Development Plot on Southgate Street, Long Melford

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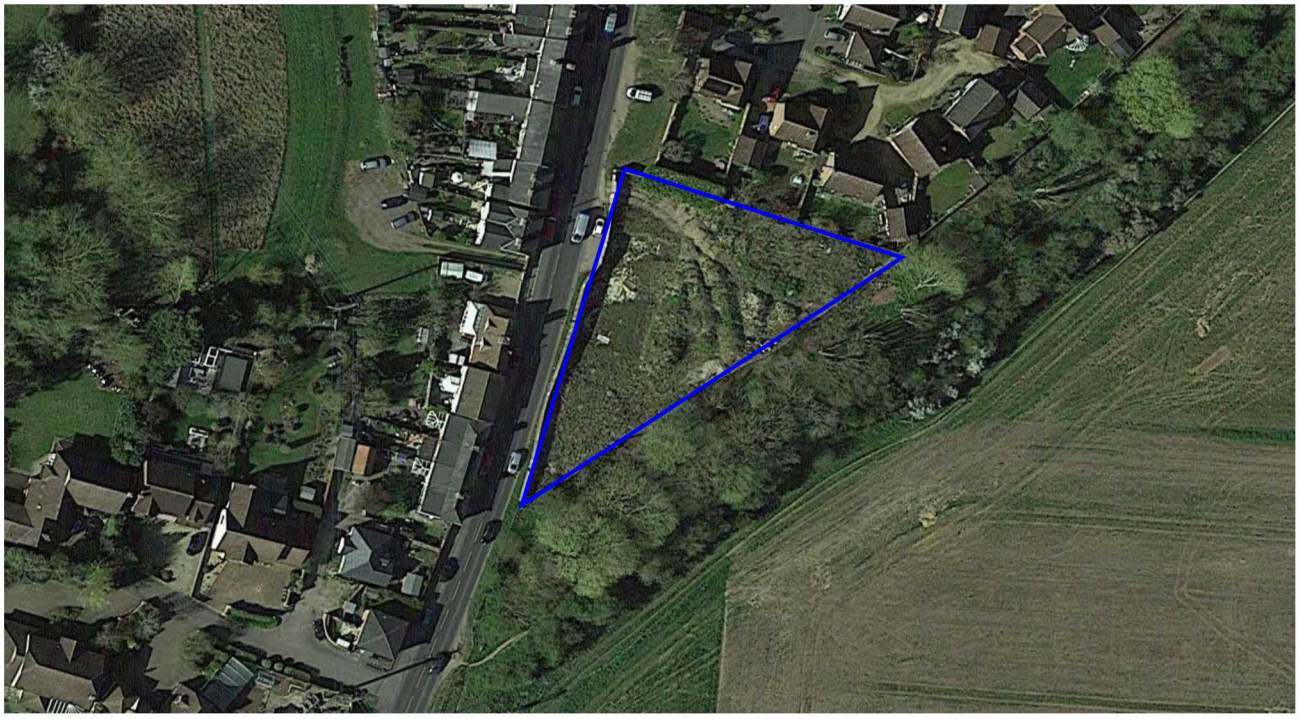
VALIDATION MONITORING REPORT AND UPDATED REMEDIATION STRATEGY



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Client: Willowwalk (Thaxted) Developments Ltd	Subadra Consulting Ltd. Registered in England No. 4586038 Registered Office 13 Triangle Business Park, Stoke Mandeville, HP22 5BL	Our Ref	Fi03088 CL 023a
		Date	June 2023
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List of Attachments

Attachment One:	Notice to Interested Parties
Attachment Two:	Borehole Logs (100 series)
Attachment Three:	Chemical Analysis Certificates

1 Introduction

1.1 The Purpose of This Assessment

The site is a cleared development plot on Southgate Street in Long Melfond, Sudbury. We understand that Willowwalk (Thaxted) Developments Ltd (Willowwalk) proposes to redevelop the site with three detached houses as detailed in planning application references B/13/00875 and DC/23/00659, which has been conditionally approved by Babergh and Mid Suffolk District Councils. Conditions 9 through 13 relate to potential contamination issues and detail requirements for an environmental investigation, risk assessment, remedial actions, verification and then long-term monitoring.

Various phases of remedial works have been carried out at the site since the former petrol station was decommissioned in 2004. Most recently, in 2018, Willowwalk excavated and removed ~1,200tonnes of hydrocarbon impacted soils from the site. The excavation works were focussed on the removed of shallow River Terrace Deposits from the former central forecourt area (and were directed by groundwater quality data provided by ourselves).

In June 2022 we installed three monitoring wells on the site boundaries, extending into the underlying chalk, in order to verify that the historical hydrocarbon contamination had not leached into and impacted the Principal (Chalk) Aquifer. The results of the subsequent groundwater monitoring and sampling recorded trace concentrations of aromatic hydrocarbons and MTBE (a fuel additive historically used in petrol). No monitoring wells were installed in the central area of the site, where the soil excavations had been carried out. As part of thee works we also installed several ground gas monitoring wells and carried out monitoring.

As part of our ongoing environmental appraisal of the site, we have been commissioned by Willowwalk to install additional shallow boreholes, followed by monitoring of groundwater, in the former area of impact in order to provide an update on site conditions and verify the effectiveness of the previous remedial works. Groundwater samples have also collected from the deep chalk wells and we have carried out two further rounds of ground gas monitoring. The results of these works are presented within this report and are intended to assist in the discharge of relevant conditions relating to ground contamination issues.

Our environmental assessment was undertaken in accordance with the guidelines presented in the Environment Agency (2020) 'Land contamination risk management (LCRM)' documents and Environment Agency (2010) Guiding principles for land contamination (GPLC). All the activities comprising this assessment were carried out in accordance with the procedures set out in our Quality Manual.

Your attention is drawn to the Notice to Interested Parties included as Attachment One.

1.2 The Scope of This Assessment

Our works at the site was carried out in the following parts:

- An intrusive site investigation comprising five boreholes drilled using our Comacchio drilling rig, with monitoring wells installed at all locations (extending into shallow drift deposits);
- Logging of soil cores and the collection of soil samples;
- Two rounds of groundwater monitoring and collection of groundwater samples from existing and newly installed monitoring wells. As part of our groundwater monitoring visit, we completed permeability testing and a survey of borehole elevations to assist us in determining the direction of groundwater flow;
- Chemical analysis of representative soil and groundwater samples;
- Screening of hazardous ground gases and hydrocarbons vapours using GA5000 series landfill gas monitor and photo-ionisation detector (PID);
- Provision of this report, which details the results of our assessment, conclusions, and a revised remedial strategy.

1.3 Previous Reports Relating to the Site

We have produced the following reports on behalf of Willowwalk over the course of the last three years.

Our Ref.	Report Title	Date of Issue	Report Reference
Ref.1	Remedial Strategy Report	December 2018	FI03088 CL 015
Ref.2	Updated Detailed Quantitative Risk Assessment Report	February 2019	FI03088 CL 016
Ref.3	Groundwater Monitoring Results	November 2019	FI03088 CL 019
Ref.4	Update on Site Remediation	November 2020	FI03088 CL 020
Ref.5	Investigation and Monitoring Report	October 2022	FI03088 CL 022

Table One: Previous Environmental Reports Relating to the Site

2 Monitoring Well Installation Works

2.1 Details of Our Investigation

Activity	Description of Works
Drilling	Our additional site investigation was completed on 16th February 2023 using our Comacchio Geo205 (rotary/dynamic sampling) drill rig. We constructed five boreholes to a maximum depth of 6.7m (denoted BH101 to BH105). Borehole logs are included as Attachment Two and a site plan showing borehole locations is provided as Figure One.
Rationale	Borehole locations were selected to provide coverage of the River Terrace Deposits in the western part of the site, where hydrocarbons were historically recorded, to verify the effectiveness of past remedial works in this area.
Monitoring Wells	All five boreholes were installed as groundwater monitoring wells with gas taps for ground gas monitoring. The location of the newly installed wells, as well as any retained monitoring wells, are presented on Figure One on the following page.
Soil Logging	Representative soil samples were recovered from each borehole in sealed liners and logged on-site by a suitably qualified technician.
Sample Preservation	Sub-samples were preserved in glass jars and stored in cool boxes during transportation to the laboratory for subsequent analysis.
Chemical Analysis	Selected soil samples were analysed for representative hydrocarbons including speciated TPH, BTEX compounds, MTBE and PAHs. Chemical analysis results are summarised in Section 4 of this report. Chemical analysis certificates are included in Attachment Three.

Table Two: Drilling and Sampling Methodologies

2.2 Well Installation Details

	BH101	BH102	BH103	BH104	BH105
Well Response Zone (m bgl)	0.5 to 5.5	0.7 to 6.7	0.7 to 6.2	0.8 to 6.3	0.6 to 6.0
Well Diameter (mm)	50	50	50	50	50
Gas tap fitted?	✓	✓	✓	✓	✓

Table Three: Well Installation Details

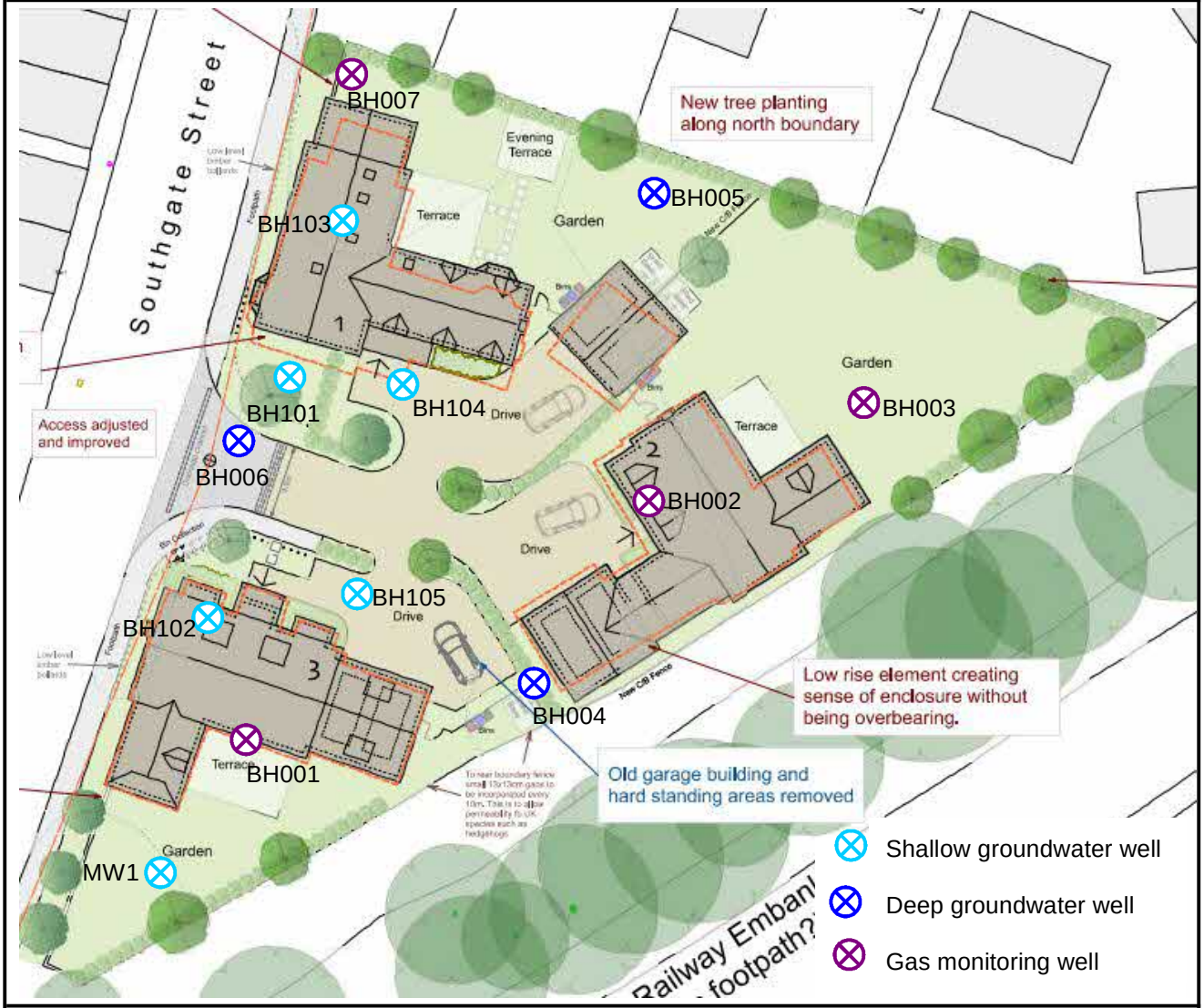

Figure One: Monitoring Well Locations

2.3 Site Geology

	Unit	Description			
Layer I	Made Ground	Layers of sandy clay, clayey sand and gravels including brick fragments			
Layer II	River Terrace Deposits	Loose to medium dense orange brown or black SAND with occasional gravel			
	Depth to Base of Layer				
	BH101	BH102	BH103	BH104	BH105
Layer I	3.5m	3.4m	3.5m	2.5m	2.6m
Layer II	>6.0m	>6.7m	>6.2m	>6.3m	>6.0m

All dimensions in metres below ground level

Table Four: Soil Lithology

2.4 Visual and Olfactory Signs of Hydrocarbon Contamination

BH101	BH102	BH103	BH104	BH105
Odour 2.3-2.5m	None noted	Odour and black staining 2.0-3.5m	Odour and staining 2.3-2.5m	Odour 1.7-2.6m, staining 2.5 to 2.6m

Table Five: Visual and Olfactory Signs of Hydrocarbon Contamination

3 Groundwater Monitoring

3.1 Groundwater Monitoring Methodology

We completed the following works as part of our monitoring of groundwater quality at the site:

Visit Details	We carried out three rounds of groundwater monitoring at the site on 7th March, 17th March and 11th to 12th May 2023.
Monitoring Wells	We monitored the following wells: ➢ Three deep groundwater monitoring wells installed into the chalk aquifer: BH004 to BH006. ➢ Five new monitoring wells installed into the shallow drift deposits; BH101 to BH105 detailed above, and MW1 (pre-existing).
Monitoring	Prior to sampling, resting groundwater levels were recorded using a dip meter.

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Sampling	During both March monitoring rounds, we purged a minimum of three well volumes from each well prior to sampling. Samples were collected, following recovery of groundwater levels, using disposable bailers. During our May monitoring round we purged and collected groundwater samples from each of the monitoring wells using low flow techniques (peristaltic pump incorporating a flow through dedicated tubing into a multi-parameter cell which allows for collection of the following field measurements: pH, conductivity, temperature, redox potential and dissolved oxygen).
Sample Preservation	Sub-samples were preserved in glass bottles and stored in cool boxes during transportation to the laboratory for subsequent analysis
Chemical Analysis	Groundwater samples were analysed for representative hydrocarbons including speciated TPH, BTEX compounds, MTBE and PAHs. One set of samples was submitted for an analysis suite of natural attenuation indicators. Chemical analysis results are summarised in Section Five of this report. Chemical analysis certificates are included in Attachment Three.
Additional works	We completed field permeability tests (rising head) and a survey of borehole elevations.

Table Six: Groundwater Monitoring and Sampling Methodologies

3.2 Groundwater Monitoring Results

Groundwater monitoring data is summarised in the following table.

