

KELLEN HOMES
103 Dalton Avenue
Risley
Warrington
WA3 6YF

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Ref: 17-468-L5

SUPPLEMENTARY CONTROLLED WATERS ASSESSMENT HEYWOOD ROAD, CASTLETON

1. INTRODUCTION

E3P has previously completed several phases of intrusive ground investigations at the Site known as Castleton Sidings, located off Heywood Road, Castleton in Rochdale.

The Phase I and II Geoenvironmental Assessment, Ref: 14-768-R1-4, November 2023), is most pertinent to the main development area of the site and included a controlled waters risk assessment. The assessment recommended further sampling in the area of WS105 due to the presence of elevated naphthalene and aromatic hydrocarbon fractions at this location, and limited monitoring locations to the south and east of this.

E3P has therefore been commissioned by Kellen to undertake further groundwater sampling to inform an updated assessment of the risk to controlled waters.

1.1. PROPOSED DEVELOPMENT

Kellen Homes are considering the proposed acquisition and future redevelopment of the site with a hybrid planning application comprising the following:

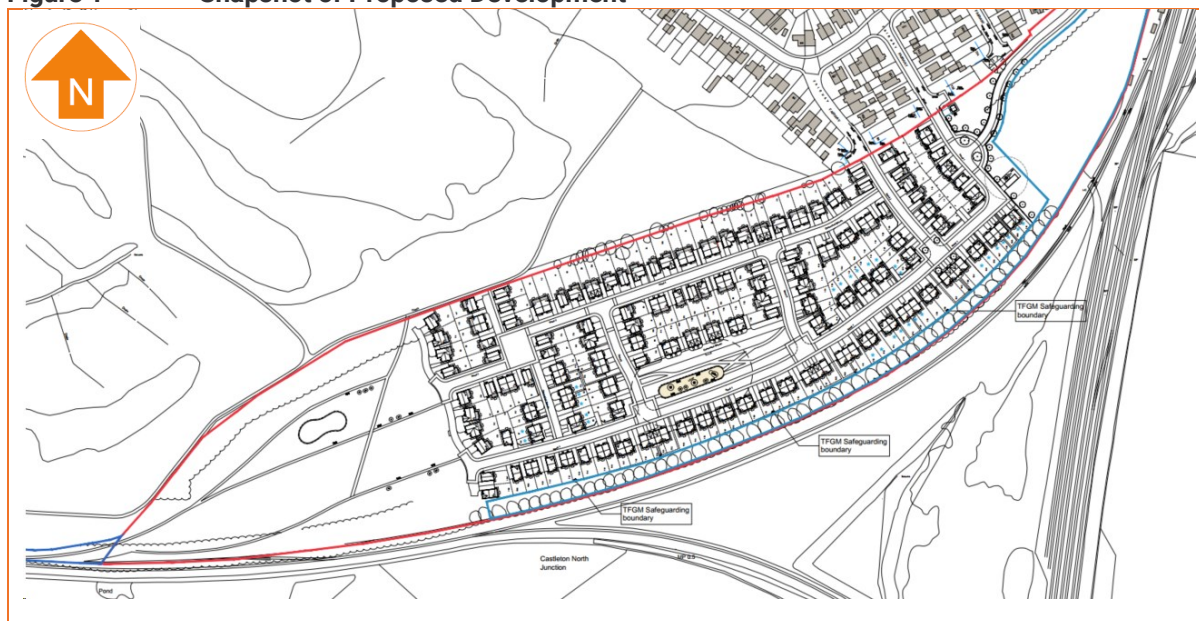
-  Full planning application for residential development, including access, car parking, landscaping, open space and associated engineering and infrastructure including an electric substation and foul water pump station.
-  Outline planning permission with all matters reserved for the principle of development to facilitate the East Lancashire Railway (ELR) extension.

The proposed development is shown in Figure 1.





Figure 1 **Snapshot of Proposed Development**



2. SUMMARY OF PREVIOUS WORKS

2.1. E3P – PHASE I & II GEO-ENVIRONMENTAL SITE ASSESSMENT. REF: REPORT NO. 14-768-R1-4, NOVEMBER 2023

For the avoidance of any doubt, the above referenced reports should be read both as a precursor to and in conjunction with this document.

2.1.1. SITE SETTING

Table 1 **Site Details**

Site Address	Castleton Sidings, Heywood Road, Rochdale OL11 3AU
Grid Reference	E 387930, N 410140
Site Area	Approximately 6.0 Hectares

All acronyms used within this report are defined in the glossary presented in Appendix II.

