



Ref: J19-018-R01

Date: 2nd April 2019

FAO: Mr Kevin Conlon
Yeomans Ltd
c/o HNW Architects Ltd.
61 North Street,
Chichester,
West Sussex,
PO19 1NB

Dear Kevin,

Re: Supplementary soil and groundwater sampling – Yeoman Honda, Littlehampton Road, Worthing

Background

GCC was commissioned by HNV Architects on behalf of Yeoman Ltd in March 2019 to undertake supplementary soil and groundwater sampling on the site to address concerns raised by the Environment Agency, which resulted in the rejection of the discharge of planning conditions 4 and 16 for the proposed development.

The EA sought further data on groundwater quality and the extent of the identified TPH impact identified in the soil at WS104 and in the vicinity of the groundwater table in WS104 and WS103 from the June 2018 investigation.

Separate to Conditions 4 and 16, Arun DC also requested additional infiltration testing (undertaken and reported separately in January 2019) on the site and groundwater monitoring over winter months (undertaken between December 2018 and March 2019), reported separately, with a requirement in Condition 10 that wells were decommissioned on completion of monitoring. GCC Therefore decommissioned the monitoring wells on site on the 4th March 2019, a few days before the request from the EA for further contamination data was received from Arun DC.

Scope of supplementary investigation

As a results, GCC remobilised to site on the 18th March 2019 to drill three new boreholes and install three new monitoring wells. Due to site access constraints, it was not possible to reinstall a well at the location of WS103 so a well was installed as close as possible (WS101a), close to WS104 (WS103a) and as close as possible to the line between WS104 and WS103.

Due to time constraints on the development programme, the wells were developed and sampled on the day of installation and the recovered water samples were submitted for testing for a suite of potential contaminants including TPH, BTEX, PAH, Metals and various inorganic parameters. In order to comply with the requirements of Condition 10, the monitoring wells were also decommissioned on the day of the investigation.

Exploratory excavation works had commenced on site by the time of the supplementary investigation and included a 2.5m deep stepped excavation adjacent to the south of the former WS104 location, in line between WS104 and WS103. The exploratory excavation works contractor noted that no evidence of hydrocarbon contamination was encountered in the soil or encountered groundwater during the excavation works and no evidence of contamination was observed in the open excavation or the GCC windowless sample boreholes at the time of the GCC investigation.

As part of the GCC investigation, hand excavated trial pits were dug into the stepped sides of the exploratory works excavation to obtain samples of unexposed soil from the vicinity of WS104. These samples are identified and HDTP101-104, as shown on the attached plan, and were submitted for testing for a suite of potential contaminants including TPH, BTEX, PAH, Metals and various inorganic parameters. The samples were recovered from the Brickearth/River Terrace Deposits at depths of between 0.7m and 1.3mbgl.

Ground conditions encountered

Ground conditions encountered during the site investigation were broadly in agreement with those presented in the published literature and encountered in the previous investigation and comprised Topsoil overlying Brickearth/River Terrace Deposits over the Lewes Nodular Chalk Formation, Seaford Chalk Formation, Newhaven Chalk Formation, Culver Chalk Formation and Portsdown Chalk Formation (Undifferentiated). Variations in strata thicknesses are summarised in the table below and engineering logs are attached.

Summary of encountered ground conditions

Location	Topsoil/Made Ground		Brickearth/River Terrace Deposits		Chalk	
	From (mbgl)	Thickness (m)	From (mbgl)	Thickness (m)	From (mbgl)	Thickness (m)
WS101a	GL	0.20	0.20	1.60	1.80	>3.20
WS102a	GL	0.20	0.20	1.30	1.50	>3.50
WS103a	GL	0.20	0.20	2.10	2.30	>2.70

Groundwater levels

Summary of monitored groundwater levels (m below ground level)

Location	27/06/18	05/12/18	02/01/19	04/02/19	04/03/19	18/03/19	Range
WS101	2.69	-	-	-	-	-	-
WS102	2.81	2.26	2.16	2.14	-	-	0.67
WS103	3.00	2.44	2.20	2.16	1.55	-	1.45
WS104	2.44	2.41	2.17	2.05	1.61	-	0.83
WS101a	-	-	-	-	-	2.37	-
WS102a	-	-	-	-	-	2.40	-
WS103a	-	-	-	-	-	2.40	-

Note: Between 27/06/18 and 05/12/18 ground surfacing had been removed, changing ground levels. Further surface clearance works were undertaken between 04/02/19 and 04/03/19 and 18/03/19, again changing ground levels.

As noted in the GCC Ground Condition Assessment (August 2018), although the monitoring wells had not been surveyed, approximate ground levels at the investigation locations, taken from the topographic survey, were used to estimate groundwater levels in mAOD from the 27/06/18 dataset: WS101 - 47.30mAOD, WS102 - 47.11mAOD, WS103 - 46.97mAOD and WS104 - 47.55mAOD. These levels indicated a general east or south-easterly groundwater flow direction.

While there are limits to the comparisons that can be drawn from the datasets from the various monitoring rounds as a result of the changing ground levels, it should be noted that when the site levels have been reduced the site has remained broadly level. Therefore, the groundwater levels from the monitoring rounds undertaken between December 2018 and March 2019 can be considered as being in relation to an approximately level ground surface datum.

Of particular interest to this assessment is the difference in groundwater levels between WS103 and WS104 through the monitoring rounds. The monitoring round on 27/06/18 shows a difference in elevation of groundwater in WS103 and WS104 of approximately 0.6m while the level difference monitored between 05/12/18 and 04/03/19 varies between 0.03m and 0.11m. This is considered to indicate a much shallower hydraulic gradient through the winter months with groundwater levels rising and falling by roughly the same amounts across the site between monitoring rounds. As the difference in groundwater levels is likely to be less than the uncertainty in the variability of the surface levels, no clear groundwater flow direction can be determined from the 05/12/19 to 04/03/19 data.

Chemical analysis results and assessment

Soil

The chemical analysis of the soil samples from the exploratory works excavation adjacent to the south of WS104 did not identify any TPH or PAH concentrations in excess of the laboratory detection limits. This data combined with the absence of any visual or olfactory evidence of contamination during the exploratory works excavation or in WS101a, WS102a and WS103a during the GCC investigation and the low TPH concentrations identified in WS104 during the June 2018 investigation indicates that the soil impact in WS104 was minor in magnitude and very localised to WS104.

