstone and crystalline gravel was encountered, extending to the full depth of both boreholes (5.20m in BH01 and 5.70m in BH02).

Groundwater was not encountered prior to the addition of water to the holes; at 2.70m bgl in both boreholes. No water strikes were recorded after this stage, however it should be noted that the presence of flush water and/or installed casing may have masked seepages or minor strikes. On the instruction of the Consultant the boreholes were terminated above the elevation of groundwater within the main gravel aquifer from which the site abstracts water.

Upon completion of drilling activities within BH01 on the 9th March 2017 (at 4.20m bgl) the borehole was purged dry and left overnight in an attempt to establish if groundwater was present, upon commencement of operations on 10th March 2017 the borehole was found to be dry.

5.2 Environmental Considerations

Basis of Assessment – Soils

The concentration of contamination present at a site must be assessed in relation to a recognised system of defining whether a site presents a significant possibility of significant harm to human health. In the UK, the Department of the Environment Food and Rural Affairs (DEFRA) and the Environment Agency (EA) prepared a method for deriving generic and site-specific assessment criteria to establish actual or potential risk to human health. This comprised the Contaminated Land Exposure Assessment (CLEA) methodology, and the associated DEFRA/EA Soil Guideline Value (SGV) reports.

Further guidance was produced by DEFRA in "Environmental Protection Act 1990: Part 2A, Contaminated Land Statutory Guidance (2012)" supporting the use of Generic Assessment Criteria (GACs) as screening tools in generic quantitative human health risk assessment to help assessors decide when land can be excluded from the need for further inspection and assessment, or when further work may be warranted. They may be used to indicate when land is very unlikely to pose a significant possibility of significant harm to human health but they should not be used as direct indicators of whether a significant possibility of significant harm to human health may exist. Furthermore the Category 4 Screening Levels (C4SLs) derived by DEFRA in 2014 will generally be used in place of SGVs and other guidance. In the absence of a suitable C4SL or SGV, risk assessors are advised to identify and select appropriate generic assessment criteria in accordance with established good practice.

The CLEA computer model has been used for this assessment to derive S4ULs and similarly EIC/AGS/CL:AIRE values, in lieu of any other available guidance. The basis for assessment of soils is discussed in full in Appendix C.

Comparison of Results - Soil

Potential contamination at the site has been compared with the GAC screening values for a commercial end use. The screening values are defined by SGVs and C4SL's (where available), LQM/CIEH S4UL values (2015) and ATRISK SSVs (2011). Total Organic Carbon contents ranging between 0.2% and 1.6% were measured within the analysed soil samples. Corrected Soil Organic Matter (SOM) values of between 0.35% and 2.8% SOM are derived (using the formula TOC/0.58 = SOM, Environment Agency Science report: SC050021/SR4, 2009). Based upon the variability of recorded SOM values this assessment utilizes a Soil Organic Matter of 6% SOM (defined by Environment Agency) for the SGVs and C4SL's, whilst a conservative Soil Organic Matter of 1.0% SOM was used for the LQM values (where applicable) and SSVs.

General Contaminants

When compared with the GAC screening values for published SGVs, C4SLs, LQM/CIEH S4ULs and ATRISK SSVs, no exceedances of the GACs was recorded. It is therefore considered that these soils are unlikely to present a possibility of significant harm to human health. The results are summarised in Table 5.1 below:

Contaminant	**Concentration ranges with exceedances**	**GACs (mg/kg)**
Arsenic	Range: 5.1-10mg/kg	640
Beryllium	Range: 0.67 – 0.99mg/kg	12
Boron	Range: 0.3 – 0.5mg/kg	240,000
Cadmium	All less than 0.2mg/kg	190
Chromium (Trivalent)	Range: 31 - 43mg/kg	8,600
Chromium (Hexavalent)	All less than 4.0mg/kg	33
Cyanide	All less than 1.0mg/kg	34*
Mercury	All less than 0.3mg/kg	26#
Nickel	Range: 28 - 47mg/kg	980
Lead	Range: 11 - 29mg/kg	2,300$
Phenols	All less than 1.0mg/kg	440
Selenium	All less than 1.0mg/kg	12,000
Vanadium	Range: 26 - 50mg/kg	9,000
Zinc	Range: 52 - 100mg/kg	730,000

GACs derived from Land Quality Management (LQM)/CIEH S4UL Values (2015) for a commercial end-use (1% SOM)
*ATRISK (2011) Soil Screening Values (SSVs) for a commercial land use (1% SOM)
#SGVs (2009) for a commercial end-use (6% SOM)
$C4SL (2009) for a commercial end-use (6% SOM)
Exceedances marked in **bold**

Table 5.1: GAC for Heavy Metals and General contaminants

Poly-cyclic Aromatic Hydrocarbons

When compared with the published LQM/CIEH S4UL screening values no exceedance of the relevant assessment criteria were recorded for any of the determinands. It is therefore considered that these soils are unlikely to present a possibility of significant harm to human health. The results are summarised in Table 5.2 below:

Contaminant	**Concentration ranges with exceedances**	**GACs (mg/kg)**
Acenaphthene	All less than 0.1 mg/kg	57[SOL]
Acenaphthylene	All less than 0.1 mg/kg	86[SOL]
Anthracene	All less than 0.1 mg/kg	520,000
Benzo(a)anthracene	All less than 0.1 mg/kg	170
Benzo(a)pyrene	All less than 0.1 mg/kg	35 / 77[+]
Benzo(b)fluoranthene	All less than 0.1 mg/kg	44
Benzo(ghi)perylene	All less than 0.05 mg/kg	3,900
Benzo(k)fluoranthene	All less than 0.1 mg/kg	1,200
Chrysene	All less than 0.05 mg/kg	350
Dibenzo(ah)anthracene	All less than 0.1 mg/kg	3.5
Fluoranthene	All less than 0.1 mg/kg	23,000
Fluorene	All less than 0.1 mg/kg	30.9[SOL]
Indeno(123-cd)pyrene	All less than 0.1 mg/kg	500
Naphthalene	All less than 0.05 mg/kg	76[SOL]
Phenanthrene	All less than 0.1 mg/kg	22,000
Pyrene	All less than 0.1 mg/kg	54,000

GACs derived from Land Quality Management (LQM)/CIEH S4UL Values (2015) for a commercial end-use (1%)
[SOL] = Adopted value is the solubility saturation limit.
[+]C4SL's (2009) for a commercial end-use (6% SOM)
Exceedances marked in **bold**

Table 5.2: GAC for Poly-cyclic Aromatic Hydrocarbons

Petroleum Hydrocarbons and associated compounds

When compared with the published SGV's, LQM/CIEH and CL:AIRE screening values no exceedance of the relevant guideline values were recorded. It is therefore considered that these soils are unlikely to present a significant possibility of significant harm to human health. The results are summarised in Table 5.3 below.