Table 2 **Site Description and Environmental Setting**

Occupancy/Use	The site is a roughly semi-circular shaped parcel of land to the south of Heywood Road in Rochdale and to the west of Castleton railway station. Live railway lines are present along the south/eastern site boundary and the site itself forms derelict railway sidings open to the adjacent active railway. The southwestern quarter of the site falls within a designated area of greenbelt and the north eastern quarter falls within an area of network rail operated land. All former structures except for an active signal box have now been removed; however, track sidings, ballast, and relict hardstanding and concrete slabs remain. Self-seeded vegetation and young trees have now grown across the site and along the periphery.
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Site History	A review of the pertinent Ordnance Survey mapping dating from circa 1850 to the present day confirmed the following land use: - Earliest historical mapping (1851) shows the site to comprise agricultural land with the railway shown to be present along the southern boundary and brick kiln/clay pits immediately to the northwest. - By 1893, the site was in use as railway sidings with an engineering stores and saw mills with chimneys located in the west. Ancillary structures encroached the western sector together with wetlands/possible marshes encroaching the central northern sector. - Tanks and a gasometer are later shown in the centre north and north east respectively, together with an earth working/embankment in the centre of the site, which moves north over time (likely associated with raising levels to create a level platform for expansion of the railway sidings). - By 1956 the engineering works / sawmill had been removed and by 1970s a welding shop, travelling crane, engineering shed, electricity substation and tanks are indicated to be present in the central sector of the site. - Aerial imagery between 2000-2005 shows the site to be covered by hardstanding/ballast, tracks, sheds and various structures. The site appears to have been dismantled/demolished sometime between 2005 and 2013.	
Environmental Setting	Drift Geology	North: Glacio-fluvial Deposits – SAND and GRAVEL South: Glacial Till – CLAY, SAND, GRAVEL
	Bedrock Geology	Pennine Lower Coal Measures Formation – MUDSTONE, SILTSTONE, SANDSTONE.
	Hydrogeology	Unproductive and Secondary A strata (drift) overlying Secondary A aquifer (solid). No groundwater abstractions have been identified within a 1 km radius.
	Hydrology	There are no surface water courses within influencing distance of the site. However, drainage ditches are located along the northern site boundary, which may feed into water courses further afield.
	Flood Risk	Unaffected by flooding.
Landfill Sites and Ground Gases	Historical landfill located c. 475 m north west of site: Land South of Chadwick Lane, Heywood, Rochdale	
	Received Inert, Industrial, Commercial, Household and Special Waste between 31/12/1984 and 31/12/1986. Given the time passed since last deposit and distance to the site, the risk from migrating ground gas from this source is reduced.	
Surface Cover (%)	Buildings	0%
	Hardstand	40%
	Soft Cover	60%



Hazardous Material Storage	No above-ground storage tanks (ASTs) or underground storage tanks (USTs) have been observed on-site. However, historical mapping has identified tanks on site and due to the previously developed railway sidings nature of the site, it is likely that unrecorded hazardous materials storage will have occurred on the site.
PCBs	There is no equipment identified that may contain PCBs within the site boundary. However, historically equipment containing PCBs may have been present.

2.1.2. GROUND CONDITIONS

Table 3 Summary of Ground Conditions

Made Ground	Made Ground deposits have been encountered within all of the exploratory hole locations from ground level to a maximum proven depth of 6.60 m bgl (R0227). The full depth of Made Ground remained unproven in c. 50% of exploratory hole locations due to its extent or the presence of obstructions. The material generally comprises a black slightly clayey gravelly medium sand / sandy gravel. Gravel constituents predominantly include mudstone, brick, clinker, coal, and ceramic with less frequent inclusions of metal, shale, glass and timber/wood. Track ballast comprising greyish black subangular gravel was encountered in areas along rail tracks, with a thickness of c. 0.50-1.00 m. Obstructions (reinforced concrete slabs and redundant services) were encountered frequently across the site, together with visual and olfactory evidence of (hydrocarbon) contamination.
Peat	Blackish brown pseudo fibrous PEAT / organic material was encountered beneath the Made Ground in 26 no. locations. The material was found to range in thickness from 0.20 to 2.60 m thick (CP102), although was predominantly 1.0 m thick or less, and noted to be generally thicker towards the south and west of the site and absent in the east (towards the Network Rail Land).
Drift	Drift deposits were encountered beneath the Made Ground and Peat (where proven) and comprised of alternating SAND/GRAVEL and sandy CLAY extending to depths in excess of 60.50 m bgl (RB101). Where encountered, the shallowest drift deposits were noted to be predominantly granular.