Groundwater

The chemical analysis of groundwater samples taken from WS101a, WS102a and WS103a has identified the presence of minimal concentrations of TPH contamination in WS101a, in the south of the site, and WS103a, just to the northwest (up hydraulic gradient) of WS104, with low concentrations of aromatic C9-C12 fraction TPH slightly exceeding the WHO drinking water standards (UK drinking water standards unavailable) in the sample from WS102a. Marginally elevated concentrations of several PAH compounds were also identified in all three samples across the site. These elevated hydrocarbon concentrations were not associated with any visual or olfactory evidence of contamination during the sampling process.

Considering that the TPH impact identified on the site is very minor in its magnitude and extent and as no nearby groundwater abstraction points have been identified down gradient of the site, TPH on site is not considered to represent a significant source of contamination with regard to controlled waters.

Revised Conceptual Site Model

The conceptual site model has been reviewed in the light of the additional soil and groundwater data gathered from this investigation and it is considered that this data supports the conceptual understanding of the site presented in the GCC Ground Condition Assessment (August 2018).

It is apparent that there is a very localised TPH impact to soil in the immediate vicinity of WS104, which could not be identified with the additional investigation undertaken around WS104 for this assessment, and which does not present a significant risk to human health.



The soil impact appears to have historically migrated vertically to groundwater and resulted in a minor impact identified in the groundwater sample from WS102a with olfactory evidence also noted around groundwater level in WS104 and WS103 during the June 2018 investigation. While TPH concentrations in the groundwater sample from WS102a slightly exceed the WHO drinking water standards, the impact is not considered to represent a significant source of contamination with regard to controlled waters.

Conclusions

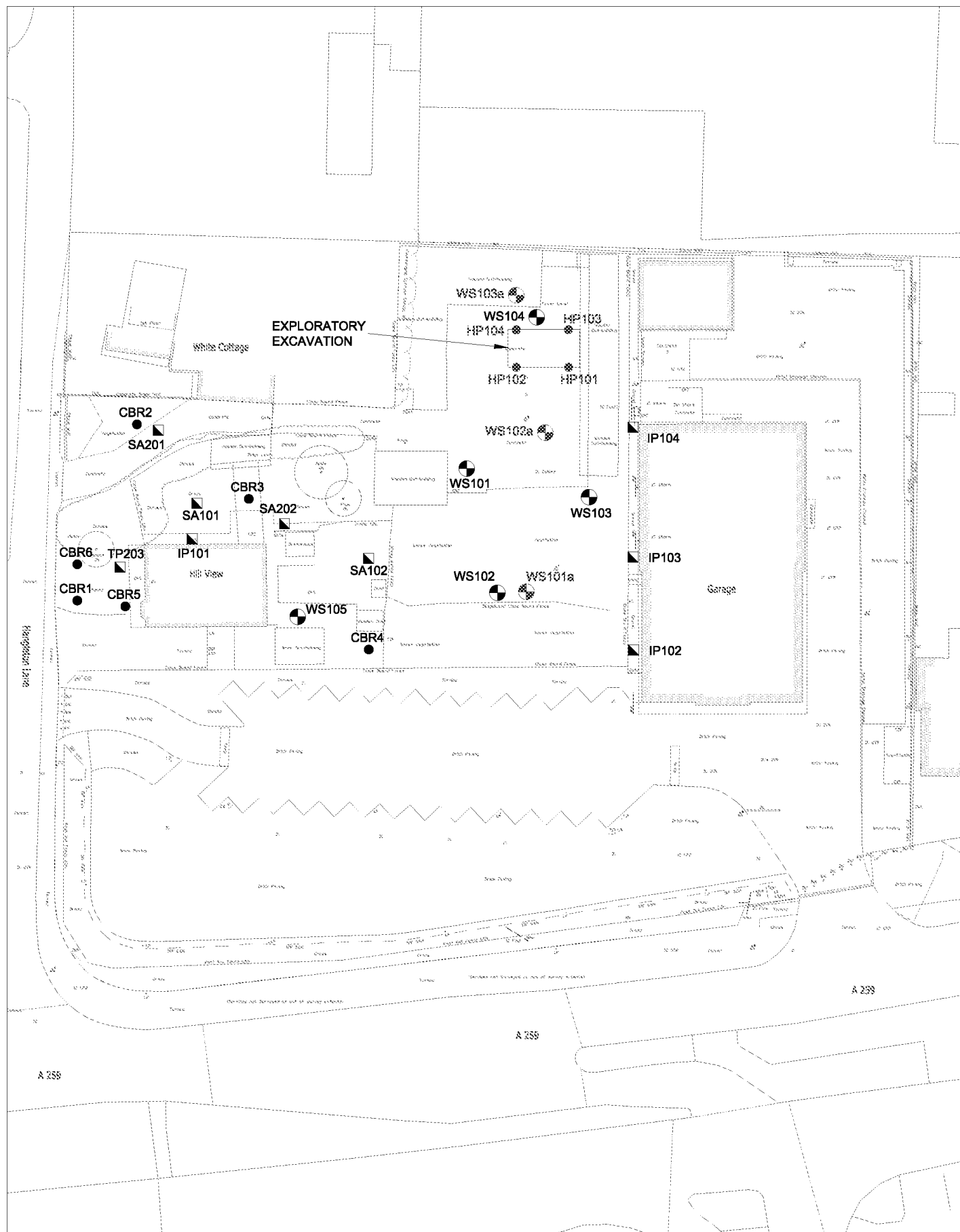
With no evidence of an on-going primary source of the contamination (fuel tank), with the secondary soil source exhibiting low and very localised TPH concentrations and with the tertiary groundwater impact exhibiting low concentrations, it is considered that the impacts will naturally attenuate over time and remediation or further monitoring of the minor TPH impacts to soil and groundwater are not considered to be required or justifiable from a cost benefit perspective.