		BH004	BH005	BH006	MW1	BH101
Borehole Elevation (mASD)		100.040	100.354	99.873	99.919	99.821
Depth to Base of Well		11.8	13.3	12.4	3.4	5.2
Response Zone (m bgl)		8.9 to 11.8	9.8 to 12.3	9.5 to 12.4	1.2 to 3.4	0.5 to 5.2
Groundwater Strike (m bgl)		-	-	-	-	N/R
Groundwater Rest Level 7/3/2023	m bgl	1.608	1.909	1.424	1.491	1.365
	m ASD	98.432	98.445	98.449	98.428	98.456
Groundwater Rest Level 17/3/2023	m bgl	1.227	1.518	1.038	1.103	0.973
	m ASD	98.813	98.836	98.835	98.816	98.848
Groundwater Rest Level 11-12/5/2023	m bgl	1.268	1.580	1.089	1.153	1.029
	m ASD	98.772	98.774	98.784	98.766	98.792

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		BH102	BH103	BH104	BH105	-
Borehole Elevation* (mASD)		99.912	100.094	100.003	99.901	-
Depth to Base of Well		6.6	6.1	6.3	3.1	-
Response Zone (m bgl)		0.7 to 6.6	0.7 to 6.1	0.8 to 6.3	0.6 to 3.1	-
Groundwater Strike (m bgl)		2.2	N/R	N/R	1.8	-
Groundwater Rest Level 7/3/2023	m bgl	1.463	1.635	1.542	1.451	-
	m ASD	98.449	98.459	98.461	98.450	-
Groundwater Rest Level 11-12/5/2023	m bgl	1.075	1.254	1.166	1.058	-
	m ASD	98.837	98.840	98.837	98.843	-
Groundwater Rest Level 11-12/5/2023	m bgl	1.128	1.308	1.196	1.111	
	m ASD	98.784	98.786	98.807	98.790	
Calculated Permeability (m/day)		Rapid recharge recorded in all locations indicating high permeability				
Groundwater Flow Direction		Piezometric plots, presented below, indicate the following groundwater flow directions: Cretaceous Upper Chalk: To the east or south-east with a gradient of ~0.001. River Terrace Deposits: Overall direction to the south, but some distortion in the north-western corner of the site.				

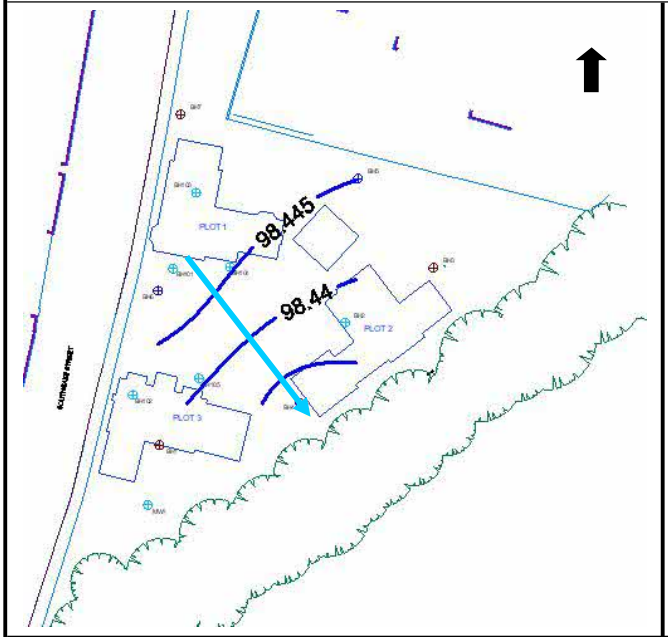
Note: m bgl denotes metres below ground level, mASD denotes metres above arbitrary site datum. N/R - not recorded / not clear.

Table Seven: Groundwater Monitoring Data

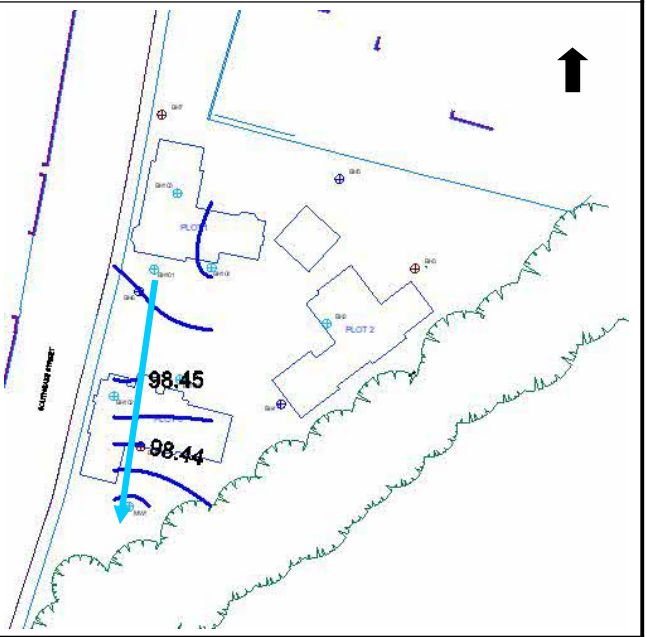
	MW1	BH101	BH102	BH103	BH104	BH105
DO (mg/litre)	0.68	1.16	0.31	0.51	5.33	0.18
ORP (mV)	-173	-28.6	-15.4	-88.3	-127	-316
pH	7.4	6.7	7.0	6.7	7.5	7.8
Conductivity	2,229	1,245	2,499	1,139	1,039	1,978

Table Eight: Low Flow Monitoring Parameters, 11th-12th May 2023

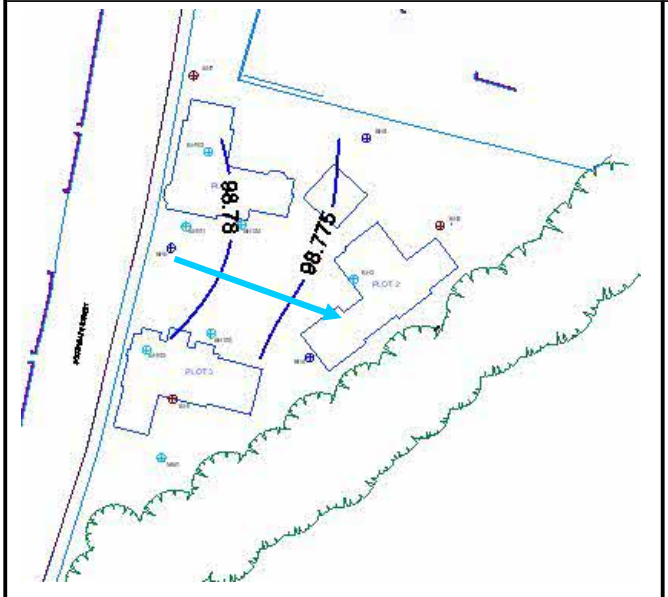
3.3 Direction of Groundwater Flow



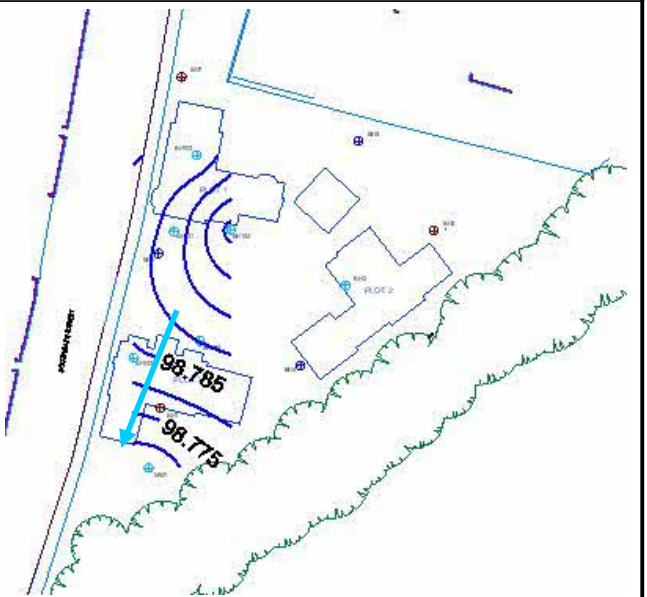
7/3/2023 Deep Boreholes (BH004, BH005 and BH006). Groundwater flow to the south-east



7/3/2023 Shallow Boreholes (MW1, BH101 to BH105). Overall groundwater flow to the south



11/5/2023 Deep Boreholes (BH004, BH005 and BH006). Groundwater flow to the south-east



11/5/2023 Shallow Boreholes (MW1, BH101 to BH105). Overall groundwater flow to the south

Figure Two: Piezometric Plots

3.4 Visual and Olfactory Signs of Hydrocarbon Contamination

	BH101	BH102	BH103	BH104	BH105
7th March 2023	Odour, no sheen	None noted	Odour, no sheen	Odour, no sheen	Odour and sheen
17th March 2023	None noted	None noted	Odour and sheen	None noted	Odour and sheen
11th/12th May 2023	Faint odour, no sheen	None noted	None noted	Faint odour, no sheen	Strong odour, no sheen

	BH004	BH005	BH006	MW1	
7th March 2023	None noted	None noted	None noted	Odour, no sheen	-
17th March 2023	None noted	None noted	None noted	None noted	
11th/12th May 2023	None noted	None noted	None noted	Odour, no sheen	

Table Nine: Visual and Olfactory Signs of Hydrocarbon Contamination During Monitoring

4 Chemical Analysis Results

4.1 Chemical Analysis Rationale

Analysis	Rationale	No of Samples	
		Soil	Water
Total Petroleum Hydrocarbons (TPH) reported by carbon range and with aromatic and aliphatic speciation	Representative of compounds present in petrol, diesel and lube oils	12	18
Benzene, Toluene, Ethylbenzene and Xylenes (BTEX) and MTBE	Representative of compounds present in petrol	12	18
Polycyclic Aromatic Hydrocarbons (PAHs)	Representative of compounds present in diesel and lube oil	3	18
MNA Suite	Suite of analytes used to identify natural attenuation activity	-	6

The results of our analysis are summarised below.
Certificates for all chemical analysis are included in Attachment Three.

Table Ten: Schedule of Analysis

4.2 Soil Analysis Results

Analyte	Unit	Sample Details and Results					
		BH101	BH101	BH102	BH102	BH103	BH103
		1.9m	3.7m	1.6m	3.9m	2.4m	3.3m
MTBE	mg/kg	<0.5	<0.5	<0.5	<0.5	**1.97**	<0.5
Benzene	mg/kg	<0.1	<0.1	<0.1	<0.1	**7.93**	<0.1
Toluene	mg/kg	<0.1	<0.1	<0.1	<0.1	**7.31**	<0.1
Ethylbenzene	mg/kg	<0.1	<0.1	<0.1	<0.1	**18.5**	<0.1
Xylenes	mg/kg	<0.2	<0.2	<0.2	<0.2	**115**	<0.2

Analyte	Unit	BH104	BH104	BH04	BH105	BH105	BH105
		0.9m	1.7m	2.4m	0.9m	1.7m	2.3m
MTBE	mg/kg	<0.5	<0.5	**0.988**	<0.5	<0.5	<0.5
Benzene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Toluene	mg/kg	<0.1	<0.1	**3.43**	<0.1	<0.1	<0.1
Ethylbenzene	mg/kg	<0.1	<0.1	**4.3**	<0.1	<0.1	<0.1
Xylenes	mg/kg	<0.2	<0.2	**26**	<0.2	<0.2	<0.2

Table Eleven: BTEX and Volatile TPH Bands Analysis Results – Soil

Analyte	Unit	Sample Details and Results					
		BH101	BH101	BH102	BH102	BH103	BH103
		2.9m	3.7m	3.5m	3.9m	1.9m	2.4m
C_{6-8} Aliphatic TPH	mg/kg	<2.5	<2.5	<2.5	<2.5	<2.5	**48.2**
$>C_{8-10}$ Aliphatic TPH	mg/kg	<2.5	<2.5	<2.5	<2.5	<2.5	**23.4**
$>C_{10-12}$ Aliphatic TPH	mg/kg	<5	<5	<5	<5	<5	**42.5**
$>C_{12-16}$ Aliphatic TPH	mg/kg	<5	<5	<5	<5	<5	**17.7**
$>C_{16-21}$ Aliphatic TPH	mg/kg	<5	<5	<5	<5	<5	<5
$>C_{21-35}$ Aliphatic TPH	mg/kg	<20	<20	<20	**24.8**	<20	<20
C_{6-8} Aromatic TPH	mg/kg	<2.5	<2.5	<2.5	<2.5	<2.5	**15.2**
$>C_{8-10}$ Aromatic TPH	mg/kg	<2.5	<2.5	<2.5	<2.5	<2.5	**411**
$>C_{10-12}$ Aromatic TPH	mg/kg	<5	<5	<5	<5	<5	**424**

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Analyte	Unit	Sample Details and Results					
		BH101	BH101	BH102	BH102	BH103	BH103
		2.9m	3.7m	3.5m	3.9m	1.9m	2.4m
>C_{12-16} Aromatic TPH	mg/kg	<5	<5	<5	<5	<5	**42**
>C_{16-21} Aromatic TPH	mg/kg	<5	<5	<5	<5	<5	<5
>C_{21-35} Aromatic TPH	mg/kg	<10	<10	<10	<10	<10	<10

Analyte	Unit	BH103	BH104	BH104	BH104	BH105	BH105
		3.7m	0.9m	1.7m	2.4m	1.7m	2.3m
C_{6-8} Aliphatic TPH	mg/kg	<2.5	<2.5	<2.5	**8.29**	<2.5	<2.5
>C_{8-10} Aliphatic TPH	mg/kg	<2.5	<2.5	<2.5	**3.92**	<2.5	<2.5
>C_{10-12} Aliphatic TPH	mg/kg	<5	<5	<5	**25.2**	<5	<5
>C_{12-16} Aliphatic TPH	mg/kg	<5	<5	<5	**12.3**	**7.03**	<5
>C_{16-21} Aliphatic TPH	mg/kg	<5	<5	<5	<5	**5.78**	<5
>C_{21-35} Aliphatic TPH	mg/kg	<20	<20	<20	<20	<20	<20
C_{6-8} Aromatic TPH	mg/kg	<2.5	<2.5	<2.5	**3.51**	<2.5	<2.5
>C_{8-10} Aromatic TPH	mg/kg	<2.5	<2.5	<2.5	**58.6**	<2.5	<2.5
>C_{10-12} Aromatic TPH	mg/kg	<5	<5	<5	**148**	<5	<5
>C_{12-16} Aromatic TPH	mg/kg	<5	<5	<5	**18**	<5	<5
>C_{16-21} Aromatic TPH	mg/kg	<5	<5	<5	<5	<5	<5
>C_{21-35} Aromatic TPH	mg/kg	<10	<10	<10	<10	<10	<10

Table Twelve: Speciated TPH Analysis Results – Soil

Analyte	Unit	Sample Details and Results		
		BH103	BH104	BH105
		2.4m	2.4m	2.3m
Naphthalene	mg/kg	**17.4**	**10.7**	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1
Fluorene	mg/kg	**0.54**	**0.18**	<0.1
Phenanthrene	mg/kg	**0.54**	**0.26**	**0.12**

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Analyte	Unit	Sample Details and Results		
		BH103	BH104	BH105
		2.4m	2.4m	2.3m
Anthracene	mg/kg	**0.11**	<0.1	<0.1
Fluoranthene	mg/kg	**0.15**	**0.12**	**0.29**
Pyrene	mg/kg	**0.16**	**0.12**	**0.27**
Benzo(a)anthracene	mg/kg	<0.1	<0.1	**0.18**
Chrysene	mg/kg	<0.1	<0.1	**0.19**
Benzo(b)fluoranthene	mg/kg	<0.1	<0.1	**0.19**
Benzo(k)fluoranthene	mg/kg	<0.1	<0.1	<0.1
Benzo(a)pyrene	mg/kg	<0.1	<0.1	**0.21**
Indeno(1,2,3-cd)pyrene	mg/kg	<0.1	<0.1	**0.12**
Dibenzo(ah)anthracene	mg/kg	<0.1	<0.1	<0.1
Benzo(ghi)perylene	mg/kg	<0.1	<0.1	**0.12**
Total PAHs (EPA16)	mg/kg	**18.9**	**11.4**	**1.7**

Table Thirteen: PAH Analysis Results – Soil

4.3 Groundwater Analysis Results

4.3.1 7th March 2023

Analyte	Sample Details and Results (µg/litre)								
	BH004	BH005	BH006	BH101	BH102	BH103	BH104	BH105	MW1
MTBE	<10	<10	<10	<10	<10	<10	<10	<10	<10
Benzene	<1	<1	<1	<1	<1	<1	<1	**11.1**	<1
Toluene	<5	<5	<5	<5	<5	**6.6**	<5	<5	<5
Ethylbenzene	<5	<5	<5	<5	<5	<5	<5	<5	<5
Xylenes	<15	<15	<15	<15	<15	**2,570**	**10.4**	<15	<15