	Drift deposits were generally described as follows: ✳ Medium dense light brown variably slightly clayey SAND with occasional gravel of fine to coarse angular to rounded of sandstone. Loose silty sand was encountered in WS103 from 4.50 m bgl. The granular soils were also noted to be loose and collapsing in TP207 and TP212 ✳ Light brown sandy GRAVEL of medium subangular to rounded mudstone and sandstone. ✳ Stiff to very stiff medium to high strength sandy CLAY with occasional gravel of fine to coarse angular to rounded mudstone. At one location (CP101), directly beneath the Made Ground, a soft very low strength brown sandy CLAY was encountered between 4.20 m and 5.00 m bgl.
Bedrock	The solid geology was not encountered within the deeper cable holes or rotary open holes which extended to a maximum depth of 60.50 m bgl. A nearby BGS borehole (180 m E, SD81SE9) indicates rockhead at circa 81.00 m bgl.
Groundwater	Groundwater strikes were generally encountered as seepages between 1.20 m and 4.80 m bgl. During the subsequent monitoring visits, the monitoring wells were predominantly found to be dry or containing only small volumes of water.
Evidence of Contamination	Hydrocarbon odours were frequently noted within the Made Ground and granular strata.

2.1.3. CONTROLLED WATERS CONTAMINATION RISK SUMMARY

- ✳ Widespread leachable heavy metal, PAH, TPH and SVOC contamination has been identified in the soils across the site, thus posing a risk to controlled waters.
- ✳ The site is underlain by a mixed geology, generally cohesive clay in the northeast of the site and generally granular sand and gravel in the southwest, with thick bands of clay beyond 10.0 m bgl. The clay deposits will afford the protection of the underlying bedrock aquifer. Given the extensive thickness of drift (>60.0 m) and absence of a nearby water abstraction borehole, the risk to the underlying bedrock aquifer is considered to be significantly reduced and therefore deemed to be at a low risk from on-site contamination.
- ✳ However, high concentrations of naphthalene and aromatic hydrocarbon fractions were recorded in the initial groundwater sample taken from WS105 (sample-1, March 2021) in the centre west of the site, potentially representative of a plume.
- ✳ The site sits at an approximate elevation of 130-135 m AOD and is inferred to slope very gently down to the south west. The land to the north west and Roeacre Brook (circa 150 m to the north west) is noted to be at a lower elevation (~125 m AOD) and thus down hydraulic gradient of the site. Although this is considered outside of typical influencing distance, a surface water drain is present along the northern boundary, which may act as a conduit for site derived contamination to enter nearby watercourses. It is noted that at the ditch was dry at the time of the initial phase of works but has been assumed to be ephemeral.
- ✳ Further sampling of WS105 (sample-2) was therefore undertaken in November 2021 to determine whether the identified elevated concentrations were persistent within the shallow/perched groundwater. The results again showed high concentrations of volatile



compounds at this location, including naphthalene and aromatic hydrocarbon fractions, together with heavy metals and non-volatile PAHs.

- ✚ Water samples taken from surrounding boreholes to the north west (WS101 and RO223) and west (RO221) of WS105 contained elevated heavy metal concentrations, but did not identify elevated volatile compounds, thus indicating no significant migration of volatile contamination towards the west or north west i.e. down-gradient and in the direction of the Roeacre Brook / peripheral drainage channels.
- ✚ Further sampling of surrounding monitoring wells to the east and south would be considered prudent to confirm the extent of the volatile impact in the vicinity of WS105 to ascertain whether the identified impact is an isolated occurrence or a plume.
- ✚ It should be noted that in the longer term, the proposed development will create increased hardstanding cover across the site, thus containing the Made Ground beneath the impermeable surface and reducing the amount of infiltration generated. This will in turn, reduce the amount of subsurface lateral flow and therefore the risk to adjacent surface water course.
- ✚ However, the risk to surface water courses was considered to remain moderate in the absence of further water analysis to the south and west, and due to the presence of heavy metals in the water samples obtained from locations (WS101, RO223 and WS110) and leachate samples (TP105 and TP123) adjacent the northern boundary. These locations are in closest proximity to peripheral drainage networks. An M-BAT assessment has therefore been completed using the data to date to assess the risk to surface water networks and aquatic life. In light of the above assessment, E3P do not consider the site to pose an unacceptable level of risk to surface waters for copper, zinc and nickel.
- ✚ During the enabling works, the following surface water management mitigation measures should be adopted to ensure no risk to neighbouring water courses:
 - Treatment of pumped water from excavations and discharge to local sewers (in accordance with the relevant permit),
 - Prevention of run-off to local drainage ditches (bund along length of ditches) in accordance with an appropriate surface water management plan.
 - Ensure any stockpiles of excavated materials are located in central areas of the site and banded to prevent any lateral runoff.

2.2. REGULATORY RESPONSE (ENVIRONMENT AGENCY)

The Environment Agency has been consulted as a statutory consultee and has provided comment on the assessment. This has been issued in a Rochdale Metropolitan Borough Council memorandum ref: SO/2023/123300/01-L01 dated 3rd August 2023.