Yours sincerely,

ANTONY PLATT
Director
For Ground Condition Consultants Ltd

RASMUS PALMGREN
Director
For Ground Condition Consultants Ltd

Encl: Figure 1: Investigation Location Plan
Appendix A: Engineering Logs
Appendix B: Soil Screening Summary
Appendix C: Groundwater Screening Summary
Appendix D: Laboratory Test Certificates



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client
YEOMAN LTD

site
YEOMANS HONDA, WORTHING

title
INVESTIGATION LOCATION PLAN

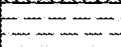
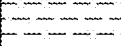
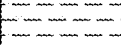
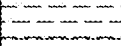
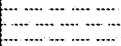
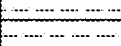
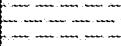
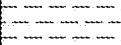
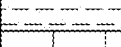
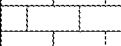
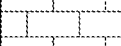
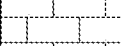
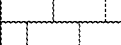
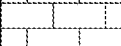
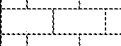
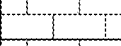
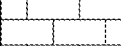
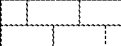
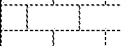
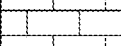
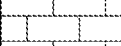
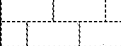
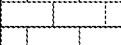
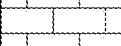
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date	27 MAR 2019	job no	J19-018		
drawing number	FIGURE 1			rev.	-

BOREHOLE LOG WS101a

PROJECT NUMBER J19-018	DRILLING COMPANY South Coast Drilling
PROJECT NAME Yeomans Honda	DRILLING METHOD Windowless Sampling
CLIENT AKS Ward	DRILL RIG Terrier Mk2
ADDRESS Worthing	LOGGED BY RP
DRILLING DATE 18/03/19	

COMPLETION	CASING
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COMMENTS

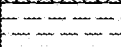
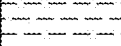
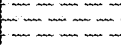
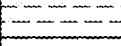
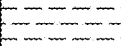
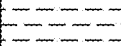
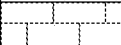
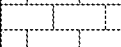
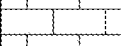
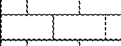
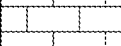
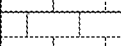
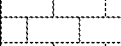
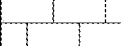
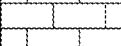
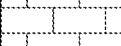
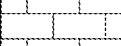
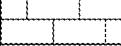
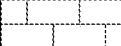
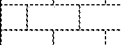
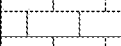
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0.4					Firm brown slightly gravelly CLAY. Gravel is fine to coarse sub-angular chalk and flint.	
0.6						
0.8						
1.0						
1.2					Firm to stiff light brown slightly silty gravelly CLAY. Gravel is fine to coarse sub rounded chalk.	
1.4						
1.6						
1.8						
2.0					Recovered as structureless CHALK composed of white to off white sandy gravelly SILT. Gravel is of angular to sub angular chalk and occasional angular to rounded flint. (Grade Dm)	
2.2						
2.4						
2.6						
2.8						
3.0						
3.2						
3.4						
3.6						
3.8						
4.0						
4.2						
4.4						
4.6						
4.8						
5.0						
5.2					Termination Depth at: 5.0 m	
5.4						

BOREHOLE LOG WS102a

PROJECT NUMBER J19-018	DRILLING COMPANY South Coast Drilling
PROJECT NAME Yeomans Honda	DRILLING METHOD Windowless Sampling
CLIENT AKS Ward	DRILL RIG Terrier Mk2
ADDRESS Worthing	LOGGED BY RP
DRILLING DATE 18/03/19	

COMPLETION	CASING
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COMMENTS

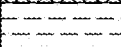
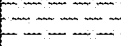
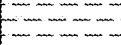
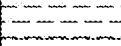
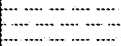
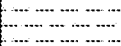
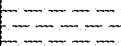
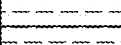
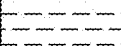
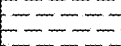
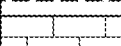
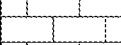
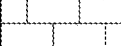
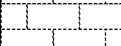
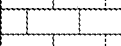
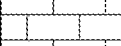
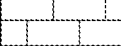
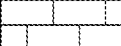
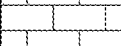
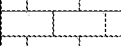
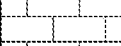
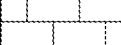
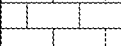
Depth (m)	Samples	SPT N	Water	Graphic Log	Material Description	Well Installation
0.2					Firm brown silty CLAY with brick and concrete fragments (Made Ground)	
0.4					Firm brown slightly gravelly CLAY. Gravel is fine to coarse sub-angular chalk and flint.	
0.6						
0.8						
1.0					Firm to stiff light brown slightly silty gravelly CLAY. Gravel is fine to coarse sub rounded chalk.	
1.2						
1.4						
1.6					Recovered as structureless CHALK composed of white to off white sandy gravelly SILT. Gravel is of angular to sub angular chalk and occasional angular to rounded flint. (Grade Dm)	
1.8						
2.0						
2.2						
2.4			▽			
2.6						
2.8						
3.0						
3.2						
3.4						
3.6						
3.8						
4.0						
4.2						
4.4						
4.6						
4.8						
5.0					Termination Depth at: 5.0 m	
5.2						
5.4						

BOREHOLE LOG WS103a

PROJECT NUMBER J19-018	DRILLING COMPANY South Coast Drilling
PROJECT NAME Yeomans Honda	DRILLING METHOD Windowless Sampling
CLIENT AKS Ward	DRILL RIG Terrier Mk2
ADDRESS Worthing	LOGGED BY RP
DRILLING DATE 18/03/19	

COMPLETION	CASING
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COMMENTS

Depth (m)	Samples	SPT N	Water	Graphic Log	Material Description	Well Installation
0.2					Firm brown silty CLAY with brick and concrete fragments (Made Ground)	
0.4					Firm brown slightly gravelly CLAY. Gravel is fine to coarse sub-angular chalk and flint.	
0.6						
0.8						
1						
1.2						
1.4						
1.6						
1.8					Firm to stiff light brown slightly silty gravelly CLAY. Gravel is fine to coarse sub rounded chalk.	
2						
2.2						
2.4			▽		Recovered as structureless CHALK composed of white to off white sandy gravelly SILT. Gravel is of angular to sub angular chalk and occasional angular to rounded flint. (Grade Dm)	
2.6						
2.8						
3						
3.2						
3.4						
3.6						
3.8						
4						
4.2						
4.4						
4.6						
4.8						
5					Termination Depth at: 5.0 m	
5.2						
5.4						