Contaminant	Concentration ranges with exceedances	GACs (mg/kg)
Aliphatic >C_5-C_6	All less than 0.1mg/kg	304[SOL]
Aliphatic >C_6-C_8	All less than 0.1mg/kg	144[SOL]
Aliphatic >C_8-C_{10}	All less than 0.1mg/kg	78[SOL]
Aliphatic >C_{10}-C_{12}	Range <1.0 – 2.4mg/kg	48[SOL]
Aliphatic >C_{12}-C_{16}	Range <2.0 – 7.9mg/kg	24[SOL]
Aliphatic >C_{16}-C_{21}	All less than 8.0mg/kg	1,600,000
Aliphatic >C_{21}-C_{35}	Range: <8.0 - 14mg/kg	
Aromatic >C_5-C_7	All less than 0.1mg/kg	1,220[SOL]
Aromatic >C_7-C_8	All less than 0.1mg/kg	869[VAP]
Aromatic >C_8-C_{10}	All less than 0.1mg/kg	613[VAP]
Aromatic >C_{10}-C_{12}	All less than 1.0mg/kg	364[SOL]
Aromatic >C_{12}-C_{16}	All less than 2.0mg/kg	169[SOL]
Aromatic >C_{16}-C_{21}	All less than 10.0mg/kg	28,000
Aromatic >C_{21}-C_{35}	Range: <10 - 15mg/kg	28,000
Benzene	All less than 1.0mg/kg	27 / 95#
Toluene	All less than 1.0mg/kg	869VAP / 4,400#
Ethylbenzene	All less than 1.0mg/kg	518VAP / 2,800#
m- & p-Xylene	All less than 1.0mg/kg	m-: 625VAP / 3,500#
		p-: 576SOL / 3,200#
o-Xylene	All less than 1.0mg/kg	478SOL / 2,600#
Methyl-Tert-Butyl-Ether (MTBE)	All less than 1.0mg/kg	7,900~

GACs derived from Land Quality Management (LQM)/CIEH S4UL Values (2015) for a commercial end-use (1%)
[SOL] = adopted value is the solubility saturation limit. [VAP] = adopted value is the vapour saturation limit.
#SGVs (2009) for a commercial end-use (6% SOM)
~ EIC/AGS/CL:AIRE Soil Generic Assessment Criteria for a commercial end-use (1% SOM)
Exceedances marked in **bold**

Table 5.3: GAC for Petroleum Hydrocarbons and associated compounds

Volatile Oganic Compounds and Semi-Volatile Organic Compounds

Analysis completed for a suite of 56 Volatile Organic Compounds (VOC's) did not record any exceedance of the laboratory limit of detection within the four analysed samples. Similarly no exceedance of the laboratory limit of detection was recoded within the four samples subjected to the suite of 55 Semi-Volatile Organic Compound (SVOC) analysis. Based upon the above considered that these soils are unlikely to present a significant possibility of significant harm to human health relating to VOC's or SVOC's.

6. CONTAMINATION RISK ASSESSMENT AND RECOMMENDATIONS

Based upon the findings of the ground investigation and subsequent chemical analysis of selected soil samples the encountered ground conditions are generally compatible with the existing commercial / industrial end-use with regard to human health concerns, no assessment of the risk to controlled waters has been made within this report, it is understood that any required assessment will be completed by others.

The reported results should be kept on-file for review and/or comparison with any future analysis completed relating to any permit eventually granted.

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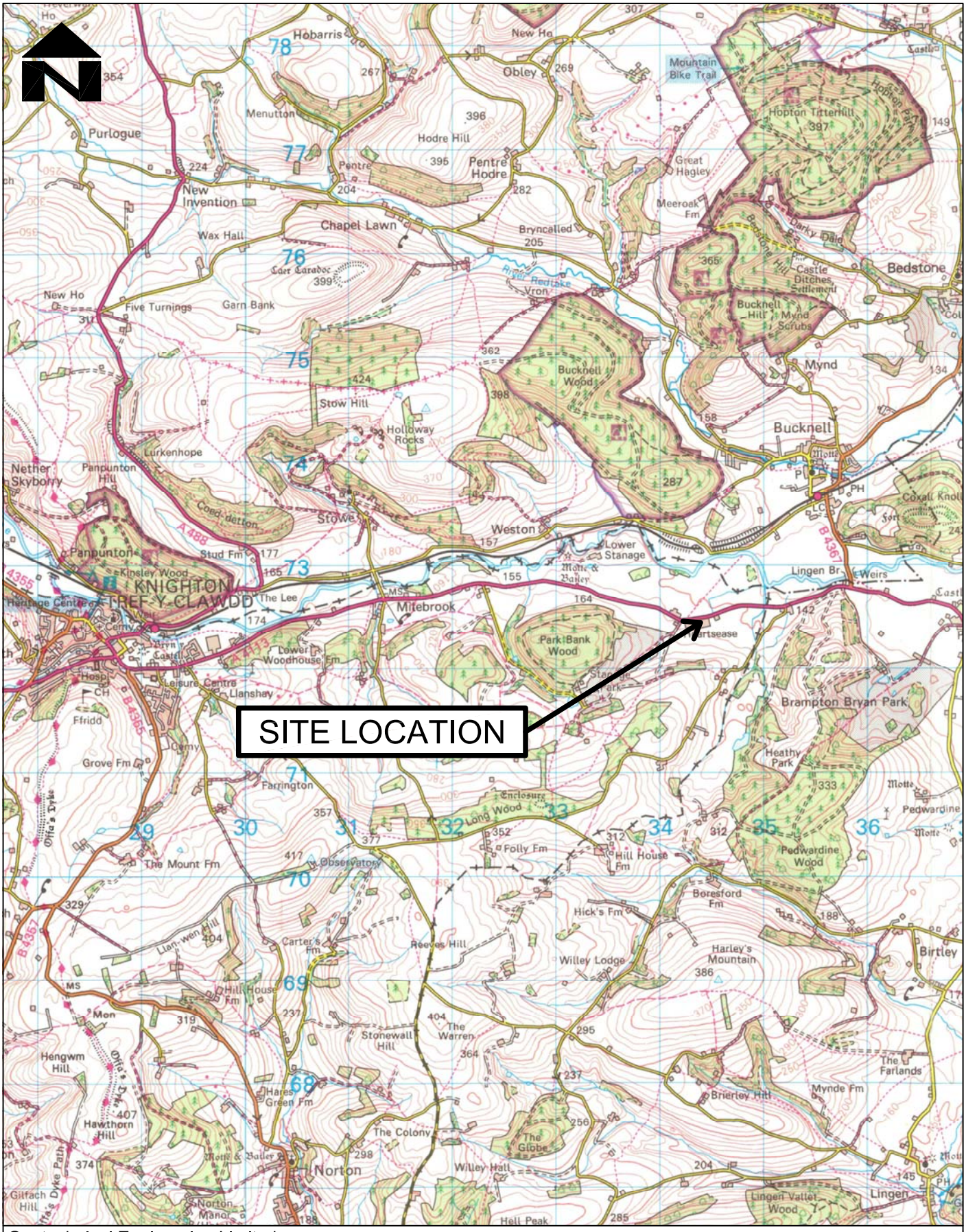
7. REFERENCES

British Standards Institution (2015): Code of practice for ground investigations. BS 5930:2015.