The pertinent points are as follows:

The information submitted to date by the applicant demonstrates that it will be possible to manage the risks posed to controlled waters by this development. Further detailed information will however be required before built development is undertaken. We agree that further sampling of monitoring wells to the west and south of the site is considered essential to establish the extent of the volatile contaminant impact in the vicinity of WS105 and determine whether the contamination is an isolated occurrence or a plume.



We also agree that further sampling is required next to the live railway along the southern boundary, together with sampling of the surface water courses and drainage ditches located along the northern site boundary to protect Roeacre Brook. This will help to address identified information gaps prior to development.

The following planning condition is recommended by the EA:

No development approved by this planning permission shall commence until a remediation strategy to deal with the risks associated with contamination of the site in respect of the development hereby permitted, has been submitted to, and approved in writing by, the local planning authority. This strategy will include the following components:

- 1. Additional site investigation, based on the submissions to date, to provide additional information for a detailed assessment of the risk to all receptors that may be affected, including those off site.*
- 2. The results of the site investigation and the detailed risk assessment referred to in the (1) and, based on these, an options appraisal and remediation strategy giving full details of the remediation measures required and how they are to be undertaken.*
- 3. A verification plan providing details of the data that will be collected to demonstrate that the works set out in the remediation strategy in (2) are complete and identifying any requirements for longer-term monitoring of pollutant linkages, maintenance, and arrangements for contingency action.*

The above has been considered when developing the scope for further investigation to inform the updated Controlled Waters Risk Assessment.

3. SUPPLEMENTARY SITE INVESTIGATION WORKS

3.1. OVERVIEW

E3P returned to site on 12th December 2023 to advance five window sample probeholes to the south and east of WS105 with the installation of monitoring wells within each location. The radius of installations was extended towards the area of TP211 (south east of WS105), where significant hydrocarbon impact was also previously noted). The works are summarised in Table 4.

Monitoring well response zones were installed to target the perched groundwater within the Made Ground in each location with the exception of WS304, in which the response zone was placed in the natural drift deposits. This was done in order to determine whether contamination is limited to the shallow perched groundwater horizon and thus associated with localised soil leaching, or whether downward migration is occurring.



Table 4 Summary of Supplementary Fieldwork

POTENTIAL SOURCE/ RATIONALE	HOLE	TYPE	MAXIMUM DEPTH (m bgl)	MONITORING WELLS RESPONSE ZONE (m bgl)	STRATA
East of WS105	WS301	Window sample Probe hole	5.00	2.50-3.50	Made Ground with hydrocarbon odour and oily sheen
South east of WS105 and in proximity of TP211	WS302		5.00	0.50-2.50	Made Ground with hydrocarbon odour
	WS303		5.00	2.00-3.00	Made Ground with hydrocarbon odour, oily sheen and staining
South of WS105	WS304		5.00	1.50-4.00	Natural sand (no evidence of contamination)
South east of WS105	WS305		5.00	0.50-2.00	Made Ground (no evidence of contamination)

The borehole locations are shown on Drawing 14-768-005. Logs are appended to this letter.

3.2. SUMMARY OF GROUND CONDITIONS

The ground conditions were found to be generally consistent with previous phases of investigation, as summarised in Table 5.

Table 5 Summary of Strata

HOLE	DEPTH TO STRATUM (m bgl)			
	MADE GROUND	Clayey Sand	Peat	Sand With Organics
WS301	0.00–3.95	3.95–5.00	–	–
WS302	0.00–2.50	3.60–5.00	2.50–3.60	–
WS303	0.00–4.20	4.20–5.00	–	–
WS304	0.00–1.30	1.30–5.00	–	–
WS305	0.00–2.10	2.30–5.00	–	2.10–2.30

MADE GROUND

Made Ground was encountered within each of the borehole locations from ground level to a maximum depth of 4.20 m bgl (WS303). Made Ground generally comprised the following sequence:

- ✿ Black slightly clayey gravel of sandstone and mudstone with fragments of concrete, brick, clinker and ash inclusions.
- ✿ Firm dark grey slightly gravelly clay with fragments of brick and clinker.
- ✿ Black clayey gravel of sandstone and mudstone with fragments of brick, clinker and timber.



Strong hydrocarbon odours and oily sheens were noted in the deeper gravelly soils in WS301 (east of WS105) and WS302 and WS303 (south east of WS105 and in proximity of TP211). Black staining was also noted within the made ground clay of WS303.

PEAT / ORGANIC DEPOSITS

Brown pseudo fibrous PEAT was identified within WS302 between 2.50 – 3.60m bgl.

A lens of SAND with organics was also identified within WS305 between 2.10 – 2.30m bgl.