Project Name: Worthing
Project Ref: J19-018
GAC Comparison: GCC - Commercial/Industrial (1% SOM)

Sample ID	Units	GAC	HP101	HP102	HP103	HP104
Depth to Top			0.80	1.00	0.70	1.10
Depth to Bottom			1.00	1.20	0.90	1.30
Date Sampled			18-Mar-19	18-Mar-19	18-Mar-19	18-Mar-19
% Stones >10mm	% w/w		9.5	3.7	9.2	6.4
pH	pH	5-9	8.39	8.12	8.31	8.29
Cyanide (free)	mg/kg		<1	<1	<1	<1
Phenols - Total by HPLC	mg/kg	760	<0.2	<0.2	<0.2	<0.2
Organic matter	% w/w		<0.1	0.4	<0.1	0.2
Total Organic Carbon	% w/w		<0.03	0.21	0.05	0.09
Antimony	mg/kg		<5	<5	<5	<5
Arsenic	mg/kg	640	2	5	6	7
Cadmium	mg/kg	190	<0.5	0.8	0.5	0.8
Copper	mg/kg	68000	5	9	6	7
Chromium	mg/kg		19	26	19	26
Chromium (hexavalent)	mg/kg	33	<1	<1	<1	<1
Lead	mg/kg	2300	5	11	7	8
Mercury	mg/kg	1100	0.44	0.24	0.37	0.34
Nickel	mg/kg	980	15	23	30	20
Selenium	mg/kg	12000	2	<1	2	<1
Zinc	mg/kg	730000	24	39	31	43
Asbestos in soil		NAD	NAD	NAD	NAD	NAD
PAH-16MS (MSD order)						
Naphthalene	mg/kg	190	<0.03	<0.03	<0.03	<0.03
Acenaphthylene	mg/kg	83000	<0.01	<0.01	<0.01	<0.01
Acenaphthene	mg/kg	84000	<0.01	<0.01	<0.01	<0.01
Fluorene	mg/kg	63000	<0.01	<0.01	<0.01	<0.01
Phenanthrene	mg/kg	22000	<0.03	<0.03	<0.03	<0.03
Anthracene	mg/kg	520000	<0.02	<0.02	<0.02	<0.02
Fluoranthene	mg/kg	23000	<0.08	<0.08	<0.08	<0.08
Pyrene	mg/kg	54000	<0.07	<0.07	<0.07	<0.07
Benzo(a)anthracene	mg/kg	170	<0.04	<0.04	<0.04	<0.04
Chrysene	mg/kg	350	<0.06	<0.06	<0.06	<0.06
Benzo(b)fluoranthene	mg/kg	44	<0.05	<0.05	<0.05	<0.05
Benzo(k)fluoranthene	mg/kg	1200	<0.07	<0.07	<0.07	<0.07
Benzo(a)pyrene	mg/kg	35	<0.04	<0.04	<0.04	<0.04
Indeno(123-cd)pyrene	mg/kg	500	<0.03	<0.03	<0.03	<0.03
Dibenzo(ah)anthracene	mg/kg	3.5	<0.04	<0.04	<0.04	<0.04
Benzo(ghi)perylene	mg/kg	3900	<0.05	<0.05	<0.05	<0.05
Total PAH-16MS (MSD order)	mg/kg		<0.08	<0.08	<0.08	<0.08
TPH CWG						
Ali >C5-C6	mg/kg	3200	<0.01	<0.01	<0.01	<0.01
Ali >C6-C8	mg/kg	7800	<0.01	<0.01	<0.01	<0.01
Ali >C8-C10	mg/kg	2000	<0.01	<0.01	<0.01	<0.01
Ali >C10-C12	mg/kg	9700	<0.1	<0.1	<0.1	<0.1
Ali >C12-C16	mg/kg	59000	<0.1	<0.1	<0.1	<0.1
Ali >C16-C21	mg/kg	1000000	<0.1	<0.1	<0.1	<0.1
Ali >C21-C35	mg/kg	1000000	<0.1	<0.1	<0.1	<0.1
Total Aliphatics	mg/kg		<0.1	<0.1	<0.1	<0.1
Aro >C5-C7	mg/kg	26000	<0.01	<0.01	<0.01	<0.01
Aro >C7-C8	mg/kg	56000	<0.01	<0.01	<0.01	<0.01
Aro >C8-C9	mg/kg	3500	<0.01	<0.01	<0.01	<0.01
Aro >C9-C10	mg/kg	3500	<0.01	<0.01	<0.01	<0.01
Aro >C10-C12	mg/kg	16000	<0.1	<0.1	<0.1	<0.1
Aro >C12-C16	mg/kg	36000	<0.1	<0.1	<0.1	<0.1
Aro >C16-C21	mg/kg	28000	<0.1	<0.1	<0.1	<0.1
Aro >C21-C35	mg/kg	28000	<0.1	<0.1	<0.1	<0.1
Total Aromatics	mg/kg		<0.1	<0.1	<0.1	<0.1
TPH (Ali & Aro)	mg/kg		<0.1	<0.1	<0.1	<0.1
BTEX - Benzene	mg/kg	27	<0.01	<0.01	<0.01	<0.01
BTEX - Toluene	mg/kg	869	<0.01	<0.01	<0.01	<0.01
BTEX - Ethyl Benzene	mg/kg	518	<0.01	<0.01	<0.01	<0.01
BTEX - m & p Xylene	mg/kg	5900	<0.01	<0.01	<0.01	<0.01
BTEX - o Xylene	mg/kg	6200	<0.01	<0.01	<0.01	<0.01
MTBE	mg/kg		<0.01	<0.01	<0.01	<0.01