Environment Agency. (2009): CLEA software (version 1.05) handbook. Science Report SC050021/SR4. Bristol: Environment Agency.

RUKHYDRO Limited (2016): Radnor Hills Effluent Discharge, Evaluation of Risks to the Water Environment – Addendum A. Ref:00058/RP210/Issue 2, dated 18th October 2016.



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SITE LOCATION

CLIENT RADNOR HILLS MINERAL WATER COMPANY LIMITED

SITE RADNOR HILLS MINERAL WATER COMPANY - HEARTSEASE

SCALE: 1:50,000 @ A4

CONTRACT	FIGURE
32861	1

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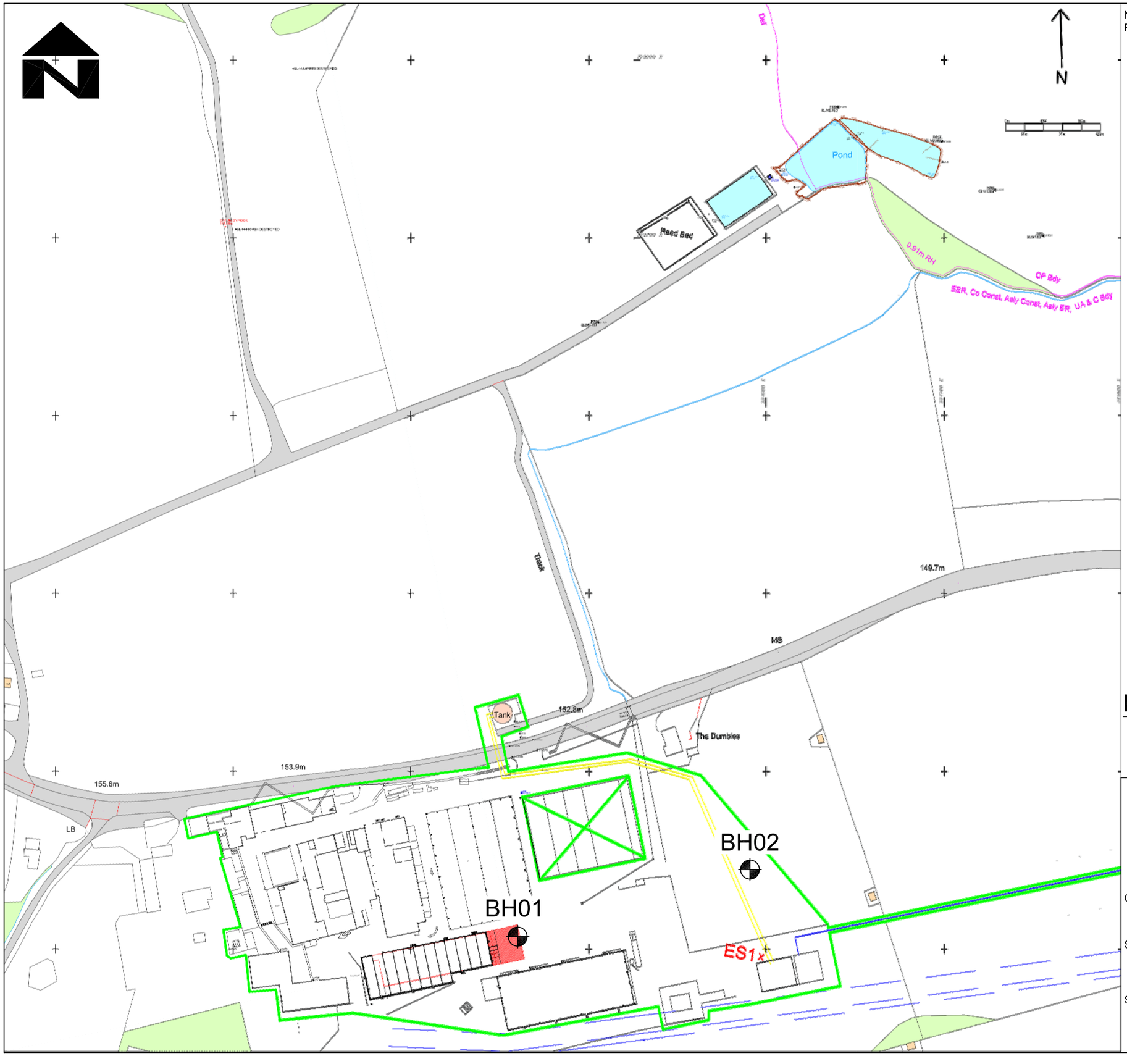

Notes
Reproduced from Radnor Hills site drawing supplied by the Client.

KEY:

⊕ = Approximate borehole location

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SITE PLAN

Client: RADNOR HILLS MINERAL WATER COMPANY LIMITED

Site: RADNOR HILLS MINERAL WATER COMPANY - HEARTSEASE

Scale: 1 : 5,000 @ A3

CONTRACT	FIGURE
32861	2

APPENDIX A

FIELDWORK DATA

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KEY TO EXPLORATORY HOLE LOGS

Sample type

D	Small disturbed	U	Undisturbed	X/L	Dynamic	D*/ES	Environmental - soil	Cs	Core subsample (prepared)
B	Bulk disturbed	UT	Undisturbed thin wall	C	Core	EW	Environmental - water	Xs/Ls	Dynamic subsample (prepared)
LB	Large bulk disturbed	P	Piston	W	Water				

Test type

S SPT - Split spoon sampler followed by uncorrected SPT 'N' Value
C SPT - Solid cone followed by uncorrected SPT 'N' Value
(*250 - Where full test drive not completed, linearly extrapolated 'N' value reported, ** - Denotes no effective penetration)
H Hand vane - direct reading in kPa - not corrected for BS1377 (1990). Re* denotes refusal
M Mackintosh probe - number of blows to achieve 100mm penetration
PP Pocket penetrometer - direct reading in kg/sq.cm
Vo Headspace vapour reading, uncorrected peak values in ppm, using a PID (calibrated with Isobutylene, using a 10.6eV bulb)

Sample/core range/I_f

Dynamic sample

Undisturbed sample - open drive including thin wall. Symbol length reflects recovery

x x = Total Core Recovery (TCR) as percentage of core run

y y = Solid Core Recovery (SCR) as percentage of core run. Assessment of core is based on full diameter.

z z = Rock Quality Designation (RQD). The amount of solid core greater than 100mm expressed as percentage of core run.