DRIFT DEPOSITS

The drift deposits were encountered beneath the Made Ground or Peat to the base of the boreholes (5.00 m bgl) at each location, comprising of a greyish brown clayey fine to medium SAND. No visual or olfactory evidence of contamination was observed in the natural soils.

GROUNDWATER

Groundwater strikes were encountered as seepages and slow ingress, as summarised in Table 6.

Table 6 Summary of Water Strikes

LOCATION	DEPTH OF WATER STRIKE (M BGL)	COMMENT
W301	2.80	Oily sheen
W302	2.30	Water level rose to 1.00m bgl, with hydrocarbon odour
W303	2.00	Hydrocarbon odour and oily sheen
W304	2.00	Slow ingress
W305	3.40	Slow ingress

VISUAL AND OLFACTORY EVIDENCE OF CONTAMINATION

Visual and olfactory evidence of contamination has been identified and is summarised in Table 7.

Table 7 Summary Visual and Olfactory Evidence of Contamination

LOCATION	DEPTH (M)	STRATUM	NOTES
WS301	2.70 – 3.95	Made Ground	Strong hydrocarbon odour and oily sheen
WS301	2.80	Groundwater	Oily sheen on water surface
WS302	2.10 – 2.50	Made Ground	Hydrocarbon odour
WS302	2.30	Groundwater	Black staining and strong hydrocarbon odour
WS303	2.00	Groundwater	Hydrocarbon odour and oily sheen on water surface
WS303	2.40 – 3.80	Made Ground	Black staining in clayey soils

3.3. SAMPLING AND ANALYSIS

Three return visits were made to the site on 2nd, 12th and 30th of January 2024 to conduct specialist low flow groundwater sampling within the monitoring wells to determine the potential dissolved state hydrocarbon and S/VOC impact within the groundwater.



Attempts were made to locate previously installed monitoring wells from earlier phases of investigation to obtain supplementary samples for comparison; however, these could not be located due to either being destroyed/vandalised or obstructed by vegetation.

During sampling, the dissolved oxygen, pH, oxidation reduction potential (ORP), conductivity and temperature were also measured using a water quality instrument (YSI).

Once samples were obtained, they were submitted to I2 Laboratory for chemical analysis within 24 hours to avoid deviation. Samples were submitted for the following analysis:

- ✳ pH, cyanide, dissolved organic carbon (DOC), total suspended solids
- ✳ Phenols
- ✳ Metals
- ✳ Speciated total petroleum hydrocarbon (TPH).
- ✳ BTEX compounds and MTBE
- ✳ Semi volatile organic compounds (SVOC) including speciated polycyclic aromatic hydrocarbons (PAHs)
- ✳ Volatile organic compounds (VOC).

The results of the analysis are presented in Appendix VI and discussed in Section 4.

Given the extent of soil sampling completed across the site previously, it was not considered necessary to obtain further soil sampling for leachate analysis. It is apparent that the soils are the point source of contamination, therefore only analysis of the true dissolved phase in groundwater samples has been undertaken.