Table Fourteen: BTEX Analysis Results - Groundwater, 7th March 2023

Analyte	Sample Details and Results (µg/litre)								
	BH004	BH005	BH006	BH101	BH102	BH103	BH104	BH105	MW1
C_{6-8} Aliphatic TPH	<10	<10	<10	<10	**24.4**	**1,020**	**534**	**173**	<10
$>C_{8-10}$ Aliphatic TPH	<10	<10	<10	<10	<10	**987**	**10.2**	**138**	<10
$>C_{10-12}$ Aliphatic TPH	<50	<50	<50	<50	<50	<50	**52.3**	**734**	<50
$>C_{12-16}$ Aliphatic TPH	<50	<50	<50	<50	<50	<50	<50	**705**	<50
$>C_{16-21}$ Aliphatic TPH	<50	<50	<50	<50	<50	<50	<50	<50	<50
$>C_{21-35}$ Aliphatic TPH	<50	<50	<50	<50	<50	<50	<50	**169**	<50
C_{6-8} Aromatic TPH	<10	<10	<10	<10	<10	**712**	**264**	**56.2**	<10
$>C_{8-10}$ Aromatic TPH	<10	<10	<10	<10	<10	**9,310**	**660**	**305**	<10
$>C_{10-12}$ Aromatic TPH	<50	<50	<50	<50	<50	**905**	**200**	**302**	<50
$>C_{12-16}$ Aromatic TPH	<50	<50	<50	<50	<50	<50	<50	**50.2**	<50
$>C_{16-21}$ Aromatic TPH	<50	<50	<50	<50	<50	<50	<50	<50	<50
$>C_{21-35}$ Aromatic TPH	<50	<50	<50	<50	<50	<50	<50	**217**	<50

Table Fifteen: Speciated TPH Analysis Results - Groundwater, 7th March 2023

Analyte	Sample Details and Results								
	BH004	BH005	BH006	BH101	BH102	BH103	BH104	BH105	MW1
Naphthalene	<0.01	<0.01	<0.01	<0.01	<0.01	**68.1**	<0.01	**5.52**	<0.01
Acenaphthylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluorene	<0.01	<0.01	<0.01	<0.01	<0.01	**0.97**	<0.01	<0.01	<0.01
Phenanthrene	<0.01	<0.01	<0.01	<0.01	<0.01	**0.51**	<0.01	<0.01	<0.01
Anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(a)anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chrysene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(b)fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(k)fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

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Analyte	Sample Details and Results								
	BH004	BH005	BH006	BH101	BH102	BH103	BH104	BH105	MW1
Benzo(a)pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Ideno(1,2,3-cd)pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dibenzo(ah)anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(ghi)perylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Total PAHs (EPA16)	<0.01	<0.01	<0.01	<0.01	<0.01	**69.6**	<0.01	**5.52**	<0.01

Table Sixteen: PAH Analysis Results – Groundwater, 7th March 2023

4.3.2 17th March 2023

Analyte	Sample Details and Results (µg/litre)								
	BH004	BH005	BH006	BH101	BH102	BH103	BH104	BH105	MW1
MTBE	<10	<10	<10	<10	<10	<10	<10	<10	<10
Benzene	<1	<1	<1	<1	<1	<1	<1	**18.0**	<1
Toluene	<5	<5	<5	<5	<5	<5	<5	<5	<5
Ethylbenzene	<5	<5	<5	<5	<5	<5	<5	<5	<5
Xylenes	<15	<15	<15	<15	<15	<15	<15	<15	<15

Table Seventeen: BTEX Analysis Results - Groundwater, 17th March 2023

Analyte	Sample Details and Results (µg/litre)								
	BH004	BH005	BH006	BH101	BH102	BH103	BH104	BH105	MW1
>C_{6-8} Aliphatic TPH	<10	<10	<10	<10	<10	**151**	<10	**31.6**	<10
>C_{8-10} Aliphatic TPH	<10	<10	<10	<10	<10	**136**	<10	**59.1**	<10
>C_{10-12} Aliphatic TPH	<50	<50	<50	<50	<50	<50	<50	<50	<50
>C_{12-16} Aliphatic TPH	<50	<50	<50	<50	<50	<50	<50	<50	<50
>C_{16-21} Aliphatic TPH	<50	<50	<50	<50	<50	<50	<50	<50	<50
>C_{21-35} Aliphatic TPH	<50	<50	<50	<50	<50	<50	<50	<50	<50
>C_{6-8} Aromatic TPH	<10	<10	<10	<10	<10	**56.4**	<10	**35**	<10
>C_{8-10} Aromatic TPH	<10	<10	<10	<10	<10	**2,120**	<10	**83.9**	<10

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Analyte	Sample Details and Results (µg/litre)								
	BH004	BH005	BH006	BH101	BH102	BH103	BH104	BH105	MW1
>C_{10-12} Aromatic TPH	<50	<50	<50	<50	<50	**331**	<50	<50	<50
>C_{12-16} Aromatic TPH	<50	<50	<50	<50	<50	<50	<50	<50	<50
>C_{16-21} Aromatic TPH	<50	<50	<50	<50	<50	<50	<50	<50	<50
>C_{21-35} Aromatic TPH	<50	<50	<50	<50	<50	<50	<50	<50	<50

Table Eighteen: Speciated TPH Analysis Results - Groundwater, 17th March 2023

Analyte	Sample Details and Results (µg/litre)								
	BH004	BH005	BH006	BH101	BH102	BH103	BH104	BH105	MW1
Naphthalene	<0.01	<0.01	<0.01	<0.01	<0.01	**16.3**	<0.01	**1.86**	<0.01
Acenaphthylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	**0.17**	<0.01
Fluorene	<0.01	<0.01	<0.01	<0.01	<0.01	**0.27**	<0.01	<0.01	<0.01
Phenanthrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(a)anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(a)pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dibenzo(ah)anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Total PAHs (EPA16)	<0.01	<0.01	<0.01	<0.01	<0.01	**16.5**	<0.01	**2.03**	<0.01

Table Nineteen: Selected PAH Analysis Results – Groundwater, 17th March 2023

4.3.3 11th-12th May 2023

Analyte	Sample Details and Results (µg/litre)								
	BH004	BH005	BH006	BH101	BH102	BH103	BH104	BH105	MW1
MTBE	<25	<25	<25	<25	<25	<25	<25	**59.3**	<25
Benzene	<5	<5	<5	<5	<5	<5	<5	**37.7**	<5
Toluene	<5	<5	<5	<5	<5	<5	<5	<5	<5
Ethylbenzene	<5	<5	<5	<5	<5	<5	<5	<5	<5
p+m Xylene	<10	<10	<10	<10	<10	<10	<10	<10	<10
o Xylene	<5	<5	<5	<5	<5	<5	<5	<5	<5

Table Twenty: BTEX Analysis Results - Groundwater, 11th-12th May 2023

Analyte	Sample Details and Results (µg/litre)								
	BH004	BH005	BH006	BH101	BH102	BH103	BH104	BH105	MW1
C6-8 Aliphatic TPH	<10	<10	<10	<10	<10	<10	<10	<10	<10
>C8-10 Aliphatic TPH	<10	<10	<10	<10	<10	<10	<10	**13.7**	<10
>C10-12 Aliphatic TPH	<50	<50	<50	<50	<50	<50	<50	<50	<50
>C12-16 Aliphatic TPH	<50	<50	<50	<50	<50	<50	<50	<50	<50
>C16-21 Aliphatic TPH	<50	<50	<50	<50	<50	<50	<50	<50	<50
>C21-35 Aliphatic TPH	<50	<50	<50	<50	<50	<50	<50	<50	<50
C6-8 Aromatic TPH	<10	<10	<10	<10	<10	<10	<10	**39.8**	<10
>C8-10 Aromatic TPH	<10	<10	<10	<10	<10	<10	<10	<10	<10
>C10-12 Aromatic TPH	<50	<50	<50	<50	<50	<50	<50	<50	<50
>C12-16 Aromatic TPH	<50	<50	<50	<50	<50	<50	<50	<50	<50
>C16-21 Aromatic TPH	<50	<50	<50	<50	<50	<50	<50	<50	<50
>C21-35 Aromatic TPH	<50	<50	<50	<50	<50	<50	<50	<50	<50

Table Twenty-one: Speciated TPH Analysis Results - Groundwater, 11th- 12th May 2023

Analyte	Sample Details and Results (mg/litre)					
	BH101	BH102	BH103	BH104	BH105	MW1
Nitrate as NO3-N	**9.12**	**3.23**	**0.771**	**11.7**	**0.473**	**0.628**
Nitrite as NO2-N	<0.015	<0.015	**0.0828**	<0.015	**0.0163**	**0.0269**
Sulphate	**76.1**	**347**	**42.1**	<40	**661**	**637**
Sulphide	<0.1	<0.1	<0.1	<0.1	**1.99**	<0.1
Chloride	**50.8**	**135**	**41.5**	**38.5**	**61**	**60.1**
Manganese II	**0.191**	**1.32**	**2.29**	<0.02	**0.283**	**0.406**
Manganese IV	<0.02	<0.02	<0.02	<0.02	**0.289**	<0.02
Iron II	<0.2	<0.2	<0.2	<0.2	**0.341**	<0.2
Iron III	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2

Table Twenty-two: MNA Suite Analysis Results – Groundwater, 11th-12th May 2023

4.4 Summary of Analysis Results

4.4.1 Soil

We encountered visual and/or olfactory evidence of hydrocarbons at depths of around 2.5 to 3.5m in four of the five boreholes constructed. Chemical analysis of selected soil samples confirmed the presence of:

- Predominantly petrol range hydrocarbons in BH103 and BH104 in samples taken from 2.4m. Samples taken from above (in both boreholes) and below (in BH103 only) did not contain detectable concentrations of hydrocarbons.These boreholes are located towards the north of the site.
- Low concentrations of predominantly diesel/oil-range hydrocarbons were recorded in samples from 1.7m (TPH) and 2.3m (PAHs) from BH105. A trace concentration of TPH was recorded in BH102 at 3.9m. These boreholes are located towards the south of the site.

The results indicate a narrow band, ~1m thick, of residual hydrocarbon impact of soils in the top of the saturated zone in the River Terrace Deposits.

4.4.2 Groundwater

We did not encounter detectable concentrations of hydrocarbons in samples from the three monitoring wells installed into the chalk aquifer on any of the three monitoring rounds, indicating no significant impact of the chalk aquifer.

In samples taken from the shallow boreholes on 7th March, two to three weeks after borehole installation, we recorded high concentrations of petrol-range hydrocarbons in BH103 with lower concentrations in BH105 (with a diesel component) and BH104 and only a trace concentration in BH102.

Ten days later on 17th March we recorded a significant reduction in concentrations in BH103 and BH105 with no detectable concentration in the remaining monitoring wells. Ground disturbance during borehole construction can result in the release of hydrocarbons adsorbed to soils and result in a temporary increase in dissolve concentrations. We attribute the reduction in concentrations recorded to equilibration of groundwater in the wells following construction. To confirm this we carried out a third groundwater monitoring round.

Our sampling on 11-12th May recorded low concentrations of hydrocarbons in BH105 with no detectable concentrations in any of the remaining monitoring wells.

In 2019 we carried out two rounds of monitoring of boreholes installed into the drift deposits. These boreholes were subsequently destroyed during levelling of the site (with the exception of MW1), so direct comparison of results is not possible. However concentrations recorded in all three of our recent monitoring rounds are significantly lower than those recorded in 2019 indicating an improvement in groundwater quality.

Contaminant of Concern	Maximum Concentration Recorded in Groundwater (µg/litre)			
	November 2018	7th March 2023	17th March 2023	11-12th May 2023
Benzene	1,960 (MW4)	11.1 (BH105)	18.0 (BH105)	37.7 (BH105)
Toluene	15,600 (MW4)	6.6 (BH103)	<5	<5
Ethylbenzene	7,300 (MW4)	<5	<5	<5
Xylenes	42,000 (MW4)	2,570 (BH103)	<15	<15
MTBE	2,840 (MW4)	<10	<10	59.3 (BH105)
TPH Aromatic C_{6-8}	22,400 (MW3)	712 (BH103)	56.4 (BH103)	39.8 (BH105)
TPH Aromatic C_{8-10}	40,300 (MW3)	9,310 (BH103)	2,120 (BH103)	<10
TPH Aromatic C_{10-12}	18,400 (MW3)	905 (BH103)	331 (BH103)	<50
TPH Aromatic C_{12-16}	12,500 (MW3)	50.2 (BH105)	<50	<50
TPH Aromatic C_{16-21}	567 (MW2)	<50	<50	<50
TPH Aromatic C_{21-35}	Not Detected	217 (BH105)	<50	<50

Table Twenty-three: Comparison of Contaminant Concentrations Over Time

5 Quantitative Risk Assessment

5.1 Human Health

5.1.1 Methodology

Receptor	Generic Risk Assessment Methodology: Human Health
Soil	We have compared contaminant concentrations recorded in soil samples against Generic Acceptance Criteria (GAC). We have used the following GACs in order of preference: ➢ C4SLs published by CL:AIRE (CL;AIRE, 2014); ➢ S4ULs published by Land Quality Management Ltd (in conjunction with the Chartered Institute of Environmental Health) [1]; ➢ Soil Guideline Values (SGVs) published by the Environment Agency. GACs have been produced for a range of standard land uses: residential (with/without produce), allotments, commercial and public open spaces (residential/parks). For the purposes of this assessment we have considered all potential risks associated with typical residential end use. [[1]Note: Copyright Land Quality Management Ltd reproduced with permission; Publication Number S4UL3461. All rights reserved].
Groundwater	We have compared contaminant concentrations recorded in groundwater samples against Generic Acceptance Criteria (GAC). We have used values published by SoBRA as GACs (SoBRA, 2017).

Table Twenty-four: GACs: Methodology: Human Health Receptors

In carrying out our risk assessment we have adhered to the following assumptions:

- Contaminants of concern for our risk assessment for soil and/or groundwater are limited to those listed in the tables below.
- The results of the chemical analyses carried out on soil and groundwater samples have been used to determine concentrations of these contaminants at the site. For our soil assessment we have assessed the concentrations recorded in boreholes constructed during July 2022 (Ref.5) and March 2023; and for our groundwater assessment we have assessed the results reported above.
- The GAC for our assessment of xylene in soil is the lowest of those published for o-xylene, m-xylene and p-xylene.