Where SPT has been carried out at beginning of core run, disturbed section of core excluded from SCR and RQD assessment.

I_f - fracture spacing - the modal fracture spacing (mm) over the indicated length of core. Where spacing varies significantly, the minimum, mode and maximum values are given. NI = non-intact core NA = not applicable

Instrumentation

Porous tip | Perforated standpipe | Granular response zone | Bentonite seal | Cement/ bentonite grout | Soil Backfill | Concrete

Stratum boundaries

Estimated boundary

Grading boundary

Logging

The logging of soils and rocks has been carried out in general accordance with BS 5930:2015.

Chalk is logged in general accordance with Lord et al (2002) CIRIA C574. Where possible, dynamic samples in chalk have been logged in accordance with CIRIA C574; descriptions and gradings (if presented) should be treated with caution given the potential for sample disturbance.

For rocks the term fracture has been used to identify a mechanical break within the core. Where possible incipient and drilling induced fractures have been excluded from the assessment of fracture state. Where doubt exists, a note has been made in the descriptions. All fractures are considered to be continuous unless otherwise reported.

Made Ground is readily identifiable when, within the material make up, man made constituents are evident. Where Made Ground appears to be reworked natural material the differentiation between in situ natural deposits and Made Ground is much more difficult to ascertain. The interpretation of Made Ground within the logs should therefore be treated with caution.

The descriptors "topsoil" and "tarmacadam" are used as generic terms and do not imply conformation to any particular standard or composition.

Rootlets are defined as being less than 2mm in diameter, roots are defined as in excess of 2mm diameter.

General Comments

The process of drilling and sampling will inevitably lead to disturbance, mixing or loss of material in some soil and rocks.

Indicated water levels are those recorded during the process of drilling or excavating exploratory holes and may not represent standing water levels.

All depths are measured along the axis of the borehole and are related to ground level at the point of entry. All inclinations are measured normal to the axis of the core.

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BOREHOLE LOG

BH01

CLIENT RADNOR HILLS MINERAL WATER COMPANY LIMITED

SITE RADNOR HILLS MINERAL WATER COMPANY - HEARTSEASE

Sheet 1 of 1

Start Date 9 March 2017

Scale 1 : 50

End Date 10 March 2017

Depth 5.20 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	instru -ment	description	depth (m)	reduced level (m)	legend
09/03/17 1400hrs	C	0.00 - 0.10			100		MADE GROUND comprising black TARMACADAM.	0.10		
	1ES	0.20					Grey slightly silty sandy subangular fine to coarse crystalline GRAVEL. (MADE GROUND)	0.50		
	1B	0.20 - 0.40								
	2ES	0.60 - 0.80					Stiff reddish brown sandy gravelly CLAY. Gravel is subangular to rounded fine to coarse sandstone, siltstone and crystalline.			
	2B	0.60 - 0.80								
	3ES	1.00 - 1.20								
	3B	1.00 - 1.20								
	4L	1.20 - 2.70	Nil					1.40		
							Greyish brown and reddish brown slightly silty sandy subangular to rounded fine to coarse sandstone, siltstone and crystalline GRAVEL.			
	4ES	2.00 - 2.10								
	5L	2.70 - 4.20	2.70							
	5ES	3.00 - 3.10								
09/03/17 1730hrs 4.10m	6ES	4.00 - 4.10								
10/03/17 0820hrs Dry	6L	4.20 - 5.20	4.20							
10/03/17 0940hrs 4.10m	7ES	5.00 - 5.10						5.20		
							Borehole completed at 5.20m.			
								{8.00}		

EQUIPMENT: Geotechnical Pioneer rig.

METHOD: Waterflush rotary coring (300mm diam) 0.00-0.10m. Hand dug inspection pit 0.10-1.20m. Dynamic sampled (128mm) 1.20-5.20m.

CASING: 168mm diam to 4.20m.

BACKFILL: On completion, hole backfilled with bentonite pellets and surface reinstated.

REMARKS: Borehole purged of water end of shift 09/03/17. Start of shift 10/03/17 borehole dry.

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

water strike (m)	casing (m)	rose to (m)	time to rise (min)	remarks
				Groundwater not encountered prior to use of water flush.

AGS

CONTRACT	CHECKED
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BOREHOLE LOG

BH02

CLIENT RADNOR HILLS MINERAL WATER COMPANY LIMITED

SITE RADNOR HILLS MINERAL WATER COMPANY - HEARTSEASE — Sheet 1 of 1

Start Date 9 March 2017 — Scale 1 : 50

End Date 9 March 2017 — Depth 5.70 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	instru -ment	description	depth (m)	reduced level (m)	legend
09/03/17 0900hrs	C	0.00 - 0.08			50		MADE GROUND comprising black TARMACADAM.	0.05		
	1ES	0.20 - 0.40					Grey slightly silty sandy subangular fine to coarse crystalline GRAVEL. (MADE GROUND)	0.10		
	1B	0.20 - 0.40								
	2ES	0.60 - 0.80					Stiff brown sandy gravelly CLAY with frequent rootlets to 0.30m. Gravel is subangular fine to coarse sandstone and crystalline.			
	2B	0.60 - 0.80								
	3ES	1.00 - 1.20					0.80 - 1.50m: With a low rounded siltstone cobble content.			
	3B	1.00 - 1.20								
	4L	1.20 - 2.70	Nil					1.50		
							Greyish brown and reddish brown slightly silty sandy subangular to rounded fine to coarse sandstone, siltstone and crystalline GRAVEL.			
	4ES	2.00 - 2.10					2.20m: Band (80mm) of reddish brown sandy silt.			
	5L	2.70 - 4.20	2.70							
	5ES	3.00 - 3.10					3.70m: Band (40mm) of rounded fine and medium siltstone gravel.			
	6ES	4.00 - 4.10								
	6L	4.20 - 5.70	4.20							
	7ES	5.00 - 5.10								
09/03/17 1210hrs 1.60m								5.70		
							Borehole completed at 5.70m.			
								{8.00}		

EQUIPMENT: Geotechnical Pioneer rig.

METHOD: Waterflush rotary coring (300mm diam) 0.00-0.08m. Hand dug inspection pit 0.08-1.20m. Dynamic sampled (128mm) 1.20-5.70m.

CASING: 168mm diam to 4.20m.

BACKFILL: On completion, hole backfilled with bentonite pellets and surface reinstated.

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

water strike (m)	casing (m)	rose to (m)	time to rise (min)	remarks
				Groundwater not encountered prior to use of water flush.