4. CONTROLLED WATERS ASSESSMENT

4.1. CONCEPTUAL SITE MODEL

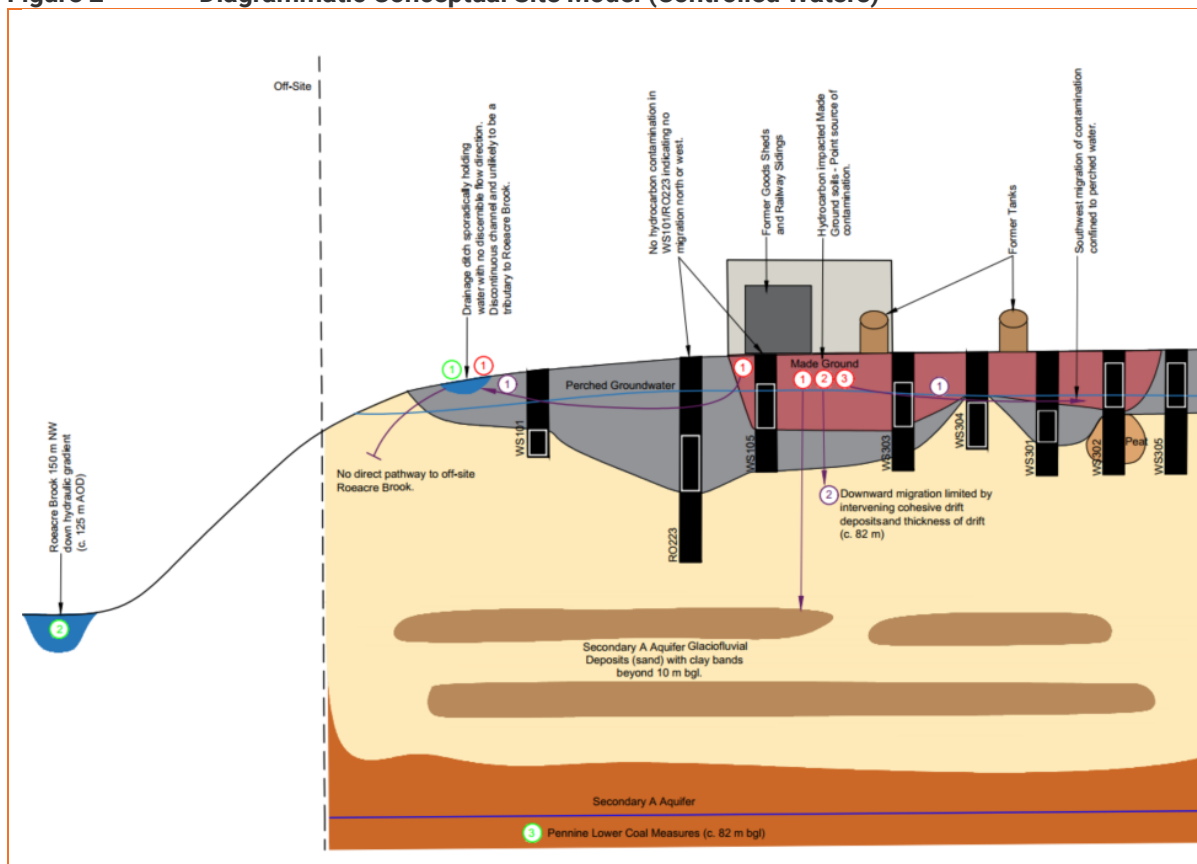
The conceptual site model developed within the context of the site setting has identified a viable pollutant pathway for the identified contaminants identified in the groundwater in WS105, which would be the lateral migration of potentially mobile phase-soluble contaminants towards nearby surface water courses including the adjacent inland river (northern boundary) which may ultimately act as a tributary to the off-site Roeacre Brook.

Downward/vertical migration toward the Secondary A bedrock aquifer is not considered a viable pathway due to the thickness and variability of drift (>80 m of interbedded sand and clay). Furthermore, there are no groundwater abstractions within 1 km of the site and the site is not located within a Groundwater Source Protection Zone or Drinking Water Safeguard Zone, so the sensitivity of the underlying aquifer(s) is further reduced.

A diagrammatic conceptual model is presented as Drawing 14-768-010 and a snapshot is included in Figure 2.



Figure 2 Diagrammatic Conceptual Site Model (Controlled Waters)



4.2. TIER 2 QUALITATIVE RISK ASSESSMENT

The Tier I assessment in Table 8 has included a comparison of groundwater samples to Environmental Quality Standards (EQS) screening values in the first instance, with reference to Drinking Water Standards (DWS) values where EQS are absent.

Table 8 includes site investigation data from water samples collected during this phase of investigation (January 2024) only.

It should be noted that attempts were made to locate WS105 during Round 1 and 2, however, it could not be found. Another search was carried out during Round 3 and WS105 was located and sampled.

WS304 and WS305 were only sampled during the first monitoring visit and were found not to contain any significant concentrations of hydrocarbons or volatile compounds, therefore further sampling of these locations was not considered necessary.