Project Name: Worthing
Project Ref: J19-010

Sample ID	Units	GAC	WS101a	WS102a	WS103a
Date Sampled			18-Mar-19	18-Mar-19	18-Mar-19
pH (w)	pH	6-9	6.84	7.2	7.13
Alkalinity (total) (w) Colorimetry	mg/l Ca CO ₃	-	408	300	303
Ammoniacal nitrogen as N (w)	mg/l	0.5	0.12	0.24	0.12
Ammonia / Ammoniacal Nitrogen as NH ₃ (w)	mg/l	-	0.145	0.294	0.14
Chloride (w)	mg/l	250	67	39	52
Nitrate (w)	mg/l	-	0.8	1.4	35.6
Sulphate (w)	mg/l	250	40	33	82
Cyanide (total) (w)	mg/l	0.001	<0.005	<0.005	<0.005
Phenols - Total by HPLC (w)	mg/l	0.0077	0.05	<0.01	<0.01
Antimony (dissolved)	µg/l	-	1	<1	<1
Arsenic (dissolved)	µg/l	50	2	<1	1
Boron (dissolved)	µg/l	2000	103	58	111
Barium (dissolved)	µg/l	-	61	42	41
Cadmium (dissolved)	µg/l	0.09	<0.2	<0.2	<0.2
Copper (dissolved)	µg/l	28	4	2	2
Chromium (dissolved)	µg/l	4.7	<1	<1	<1
Lead (dissolved)	µg/l	10	<1	<1	<1
Mercury (dissolved)	µg/l	0.07	0.1	<0.1	<0.1
Nickel (dissolved)	µg/l	20	15	11	3
Selenium (dissolved)	µg/l	-	<1	<1	<1
Zinc (dissolved)	µg/l	125	5	2	2
PAH-16MS (w)					
Naphthalene (w)	µg/l	2	0.3	1.11	0.52
Acenaphthylene (w)	µg/l	-	<0.01	<0.01	<0.01
Acenaphthene (w)	µg/l	-	0.58	0.16	0.09
Fluorene (w)	µg/l	-	0.35	0.13	0.06
Phenanthrene (w)	µg/l	-	0.73	0.15	0.18
Anthracene (w)	µg/l	0.1	0.18	0.06	0.04
Fluoranthene (w)	µg/l	0.0063	0.39	0.14	0.22
Pyrene (w)	µg/l	-	0.28	0.1	0.17
Benzo(a)anthracene (w)	µg/l	-	0.04	0.02	0.06
Chrysene (w)	µg/l	-	0.04	0.02	0.07
Benzo(b)fluoranthene (w)*	µg/l	0.1	0.03	0.02	0.07
Benzo(k)fluoranthene (w)*	µg/l	0.1	<0.01	<0.01	0.02
Benzo(a)pyrene (w)*	µg/l	0.01	0.02	0.01	0.05
Indeno(123-cd)pyrene (w)*	µg/l	0.1	0.01	0.01	0.05
Dibenzo(ah)anthracene (w)	µg/l	-	<0.01	<0.01	<0.01
Benzo(ghi)perylene (w)*	µg/l	0.1	<0.01	<0.01	0.04
PAH (SUM 5*)	µg/l	0.1	0.06	0.04	0.23
Total PAH-16MS (w)	µg/l	-	2.95	1.93	1.64
TPH CWG (w)					
Ali >C5-C6 (w)	µg/l	15000	<1	<1	<1
Ali >C6-C8 (w)	µg/l	15000	<1	<1	1
Ali >C8-C10 (w)	µg/l	300	<1	3	2
Ali >C10-C12 (w)	µg/l	300	7	25	9
Ali >C12-C16 (w)	µg/l	300	<5	<5	<5
Ali >C16-C21 (w)	µg/l	-	<5	<5	<5
Ali >C21-C35 (w)	µg/l	-	<5	<5	<5
Total Aliphatics (w)	µg/l	-	7	27	12
Aro >C5-C7 (w)	µg/l	10	<1	<1	<1
Aro >C7-C8 (w)	µg/l	700	<1	<1	<1
Aro >C8-C9 (w)	µg/l	300	5	28	6
Aro >C9-C10 (w)	µg/l	300	43	546	91
Aro >C10-C12 (w)	µg/l	90	52	459	71
Aro >C12-C16 (w)	µg/l	90	<5	11	<5
Aro >C16-C21 (w)	µg/l	90	<5	<5	<5
Aro >C21-C35 (w)	µg/l	90	<5	<5	<5
Total Aromatics (w)	µg/l	-	100	1044	168
TPH (Ali & Aro) (w)	µg/l	-	107	1071	180
BTEX - Benzene (w)	µg/l	1	<1	<1	<1
BTEX - Toluene (w)	µg/l	700	<1	<1	<1
BTEX - Ethyl Benzene (w)	µg/l	300	<1	5	<1
BTEX - m & p Xylene (w)	µg/l	30	1	10	2
BTEX - o Xylene (w)	µg/l	30	2	12	2
MTBE (w)	µg/l	15	<1	<1	<1

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 19/02688
Issue Number: 1

Date: 01 April, 2019

Client: Ground Condition Consultants Ltd
10 Waldegrave Close
Southampton
SO19 9RY

Project Manager: Antony Platt
Project Name: Worthing
Project Ref: J19-010
Order No: J19-010
Date Samples Received: 20/03/19
Date Instructions Received: 20/03/19
Date Analysis Completed: 01/04/19

Prepared by:

Approved by:

Laboratory Coordinator

Client Manager

Envirolab Job Number: 19/02688

Client Project Name: Worthing

Client Project Ref: J19-010

Lab Sample ID	19/02688/1	19/02688/2	19/02688/3						Units	Method ref
Client Sample No										
Client Sample ID	WS101a	WS102a	WS103a							
Depth to Top										
Depth To Bottom										
Date Sampled	16-Mar-19	18-Mar-19	18-Mar-19							
Sample Type	Water - EW	Water - EW	Water - EW							
Sample Matrix Code	N/A	N/A	N/A							
pH (w) _A [#]	6.84	7.20	7.13						pH	A-T-031w
Alkalinity (total) (w) Colorimetry _A [#]	408	300	303						mg/l Ca CO ₃	A-T-038w
Ammoniacal nitrogen as N (w) _A [#]	0.12	0.24	0.12						mg/l	A-T-033w
Ammonia / Ammoniacal Nitrogen as NH ₃ (w) _A [#]	0.145	0.294	0.140						mg/l	A-T-033w
Chloride (w) _A [#]	67	39	52						mg/l	A-T-026w
Nitrate (w) _A [#]	0.8	1.4	35.6						mg/l	A-T-026w
Sulphate (w) _A [#]	40	33	82						mg/l	A-T-026w
Cyanide (total) (w) _A [#]	<0.005	<0.005	<0.005						mg/l	A-T-042wTCN
Phenols - Total by HPLC (w) _A	0.05	<0.01	<0.01						mg/l	A-T-050w
Antimony (dissolved) _A [#]	1	<1	<1						µg/l	A-T-025w
Arsenic (dissolved) _A [#]	2	<1	1						µg/l	A-T-025w
Boron (dissolved) _A [#]	103	58	111						µg/l	A-T-025w
Barium (dissolved) _A [#]	61	42	41						µg/l	A-T-025w
Cadmium (dissolved) _A [#]	<0.2	<0.2	<0.2						µg/l	A-T-025w
Copper (dissolved) _A [#]	4	2	2						µg/l	A-T-025w
Chromium (dissolved) _A [#]	<1	<1	<1						µg/l	A-T-025w
Lead (dissolved) _A [#]	<1	<1	<1						µg/l	A-T-025w
Mercury (dissolved) _A [#]	0.1	<0.1	<0.1						µg/l	A-T-025w
Nickel (dissolved) _A [#]	15	11	3						µg/l	A-T-025w
Selenium (dissolved) _A [#]	<1	<1	<1						µg/l	A-T-025w
Zinc (dissolved) _A [#]	5	2	2						µg/l	A-T-025w

Envirolab Job Number: 19/02688

Client Project Name: Worthing

Client Project Ref: J19-010

Lab Sample ID	19/02688/1	19/02688/2	19/02688/3						Units	Method ref
Client Sample No										
Client Sample ID	WS101a	WS102a	WS103a							
Depth to Top										
Depth To Bottom										
Date Sampled	16-Mar-19	18-Mar-19	18-Mar-19							
Sample Type	Water - EW	Water - EW	Water - EW							
Sample Matrix Code	N/A	N/A	N/A							
PAH-16MS (w)										
Naphthalene (w) _A [#]	0.30	1.11	0.52						µg/l	A-T-019w
Acenaphthylene (w) _A [#]	<0.01	<0.01	<0.01						µg/l	A-T-019w
Acenaphthene (w) _A [#]	0.58	0.16	0.09						µg/l	A-T-019w
Fluorene (w) _A [#]	0.35	0.13	0.06						µg/l	A-T-019w
Phenanthrene (w) _A [#]	0.73	0.15	0.18						µg/l	A-T-019w
Anthracene (w) _A [#]	0.18	0.06	0.04						µg/l	A-T-019w
Fluoranthene (w) _A [#]	0.39	0.14	0.22						µg/l	A-T-019w
Pyrene (w) _A [#]	0.28	0.10	0.17						µg/l	A-T-019w
Benzo(a)anthracene (w) _A [#]	0.04	0.02	0.06						µg/l	A-T-019w
Chrysene (w) _A [#]	0.04	0.02	0.07						µg/l	A-T-019w
Benzo(b)fluoranthene (w) _A [#]	0.03	0.02	0.07						µg/l	A-T-019w
Benzo(k)fluoranthene (w) _A [#]	<0.01	<0.01	0.02						µg/l	A-T-019w
Benzo(a)pyrene (w) _A [#]	0.02	0.01	0.05						µg/l	A-T-019w
Indeno(123-cd)pyrene (w) _A [#]	0.01	0.01	0.05						µg/l	A-T-019w
Dibenzo(ah)anthracene (w) _A [#]	<0.01	<0.01	<0.01						µg/l	A-T-019w
Benzo(ghi)perylene (w) _A [#]	<0.01	<0.01	0.04						µg/l	A-T-019w
Total PAH-16MS (w) _A [#]	2.95	1.93	1.64						µg/l	A-T-019w

Envirolab Job Number: 19/02688

Client Project Name: Worthing

Client Project Ref: J19-010

Lab Sample ID	19/02688/1	19/02688/2	19/02688/3						Units	Method ref
Client Sample No										
Client Sample ID	WS101a	WS102a	WS103a							
Depth to Top										
Depth To Bottom										
Date Sampled	16-Mar-19	18-Mar-19	18-Mar-19							
Sample Type	Water - EW	Water - EW	Water - EW							
Sample Matrix Code	N/A	N/A	N/A							
TPH CWG (w)										
Ali >C5-C6 (w) _A [#]	<1	<1	<1						µg/l	A-T-022w
Ali >C6-C8 (w) _A [#]	<1	<1	1						µg/l	A-T-022w
Ali >C8-C10 (w) _A [#]	<1	3	2						µg/l	A-T-022w
Ali >C10-C12 (w) _A [#]	7	25	9						µg/l	A-T-023w
Ali >C12-C16 (w) _A [#]	<5	<5	<5						µg/l	A-T-023w
Ali >C16-C21 (w) _A [#]	<5	<5	<5						µg/l	A-T-023w
Ali >C21-C35 (w) _A [#]	<5	<5	<5						µg/l	A-T-023w
Total Aliphatics (w) _A	7	27	12						µg/l	A-T-022+23w
Aro >C5-C7 (w) _A [#]	<1	<1	<1						µg/l	A-T-022w
Aro >C7-C8 (w) _A [#]	<1	<1	<1						µg/l	A-T-022w
Aro >C8-C9 (w) _A [#]	5	28	6						µg/l	A-T-022w
Aro >C9-C10 (w) _A [#]	43	546	91						µg/l	A-T-022w
Aro >C10-C12 (w) _A [#]	52	459	71						µg/l	A-T-023w
Aro >C12-C16 (w) _A [#]	<5	11	<5						µg/l	A-T-023w
Aro >C16-C21 (w) _A [#]	<5	<5	<5						µg/l	A-T-023w
Aro >C21-C35 (w) _A [#]	<5	<5	<5						µg/l	A-T-023w
Total Aromatics (w) _A	100	1044	168						µg/l	A-T-022+23w
TPH (Ali & Aro) (w) _A	107	1071	180						µg/l	A-T-022+23w
BTEX - Benzene (w) _A [#]	<1	<1	<1						µg/l	A-T-022w
BTEX - Toluene (w) _A [#]	<1	<1	<1						µg/l	A-T-022w
BTEX - Ethyl Benzene (w) _A [#]	<1	5	<1						µg/l	A-T-022w
BTEX - m & p Xylene (w) _A [#]	1	10	2						µg/l	A-T-022w
BTEX - o Xylene (w) _A [#]	2	12	2						µg/l	A-T-022w
MTBE (w) _A [#]	<1	<1	<1						µg/l	A-T-022w

REPORT NOTES

General

This report shall not be reproduced, except in full, without written approval from Envirolab.