AGS

CONTRACT **32861**

CHECKED

DRAFT

APPENDIX B

CHEMCIAL TESTING

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Analytical Report Number : 17-43155

Project / Site name:	Radnor Hills	**Samples received on:**	13/03/2017
Your job number:	32861	**Samples instructed on:**	17/03/2017
Your order number:		**Analysis completed by:**	Not complete
Report Issue Number:	1	**Report issued on:**	24/03/2017
Samples Analysed:	4 soil samples		

Signed:

Rexona Rahman
Reporting Manager
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 17-43155

Project / Site name: Radnor Hills

Lab Sample Number				720756	720757	720758	720759	
Sample Reference				BH01	BH01	BH02	BH02	
Sample Number				1	6	1	3	
Depth (m)				0.20	4.00-4.10	0.20-0.40	1.00-1.20	
Date Sampled				09/03/2017	10/03/2017	09/03/2017	09/03/2017	
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	72	< 0.1	< 0.1	39	
Moisture Content	%	N/A	NONE	3.2	13	18	8.6	
Total mass of sample received	kg	0.001	NONE	1.9	2.0	1.9	2.0	
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	8.4	7.8	6.9	7.2	
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1	
Water Soluble Sulphate as SO_4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	40	350	170	110	
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.020	0.17	0.085	0.057	
Water Soluble Chloride (2:1)	mg/kg	1	MCERTS	8.4	15	8.3	5.0	
Ammoniacal Nitrogen as N	mg/kg	0.5	MCERTS	< 0.5	< 0.5	< 0.5	< 0.5	
Total Nitrogen (Kjeldahl)	mg/kg	5	NONE	130	170	1300	310	
Total Organic Carbon (TOC)	%	0.1	MCERTS	0.3	0.2	1.6	0.3	
Carbonate as $CaCO_3$	%	0.1	NONE	19	0.3	1.5	1.1	
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	
Acenaphthylene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	
Acenaphthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	
Fluorene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	
Phenanthrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	
Anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	
Fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	
Pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	
Benzo(a)anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	
Chrysene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	
Benzo(b)fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	
Benzo(k)fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	
Benzo(a)pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	
Dibenz(a,h)anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	1.6	MCERTS	< 1.60	< 1.60	< 1.60	< 1.60	

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Project / Site name: Radnor Hills

Lab Sample Number				720756	720757	720758	720759	
Sample Reference				BH01	BH01	BH02	BH02	
Sample Number				1	6	1	3	
Depth (m)				0.20	4.00-4.10	0.20-0.40	1.00-1.20	
Date Sampled				09/03/2017	10/03/2017	09/03/2017	09/03/2017	
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	5.1	10	7.0	5.9	
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	0.67	0.99	0.68	0.94	
Boron (water soluble)	mg/kg	0.2	MCERTS	0.5	0.4	0.5	0.3	
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0	
Chromium (III)	mg/kg	1	NONE	31	39	37	43	
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	31	39	39	43	
Cobalt (aqua regia extractable)	mg/kg	0.15	MCERTS	9.7	13	12	13	
Iron (aqua regia extractable)	mg/kg	40	MCERTS	39000	44000	39000	46000	
Lead (aqua regia extractable)	mg/kg	1	MCERTS	11	14	29	16	
Manganese (aqua regia extractable)	mg/kg	1	MCERTS	670	1100	1200	770	
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	30	46	28	47	
Phosphorus (aqua regia extractable)	mg/kg	20	ISO 17025	430	1100	1700	1100	
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	26	31	50	37	
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	52	74	100	83	
Calcium (aqua regia extractable)	mg/kg	20	ISO 17025	97000	3100	4300	3400	
Magnesium (aqua regia extractable)	mg/kg	20	ISO 17025	15000	12000	9400	14000	
Potassium (aqua regia extractable)	mg/kg	20	ISO 17025	2900	2100	1900	2400	
Sodium (aqua regia extractable)	mg/kg	20	ISO 17025	250	170	180	160	

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Lab Sample Number				720756	720757	720758	720759	
Sample Reference				BH01	BH01	BH02	BH02	
Sample Number				1	6	1	3	
Depth (m)				0.20	4.00-4.10	0.20-0.40	1.00-1.20	
Date Sampled				09/03/2017	10/03/2017	09/03/2017	09/03/2017	
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Monoaromatics								
Benzene	ug/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
Toluene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
p & m-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
o-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
Petroleum Hydrocarbons								
TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	2.4	< 1.0	< 1.0	
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	7.9	< 2.0	< 2.0	
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0	< 8.0	
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	< 8.0	14	< 8.0	< 8.0	
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	< 10	31	< 10	< 10	
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0	
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10	
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	< 10	< 10	15	< 10	
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	< 10	< 10	15	< 10	

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Lab Sample Number				720756	720757	720758	720759	
Sample Reference				BH01	BH01	BH02	BH02	
Sample Number				1	6	1	3	
Depth (m)				0.20	4.00-4.10	0.20-0.40	1.00-1.20	
Date Sampled				09/03/2017	10/03/2017	09/03/2017	09/03/2017	
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
VOCs								
Chloromethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
Chloroethane	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	
Bromomethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
Vinyl Chloride	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	
Trichlorofluoromethane	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	
1,1-Dichloroethene	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
1,1-Dichloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
2,2-Dichloropropane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
Trichloromethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
1,1,1-Trichloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
1,2-Dichloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
1,1-Dichloropropene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
Trans-1,2-dichloroethene	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	
Benzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
Tetrachloromethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
1,2-Dichloropropane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
Trichloroethene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
Dibromomethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
Bromodichloromethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
Toluene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
1,1,2-Trichloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
1,3-Dichloropropane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
Dibromochloromethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
Tetrachloroethene	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	
1,2-Dibromoethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
Chlorobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
p & m-Xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
Styrene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
Tribromomethane	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	
o-Xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
Isopropylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
Bromobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
n-Propylbenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
2-Chlorotoluene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
4-Chlorotoluene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
tert-Butylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
sec-Butylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
p-Isopropyltoluene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
1,2-Dichlorobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
1,4-Dichlorobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
Butylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
Hexachlorobutadiene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	