Table 8 Comparison of Groundwater Data With Tier 1 Screening Levels

DETERMINAND	UNIT	EQS ^{1, 2, 3}	DWS _{3,4,5}	NO. OF GW SAMPLES	MAX CONC. IN GROUNDWATER ROUND 1 2/1/2024	LOCATION OF EXCEEDANCE	MAX CONC. IN GROUNDWATER ROUND 2 12/1/2024	LOCATION OF EXCEEDANCE	MAX CONC. IN GROUNDWATER ROUND 3 30/1/2024	LOCATION OF EXCEEDANCE
		AA								
Arsenic	µg/l	50	10	11	4.35	N/A	1.36	N/A	1.45	N/A
Cadmium	µg/l	0.08-0.25	5	11	0.07	N/A	0.05	N/A	0.07	N/A
Chromium (VI)	µg/l	3.4	–	11	<5.0	N/A	<5.0	N/A	<5.0	N/A
Chromium (III)	µg/l	4.7	50	11	<0.2	N/A	0.8	N/A	0.3	N/A
Copper	µg/l	1	2000	11	6.2 3.5 1.9 1.6	WS304 EQS WS305 EQS WS303 EQS WS301 EQS	7.3 6.5 4.3	WS301 EQS WS302 EQS WS303 EQS	6.7 5.3 3.9 2.2	WS303 EQS WS302 EQS WS301 EQS WS105 EQS
Total Cyanide	µg/l	1	50	11	<1.0	N/A	<1.0	N/A	<1.0	N/A
Lead	µg/l	1.2	10	11	0.3	N/A	0.2	N/A	0.6	N/A
Mercury	µg/l	–	1.0	11	<0.05	N/A	<0.05	N/A	<0.05	N/A
Nickel	µg/l	4	20	11	9 6.8	WS301 EQS WS304 EQS	5.5	WS301 EQS	11 4.4 4.3	WS105 EQS WS303 EQS WS302 EQS
Selenium	µg/l	–	10	11	1.5	N/A	<0.6	N/A	<0.6	N/A
Zinc	µg/l	10.9	–	11	160 34 25 13	WS301 EQS WS305 EQS WS303 EQS WS304 EQS	120 43 19	WS301 EQS WS302 EQS WS303 EQS	66 41 39 30	WS301 EQS WS302 EQS WS303 EQS WS105 EQS
pH	6–9			11	7	N/A	7	N/A	7.1	N/A
Naphthalene	µg/l	2	10*	11	3.8	WS301 EQS	1	N/A	0.96	N/A
Anthracene	µg/l	0.1	10*	11	<0.01	N/A	0.06	N/A	<0.01	N/A
Benzo[b]fluoranthene	µg/l	0.00017*	10*	11	<0.01	N/A	<0.01	N/A	<0.01	N/A
Benzo[k]fluoranthene	µg/l	0.00017*	10*	11	<0.01	N/A	<0.01	N/A	<0.01	N/A
Benzo(a)pyrene	µg/l	0.00017*	10*	11	<0.01	N/A	<0.01	N/A	<0.01	N/A
Indeno (123-cd)pyrene	µg/l	0.00017*	10*	11	<0.01	N/A	<0.01	N/A	<0.01	N/A
Fluoranthene	µg/l	0.0063	10*	11	0.21	WS301 EQS	0.22 0.13	WS301 EQS WS302 EQS	0.26	WS301 EQS



DETERMINAND	UNIT	EQS ^{1, 2, 3}	DWS _{3,4,5}	NO. OF GW SAMPLES	MAX CONC. IN GROUNDWATER ROUND 1 2/1/2024	LOCATION OF EXCEEDANCE	MAX CONC. IN GROUNDWATER ROUND 2 12/1/2024	LOCATION OF EXCEEDANCE	MAX CONC. IN GROUNDWATER ROUND 3 30/1/2024	LOCATION OF EXCEEDANCE
		AA								
Benzo(ghi)perylene	µg/l	1.7–4	10*	11	<0.01	N/A	<0.01	N/A	<0.01	N/A
Aro TPH C5-C6 (benzene)	µg/l	10	1	11	<1.0	N/A	<1.0	N/A	5.7	WS105 DWS
Aro TPH C6-C8 (toluene)	µg/l	74	700	11	<1.0	N/A	<1.0	N/A	5.2	N/A
Aro TPH C8-C10 (ethyl benzene)	µg/l	20	300	11	<1.0	N/A	<1.0	N/A	7.7	N/A
Aro TPH C10-C12 (xylene)	µg/l	30	500	11	28	N/A	15	N/A	100 95	WS105 EQS WS301 EQS
Aro TPH C12-C16	µg/l	2	90 ⁵	11	65 22	WS301 EQS WS303 EQS	120	WS301 EQS	120 80	WS105 EQS WS301 EQS
Aro TPH C16-C35	µg/l	50#	90 ⁵	11	14	N/A	80	WS301 EQS	135 95	WS105 EQS/DWS WS303 EQS, DWS
Ali TPH C5-C6	µg/l	–	15000	11	<1.0	N/A	<1.0	N/A	<1.0	N/A
Ali TPH C6-C8	µg/l	–	15000	11	<1.0	N/A	<1.0	N/A	<1.0	N/A
Ali TPH C8-C10	µg/l	–	300	11	<1.0	N/A	<1.0	N/A	<1.0	N/A
Ali TPH C10-C12	µg/l	–	300	11	<10	N/A	<10	N/A	<10	N/A
Ali TPH C12-C16	µg/l	–	300	11	<1.0	N/A	75	N/A	<10	N/A
Ali TPH C16-C21	µg/l	–	300**	11	<1.0	N/A	70	N/A	<10	N/A
Ali TPH C21-C35	µg/l	–	300**	11	<1.0	N/A	30	N/A	<10	N/A
Trichloromethane	µg/l	2.5	–	11	<1.0	N/A	<1.0	N/A	<1.0	N/A
Carbon Tetrachloride	µg/l	12	3	11	<3.0	N/A	<3.0	N/A	<3.0	N/A
Vinyl Chloride	µg/l	–	0.3	11	<3.0	N/A	<3.0	N/A	<3.0	N/A
Cis-1,2- dichloroethene	µg/l	–	50	11	<3.0	N/A	<3.0	N/A	<3.0	N/A
1,1-Dichloroethane	µg/l	–	50	11	<3.0	N/A	<3.0	N/A	<3.0	N/A
1,1,1- Trichloroethane	µg/l	100	–	11	<3.0	N/A	<3.0	N/A	<3.0	N/A