Table Twenty-five: Generic Acceptance Criteria: Assumptions

5.1.2 Results: Soil

Contaminant	Maximum Concentration Recorded in Soil (mg/kg)		GAC (mg/kg) - Residential End Use	Does Maximum Concentration Exceed GAC?
	July 2022	March 2023		
TPH Aliphatic C_{6-8}	7.34	48.2	100	No
TPH Aliphatic C_{8-10}	<2.5	23.4	27	No
TPH Aliphatic C_{10-12}	<2.5	42.5	130**	No
TPH Aliphatic C_{12-16}	<2.5	17.7	1,100*	No
TPH Aliphatic C_{16-35}	<2.5	24.8	65,000*	No
TPH Aromatic C_{6-8}	134	15.2	370	No
TPH Aromatic C_{8-10}	5.63	411	47	**Yes**
TPH Aromatic C_{10-12}	<2.5	424	250	**Yes**
TPH Aromatic C_{12-16}	<2.5	42	1,800	No
TPH Aromatic C_{16-21}	<2.5	<5	1,900	No
TPH Aromatic C_{21-35}	<2.5	<10	1,900	No
Benzene	<5	7.93	1.4	**Yes**
Toluene	0.377	7.31	880**	No
Ethylbenzene	1.52	18.5	83	No
Xylenes	1.86	115	79	**Yes**
MTBE	0.149	1.97	73	No
Acenaphthene	<0.1	<0.1	3,000*	No
Acenaphthylene	<0.1	<0.1	2,900*	No
Anthracene	<0.1	0.11	31,000**	No
Benz[a]anthracene	0.42	0.18	11	No
Benzo[a]pyrene	0.42	0.21	2.5	No
Benzo[b]fluoranthene	0.47	0.19	3.9	No
Benzo[ghi]perylene	0.23	0.12	360	No
Benzo[k]fluoranthene	0.15	<0.1	110	No
Chrysene	0.36	0.19	30	No
Dibenz[ah]anthracene	<0.1	<0.1	0.31	No

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Contaminant	Maximum Concentration Recorded in Soil (mg/kg)		GAC (mg/kg) - Residential End Use	Does Maximum Concentration Exceed GAC?
	July 2022	March 2023		
Fluoranthene	0.62	0.29	1,500	No
Fluorene	<0.1	0.54	2,800*	No
Indeno[123-cd]pyrene	0.30	0.12	45	No
Naphthalene	<0.1	17.4	2.3	**Yes**
Phenanthrene	<0.1	0.54	1,300*	No
Pyrene	0.65	0.27	3,700	No

Note: * GAC exceeds solubility saturation limit / **GAC exceeds vapour saturation limit

Table Twenty-six: Generic Risk Assessment - Human Health/Soil - Commercial Site Use

5.1.3 Results: Groundwater

Contaminant	Concentration Recorded in Groundwater (µg/l)			GAC Residential End-use (µg/l)	Does Maximum Concentration Exceed GAC?		
	7/3/2023	17/3/2023	11/5/2023		7/3/2023	17/3/2023	11/5/2023
Benzene	11.1	18.0	37.7	210	No	No	No
Toluene	6.6	ND	<5	230,000	No	No	No
Ethylbenzene	ND	ND	<5	10,000	No	No	No
Xylene	2,570	ND	<15	9,500	No	No	No
Acenaphthene	<0.01	0.17	-	170,000 (Sol)	No	No	No
Acenaphthylene	<0.01	<0.01	-	220,000 (Sol)	No	No	No
Fluorene	0.97	0.27	-	210,000 (Sol)	No	No	No
Naphthalene	68.1	16.3	-	220	No	No	No
TPH Aliphatic C_{6-8}	1,020	151	<10	1,500	No	No	No
TPH Aliphatic C_{8-10}	987	136	13.7	57	**Yes**	**Yes**	No
TPH Aliphatic C_{10-12}	734	<50	<50	37	**Yes**	No	No
TPH Aliphatic C_{12-16}	705	<50	<50	ND	No	No	No
TPH Aliphatic C_{16-35}	160	<100	<100	ND	No	No	No
TPH Aromatic C_{7-8}	712	56.4	39.8	220,000	No	No	No

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Contaminant	Concentration Recorded in Groundwater (µg/l)			GAC Residential End-use (µg/l)	Does Maximum Concentration Exceed GAC?		
	7/3/2023	17/3/2023	11/5/2023		7/3/2023	17/3/2023	11/5/2023
TPH Aromatic C_{8-10}	9,310	2,120	<10	1,900	**Yes**	**Yes**	No
TPH Aromatic C_{10-12}	950	331	<50	6,800	No	No	No
TPH Aromatic C_{12-16}	50.2	ND	<50	39,000	No	No	No
TPH Aromatic C_{16-21}	ND	ND	<50	ND	No	No	No
TPH Aromatic C_{21-35}	271	ND	<50	ND	No	No	No

Note: ND denotes GAC not derived by SoBRA due to contaminant being insufficiently volatile or soluble
Sol indicates the GAC exceeds the theoretical limit of solubility

Table Twenty-seven: Generic Risk Assessment: Human Health – Groundwater

5.1.4 Drinking Water Pipework

In the following table, we have listed the number of shallow soil samples that exceed the compound thresholds as presented in the UK Water Industry Research (UKWIR) Guidance.

Contaminant	Maximum Concentration Recorded in Soil (mg/kg)	Threshold (mg/kg)	Number of Sample Exceedences
Total BTEX and MTBE	150	0.1	2
TPH C_{5-10}	498	2.0	2
TPH C_{10-16}	526	10	2
TPH C_{16-40}	24.8	500	0

Table Twenty-eight: Assessment for Risks to Drinking Water Pipework

5.1.5 Human Health Assessment Conclusions

- Two soil samples from BH103 and BH104 at 2.4m contained concentrations of hydrocarbons in excess of the GAC for residential end use, indicating soils in these locations pose a potential risk to future site users. Samples from shallower depths in both boreholes contained no detectable concentrations of hydrocarbons. As the source is at depth we consider there to be no/minimal risk from direct contact with soils (ingestion / inhalation of dust). The primary pathway is Inhalation of hydrocarbons in indoor air.
- Two soil samples contain concentrations exceeding the UKWIR thresholds for the placement of drinking water pipes, indicating a potential risk of impact to drinking water on site.
- Groundwater samples from BH103 and BH105 taken on the two March monitoring rounds contained TPH considerations in excess of GACs, with a marginal exceedence in the sample from BH104 on the first round. None of the samples analysed in May contained detectable concentrations of hydrocarbons. As discussed above we consider the May results to be representative of site conditions and therefore it is unlikely that hydrocarbon concentrations in groundwater pose a significant risk to future site users.

5.2 Controlled Waters

5.2.1 Methodology

To assess if the contaminant concentrations we have encountered in groundwater in the drift deposits pose a risk to environmental receptors associated with the site, specifically the chalk aquifer, we have compared contaminant concentrations recorded in groundwater samples against the Site Specific Target Level derived as part of our previous updated detailed quantitative risk assessment (Ref.2).

We note that the target levels were generated for the chalk aquifer and may be overly conservative for other controlled water receptors.

5.2.2 Results

Compound	SSTL at Compliance Point (µg/litre)		Concentration Recorded in Groundwater (µg/l)			Pass/Fail					
	50m	100m	7/3/2023	17/3/2023	11-12/5/2023	7/3/2023		17/3/2023		11-12/5/2023	
Benzene	29.5	139	11.1	18.0	37.7	P	P	P	P	**F**	P
Toluene	302,000	Sol	6.6	ND	<5	P	P	P	P	P	P
Ethylbenzene	165	1,680	ND	ND	<5	P	P	P	P	P	P
Xylenes	145	1,020	2,570	ND	<15	**F**	**F**	P	P	P	P
MTBE	145	1,020	ND	ND	59.3	P	P	P	P	P	P
TPH Aromatic C_{8-10}	242	1,690	9,310	2,120	<10	**F**	**F**	**F**	**F**	P	P
TPH Aromatic C_{10-12}	350	3,180	950	331	<50	**F**	P	P	P	P	P
TPH Aromatic C_{12-16}	484	5,480	50.2	ND	<50	P	P	P	P	P	P
TPH Aromatic C_{16-21}	110	406	ND	ND	<50	P	P	P	P	P	P
TPH Aromatic C_{21-35}	Sol	Sol	271	ND	<50	P	P	P	P	P	P

Note: Sol – target is greater than solubility limit.: target is removal of free-phase, if present.

Table Twenty-nine: Groundwater Targets - Protective of Controlled Water Receptors

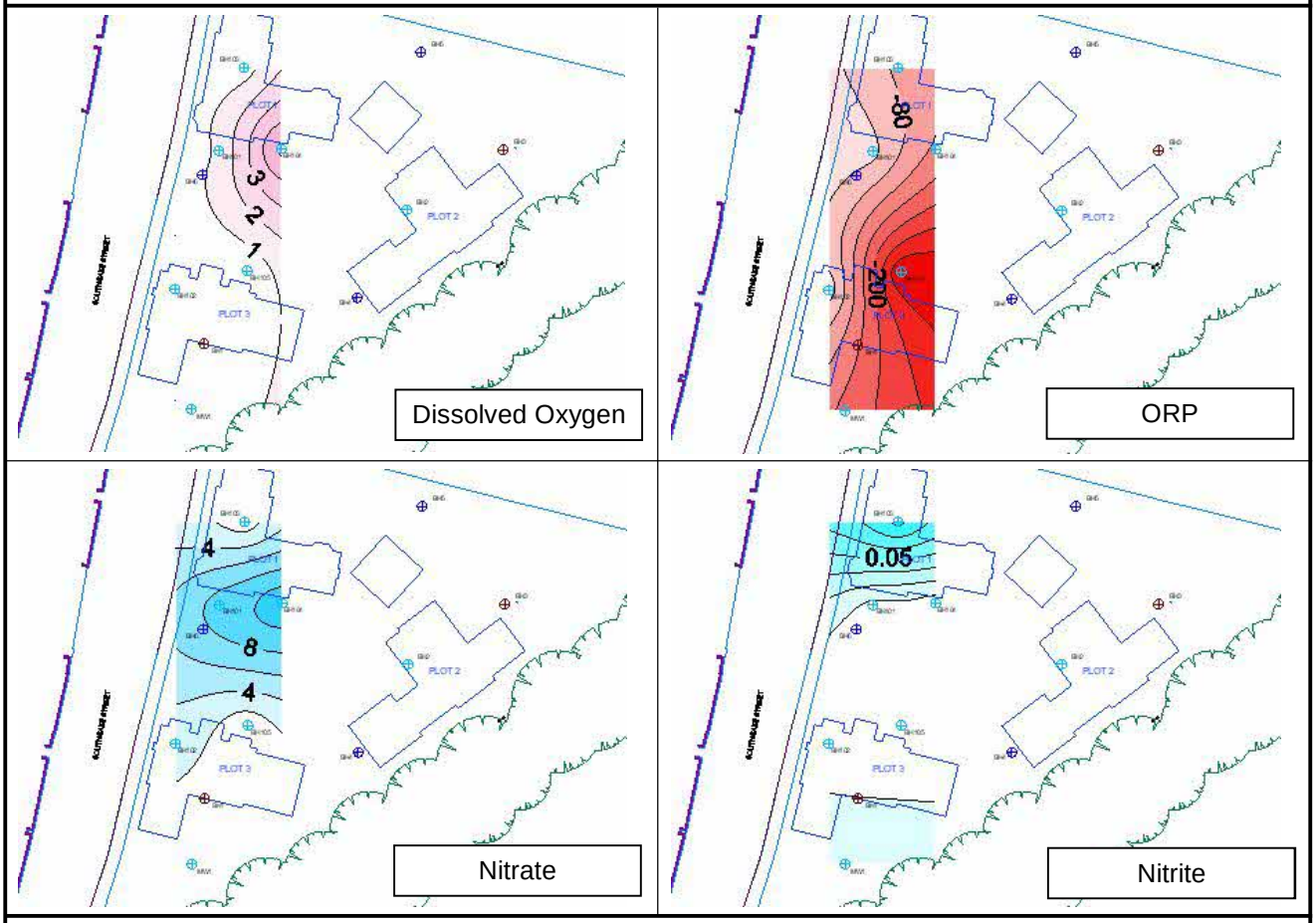
5.2.3 Groundwater Assessment:Conclusions

- Chalk: None of the groundwater samples from deep monitoring wells contained detectable concentrations of dissolved hydrocarbons (TPH, BTEX or PAHs), indicating that there has not been significant downward migration of hydrocarbons into the underlying chalk aquifer.
- River Terrace Deposits: On 7th March concentrations of xylenes in the sample from BH103 and TPH Aro 8-12 in the samples from BH103, BH104 and BH105 exceeded the SSTLs. On 17th March monitoring round concentrations of only TPH in the sample from BH103 exceeded SSTLs. In May all TPH concentrations were below the SSTLs. As discussed above we consider the May analysis results to be representative of site conditions and therefore consider the concentrations recorded do not pose a risk to controlled water receptors

- We recorded a marginal exceedece of benzene in the sample from BH105 obtained in May, for the compliance point at 50m but not at 100m. Low concentrations of benzene were recorded in all samples from BH105 and we consider the May value to be within the likely range of variation in this location. We do not consider the concentrations recorded pose a significant risk to controlled waters.

6 Assessment of Natural Attenuation

We analysed shallow groundwater samples obtained in May 2023 for a range of indicator species for the occurrence of natural attenuation. Selected plots are presented in the table below.



Note: All concentrations in mg/litre

Figure Three: Plots of Selected Natural Attenuation Indicators

We make the following comments:

- Dissolved oxygen concentrations are depleted in the north and south of the site, around BH103 and BH105, where hydrocarbon impact has been recorded, but not in the centre of the site, around BH104 where lower concentrations of hydrocarbons have also been recorded. The dissolved oxygen contours correlate with the distortion in the piezometric contours recorded around BH104 and there may be some groundwater effect (possibly surface recharge) that is affecting both groundwater levels and the geochemistry in this area.
- Nitrate depletion and the presence of nitrite was recorded in the north and south of the site indicating that microbial denitrification may be occurring.
- We conclude that there are potential lines of evidence for microbial degradation occurring in groundwater under the site. However there appears to be some other effect around BH104 which may be masking the extent of the microbial degradation in this area.

7 Hazardous Ground Gas Monitoring and Assessment

7.1 Works Completed

Visit Details	We attended site to completed hazardous ground gas monitoring on 7th March 2023 and 17th March 2023.
Screening for Hazardous Ground Gases	During both site visits we carried out preliminary screening for hazardous ground gases in the dedicated ground gas monitoring wells installed at the site (BH001, BH002 and BH007) and from groundwater monitoring wells (completed with gas taps) installed into the drift deposits. Monitoring was competed using a GA5000 series landfill gas monitor, designed to record concentrations of methane, carbon dioxide, carbon monoxide, hydrogen sulphide and oxygen (and flow readings).
Hydrocarbon Vapours	During both site visits we carried out preliminary (semi-quantitative) screening for hydrocarbon vapour concentrations using a photo-ionisation detector (PID) calibrated with isobutylene gas.
Notes:	Due to changes in site levels, the response (screened section) of BH003 now extends above the ground and is therefore unsuitable for gas monitoring. Similarly, BH002 which was previously unsuitable is now considered acceptable.

Table Thirty: Ground Gas Monitoring Procedures

7.1.1 Hazardous Ground Gases Monitoring Data

The result of our monitoring for hazardous ground gases are provided in the following table.

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		BH001	BH002	BH007	MW1	BH 101	BH 102	BH 103	BH 104	BH 105
Groundwater Level (m bgl)		1.861	-	1.847	1.842	2.260	2.000	2.325	2.478	2.413
Depth to Base (m bgl)		1.5	1.6	1.5	3.4	5.2	6.6	6.1	6.3	3.1
Response Zone (m bgl)		0.5 to 1.5	0.6 to 1.6	0.5 to 1.5	1.2 to 3.3	0.5 to 5.2	0.7 to 6.6	0.7 to 6.1	0.8 to 6.3	0.6 to 3.1
PID reading (ppm)	Peak	0	0	0	0	3	1	6	29	2
	Stable	0	0	0	0	1	1	6	29	2
CH_4 (%)	Peak	0	0.1	0.1	0.1	0.1	0.1	0.1	0.3	0.1
	Stable	0	0	0.1	0.1	0.1	0.1	0.1	0.2	0.1
CO_2 (%)	Peak	1.5	1.1	0.5	2.3	2.2	2.6	0.8	1.5	1.9
	Stable	1.1	1.1	0.5	2.3	2.2	2.6	0.7	1.5	1.7
O_2 (%)	Min	20.2	21.1	21.1	18.9	19.1	19.0	20.7	19.8	17.9
	Stable	20.8	21.1	21.1	18.9	19.1	19.0	20.7	19.8	18.4
H_2S	Peak	0	0	0	0	0	0	0	0	0
	Stable	0	0	0	0	0	0	0	0	0
CO	Peak	0	0	0	0	0	0	0	0	0
	Stable	0	0	0	0	0	0	0	0	0
Flow (L/hr)	Peak	0.1	0.1	0	0.1	0	0	0.1	0	0
	Stable	0.1	0.1	0	0.1	0	-0.1	0.1	-0.1	-0.1
Time to Stabilise (mins)		5	5	5	5	5	5	5	5	5
Weather		Overcast, Barometric pressure 996 to 997hPa and rising								

Table Thirty-one: Ground Gas Monitoring Data, 7th March 2023

		BH001	BH002	BH007	MW1	BH 101	BH 102	BH 103	BH 104	BH 105
Groundwater Level (m bgl)		1.457	1.482	1.671	1.454	1.868	1.613	1.944	2.102	2.024
PID reading (ppm)	Peak	0	0	0	0	0	2	0	39	2
	Stable	0	0	0	0	0	2	0	38	2
CH_4 (%)	Peak	0	0	0.1	0.1	0.1	0.1	0.1	0.2	0.1
	Stable	0	0	0.1	0.0	0.1	0.1	0.0	0.1	0.0
CO_2 (%)	Peak	0.2	1.3	0.2	1.5	1.0	0.3	0.1	0.2	0.2
	Stable	0.2	1.3	0.2	1.5	1.0	0.3	0.1	0.2	0.2
O_2 (%)	Min	21.2	20.3	21.3	19.5	19.6	21.2	21.3	20.8	21.1
	Stable	21.2	20.3	21.3	19.5	19.8	21.2	21.3	21.2	21.1
H_2S	Peak	0	0	0	0	0	0	0	0	0
	Stable	0	0	0	0	0	0	0	0	0
CO	Peak	0	0	0	0	0	0	0	0	0
	Stable	0	0	0	0	0	0	0	0	0
Flow (L/hr)	Peak	0.2	0.2	0.2	0.3	0.1	0.2	0.1	0.2	0.2
	Stable	0.2	0.2	0.1	0.3	0.1	0.2	0.1	0.2	0.2
Time to Stabilise (mins)		5	5	5	5	5	5	5	5	5
Weather		Raining, Barometric pressure 1002hPa and stable								

Table Thirty-two: Ground Gas Monitoring Data, 17th March 2023

7.1.2 Gas Screening Assessment

To establish whether the concentrations of methane and carbon dioxide are present at potentially hazardous concentrations in shallow soils in the vicinity of the shop building, we have calculated Gas Screening Values (GSV) using our monitoring data. These were calculated using gas concentrations and flow rates, in accordance with the methodologies and guidance presented within BS8485 (2015).