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Sample Number				1	6	1	3	
Depth (m)				0.20	4.00-4.10	0.20-0.40	1.00-1.20	
Date Sampled				09/03/2017	10/03/2017	09/03/2017	09/03/2017	
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
SVOCs								
Aniline	mg/kg	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	
Phenol	mg/kg	0.2	ISO 17025	< 0.2	< 0.2	< 0.2	< 0.2	
2-Chlorophenol	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Bis(2-chloroethyl)ether	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	
1,3-Dichlorobenzene	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	
1,2-Dichlorobenzene	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
1,4-Dichlorobenzene	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	
Bis(2-chloroisopropyl)ether	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
2-Methylphenol	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	
Hexachloroethane	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	
Nitrobenzene	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	
4-Methylphenol	mg/kg	0.2	NONE	< 0.2	< 0.2	< 0.2	< 0.2	
Isophorone	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	
2-Nitrophenol	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	
2,4-Dimethylphenol	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	
Bis(2-chloroethoxy)methane	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	
1,2,4-Trichlorobenzene	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	
2,4-Dichlorophenol	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	
4-Chloroaniline	mg/kg	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	
Hexachlorobutadiene	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
4-Chloro-3-methylphenol	mg/kg	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	
2,4,6-Trichlorophenol	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
2,4,5-Trichlorophenol	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	
2-Methylnaphthalene	mg/kg	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	
2-Chloronaphthalene	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Dimethylphthalate	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
2,6-Dinitrotoluene	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Acenaphthylene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	
Acenaphthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	
2,4-Dinitrotoluene	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	
Dibenzofuran	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	
4-Chlorophenyl phenyl ether	mg/kg	0.3	ISO 17025	< 0.3	< 0.3	< 0.3	< 0.3	
Diethyl phthalate	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	
4-Nitroaniline	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	
Fluorene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	
Azobenzene	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	
Bromophenyl phenyl ether	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	
Hexachlorobenzene	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	
Phenanthrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	
Anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	
Carbazole	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	
Dibutyl phthalate	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	
Anthraquinone	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	
Fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	
Pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	
Butyl benzyl phthalate	mg/kg	0.3	ISO 17025	< 0.3	< 0.3	< 0.3	< 0.3	
Benzo(a)anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	
Chrysene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	
Benzo(b)fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	
Benzo(k)fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	
Benzo(a)pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	
Dibenz(a,h)anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	

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Analytical Report Number : 17-43155

Project / Site name: Radnor Hills

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
720756	BH01	1	0.20	Light grey clay and sand with stones.
720757	BH01	6	4.00-4.10	Brown clay and sand with gravel.
720758	BH02	1	0.20-0.40	Brown loam and clay.
720759	BH02	3	1.00-1.20	Brown clay and sand with stones.

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Analytical Report Number : 17-43155

Project / Site name: Radnor Hills

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Ammoniacal Nitrogen as N in soil	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the discrete analyser (colorimetric) salicylate/nitroprusside method,10:1 water extraction.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	MCERTS
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
Carbonate in soil	Determination of Carbonate by extraction with 1M HCl followed by titration with 1M NaOH.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L034-PL	D	NONE
Cations in soil by ICP-OES	Determination of cations in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	ISO 17025
Chloride, water soluble, in soil	Determination of Chloride colorimetrically by discrete analyser.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests. 2:1 extraction.	L082-PL	D	MCERTS
Cr (III) in soil	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS
Kjeldahl nitrogen in soil	Determination of total nitrogen using the Kjeldahl-digestion method and colorimetric determination.	In house method based on BS 7755-3.7:1995 &	L087-PL	D	NONE
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 2, 1990, Chemical and Electrochemical Tests	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	D	MCERTS
Semi-volatile organic compounds in soil	Determination of semi-volatile organic compounds in soil by extraction in dichloromethane and hexane followed by GC-MS.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests, 2:1 water:soil extraction, analysis by ICP-OES.	L038-PL	D	MCERTS

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Analytical Report Number : 17-43155

Project / Site name: Radnor Hills

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Total organic carbon in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L023-PL	D	MCERTS
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method	L076-PL	W	MCERTS
Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

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APPENDIX C

BASIS FOR ASSESSMENT OF SOILS

BASIS FOR ASSESSMENT OF SOILS

The Contaminated Land Exposure Assessment (CLEA) model

The package consists of three main reports (SR2, SR3 and SR4) and supporting toxicology reviews for individual substances. Together, they provide a coherent, consistent approach for assessing risks to human health from contaminated soil.

The development of the CLEA (2009) model was a programme of work supported by DEFRA and the EA. Future publications will include evolution of the CLEA model and individual toxicology reviews.

The three reports (SC050021) are published as part of the SR (Science Report) series of documents and are briefly introduced below.

SR2 Human Health Toxicological Assessment of Contaminants in Soil. This report incorporates the updates to how the toxicity of chemicals in soil are assessed that were introduced in *Guidance on the legal definition of contaminated land* (Defra, 2008b) together with further guidance on chemical risk assessments for soil. The report describes a framework developed by the Environment Agency (in collaboration with the Health Protection Agency and the Food Standards Agency) for the collation and review of toxicological data in order to derive Health Criteria Values (HCVs).

HCVs describe a benchmark level of exposure to a chemical at which, unless stated otherwise, long-term human exposure to chemicals in soil is tolerable or poses a minimal risk. HCVs are derived from available toxicity data. HCVs are used to derive SGVs.

SR3 Updated Technical Background to the CLEA Model. This report incorporates many of the updates to exposure assessment introduced in *Soil Guideline Values: The Way Forward* (Defra, 2006a) together with other changes. The report describes the technical principles of the Contaminated Land Exposure Assessment (CLEA) model.

The CLEA model uses generic assumptions about the fate and transport of chemicals in the environment, and a generic conceptual model (referred to in this report as generic land use scenarios) for site conditions and human behaviour, to estimate child and adult exposures to soil contaminants for those living, working and/or playing on contaminated sites over long time periods. The CLEA model is used to derive SGVs.

SR4 CLEA Software (Version 1.06) & Handbook (Version 1.05). The software enables assessors to derive assessment criteria (AC) to assist in the evaluation of the risks posed to human health from chronic exposure to chemicals in soil in relation to land use. Assumptions in the CLEA software apply to the derivation of generic assessment criteria (GAC), but also offer a useful starting point for the development of site-specific assessment criteria (SSAC). The introduction of version 1.05 will have only a minor effect on assessment criteria calculated using the CLEA software v1.04.

The accompanying handbook contains further information on using the CLEA software (outside the scope of the CLEA report SR3) for deriving SSAC. The CLEA software version 1.05 handbook is still relevant to version 1.06 and has not been changed. The CLEA software is used to derive SGVs.

The introduction of the new CLEA methodology now means that the SGVs and GACs derived using the old methodology will require updating. The former SGVs have been withdrawn and the Environment Agency have published revised SGV reports and associated TOX reports for the following eleven substances:

- Benzene
- Toluene
- Ethylbenzene
- Xylenes
- Mercury
- Selenium
- Arsenic
- Nickel

- Cadmium
- Phenol
- Dioxins, furans and dioxin-like PCBs

The publication of further SGVs is unlikely as HM Government and DEFRA have produced the document "Environmental Protection Act 1990: Part 2A, Contaminated Land Statutory Guidance". This introduces new Category 4 Screening Levels (C4SLs) where further guidance is proposed.

SGVs are scientifically based generic assessment criteria that can be used to simplify the assessment of human health risks arising from long-term and on-site exposure to chemical contamination in soil. They do not, however, consider risks to construction workers or risks from occupational exposure arising from activities in the work place.