The results reported herein relate only to the material supplied to the laboratory.

The residue of any samples contained within this report, and any received with the same delivery, will be disposed of six weeks after initial scheduling. For samples tested for Asbestos we will retain a portion of the dried sample for a minimum of six months after the initial Asbestos testing is completed.

Analytical results reflect the quality of the sample at the time of analysis only.

Opinions and interpretations expressed are outside the scope of our accreditation.

If results are in italic font they are associated with an AQC failure, these are not accredited and are unreliable.

A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.

Soil chemical analysis:

All results are reported as dry weight (<40°C).

For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.

For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any "A" subscripts

All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:

Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:

Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:

Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.

Stones etc. are not removed from the sample prior to analysis.

Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:

1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample.

Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.

Secondary Matrix Codes:

A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,

E = contains roots/twigs.

Key:

IS indicates Insufficient Sample for analysis.

US indicates Unsuitable Sample for analysis.

NDP indicates No Determination Possible.

NAD indicates No Asbestos Detected.

N/A indicates Not Applicable.

Superscript # indicates method accredited to ISO 17025.

Superscript "M" indicates method accredited to MCERTS.

Subscript "A" indicates analysis performed on the sample as received.

Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve

Please contact us if you need any further information.

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR

lab.co.uk

Client: Ground Condition Consultants Ltd, 10 Waldegrave Close, Southampton, SO19 9RY Project: Worthing Clients Project No: J19-010	Project No: 19/02688 Date Received: 20/03/2019 (am) Cool Box Temperatures (oC): 12.6
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NO DEVIATIONS IDENTIFIED

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 19/02701
Issue Number: 1

Date: 01 April, 2019

Client: Ground Condition Consultants Ltd
10 Waldegrave Close
Southampton
SO19 9RY

Project Manager: Antony Platt
Project Name: Worthing
Project Ref: J19-018
Order No: J19-018
Date Samples Received: 20/03/19
Date Instructions Received: 20/03/19
Date Analysis Completed: 01/04/19

Prepared by:

Approved by:

Elisha Hartley
Admin Assistant

Danielle Brierley
Client Manager

Envirolab Job Number: 19/02701

Client Project Name: Worthing

Client Project Ref: J19-018

Lab Sample ID	19/02701/1	19/02701/2	19/02701/3	19/02701/4					Units	Method ref
Client Sample No										
Client Sample ID	HP101	HP102	HP103	HP104						
Depth to Top	0.80	1.00	0.70	1.10						
Depth To Bottom	1.00	1.20	0.90	1.30						
Date Sampled	18-Mar-19	18-Mar-19	18-Mar-19	18-Mar-19						
Sample Type	Soil	Soil	Soil	Soil						
Sample Matrix Code	4A	4A	4A	4AB						
% Stones >10mm _A	9.5	3.7	9.2	6.4					% w/w	A-T-044
pH _D ^{M#}	8.39	8.12	8.31	8.29					pH	A-T-031s
Cyanide (free) _A ^{M#}	<1	<1	<1	<1					mg/kg	A-T-042aFCN
Phenols - Total by HPLC _A	<0.2	<0.2	<0.2	<0.2					mg/kg	A-T-050s
Organic matter _D ^{M#}	<0.1	0.4	<0.1	0.2					% w/w	A-T-032 OM
Total Organic Carbon _D ^{M#}	<0.03	0.21	0.05	0.09					% w/w	A-T-032s
Antimony _D	<5	<5	<5	<5					mg/kg	A-T-024s
Arsenic _D ^{M#}	2	5	6	7					mg/kg	A-T-024s
Cadmium _D ^{M#}	<0.5	0.8	0.5	0.8					mg/kg	A-T-024s
Copper _D ^{M#}	5	9	6	7					mg/kg	A-T-024s
Chromium _D ^{M#}	19	26	19	26					mg/kg	A-T-024s
Chromium (hexavalent) _D	<1	<1	<1	<1					mg/kg	A-T-040s
Lead _D ^{M#}	5	11	7	8					mg/kg	A-T-024s
Mercury _D	0.44	0.24	0.37	0.34					mg/kg	A-T-024s
Nickel _D ^{M#}	15	23	30	20					mg/kg	A-T-024s
Selenium _D ^{M#}	2	<1	2	<1					mg/kg	A-T-024s
Zinc _D ^{M#}	24	39	31	43					mg/kg	A-T-024s
Asbestos in Soil (inc. matrix) [^] @										
Asbestos in soil _A [#]	NAD	NAD	NAD	NAD						A-T-045
Asbestos ACM - Suitable for Water Absorption Test?	N/A	N/A	N/A	N/A						