In order to assure conservatism within our assessment we have used maximum gas concentrations and flow rates recorded at each location when calculating GSVs.

We have used the data collected during all three rounds of our groundwater monitoring visits: 14th July 2022 (data contained within Ref.5), 7th March 2023 and 17th March 2023.

		BH1	BH2	BH7	MW1	BH101
Gas Screening Value (l/hr)	CH_4	<0.07	<0.07	<0.07	<0.07	<0.07
	CO_2	<0.07	<0.07	<0.07	<0.07	<0.07
Risk Classification (CIRIA C665)		Very Low Risk	Very Low Risk	Very Low Risk	Very Low Risk	Very Low Risk
Characteristic Situation (CIRIA 149)		CS1				
NHBC Traffic Light Classification		Green				

		BH102	BH103	BH104	BH105	
Gas Screening Value (l/hr)	CH_4	<0.07	<0.07	<0.07	<0.07	-
	CO_2	<0.07	<0.07	<0.07	<0.07	
Risk Classification (CIRIA C665)		Very Low Risk	Very Low Risk	Very Low Risk	Very Low Risk	
Characteristic Situation (CIRIA 149)		CS1				
NHBC Traffic Light Classification		Green				

Table Thirty-three: Gas Screening Value for CO_2 and Methane

The results of the two rounds of screening indicate ground-gases are likely to be classified as Characteristic Situation One and NHBC Traffic Light Classification Green. This indicates mitigation measures to protect future residents from ground-gases are unlikely to be required.

The results are consistent with the result of our preliminary gas screening completed in July 2022 (Ref.5).

8 Conclusions

The results of our environmental assessment indicate the following:

Soil	We recorded Made Ground to depths of between 2.5m (centre of the site) and 3.5m (west of the site) verifying the remedial excavation work carried out on the western part of the site. During the logging of soil cores we observed hydrocarbon odours in four out of five cores at depths of between 1.7m and 3.5m in the Made Ground. The results of the chemical analysis, carried out on selected soil samples, confirm the presence of TPH and BTEX compounds in samples from 2.4m in BH103 and BH104 correlating with observed hydrocarbons-in the soil cores. Samples from shallower depths in both boreholes and from a greater depth in BH103 did not contain detectable concentrations of TPH or BTEX, indicating a relatively shallow band of impact, with no vertical migration to the underlying chalk aquifer.

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Soil	Low or trace concentrations of TPH were also recorded in a sample from BH102 at 3.9 and BH105 at 1.7m. PAHs were recorded in all 3 samples analysed, taken from Made Ground at 2.4m where odour and staining were observed. The results of our quantitative risk assessment indicate that the hydrocarbon concentrations recorded in BH103 and BH104 pose a potential risk to future site residents. Due to the depth of the impact recorded, we consider the only potential risk pathway for the hydrocarbons identified as part of these works is via inhalation of indoor air (although this does not discount potential risks posed by other contaminants in shallow soils). Two soil samples contain concentrations exceeding the UKWIR thresholds for the placement of drinking water pipes, indicating a potential risk of impact to drinking water on site.
Groundwater	*Chalk Aquifer:* ➢ No detectable concentrations of TPH or BTEX compounds were recorded in samples taken over three monitoring rounds. This is consistent with the previous monitoring round. ➢ On the previous monitoring round (July 2022) low concentrations of MTBE were recorded in all three monitoring wells. In the latest two monitoring round no detectable concentrations of MTBE were recorded. ➢ These results indicate that there has been no significant impact of the underlying chalk aquifer. *Drift Deposits:* ➢ We recorded elevated concentrations of hydrocarbons in samples from BH103, BH104 and BH105 on our first monitoring visit on 7th March, shortly after borehole installation. The concentrations decreased on each subsequent monitoring round and we have attributed this to disturbance of the ground during boreholes installation followed by equilibration of groundwater. We therefore consider the May 2023 results to be the most representative of groundwater conditions under the site. ➢ Risk to controlled water: On 7th March concentrations of xylenes in the sample from BH103 and TPH Aro 8-12 in the samples from BH103, BH104 and BH105 exceeded the SSTLs. On 17th March monitoring round concentrations of only TPH in the sample from BH103 exceeded SSTLs. In May all TPH concentrations were below the SSTLs. We recorded a marginal exceedence of benzene in the sample from BH105 obtained in May, for the compliance point at 50m but not at 100m. Low concentrations of benzene were recorded in all samples from BH105 and we consider the May value to be within the likely range of variation in this location. As discussed above we consider the May analysis results to be representative of site conditions and therefore consider the concentrations recorded do not pose a risk to controlled water receptors.

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Groundwater	➢ Risk to human health receptors: Samples from BH103 and BH105 taken on the two March monitoring rounds contained TPH considerations in excess of GACs, with a marginal exceedence in the sample from BH104 on the first round. None of the samples analysed in May contained detectable concentrations of hydrocarbons. As discussed above we consider the May results to be representative of site conditions and therefore it is unlikely that hydrocarbon concentrations in groundwater pose a significant risk to future site users. ➢ We conclude that there are potential lines of evidence for microbial degradation occurring in groundwater under the site. However there appears to be some other effect around BH104 which may be masking the extent of the microbial degradation in this area.
Hydrocarbon Vapour	We recorded only low concentrations of volatile organic compounds in all the newly installed wells.
Hazardous Ground Gas	The results of three rounds of screening indicate ground-gases are likely to be classified as Characteristic Situation One and NHBC Traffic Light Classification Green. This indicates mitigation measures to protect future residents from ground-gases are unlikely to be required.

Your attention is drawn to the Notice to Interested Parties included as Attachment One.

Table Thirty-four: Conclusions

9 Revised Remedial Strategy

9.1 Review of Works Completed to Date

The table below provides an update on the works that have been completed since 2018. We have based our review on the actions presented within Section 7 our initial Remedial Strategy report (Ref.1).

	Remedial Action	Details	Date of Completion
1.1	Excavation and Removal of Hydrocarbon Impacted Soils	~1,200tonnes of hydrocarbon impacted soils excavated and removed from the site (Ref 2). Re-instatement only partially complete at time of report	Excavation works completed in November 2018
1.2	Reinstatement of Excavations and Installation of Wells	November 2018: Six monitoring wells installed (maximum depth 3.7m) following completion of excavation works, to enable us to verify the impact of the remedial actions on groundwater quality within the River Terrace Deposits. July 2022: Three monitoring wells installed (maximum depth 12.8m) to enable us to verify any impact to the Upper Chalk Formation. February 2023: Five monitoring wells installed (maximum depth 6.7m) to enable further validation of impact of remedial actions on groundwater quality with the River Terrace Deposits.	Wells installed November 2018, July 2022, February 2023
1.3	Groundwater Treatment	The requirement for further groundwater treatment was subject to a review of site data and revisions to our Conceptual Site Model and Detailed Quantitative Risk Assessment. Initial data suggested extensive groundwater treatment was unlikely to be required. However, the use of chemical reagents may be proposed as a contingency measure if the concentrations of dissolved hydrocarbons failed to reduce further.	The results of our groundwater monitoring indicate that groundwater treatment is not required.
1.4	Engineering Controls	A cover system will be required in areas of soft landscaping (design to be confirmed as part of this revised Remedial Strategy)	Not complete: Requirements to be confirmed in this report and to be incorporated as part of construction phase of the proposed development.
1.5		Installation of gas protection may be required beneath some/all of the new buildings (subject to results of additional site testing).	
1.6		Hydrocarbon resistant 'barrier pipe' to be used for all new water supply pipes as a precautionary measure.	
1.7	Validation of Remedial Works	Six rounds of groundwater monitoring and sampling have been carried out since the remedial excavation was completed; five in the River Terrace Deposits and four in the chalk aquifer. Monitoring results confirm no free-phase is present. Chemical analysis indicates only low residual dissolved phase hydrocarbons remain present in the River Terrace Deposits.	Monitoring and sampling carried out between May 2019 and May 2023
-	Additional Works	Additional works were proposed in our Update on Site Remediation (Ref.4), including additional investigation of groundwater quality in the Upper Chalk Formation, revision of our risk assessment and remedial strategy	Completed June/July 2022 and as reported above.

Table Thirty-five: Remedial Strategy Progress Review

9.2 Summary of Viable Pollutant Linkages

The following table summarises the viable pollutant linkages that we consider need to be addressed as part of the remediation process.

Receptor		Viable Pollutant Linkages Requiring Remedial Works
Human Health	Commercial	No viable receptors identified
	Residential	Risks associated with vapour ingress to indoor air from hydrocarbons in soils/water, permeation of hydrocarbons to drinking water supply pipework and dermal contact and ingestion to residual contaminants in shallow soils.
Environmental	Surface Water Feature	No viable receptors identified
	Groundwater Resource	No - The results of our groundwater monitoring, as described in earlier sections of this report, indicate that no further remedial or monitoring works are required with respect to protection of the water environment.

Table Thirty-six: Summary of Viable Pollutant Linkages

9.3 Remedial Objectives

Our primary remedial objective is to ensure that the concentrations of residual contaminants identified in underlying soils, as highlighted in the previous sections of this report, do not pose a risk to future site users.

Our secondary objective is to provide site data sufficient to verify the above objective has been completed, which in turn should permit the discharge of any contaminated land conditions that may be specified within the Local Planning Authority decision notice and/or satisfy NHBC requirements.

9.4 Strategy Overview

Based upon our current understanding of site conditions we consider the use of engineering control measures will form the basis of our remedial strategy to mitigate residual risk of impact to the human receptors.

Further details relating to the various proposed control measures are summarised below with further details provided in the following section.

9.5 Engineering Control Measures

The engineering and control measures that we recommended to mitigate risk to future employees working in the new sales building are presented in the following table.

Item	Details		
Protection of buried water supply pipes	Hydrocarbons present in shallow soils can permeate standard PVC water supply pipework and leach into drinking water leading to tainting and in extreme cases can pose a risk to human health. Our previous assessment has confirmed that hydrocarbon concentrations exceed the threshold guidelines as presented in the UK Water Industry Research (UKWIR) Guidance We therefore recommended that all new water supply pipework that is installed during the forthcoming development works be constructed from a hydrocarbon impervious material (e.g. ductile steel or plastic/aluminium composite).		
Cover / capping layers	A layer of sub-soil and topsoil dressing should be applied to all areas that are to be used for landscaping and gardens. The thickness of soil cover required needs to fulfil two requirements. Firstly, to provide a barrier between site users and any residual contaminants that are present within the underlying soils. Secondly, to be sufficient to sustain the proposed plant growth, as specified by a horticulturalist. In this respect the thickness of total cover required is predominantly dependent upon the contaminative profile of both the underlying soil within that area and that of the cover material (in accordance with BRE 465 Cover systems for land regeneration). Based on the currently available data, and assuming that Made Ground is excavated and removed from any areas proposed for gardens/landscaping, we propose that the following cover layer be suitable for use:		
	Topsoil	0-150mm	Given nature of existing development topsoil likely to be imported
	Sub-soil	150-300mm	Likely to be site won (subject to verification analysis)
	Geo-textile membrane	600mm	Deployed to separate any residual contamination present from the clean imported soils
Gas Protection measures	We recommend that hydrocarbon resistant membranes must be installed beneath all new buildings to mitigate risks to future residents. The membrane installation must be designed to achieve complete integrity across entire building footprint. Penetrations and joints must be sealed. The membrane will act as a barrier between any hydrocarbon vapours present beneath the buildings and the future site workers. Provided the membrane is correctly installed it will mitigate the need for further remedial works (associated with the ingress of volatile vapours into inhabitable buildings).		

Table Thirty-seven: Engineering Controls

9.6 Construction Issues and Verification of Engineering Control Measures

We provide the following additional notes on the proposed engineering controls.

Item	Details
Verification of Quality of Topsoil	Any imported topsoil/subsoil for use in areas of soft landscaping should be inert uncontaminated material and comply with the sampling frequency and criteria specified in BS 3882. Analysis certificates for all imported materials should be requested from the supplier to verify the material is suitably inert and appropriate for use at site. If the producer is not able to provide analysis certificates, samples of the material should be collected for analysis, ideally prior to placement. In line with NHBC guidance we would recommend that one sample per plot, for each separate soil source, is sufficient to characterise each stream of imported material. Additionally, the contractor should be advised to carry out a visual inspection of soil on delivery in order to confirm the soil visually compares with that described on suppliers test report. Quality data made available for any imported top-soil/sub-soil will be included within our report. Analysis results should be compared against the Generic Acceptance Criteria. These criteria apply only to the risk posed to human health, relative to the proposed development end-use. Additional parameters should also be assessed. For example topsoil should be verified as being suitability as growth material, as required by British Standard (BS 3882:2007).
Cover System Thickness	The thickness of cover (both top-soil and sub-soil) should be verified; this can be in the format of a photographic record showing test pits and measuring staff clearly showing cover thickness relative to final site levels. Photos of the base of the cover layer should also be obtained to verify the presence of any geotextile membrane and/or capillary break layer (if required). Verification inspection frequency should be for every plot (as per NHBC recommendations for sites with <5 plots). A site plan showing pit locations should also be included.
Drinking Water Barrier Pipework	Pipework should be laid within a bed (minimum 100mm) of sand or other granular material (with no sharps) to prevent damage to the pipework and the trench backfilled with a clean inert material. Verification to comprise photos of pipework, ideally *in situ*, to verify the correct specification has been adhered to.

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Membrane Installation and Verification	The data sheet for the proposed membrane should be submitted to the local planning authority for confirmation that it is acceptable for use, prior to installation. Installation should ideally be carried out by an appropriately experienced, trained and qualified contractor (e.g. Construction Skills Level 2 NVQ Diploma). If the membrane is to be installed by the principal works contractor under instruction from the manufacturer, we recommend that the principal works contractor provide a Site Specific Method Statement for the installation of the membrane, which can be issued to the Local Planning Authority for review. The integrity of the installed membrane should be verified (and repaired where necessary) by an independent third party. Suitable verification methods can be found within *CIRIA Report C735: Good Practice and verification or protection systems for buildings against hazardous ground gases*. A Method Statement for the membrane validation should be submitted to the local planning authority (and any building warranty provider being used by the client) for confirmation that it is acceptable for use, prior to installation. Photographic evidence of the installed membrane may be also be requested.
Protection of Construction Workers	Construction and maintenance workers, particularly those working on below ground utilities, should be made aware of the hydrocarbon concentrations encountered in soil. Strict hygiene practices should be followed during any below ground works. To minimise potential exposure of workers to potential hydrocarbon contaminants, site clothing should be removed after each working period. A clean area should be made available with washing facilities for use after each shift. Changing and washing areas should be positioned to ensure that no field equipment enters the clean area. Eating, drinking and smoking should be restricted to the clean area.
Waste Classification	We recommend that we classify all potentially impacted soils prior to disposal. All waste soils and fill materials must be disposed of at an appropriately licensed disposal site. A registered waste haulage contractor must transport all waste soils. It is the responsibility of the site owner to ensure that wastes are safely transported and disposed of correctly. A summary of the volume and waste classification of all exported material will be collated and issued. Copies of all waste consignment notes should be made available upon request.
Treatment of Wastewater Prior to Discharge	Groundwater within excavations, particularly around the western site boundary, may be impacted with elevated concentrations of petroleum hydrocarbons. Any wastewater produced during dewatering may need to undergo treatment prior to disposal or be removed from site by tanker and disposed of appropriately. We recommend that analysis of groundwater within excavations be completed to verify water quality prior to disposal.