SGVs are a screening tool for the generic quantitative risk assessment of land contamination. They are not (unless clearly stated otherwise) relevant for assessing risks to human health from short-term exposure to chemicals in soil including injury arising from direct bodily contact and do not take account of other types of risks to humans such as explosion or suffocation risks (associated with the build-up of gases such as methane and carbon dioxide) or aesthetic issues such as odour or colour.

SGVs do not take account of other non soil based sources of contamination such as contamination in groundwater, surface waters or drinking waters. They cannot be used to evaluate risks to non-human receptors such as controlled waters, ecosystems, buildings and services, domestic pets or garden plants. Where, for example, phytotoxic effects are an important consideration in the current or future intended land use further investigation should be undertaken.

SGVs are guidelines on the level of long-term human exposure to individual chemicals in soil that, unless stated otherwise, are tolerable or pose a minimal risk to human health. They represent an indicator to a risk assessor of when land is very unlikely to pose a

significant possibility of significant harm to human health. Soil concentrations well above this level **may** pose a possibility of *significant harm* to human health. *Significance* is linked to:

- the magnitude of contamination;
- the duration and frequency of exposure;
- other site-specific factors that the enforcing authority may wish to take into account.

SGVs do not represent the threshold at which there is a *significant possibility of significant harm* (SPOSH). Nor do they automatically represent an unacceptable intake in the context of Part 2A of the Environmental Protection Act 1990. However, they are considered to be a useful starting point for such an assessment.

- SGVs can be used as a starting point for evaluating long-term risks to human health from chemicals in soil.
- SGVs can be used as an indication of chemical contamination in soil below which the long-term human health risks are considered to be tolerable or minimal.
- SGVs do not represent the "trigger" for an unacceptable intake.
- Unless specifically stated, SGVs do not cover other types of risk to humans such as fire, suffocation or explosion, or short term and acute exposures.
- SGVs cannot be used to evaluate risks to construction workers or nonhuman receptors.
- SGVs are not explicitly derived to define remediation standards.

Category 4 Screening Levels

The Impact Assessment that accompanied the revised Part 2A Statutory Guidance identified a potential role for new 'Category 4 Screening Levels' (C4SLs) in providing a simple test for deciding when land is suitable for use and definitely not contaminated land. It was envisaged that these new screening levels would allow 'low-risk' land to be dismissed from the need for further risk assessment more quickly and easily and allow regulators to focus efforts on the highest-risk land. The C4SLs were proposed to be more pragmatic (whilst still

strongly precautionary) compared to existing generic screening levels. It is anticipated that, where they exist, C4SLs will be used as generic screening criteria that can be used within a GQRA, albeit describing a higher level of risk than the currently or previously available SGVs.

The Part 2A regime and the planning regime are inter-linked such that the National Planning Policy Framework states that "after development, as a minimum, land should not be capable of being determined as contaminated land under Part 2A of the Environmental Protection Act 1990" and that "Where a site is affected by contamination or land stability issues, responsibility for securing a safe development rests with the developer and/or landowner." The Part 2A Statutory Guidance and accompanying Impact Assessment were developed on the basis that Category 4 Screening Levels could be used under the planning regime, as they would be in Part 2A investigations directly. The estimated benefits that were expected to accrue from the changes to the Part 2A Statutory Guidance and specifically from the use of the new Category 4 Screening Levels were based on this assumption. However, policy responsibility for the National Planning Policy Framework and associated Planning Practice Guidance falls to the Department for Communities and Local Government.

The Category 4 Screening Levels consist of estimates of contaminant concentrations in soil that are considered to present an 'acceptable' level of risk, within the context of Part 2A. The methodology for deriving both the Category 4 Screening Levels is based on CLEA methodology.

Where a valid Soil Guideline Value exists for a contaminant where a Category 4 Screening Level has also been derived, it is anticipated that risk assessors will use the Category 4 Screening Level in line with the Part 2A Statutory Guidance. In the absence of a suitable C4SL, risk assessors should identify and select appropriate generic assessment criteria in accordance with established good practice. It is for the Environment Agency to decide whether or not any of the Soil Guideline Values will be updated in the light of more recent toxicological data or whether any particular Soil Guideline Value should be withdrawn (as has already been the case with the SGV for lead).

LQM/CIEH Suitable for Use (S4UL) values

The "new" LQM/CIEH S4ULs[1] replace the 2nd edition of the LQM/CIEH Generic Assessment Criteria published in 2009. Generic values were developed by Land Quality Management Ltd (LQM) and the Chartered Institute of Environmental Health (CIEH) in 2014 to provide Generic Assessment Criteria (GACs) for a variety of land-uses, using the CLEA 1.06 (2009) model. These values are in accordance with Environment Agency publication SR4 (2009) which states that "You can derive GAC and SSAC using the CLEA software". The properties used in the model were subject to a peer review process during a workshop in July 2014.

The LQM/CIEH S4ULs are intended for use in assessing the potential risks posed to human health by contaminants in soil and as transparently-derived and cautious "trigger values" above which further assessment of the risks or remedial action may be needed.

In the absence of LQM/CIEH S4ULS values developed by EIC/AGS/CL:AIRE and described below will be used.

EIC/AGS/CL:AIRE values

The CL:AIRE project involved the collation and review of physico-chemical data, toxicological data and information on background exposure for 44 contaminants sometimes encountered on land affected by contamination in the UK and the derivation of Generic Assessment Criteria (GACs) for 351 of these using the CLEA model (v1.06). The GAC are intended to complement soil guideline values (SGV) produced by the Environment Agency of England and Wales and the 2nd edition GAC produced by LQM and CIEH (Nathanail et al, 2009). All three sets of assessment criteria have been derived in general accordance with the Environment Agency of England and Wales Contaminated Land Exposure Assessment (CLEA) guidance and thus the combined efforts of these three groups have resulted in a useful set of screening criteria for the assessment of risks to human health from soil contamination for more than 120 potentially contaminative substances.

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Definition of what EIC/AGS/CL:AIRE GAC are:

- They are scientifically based screening criteria that have been derived using the CLEA model (v1.06) in general accordance with the CLEA framework;
- They can be used as a starting point for evaluating long-term risks to human health from chemicals in soil; and
- They provide an indication of the chemical concentration in soil below which the long-term human health risks for site occupants (for various generic land-use scenarios) are considered to be tolerable or minimal;
- They are screening criteria to determine the need for further investigations and the need for a DQRA.

Definition of what EIC/AGS/CL:AIRE GAC are NOT:

- They do not represent the “trigger” for unacceptable intake, i.e. exceedance of the GAC does not necessarily imply significant possibility of significant harm (SPOSH);
- They do not cover other types of risk to humans such as fire, suffocation or explosion, risks from chemicals in groundwater or ground gas or short term and acute exposures;
- They cannot be used to evaluate risks to construction workers or non-human receptors; and
- They are not explicitly derived to define remediation standards.