Envirolab Job Number: 19/02701

Client Project Name: Worthing

Client Project Ref: J19-018

Lab Sample ID	19/02701/1	19/02701/2	19/02701/3	19/02701/4					Units	Method ref
Client Sample No										
Client Sample ID	HP101	HP102	HP103	HP104						
Depth to Top	0.80	1.00	0.70	1.10						
Depth To Bottom	1.00	1.20	0.90	1.30						
Date Sampled	18-Mar-19	18-Mar-19	18-Mar-19	18-Mar-19						
Sample Type	Soil	Soil	Soil	Soil						
Sample Matrix Code	4A	4A	4A	4AB						
PAH-16MS (MSD order)										
Naphthalene _A ^{M#}	<0.03	<0.03	<0.03	<0.03					mg/kg	A-T-019s
Acenaphthylene _A ^{M#}	<0.01	<0.01	<0.01	<0.01					mg/kg	A-T-019s
Acenaphthene _A ^{M#}	<0.01	<0.01	<0.01	<0.01					mg/kg	A-T-019s
Fluorene _A ^{M#}	<0.01	<0.01	<0.01	<0.01					mg/kg	A-T-019s
Phenanthrene _A ^{M#}	<0.03	<0.03	<0.03	<0.03					mg/kg	A-T-019s
Anthracene _A ^{M#}	<0.02	<0.02	<0.02	<0.02					mg/kg	A-T-019s
Fluoranthene _A ^{M#}	<0.08	<0.08	<0.08	<0.08					mg/kg	A-T-019s
Pyrene _A ^{M#}	<0.07	<0.07	<0.07	<0.07					mg/kg	A-T-019s
Benzo(a)anthracene _A ^{M#}	<0.04	<0.04	<0.04	<0.04					mg/kg	A-T-019s
Chrysene _A ^{M#}	<0.06	<0.06	<0.06	<0.06					mg/kg	A-T-019s
Benzo(b)fluoranthene _A ^{M#}	<0.05	<0.05	<0.05	<0.05					mg/kg	A-T-019s
Benzo(k)fluoranthene _A ^{M#}	<0.07	<0.07	<0.07	<0.07					mg/kg	A-T-019s
Benzo(a)pyrene _A ^{M#}	<0.04	<0.04	<0.04	<0.04					mg/kg	A-T-019s
Indeno(123-cd)pyrene _A ^{M#}	<0.03	<0.03	<0.03	<0.03					mg/kg	A-T-019s
Dibenzo(ah)anthracene _A ^{M#}	<0.04	<0.04	<0.04	<0.04					mg/kg	A-T-019s
Benzo(ghi)perylene _A ^{M#}	<0.05	<0.05	<0.05	<0.05					mg/kg	A-T-019s
Total PAH-16MS (MSD order) _A ^{M#}	<0.08	<0.08	<0.08	<0.08					mg/kg	A-T-019s

Envirolab Job Number: 19/02701

Client Project Name: Worthing

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Lab Sample ID	19/02701/1	19/02701/2	19/02701/3	19/02701/4					Units	Method ref
Client Sample No										
Client Sample ID	HP101	HP102	HP103	HP104						
Depth to Top	0.80	1.00	0.70	1.10						
Depth To Bottom	1.00	1.20	0.90	1.30						
Date Sampled	18-Mar-19	18-Mar-19	18-Mar-19	18-Mar-19						
Sample Type	Soil	Soil	Soil	Soil						
Sample Matrix Code	4A	4A	4A	4AB						
TPH CWG										
Ali >C5-C6 _A [#]	<0.01	<0.01	<0.01	<0.01					mg/kg	A-T-022s
Ali >C6-C8 _A [#]	<0.01	<0.01	<0.01	<0.01					mg/kg	A-T-022s
Ali >C8-C10 _A [#]	<0.01	<0.01	<0.01	<0.01					mg/kg	A-T-022s
Ali >C10-C12 _A [#]	<0.1	<0.1	<0.1	<0.1					mg/kg	A-T-023s
Ali >C12-C16 _A [#]	<0.1	<0.1	<0.1	<0.1					mg/kg	A-T-023s
Ali >C16-C21 _A [#]	<0.1	<0.1	<0.1	<0.1					mg/kg	A-T-023s
Ali >C21-C35 _A [#]	<0.1	<0.1	<0.1	<0.1					mg/kg	A-T-023s
Total Aliphatics _A	<0.1	<0.1	<0.1	<0.1					mg/kg	A-T-023s
Aro >C5-C7 _A [#]	<0.01	<0.01	<0.01	<0.01					mg/kg	A-T-022s
Aro >C7-C8 _A [#]	<0.01	<0.01	<0.01	<0.01					mg/kg	A-T-022s
Aro >C8-C9 _A [#]	<0.01	<0.01	<0.01	<0.01					mg/kg	A-T-022s
Aro >C9-C10 _A [#]	<0.01	<0.01	<0.01	<0.01					mg/kg	A-T-022s
Aro >C10-C12 _A [#]	<0.1	<0.1	<0.1	<0.1					mg/kg	A-T-023s
Aro >C12-C16 _A [#]	<0.1	<0.1	<0.1	<0.1					mg/kg	A-T-023s
Aro >C16-C21 _A [#]	<0.1	<0.1	<0.1	<0.1					mg/kg	A-T-023s
Aro >C21-C35 _A [#]	<0.1	<0.1	<0.1	<0.1					mg/kg	A-T-023s
Total Aromatics _A	<0.1	<0.1	<0.1	<0.1					mg/kg	A-T-023s
TPH (Ali & Aro) _A	<0.1	<0.1	<0.1	<0.1					mg/kg	A-T-023s
BTEX - Benzene _A [#]	<0.01	<0.01	<0.01	<0.01					mg/kg	A-T-022s
BTEX - Toluene _A [#]	<0.01	<0.01	<0.01	<0.01					mg/kg	A-T-022s
BTEX - Ethyl Benzene _A [#]	<0.01	<0.01	<0.01	<0.01					mg/kg	A-T-022s
BTEX - m & p Xylene _A [#]	<0.01	<0.01	<0.01	<0.01					mg/kg	A-T-022s
BTEX - o Xylene _A [#]	<0.01	<0.01	<0.01	<0.01					mg/kg	A-T-022s
MTBE _A [#]	<0.01	<0.01	<0.01	<0.01					mg/kg	A-T-022s

REPORT NOTES

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TPH analysis of water by method A-T-007:

Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:

Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:

Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.

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Predominant Matrix Codes:

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Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.

Secondary Matrix Codes:

A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,

E = contains roots/twigs.

Key:

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US indicates Unsuitable Sample for analysis.

NDP indicates No Determination Possible.

NAD indicates No Asbestos Detected.

N/A indicates Not Applicable.

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Superscript "M" indicates method accredited to MCERTS.

Subscript "A" indicates analysis performed on the sample as received.

Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve

Please contact us if you need any further information.

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR



Client: Ground Condition Consultants Ltd, 10 Waldegrave Close, Southampton, SO19 9RY

Project No: 19/02701

Date Received: 20/03/2019 (am)

Project: Worthing

Cool Box Temperatures (oC): 12.9

Clients Project No: J19-018

NO DEVIATIONS IDENTIFIED

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.