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Item	Details
Potentially Polluting Operations During Construction	The use of plant equipment on site during construction can result in the accidental release of contaminants to ground, such as fuels, oils, coolants and lubricants. To avoid such incidents all construction machines should be maintained to a safe and efficient working condition at all times and any oils or fuels stored should be contained in accordance with The Control of Pollution (Oil Storage) Regulations 2001. Further information relating to reducing the risks of causing pollution or nuisance, for example, specific refuelling areas, full time environmental support, mains electricity, a wheel wash to prevent mud being carried out onto the road, can be found within the Environment Agency's 'Working at construction and demolition sites: PPG6 Pollution Prevention Guidelines'. All existing groundwater monitoring wells must be decommissioned prior to the redevelopment works commencing to remove the pathway to groundwater should an incident occur.
Re-use of site-won material	The re-use of site-won material is subject to the following restrictions and it is the contractors responsibility to ensure these are adhered to: ➢ Chemical analysis should be undertaken to verify material is suitable for its intended purpose; ➢ Approval should be obtained from the relevant regulating authority (e.g. Building Control/NHBC and/or Environmental Health) before any material is re-used on site. ➢ Volume restrictions may also apply under current guidance and legislation. ➢ Any material re-used on-site should be geotechnically suitable for its intended purpose. Geotechnical testing and/or advice from a suitably qualified engineer should be sought if in any doubt.
Environmental Nuisance	**I**t is the Principal Contractors responsibility to monitor and mitigate risk associated with potential environmental nuisance issues. Potential nuisance issues that could result from the development process and associated remediation works include: Noise associated with plant used during demolition, construction of foundations and remediation excavations; dust produced during excavation works and odours created during excavations and/or associated with stockpiled materials.
Unforeseen Contamination	As with any development we recommend that a watching brief be established at the site during the excavation of foundation trenches for the new buildings and above/below ground structures. If any potential contamination (staining, odours etc) of underlying soils and/or groundwater are suspected, we should be notified and verification sampling completed. The results of this verification can then be used to revise our conceptual site model and complete a suitable risk assessment to determine what, if any, further is required.

Table Thirty-eight: Additional Considerations

9.7 Verification Report

All data produced during the construction phase of the remedial works will be issued within a Remediation Verification Report, shortly after the completion of the development.

9.8 Non-Conformance with Verification Criteria

As part of the verification phase we will review all available data and assess whether all remedial objectives have met successfully.

In the unlikely event that any contaminant concentrations recorded in soil, groundwater and/or gas exceed our remediation criteria and we recommend that further works are required, we would likely consider one or a number of the following actions:

- Refinement of our Conceptual Site Model and Re-assessment
- Assessment of Natural Attenuation
- Remediation Options Appraisal and Further Remediation

10 Regulatory Comment

This document should be issued to the regulators for review and comment, at least 4 weeks prior to the commencement of the development (in accordance with statutory response times). Any comment received from the regulators should be forwarded to us for review.

SUBADRA
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ATTACHMENT ONE:
NOTICE TO INTERESTED PARTIES

SUBADRA
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NOTICE TO INTERESTED PARTIES

The purpose of our work Is to provide general information on the environmental And/Or geotechnical conditions existing at the site And related to soil And/Or groundwater. The Client Or others specified the scope of the investigation And the validity of our conclusions Is limited by the scope of work specified. We are Not responsible for any such limitations Or omissions.

Where stated in this report, we have used information supplied by third parties. While we have evaluated As far As possible the validity Of this information, we cannot guarantee its accuracy In any way whatsoever.

No investigation technique Is capable Of completely identifying all Of the contaminants that might be present In the soil Or groundwater under a site. Where specified In our report, we have examined the ground by constructing a number Of boreholes And/Or trial pits. We recovered samples Of soil And/Or groundwater from available exposures.

The depth And spacing Of our Sampling locations were selected To ensure With a reasonable probability that they would be representative Of the actual conditions across the whole site. However, safety considerations relating To existing site infrastructure may have restricted our ability To investigate all potential contaminant sources. Specifically, we were unable To investigate the soil And groundwater condition immediately adjacent To the underground structures And/Or buried services. These limitations must be borne In mind When considering the conclusions reached In this report.

Soil Is intrinsically variable And the spread Of contaminants within the soil Is therefore subject To a degree Of non-uniformity. For these reasons no sampling technique can completely eliminate the possibility Of obtaining samples that are Not representative Of the actual conditions. Our sampling techniques are intended To reduce the possibility To an acceptable level, within the limits imposed by the scope of the investigation.

Groundwater levels And soil vapour levels that we report were accurate at the time of the investigation. Groundwater And soil vapour levels are variable. Long term monitoring may be required to ensure that the levels recorded during our investigation are representative of long term And possible 'worst case' conditions. In accepting our recommendations and/or conclusions the Client acknowledges that further, more detailed investigation would allow a more accurate assessment of site conditions to be made and that this would reduce any consequential risk to the Client.

Our investigation was carried out to assess the significance of contamination resulting from use of the site as identified in this report. Unless we have indicated otherwise, no assessment of the potential impact of any other previous uses has been made. No investigation was carried out to determine whether or not any deleterious or hazardous materials (such as asbestos) have been used in the construction of the buildings present on the site. Unless otherwise stated no investigation or assessment has been made of the presence or otherwise of invasive plant species including but not limited to Japanese Knotweed.

Unless specifically stated otherwise, we have not assessed the effect of any proposed future construction activities on existing structures on or near to the site. Nor, unless stated otherwise, have we assessed the likely effect of trees on existing or proposed structures on or near the site.

We do not accept any responsibility for the cost of remedial works or other costs incurred in whatever way whatsoever as a result of any omissions, errors or other shortcomings in this report unless we have been given reasonable opportunity to verify ourselves that such faults exist and we have been given a reasonable opportunity to carry out works to remedy such faults ourselves using the most practicable means available to us. We do not accept liability for any consequential losses incurred by you while either we or others carry out any remedial works we deem necessary.

This report has been prepared for the Client, as specified on the cover page of this report. In accepting our recommendations and/or conclusions the Client accepts that the terms of our appointment were as detailed in the Proposal, or Proposals, that we provided to the Client before being appointed and that these terms supersede any other terms and/or conditions set out in any contracts agreed between ourselves and the Client, regardless of when such terms and/or conditions were agreed to by us and/or signed by us.

Use of, and reliance on, this report by other third parties will be at such third parties own risk, and we do not accept any liability or responsibility to them.

Neither the whole nor any part of this report, or any reference to it, may be included in any published document circular or statement or published in any way without our prior written approval.

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ATTACHMENT TWO:
BOREHOLE LOGS

Borehole Log
BH101

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Environmental - Geotechnical - Laboratory - Foundations
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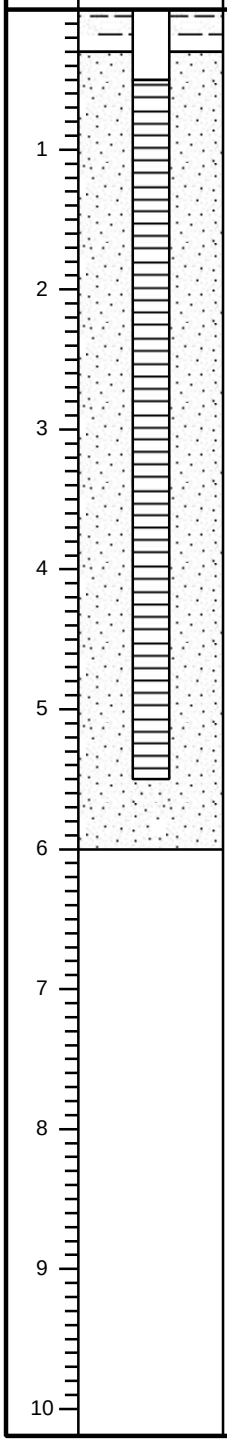
Tel: 01296 739400 Email: consultants@subadra.com

Project Name	FI03088 Southgate Service Station	Coordinates	
Date	16th February 2023	Ground Level	99.82m AOD
Site Engineer	Harriet Sagar	Drilling Method	Comacchio



Depth (m)	Sample	Laboratory Analysis	Headspace (ppm)	SPT 'N' or Su (kPa)	Description
	S1/0.20 - 0.20		1.0	Su = 25	0.00m - 2.10m Made Ground Brown sandy clay. Frequent fine to coarse gravel, including red brick fragments, pumice, and flints, at 0.3 to 0.5m, 0.7 to 0.9m, and 2.0 to 2.1m, and rootlets from ground level to 0.3m. From 1.1 to 1.8m layer is very sandy and contains organic material.
1	S2/0.90 - 0.90		0.0		
2	S3/1.90 - 1.90	BTEX&M	0.0		2.10m - 2.30m Made Ground Black fine to coarse gravel, including flint. Coarse gravels are rounded, fine to medium gravels are angular.
3	S4/2.90 - 2.90	TPH CWG	1.0		2.30m - 3.50m Made Ground Grey and black gravelly sand. Gravel include flints, occasional coarse gravel is sub-rounded, and frequent fine gravel is angular. Hydrocarbon odour from 2.3 to 2.5m.
4	S5/3.70 - 3.70	BTEX&M/ TPH CWG	0.0		3.50m - 6.00m River Terrace Deposits LOOSE TO MEDIUM DENSE orange brown SAND. Layer contains occasional medium to coarse gravel, and frequent fine gravel. Collapsing sands at 3.8, hollow stem augers used to 6.0m. Layer continues to 6.0m based on driller's logs and soil arisings.
5					
6					Borehole terminated at 6.00m
7					
8					
9					
10					

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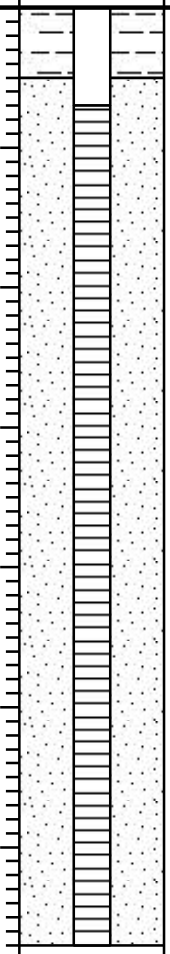
Well Diameter	50mm	Depth of Borehole	6.00m
Well Casing Length	0.50m	Depth to Groundwater	
Well Screen Length	5.00m	Page	One of One

Borehole Log
BH102

SUBADRA
Environmental - Geotechnical - Laboratory - Foundations
13 Triangle Business Park, Stoke Mandeville, HP22 5BL
Tel: 01296 739400 Email: consultants@subadra.com

Project Name	FI03088 Southgate Service Station	Coordinates	
Date	16th February 2023	Ground Level	99.91m AOD
Site Engineer	Harriet Sagar	Drilling Method	Comacchio



Depth (m)	Sample	Laboratory Analysis	Headspace (ppm)	SPT 'N' or Su (kPa)	Description
0	S1/0.20 - 0.20		1.0	Su = 25	0.00m - 2.20m Made Ground Soft brown very sandy clay with frequent fine to coarse gravel. Gravel includes red brick fragments and pumice, and is less frequent 0.0 to 0.6m, and rootlets present 0.0 to 0.2m. Brown very clayey sand layer 0.6 to 0.9m, with frequent fine to coarse gravel including red brick fragments.
1	S2/0.80 - 0.80		0.0	Su = 21.8	
2	S3/1.60 - 1.60	BTEX&M	0.0		
3					2.20m - 3.00m Made Ground Brown fine to coarse gravel, including red brick fragments and flint.
4	S4/3.50 - 3.50	TPH CWG	2.0		3.00m - 3.40m Made Ground Black gravelly sand . Gravel is fine to coarse including red brick fragments and flint.
5	S5/3.85 - 3.85	BTEX&M/ TPH CWG	2.0		3.40m - 6.70m River Terrace Deposits LOOSE TO MEDIUM DENSE black SAND with occasional fine gravel. Coarse gravel is present 3.7 to 3.8m, gravel is angular and includes flints. Collapsing sands at 3.9, hollow stem augers used to 6.7m. Layer continues to 6.7m based on driller's logs and soil arisings.
6					
7					Borehole terminated at 6.70m
8					
9					
10					

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Well Diameter	50mm	Depth of Borehole	6.70m
Well Casing Length	0.70m	Depth to Groundwater	
Well Screen Length	6.00m	Page	One of One

Borehole Log
BH103

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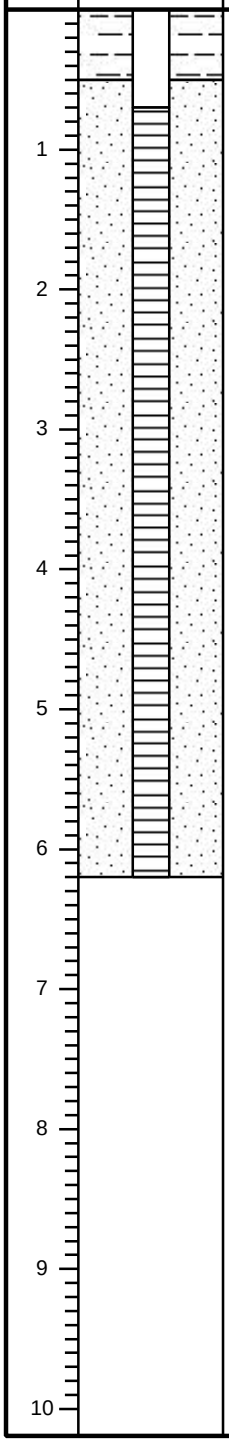
Environmental - Geotechnical - Laboratory - Foundations
13 Triangle Business Park, Stoke Mandeville, HP22 5BL
Tel: 01296 739400 Email: consultants@subadra.com

Project Name	FI03088 Southgate Service Station	Coordinates	
Date	16th February 2023	Ground Level	100.09m AOD
Site Engineer	Harriet Sagar	Drilling Method	Comacchio



Depth (m)	Sample	Laboratory Analysis	Headspace (ppm)	SPT 'N' or Su (kPa)	Description
0	S1/0.20 - 0.20		2.0	Su = 37.5	0.00m - 2.00m Made Ground Brown sandy clay with occasional fine to medium gravel. Layer contains organic material from ground level to 0.6m. Band of gravels present from 0.25 to 0.3m. Layer is very sandy from 1.8 to 2.0m.
1	S2/0.90 - 0.90		1.0	Su = 108.3	
				Su = 87.5	
2	S3/1.90 - 1.90	TPH CWG	0.0	Su = 20.83	
	S4/2.40 - 2.40	BTEX&M/ PAH/ TPH CWG	150.0		2.00m - 3.50m Made Ground Black grey sand with includes frequent fine to medium, and occasional coarse gravel. Hydrocarbon odour and black staining throughout layer.
3	S5/3.30 - 3.30	BTEX&M	6.0		
	S6/3.70 - 3.70	TPH CWG	4.0		3.50m - 6.20m River Terrace Deposits LOOSE SAND. Layer contains frequent fine to coarse gravel, which is angular to sub-angular. Collapsing sands at 3.9, hollow stem augers used to 6.7m. Layer continues to 6.2m based on driller's logs and soil arisings.
4					
5					
6					Borehole terminated at 6.20m
7					
8					
9					
10					