CLEA and other Guidance References

CL:AIRE (2010): Soil Generic Assessment Criteria for Human Health Risk Assessment. In association with the Association of Geotechnical and Geoenvironmental Specialists and The Environmental Industries Commission.

CL:AIRE (2013): Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination. PS1010 – Final Project Report. Contaminated Land: Applications in Real Environments (CL:AIRE) dated 20th December 2013.

Department for Environment, Food and Rural Affairs (2012). Environmental Protection Act 1990: Part 2A, Contaminated Land Statutory Guidance.

Department for Environment, Food and Rural Affairs (2014). SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination – Policy Companion Document. March 2014.

Environment Agency. (2008), Science Report – SC050021/SR7 Compilation of data for priority organic pollutants for derivation of Soil Guideline Values. Science Report. Bristol.

Environment Agency. (2009), Science Report – SC050021/ SGV introduction Using Soil Guideline Values Science Report. Bristol: Environment Agency.

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Environment Agency. (2009), Science Report – SC050021/SR2. Human health toxicological assessment of contaminants in soil. Science Report Final. Bristol: Environment Agency.

Environment Agency. (2009). CLEA software version 1.06. Bristol: Environment Agency.

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Jeffries, J., (2009). A review of body weight and height data used within the Contaminated Land Exposure Assessment model (CLEA). Project SC050021/ Technical Review 1. Bristol: Environment Agency.

Land Quality Management Ltd (2009): LQM/CIEH Generic Assessment Criteria for Human Health Risk Assessment 2nd Edition.

Nathanail,C P, McCaffrey C, Gillett AG, Ogden RC and Nathanail JF (2014) The LQM/CIEH S4ULs for Human Health Risk Assessment. Land Quality Press, Nottingham.

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Environment Agency. (2009), Science Report - SC050021/Arsenic SGV. Soil Guideline Values for Inorganic Arsenic in Soil.

Environment Agency. (2009), Science Report - SC050021/Mercury SGV. Soil Guideline Values for Mercury in Soil.

Environment Agency. (2009), Science Report - SC050021/Nickel SGV. Soil Guideline Values for Inorganic Nickel in Soil.

Environment Agency. (2009), Science Report - SC050021/Cadmium SGV. Soil Guideline Values for Cadmium in Soil.

Environment Agency. (2009), Science Report - SC050021/Selenium SGV. Soil Guideline Values for Selenium in Soil.

Environment Agency. (2009), Science Report - SC050021/Benzene SGV. Soil Guideline Values for Benzene in Soil.

Environment Agency. (2009), Science Report - SC050021/Toluene SGV. Soil Guideline Values for Toluene in Soil.

Environment Agency. (2009), Science Report - SC050021/Ethylbenzene SGV. Soil Guideline Values for Ethylbenzene in Soil.

Environment Agency. (2009), Science Report - SC050021/Xylenes SGV. Soil Guideline Values for Xylenes in Soil.

Environment Agency. (2009), Science Report - SC050021/Dioxins SGV. Soil Guideline Values for dioxins, furans and dioxin-like PCBs in soil. Bristol: Environment Agency.

Environment Agency. (2009), Science Report - SC050021/Phenol SGV. Soil Guideline Values for Phenol in Soil.

Toxicological reports published under the new approach

Environment Agency. (2009), Science Report - SC050021/TOX1 Contaminants in soil: updated collation of toxicological data and intake values for humans Inorganic Arsenic.

Environment Agency. (2009), Science Report - SC050021//TOX8 Contaminants in soil: updated collation of toxicological data and intake values for humans Nickel.

Environment Agency. (2009), Science Report - SC050021/ Contaminants in soil: updated collation of toxicological data and intake values for humans Mercury.

Environment Agency. (2009), Science Report - SC050021/ Contaminants in soil: updated collation of toxicological data and intake values for humans Selenium.

Environment Agency. (2009), Science Report - SC050021/TOX3 Contaminants in soil: updated collation of toxicological data and intake values for humans. Cadmium

Environment Agency. (2009), Science Report - SC050021/ Contaminants in soil: updated collation of toxicological data and intake values for humans Benzene.

Environment Agency. (2009), Science Report - SC050021/ Contaminants in soil: updated collation of toxicological data and intake values for humans Toluene.

Environment Agency. (2009), Science Report - SC050021/ Contaminants in soil: updated collation of toxicological data and intake values for humans Ethylbenzene.

Environment Agency. (2009), Science Report - SC050021/ Contaminants in soil: updated collation of toxicological data and intake values for humans Xylene.

Environment Agency. (2009), Science Report - SC050021/ Contaminants in soil: updated collation of toxicological data and intake values for humans Dioxins, furans and dioxin-like PCBs.

Environment Agency. (2009), Science Report - SC050021/ TOX9 Contaminants in soil: updated collation of toxicological data and intake values for humans Cadmium.

Toxicological reports published under the old approach

Environment Agency. (2002), Science Report – R&D Publication/ TOX4 Contaminants in soil: collation of toxicological data and intake values for humans. Chromium.

Environment Agency. (2002), Science Report - R&D Publication / TOX5 Contaminants in soil: collation of toxicological data and intake values for humans. Inorganic Cyanide.

Environment Agency. (2002), Science Report - R&D Publication / TOX6 Contaminants in soil: collation of toxicological data and intake values for humans. Lead.

Environment Agency. (2002), Science Report - R&D Publication / TOX2 Contaminants in soil: collation of toxicological data and intake values for humans. Benzo(a)Pyrene.

Environment Agency. (2003), Science Report - R&D Publication / TOX20 Contaminants in soil: collation of toxicological data and intake values for humans. Naphthalene.

Environment Agency. (2004), Science Report - R&D Publication / TOX22 Contaminants in soil: collation of toxicological data and intake values for humans. 1,2-Dichloroethane.

Environment Agency. (2004), Science Report - R&D Publication / TOX16 Contaminants in soil: collation of toxicological data and intake values for humans. Tetrachloroethane.

Environment Agency. (2004), Science Report - R&D Publication / TOX24 Contaminants in soil: collation of toxicological data and intake values for humans. Trichloroethene.

Environment Agency. (2004), Science Report - R&D Publication / TOX18 Contaminants in soil: collation of toxicological data and intake values for humans. Vinyl Chloride.

Environment Agency. (2004), Science Report - R&D Publication / TOX21 Contaminants in soil: collation of toxicological data and intake values for humans. Carbon Tetrachloride.

Environment Agency. (2004), Science Report - R&D Publication / TOX23 Contaminants in soil: collation of toxicological data and intake values for humans. Tetrachloroethene.

Environment Agency. (2004), Science Report - R&D Publication / TOX25 Contaminants in soil: collation of toxicological data and intake values for humans. 1,1,1-Trichloroethane.