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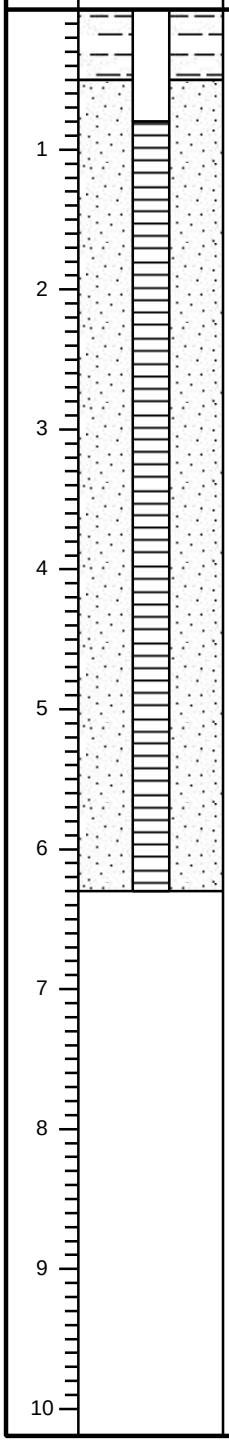
Well Diameter	50mm	Depth of Borehole	6.20m
Well Casing Length	0.70m	Depth to Groundwater	
Well Screen Length	5.50m	Page	One of One

Borehole Log
BH104

SUBADRA
Environmental - Geotechnical - Laboratory - Foundations
13 Triangle Business Park, Stoke Mandeville, HP22 5BL
Tel: 01296 739400 Email: consultants@subadra.com

Project Name	FI03088 Southgate Service Station	Coordinates	
Date	17th February 2023	Ground Level	100.00m AOD
Site Engineer	Harriet Sagar	Drilling Method	Comacchio



Depth (m)	Sample	Laboratory Analysis	Headspace (ppm)	SPT 'N' or Su (kPa)	Description
	S1/0.10 - 0.10		2.0		0.00m - 1.00m Made Ground Brown clayey sand with frequent fine to coarse gravel. Gravel includes tile, red brick fragments, pumice, flint, and wood.
1	S2/0.90 - 0.90	BTEX&M/ TPH CWG	1.0	Su = 70.8	1.00m - 2.00m Made Ground Brown slightly sandy clay with frequent fine gravel, and occasional medium gravel. Gravel includes red brick fragments.
2	S3/1.70 - 1.70	BTEX&M/ TPH CWG	1.0	Su = 79.2	2.00m - 2.50m Made Ground Brown clayey sand with frequent fine to medium gravel and occasional coarse gravel. Gravel includes flints and red brick fragments. Hydrocarbon odour and black staining present from 2.3 to 2.5m.
3	S4/2.40 - 2.40	BTEX&M/ PAH/ TPH CWG	150.0		2.50m - 6.30m River Terrace Deposits LOOSE TO MEDIUM DENSE orange brown SAND with frequent fine gravel. Collapsing sands from 2.5m, hollow stem augers used to 6.3m. Layer description based on driller's logs, soil arisings, and nearby borehole logs.
4					
5					
6					Borehole terminated at 6.30m
7					
8					
9					
10					

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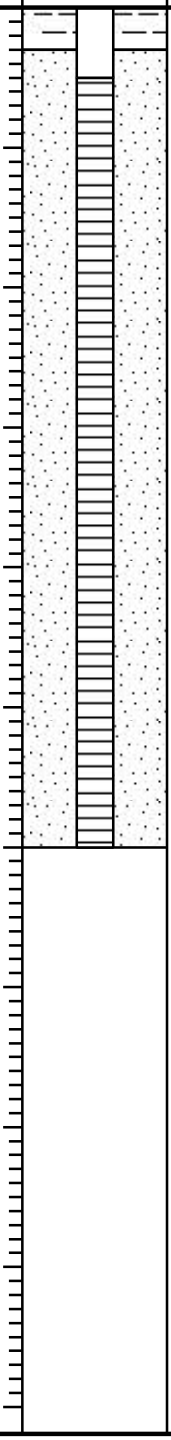
Well Diameter	50mm	Depth of Borehole	6.30m
Well Casing Length	0.80m	Depth to Groundwater	
Well Screen Length	5.50m	Page	One of One

Borehole Log
BH105

SUBADRA
Environmental - Geotechnical - Laboratory - Foundations
13 Triangle Business Park, Stoke Mandeville, HP22 5BL
Tel: 01296 739400 Email: consultants@subadra.com

Project Name	FI03088 Southgate Service Station	Coordinates	
Date	17th February 2023	Ground Level	99.90m AOD
Site Engineer	Harriet Sagar	Drilling Method	Comacchio



Depth (m)	Water Level	Sample	Laboratory Analysis	Headspace (ppm)	SPT 'N' or Su (kPa)	Description
1	Strike 1.80m	S1/0.20 - 0.20		1.0		0.00m - 1.00m Made Ground Brown clayey sand with organic material and frequent fine to coarse gravel. Gravel gets fine with depth, and includes red brick fragments, glass and wood.
		S2/0.90 - 0.90	BTEX&M	2.0	Su = 104.2	1.00m - 1.90m Made Ground Brown sandy clay with occasional fine gravel. Gravel includes red birck fragments and organic material. Hydrocarbon odour from 1.7 to 1.9m.
2		S3/1.70 - 1.70	BTEX&M/ TPH CWG	1.0	Su = 10.6	1.90m - 2.60m Made Ground Grey black slightly clayey sand. Layer contains frequent fine to medium gravel, and occasional coarse gravel, including red brick fragments, organic material, and flint. 2.5 to 2.6m is coarse gravel and wood pieces. Hydrocarbon odour and staining throughout.
3		S4/2.30 - 2.30	BTEX&M/ PAH/ TPH CWG	5.0		2.60m - 6.00m River Terrace Deposits LOOSE TO MEDIUM DENSE orange brown SAND with frequent fine gravel. Collapsing sands at 3.9, hollow stem augers used to 6.7m. Layer description based on driller's logs, soil arisings, and nearby boreholes.
4						
5						
6						Borehole terminated at 6.00m
7						
8						
9						
10						

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Well Diameter	50mm	Depth of Borehole	6.00m
Well Casing Length	0.50m	Depth to Groundwater	
Well Screen Length	5.50m	Page	One of One

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ATTACHMENT THREE:
CHEMICAL ANALYSIS CERTIFICATES

Report No 12484

fastanalysis.co.uk
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13 Triangle Business Park, Stoke Mandeville, HP22 5BL

Project	FI03088 Southgate Service Station	Sampled	16th February 2023
Client	Subadra Consulting Ltd/James May	Report Approved By	[redacted] Duty Reporting Manager
Sample Type	Soil		

Soil - BTEX and MTBE - 16th February 2023

Analyte	Unit	Method Detection Limit	Sample Details									
			BH101	BH101	BH102	BH102	BH103	BH103	BH104	BH104	BH104	BH105
			S3	S5	S3	S5	S4	S5	S2	S3	S4	S2
			1.90m	3.70m	1.60m	3.85m	2.40m	3.30m	0.90m	1.70m	2.40m	0.90m
MTBE [2]	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	1.97	<0.5	<0.5	<0.5	0.988	<0.5
Benzene [2]	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	7.93	<0.1	<0.1	<0.1	<0.1	<0.1
Toluene [2]	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	7.31	<0.1	<0.1	<0.1	3.43	<0.1
Ethylbenzene [2]	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	18.5	<0.1	<0.1	<0.1	4.3	<0.1
p+m Xylene [2]	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	86.7	<0.1	<0.1	<0.1	17.9	<0.1
o Xylene [2]	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	28.3	<0.1	<0.1	<0.1	7.97	<0.1

UKAS TESTING

Method:

2. UKAS 17025

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Chain of Custody	24709	Analysed	WS 02/03/23
Received	WS 24/02/23	Reported	KC 11/04/23
Prepared	BO 28/02/23	Page	One of Two

Report No 12484

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13 Triangle Business Park, Stoke Mandeville, HP22 5BL

Project	FI03088 Southgate Service Station	Sampled	16th February 2023
Client	Subadra Consulting Ltd/James May	Report Approved By	[redacted] Duty Reporting Manager
Sample Type	Soil		

Soil - BTEX and MTBE - 16th February 2023

Analyte	Unit	Method Detection Limit	Sample Details									
			BH105	BH105								
			S3	S4								
			1.70m	2.30m								
MTBE [2]	mg/kg	0.5	<0.5	<0.5								
Benzene [2]	mg/kg	0.1	<0.1	<0.1								
Toluene [2]	mg/kg	0.1	<0.1	<0.1								
Ethylbenzene [2]	mg/kg	0.1	<0.1	<0.1								
p+m Xylene [2]	mg/kg	0.1	<0.1	<0.1								
o Xylene [2]	mg/kg	0.1	<0.1	<0.1								

UKAS TESTING

Method:

2. UKAS 17025

Prism.NET
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Chain of Custody	24709	Analysed	WS 02/03/23
Received	WS 24/02/23	Reported	KC 11/04/23
Prepared	BO 28/02/23	Page	Two of Two

Report No 12486

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13 Triangle Business Park, Stoke Mandeville, HP22 5BL

Project	FI03088 Southgate Service Station	Sampled	16th February 2023
Client	Subadra Consulting Ltd/James May	Report Approved By	[redacted] Duty Reporting Manager
Sample Type	Soil		

Soil - PAHs (EPA16) - 16th February 2023

Analyte	Unit	Method Detection Limit	Sample Details										
			BH103	BH104	BH105								
			S4	S4	S4								
			2.40m	2.40m	2.30m								
Naphthalene [3]	mg/kg	0.1	17.4	10.7	< 0.1								
Acenaphthylene [3]	mg/kg	0.1	< 0.1	< 0.1	< 0.1								
Acenaphthene [3]	mg/kg	0.1	< 0.1	< 0.1	< 0.1								
Fluorene [3]	mg/kg	0.1	0.54	0.18	< 0.1								
Phenanthrene [3]	mg/kg	0.1	0.54	0.26	0.12								
Anthracene [3]	mg/kg	0.1	0.11	< 0.1	< 0.1								
Fluoranthene [3]	mg/kg	0.1	0.15	0.12	0.29								
Pyrene [3]	mg/kg	0.1	0.16	0.12	0.27								
Benzo(a)anthracene [3]	mg/kg	0.1	< 0.1	< 0.1	0.18								
Chrysene [3]	mg/kg	0.1	< 0.1	< 0.1	0.19								
Benzo(b)fluoranthene [3]	mg/kg	0.1	< 0.1	< 0.1	0.19								
Benzo(k)fluoranthene [3]	mg/kg	0.1	< 0.1	< 0.1	< 0.1								
Benzo(a)pyrene [3]	mg/kg	0.1	< 0.1	< 0.1	0.21								
Indeno(1,2,3-cd)pyrene [3]	mg/kg	0.1	< 0.1	< 0.1	0.12								
Dibenzo(ah)anthracene [3]	mg/kg	0.1	< 0.1	< 0.1	< 0.1								
Benzo(ghi)perylene [3]	mg/kg	0.1	< 0.1	< 0.1	0.12								
Total PAHs (EPA16) [3]	mg/kg	1.6	18.9	11.4	1.7								

Method:

3. Subcontracted

Report No 12502

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13 Triangle Business Park, Stoke Mandeville, HP22 5BL

Project	FI03088 Southgate Service Station	Sampled	16th February 2023
Client	Subadra Consulting Ltd/James May	Report Approved By	[redacted] Duty Reporting Manager
Sample Type	Soil		

Soil - TPH CWG - 16th February 2023

Analyte	Unit	Method Detection Limit	Sample Details									
			BH101	BH101	BH102	BH102	BH103	BH103	BH103	BH104	BH104	BH104
			S4	S5	S4	S5	S3	S4	S6	S2	S3	S4
			2.90m	3.70m	3.50m	3.85m	1.90m	2.40m	3.70m	0.90m	1.70m	2.40m
C6-8 Aliphatic TPH	mg/kg	2.5	<2.5	<2.5	<2.5	<2.5	<2.5	48.2	<2.5	<2.5	<2.5	8.29
>C8-10 Aliphatic TPH	mg/kg	2.5	<2.5	<2.5	<2.5	<2.5	<2.5	23.4	<2.5	<2.5	<2.5	3.92
>C10-12 Aliphatic TPH	mg/kg	5	<5	<5	<5	<5	<5	42.5	<5	<5	<5	25.2
>C12-16 Aliphatic TPH	mg/kg	5	<5	<5	<5	<5	<5	17.7	<5	<5	<5	12.3
>C16-21 Aliphatic TPH	mg/kg	5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
>C21-35 Aliphatic TPH	mg/kg	20	<20	<20	<20	24.8	<20	<20	<20	<20	<20	<20
C6-8 Aromatic TPH	mg/kg	2.5	<2.5	<2.5	<2.5	<2.5	<2.5	15.2	<2.5	<2.5	<2.5	3.51
>C8-10 Aromatic TPH	mg/kg	2.5	<2.5	<2.5	<2.5	<2.5	<2.5	411	<2.5	<2.5	<2.5	58.6
>C10-12 Aromatic TPH	mg/kg	5	<5	<5	<5	<5	<5	424	<5	<5	<5	148
>C12-16 Aromatic TPH	mg/kg	5	<5	<5	<5	<5	<5	42	<5	<5	<5	18
>C16-21 Aromatic TPH	mg/kg	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
>C21-35 Aromatic TPH	mg/kg	20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20

Method:

Report No 12502

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13 Triangle Business Park, Stoke Mandeville, HP22 5BL

Project	FI03088 Southgate Service Station	Sampled	16th February 2023
Client	Subadra Consulting Ltd/James May	Report Approved By	[redacted] Duty Reporting Manager
Sample Type	Soil		

Soil - TPH CWG - 16th February 2023

Analyte	Unit	Method Detection Limit	Sample Details									
			BH105	BH105								
			S3	S4								
			1.70m	2.30m								
C6-8 Aliphatic TPH	mg/kg	2.5	<2.5	<2.5								
>C8-10 Aliphatic TPH	mg/kg	2.5	<2.5	<2.5								
>C10-12 Aliphatic TPH	mg/kg	5	<5	<5								
>C12-16 Aliphatic TPH	mg/kg	5	7.03	<5								
>C16-21 Aliphatic TPH	mg/kg	5	5.78	<5								
>C21-35 Aliphatic TPH	mg/kg	20	<20	<20								
C6-8 Aromatic TPH	mg/kg	2.5	<2.5	<2.5								
>C8-10 Aromatic TPH	mg/kg	2.5	<2.5	<2.5								
>C10-12 Aromatic TPH	mg/kg	5	<5	<5								
>C12-16 Aromatic TPH	mg/kg	5	<5	<5								
>C16-21 Aromatic TPH	mg/kg	10	<10	<10								
>C21-35 Aromatic TPH	mg/kg	20	<20	<20								

Method:

Report No 12580

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13 Triangle Business Park, Stoke Mandeville, HP22 5BL

Project	FI03088 Southgate Service Station	Sampled	7th March 2023
Client	Subadra Consulting Ltd/James May	Report Approved By	[redacted] Duty Reporting Manager
Sample Type	Water		

Water - TPH CWG - 7th March 2023

Analyte	Unit	Method Detection Limit	Sample Details									
			BH004	BH005	BH006	BH101	BH102	BH103	BH104	BH105	MW1	
			1.61m	1.91m	1.42m	1.37m	1.46m	1.64m	1.54m	1.45m	1.49m	
C6-8 Aliphatic TPH	ug/l	10	<10	<10	<10	<10	24.4	1020	524	173	<10	
>C8-10 Aliphatic TPH	ug/l	10	<10	<10	<10	<10	<10	987	10.3	138	<10	
>C10-12 Aliphatic TPH	ug/l	50	<50	<50	<50	<50	<50	<50	52.3	734	<50	
>C12-16 Aliphatic TPH	ug/l	50	<50	<50	<50	<50	<50	<50	<50	705	<50	
>C16-21 Aliphatic TPH	ug/l	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	
>C21-35 Aliphatic TPH	ug/l	50	<50	<50	<50	<50	<50	<50	<50	169	<50	
C6-8 Aromatic TPH	ug/l	10	<10	<10	<10	<10	<10	712	264	56.2	<10	
>C8-10 Aromatic TPH	ug/l	10	<10	<10	<10	<10	<10	9310	660	305	<10	
>C10-12 Aromatic TPH	ug/l	50	<50	<50	<50	<50	<50	905	200	302	<50	
>C12-16 Aromatic TPH	ug/l	50	<50	<50	<50	<50	<50	<50	<50	50.2	<50	
>C16-21 Aromatic TPH	ug/l	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	
>C21-35 Aromatic TPH	ug/l	50	<50	<50	<50	<50	<50	<50	<50	217	<50	

Method:

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Chain of Custody	24804	Analysed	WS 13/03/23
Received	BO 13/03/23	Reported	KC 11/04/23
Prepared	BO 13/03/23	Page	One of One

Report No 12615

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13 Triangle Business Park, Stoke Mandeville, HP22 5BL

Project	FI03088 Southgate Service Station	Sampled	7th March 2023
Client	Subadra Consulting Ltd/James May	Report Approved By	[redacted] Duty Reporting Manager
Sample Type	Water		

Water - DW BTEX and MTBE - 7th March 2023

Analyte	Unit	Method Detection Limit	Sample Details									
			BH004	BH005	BH006	BH101	BH102	BH103	BH104	BH105	MW1	
			1.61m	1.91m	1.42m	1.37m	1.46m	1.64m	1.54m	1.45m	1.49m	
MTBE [3]	ug/L	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	
Benzene [3]	ug/L	1	<1	<1	<1	<1	<1	<1	<1	11.1	<1	
Toluene [3]	ug/L	5	<5	<5	<5	<5	<5	6.6	<5	<5	<5	
Ethylbenzene [3]	ug/L	5	<5	<5	<5	<5	<5	<5	<5	<5	<5	
p+m Xylene [3]	ug/L	10	<10	<10	<10	<10	<10	1430	<10	<10	<10	
o Xylene [3]	ug/L	5	<5	<5	<5	<5	<5	1140	10.4	<5	<5	

Method:

3. Subcontracted

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Chain of Custody	24802	Analysed	WS 13/03/23
Received	BO 13/03/23	Reported	KC 11/04/23
Prepared	BO 13/03/23	Page	One of One

Report No 12616

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13 Triangle Business Park, Stoke Mandeville, HP22 5BL

Project	FI03088 Southgate Service Station	Sampled	7th March 2023
Client	Subadra Consulting Ltd/James May	Report Approved By	[redacted] Duty Reporting Manager
Sample Type	Water		

Water - PAHs (EPA16) - 7th March 2023

Analyte	Unit	Method Detection Limit	Sample Details								
			BH004	BH005	BH006	BH101	BH102	BH103	BH104	BH105	MW1
			1.61m	1.91m	1.42m	1.37m	1.46m	1.64m	1.54m	1.45m	1.49m
Naphthalene [3]	ug/l	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	68.1	< 0.01	5.52	< 0.01
Acenaphthylene [3]	ug/l	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene [3]	ug/l	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluorene [3]	ug/l	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.97	< 0.01	< 0.01	< 0.01
Phenanthrene [3]	ug/l	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.51	< 0.01	< 0.01	< 0.01
Anthracene [3]	ug/l	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluoranthene [3]	ug/l	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Pyrene [3]	ug/l	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)anthracene [3]	ug/l	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chrysene [3]	ug/l	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene [3]	ug/l	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene [3]	ug/l	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene [3]	ug/l	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-cd)pyrene [3]	ug/l	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibenzo(ah)anthracene [3]	ug/l	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(ghi)perylene [3]	ug/l	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Total PAHs (EPA16) [3]	ug/l	0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	69.6	< 0.16	5.52	< 0.16

Method:

3. Subcontracted

Report No 12649

fastanalysis.co.uk
E: lab@fastanalysis.co.uk T: 01296 739 423
13 Triangle Business Park, Stoke Mandeville, HP22 5BL

Project	FI03088 Southgate Service Station	Sampled	17th March 2023
Client	Subadra Consulting Ltd/James May	Report Approved By	[redacted] Duty Reporting Manager
Sample Type	Water		

Water - DW BTEX and MTBE - 17th March 2023

Analyte	Unit	Method Detection Limit	Sample Details									
			BH004	BH005	BH006	BH101	BH102	BH103	BH104			
			2.27m	2.06m	1.31m	1.87m	1.61m	1.94m	2.10m			
MTBE [3]	ug/l	10	< 10	< 10	< 10	< 10	< 10	< 10	< 10			
Benzene [3]	ug/l	1	< 1	< 1	< 1	< 1	< 1	< 1	< 1			
Toluene [3]	ug/l	5	< 5	< 5	< 5	< 5	< 5	< 5	< 5			
Ethylbenzene [3]	ug/l	5	< 5	< 5	< 5	< 5	< 5	< 5	< 5			
p+m Xylene [3]	ug/l	10	< 10	< 10	< 10	< 10	< 10	< 10	< 10			
o Xylene [3]	ug/l	5	< 5	< 5	< 5	< 5	< 5	< 5	< 5			

Method:

3. Subcontracted

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Chain of Custody	24885	Analysed	WS 23/03/23
Received	WS 20/03/23	Reported	KC 04/04/23
Prepared	BO 22/03/23	Page	One of One

Report No 12650

fastanalysis.co.uk
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13 Triangle Business Park, Stoke Mandeville, HP22 5BL

Project	FI03088 Southgate Service Station	Sampled	17th March 2023
Client	Subadra Consulting Ltd/James May	Report Approved By	[redacted] Duty Reporting Manager
Sample Type	Water		

Water - DW BTEX and MTBE - 17th March 2023

Analyte	Unit	Method Detection Limit	Sample Details									
			BH105	MW1								
			2.02m	1.45m								
MTBE [3]	ug/l	10	< 10	< 10								
Benzene [3]	ug/l	1	18	< 1								
Toluene [3]	ug/l	5	< 5	< 5								
Ethylbenzene [3]	ug/l	5	< 5	< 5								
p+m Xylene [3]	ug/l	10	< 10	< 10								
o Xylene [3]	ug/l	5	< 5	< 5								

Method:

3. Subcontracted

Chain of Custody	24887	Analysed	WS 23/03/23
Received	WS 20/03/23	Reported	KC 04/04/23
Prepared	BO 22/03/23	Page	One of One

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Report No 12654

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13 Triangle Business Park, Stoke Mandeville, HP22 5BL

Project	FI03088 Southgate Service Station	Sampled	17th March 2023
Client	Subadra Consulting Ltd/James May	Report Approved By	[redacted] Duty Reporting Manager
Sample Type	Water		

Water - PAHs (EPA16) - 17th March 2023

Analyte	Unit	Method Detection Limit	Sample Details								
			BH004	BH005	BH006	BH101	BH102	BH103	BH104	BH105	MW1
			2.27m	2.06m	1.31m	1.87m	1.61m	1.94m	2.10m	2.02m	1.45m
Naphthalene [3]	ug/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	16.3	<0.01	1.86	<0.01
Acenaphthylene [3]	ug/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthene [3]	ug/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.17	<0.01
Fluorene [3]	ug/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.27	<0.01	<0.01	<0.01
Phenanthrene [3]	ug/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Anthracene [3]	ug/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoranthene [3]	ug/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pyrene [3]	ug/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(a)anthracene [3]	ug/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chrysene [3]	ug/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(b)fluoranthene [3]	ug/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(k)fluoranthene [3]	ug/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(a)pyrene [3]	ug/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Indeno(1,2,3-cd)pyrene [3]	ug/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dibenzo(ah)anthracene [3]	ug/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(ghi)perylene [3]	ug/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Total PAHs (EPA16) [3]	ug/l	0.16	<0.16	<0.16	<0.16	<0.16	<0.16	16.5	<0.16	2.03	<0.16

Method:

3. Subcontracted

Chain of Custody	24888	Analysed	WS 23/03/23
Received	WS 20/03/23	Reported	KC 04/04/23
Prepared	BO 22/03/23	Page	One of One

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Report No 12655

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13 Triangle Business Park, Stoke Mandeville, HP22 5BL

Project	FI03088 Southgate Service Station	Sampled	17th March 2023
Client	Subadra Consulting Ltd/James May	Report Approved By	[redacted] Duty Reporting Manager
Sample Type	Water		

Water - TPH CWG - 17th March 2023

Analyte	Unit	Method Detection Limit	Sample Details									
			BH004	BH005	BH006	BH101	BH102	BH103	BH104			
			2.27m	2.06m	1.31m	1.87m	1.61m	1.94m	2.10m			
C6-8 Aliphatic TPH	ug/l	10	<10	<10	<10	<10	<10	151	<10			
>C8-10 Aliphatic TPH	ug/l	10	<10	<10	<10	<10	<10	136	<10			
>C10-12 Aliphatic TPH	ug/l	50	<50	<50	<50	<50	<50	<50	<50			
>C12-16 Aliphatic TPH	ug/l	50	<50	<50	<50	<50	<50	<50	<50			
>C16-21 Aliphatic TPH	ug/l	50	<50	<50	<50	<50	<50	<50	<50			
>C21-35 Aliphatic TPH	ug/l	50	<50	<50	<50	<50	<50	<50	<50			
C6-8 Aromatic TPH	ug/l	10	<10	<10	<10	<10	<10	56.4	<10			
>C8-10 Aromatic TPH	ug/l	10	<10	<10	<10	<10	<10	2120	<10			
>C10-12 Aromatic TPH	ug/l	50	<50	<50	<50	<50	<50	331	<50			
>C12-16 Aromatic TPH	ug/l	50	<50	<50	<50	<50	<50	<50	<50			
>C16-21 Aromatic TPH	ug/l	50	<50	<50	<50	<50	<50	<50	<50			
>C21-35 Aromatic TPH	ug/l	50	<50	<50	<50	<50	<50	<50	<50			

Method:

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Chain of Custody	24886	Analysed	WS 23/03/23
Received	WS 20/03/23	Reported	KC 05/04/23
Prepared	BO 22/03/23	Page	One of One

Report No 12656

fastanalysis.co.uk
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13 Triangle Business Park, Stoke Mandeville, HP22 5BL

Project	FI03088 Southgate Service Station	Sampled	17th March 2023
Client	Subadra Consulting Ltd/James May	Report Approved By	[redacted] Duty Reporting Manager
Sample Type	Water		

Water - TPH CWG - 17th March 2023

Analyte	Unit	Method Detection Limit	Sample Details									
			BH105	MW1								
			2.02m	1.45m								
C6-8 Aliphatic TPH	ug/l	10	31.6	<10								
>C8-10 Aliphatic TPH	ug/l	10	59.1	<10								
>C10-12 Aliphatic TPH	ug/l	50	<50	<50								
>C12-16 Aliphatic TPH	ug/l	50	<50	<50								
>C16-21 Aliphatic TPH	ug/l	50	<50	<50								
>C21-35 Aliphatic TPH	ug/l	50	<50	<50								
C6-8 Aromatic TPH	ug/l	10	35	<10								
>C8-10 Aromatic TPH	ug/l	10	83.9	<10								
>C10-12 Aromatic TPH	ug/l	50	<50	<50								
>C12-16 Aromatic TPH	ug/l	50	<50	<50								
>C16-21 Aromatic TPH	ug/l	50	<50	<50								
>C21-35 Aromatic TPH	ug/l	50	<50	<50								

Method:

Prism.NET
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Chain of Custody	24889	Analysed	WS 23/03/23
Received	WS 20/03/23	Reported	KC 05/04/23
Prepared	BO 22/03/23	Page	One of One

Report No 12984

fastanalysis.co.uk
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13 Triangle Business Park, Stoke Mandeville, HP22 5BL

Project	FI03088 Southgate Service Station	Sampled	11th May 2023
Client	Subadra Consulting Ltd/James May	Report Approved By	[redacted] Duty Reporting Manager
Sample Type	Water		

Water - BTEX and MTBE - 11th May 2023

Analyte	Unit	Method Detection Limit	Sample Details								
			BH004	BH005	BH006	BH101	BH102	BH103	BH104	BH105	MW1
			1.27m	1.58m	1.09m	1.03m	1.13m	1.31m	1.20m	1.11m	1.15m
MTBE [2]	ug/l	25	<25	<25	<25	<25	<25	<25	<25	59.3	<25
Benzene [2]	ug/l	5	<5	<5	<5	<5	<5	<5	<5	37.7	<5
Toluene [2]	ug/l	5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Ethylbenzene [2]	ug/l	5	<5	<5	<5	<5	<5	<5	<5	<5	<5
p+m Xylene [2]	ug/l	10	<10	<10	<10	<10	<10	<10	<10	<10	<10
o Xylene [2]	ug/l	5	<5	<5	<5	<5	<5	<5	<5	<5	<5

UKAS TESTING

Method:

2. UKAS 17025

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Chain of Custody	25225	Analysed	BO 23/05/23
Received	BO 15/05/23	Reported	KC 30/05/23
Prepared	BO 22/05/23	Page	One of One

Report No 12985

fastanalysis.co.uk
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13 Triangle Business Park, Stoke Mandeville, HP22 5BL

Project	FI03088 Southgate Service Station	Sampled	11th May 2023
Client	Subadra Consulting Ltd/James May	Report Approved By	[redacted] Duty Reporting Manager
Sample Type	Water		

Water - TPH CWG - 11th May 2023

Analyte	Unit	Method Detection Limit	Sample Details									
			BH004	BH005	BH006	BH101	BH102	BH103	BH104	BH105	MW1	
			1.27m	1.58m	1.09m	1.03m	1.13m	1.31m	1.20m	1.11m	1.15m	
C6-8 Aliphatic TPH	ug/l	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	
>C8-10 Aliphatic TPH	ug/l	10	<10	<10	<10	<10	<10	<10	<10	13.7	<10	
>C10-12 Aliphatic TPH	ug/l	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	
>C12-16 Aliphatic TPH	ug/l	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	
>C16-21 Aliphatic TPH	ug/l	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	
>C21-35 Aliphatic TPH	ug/l	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	
C6-8 Aromatic TPH	ug/l	10	<10	<10	<10	<10	<10	<10	<10	39.8	<10	
>C8-10 Aromatic TPH	ug/l	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	
>C10-12 Aromatic TPH	ug/l	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	
>C12-16 Aromatic TPH	ug/l	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	
>C16-21 Aromatic TPH	ug/l	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	
>C21-35 Aromatic TPH	ug/l	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	

Method:

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Chain of Custody	25227	Analysed	BO 23/05/23
Received	BO 15/05/23	Reported	KC
Prepared	BO 22/05/23	Page	One of One

Report No 12995

fastanalysis.co.uk
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13 Triangle Business Park, Stoke Mandeville, HP22 5BL

Project	FI03088 Southgate Service Station	Sampled	11th May 2023
Client	Subadra Consulting Ltd/James May	Report Approved By	[redacted] Duty Reporting Manager
Sample Type	Water		

Water - MNA - 11th May 2023

Analyte	Unit	Method Detection Limit	Sample Details									
			BH101	BH102	BH103	BH104	BH105	MW1				
			1.03m	1.13m	1.31m	1.20m	1.11m	1.15m				
Nitrate as NO3-N	mg/l	0.23	9.12	3.23	0.771	11.7	0.473	0.628				
Nitrite as NO2-N	mg/l	0.015	<0.015	<0.015	0.0828	<0.015	0.0163	0.0269				
Sulphate	mg/L	40	76.1	347	42.1	<40	661	637				
Sulphide	mg/l	0.1	<0.1	<0.1	<0.1	<0.1	1.99	<0.1				
Chloride	mg/L	1	50.8	135	41.5	38.5	61	60.1				
Manganese II	mg/l	0.02	0.191	1.32	2.29	<0.02	0.283	0.406				
Manganese IV	mg/l	0.02	<0.02	<0.02	<0.02	<0.02	0.289	<0.02				
Iron II	mg/l	0.2	<0.2	<0.2	<0.2	<0.2	0.341	<0.2				
Iron III	mg/l	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2				

Method:

Prism.NET www.prismerp.co.uk	Chain of Custody	25226	Analysed	BO 24/05/23
	Received	BO 15/05/23	Reported	KC 30/05/23
	Prepared	BO 24/05/23	Page	One of One