Notes

Solubility <0.01 µg/l

AA – Annual Average

MAC- Maximum Admissible Concentration

* Polyaromatic hydrocarbons (PAH) - Benzo(a)pyrene (BaP), Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(g,h,i)-perylene and Indeno(1,2,3-cd)-pyrene. Benzo(a)pyrene can be considered as a marker for the other PAHs, hence only benzo(a)pyrene needs to be monitored for comparison with the biota EQS or the corresponding AA-EQS in water

** There are no WHO Guideline Values for aliphatic fractions C16-C21 and C21-C35, therefore the guideline value for aliphatic fractions inclusive of C8-C16 (300 µg/l) has been applied

^Over range data, sample was diluted and results are estimated from an extrapolated calibration. Results should be interpreted with care.

R1 – 02/01/24

R2 – 12/01/24

R3 – 30/01/24

1. The Water Environment (Water Framework Directive) (England and Wales) (Amendment) Regulations (2015)
2. Directive establishing a framework for Community action in the field of water policy (Water Framework Directive)
3. Council Directive on pollution caused by certain dangerous substances discharged into the aquatic environment of the Community (Dangerous Substances Directive) - List II substances
4. Council Directive on the quality of water intended for human consumption (Drinking Water Directive)
5. WHO Guidelines for Drinking Water Quality. Third edition (2004)



R1 refers to round 1 of sampling, R2 refers to round 2, R3 refers to round 3.

In addition to the above, a number of VOCs and SVOCs have been found above the limit of detection within the water samples from WS301 and WS302 and WS105. The identified SVOCs are typical derivatives of solvents, while the VOCs are typical derivatives of paint thinner and glue. A review of the EQS guidance has found no GAC values for these compounds, and as such, reference has been made to USEPA Risk Management Levels for tap water.

Results of the direct comparison are presented in Table 9.

Table 9 Comparison Of S/VOCs With Available USEPA GAC Values

DETERMINAND	UNIT	USEPA GAC	MAX CONC. IN GROUNDWATER	LOCATION OF EXCEEDANCE	ASSESSMENT
VOCs					
Benzene	µg/l	46	6.8– WS105 (R3)	N/A	No Further Action
Toluene	µg/	3300	6.1– WS105 (R3)	N/A	No Further Action
SVOCs					
1,3-Dichlorobenzene	µg/l	N/A	0.29–WS301 (R2)	-	No Available GAC
1,2-Dichlorobenzene	µg/l	910	1.7–WS301(R2)	N/A	No Further Action
1,4-Dichlorobenzene	µg/l	48	0.37– WS301(R2)	N/A	No Further Action
2,4-Dimethylphenol	µg/l	1100	12– WS105 (R3) 0.99–WS301(R1)	N/A	No Further Action
2,4-Dichlorophenol	µg/l	140	0.39– WS304 (R1)	N/A	No Further Action
Dibenzofuran	µg/l	110	0.63– WS105 (R3) 0.48–WS301(R1) 0.35–WS301 (R2) 0.14 –WS302 (R2)	N/A	No Further Action
Acenaphthylene	µg/l	N/A	0.29– WS105 (R3) 0.25 – WS301 (R1) 0.18–WS301 (R2) 0.14–WS301 (R3)	-	No Available GAC
Acenaphthene	µg/l	1600	5.9–WS301 (R3) 3.5–WS301(R1) 3.5–WS301(R2) 3.5–WS303 (R2) 2.7– WS105 (R3) 0.44–WS302 (R2)	N/A	No Further Action
Fluorene	µg/l	880	1.1– WS105 (R3) 0.87–WS301 (R3) 0.58–WS301(R1) 0.20–WS303 (R1) 0.32–WS301 (R2) 0.23–WS303 (R2) 0.16–WS302 (R2)	N/A	No Further Action
Phenanthrene	µg/l	N/A	0.32–WS302 (R2) 0.26–WS301(R1)	-	No Available GAC



DETERMINAND	UNIT	USEPA GAC	MAX CONC. IN GROUNDWATER	LOCATION OF EXCEEDANCE	ASSESSMENT
			0.26–WS303 (R1) 0.16–WS303 (R2)		
Carbazole	µg/l	N/A	1.7–WS105 (R3) 0.43–WS301 (R1)	-	No Available GAC
Pyrene	µg/l	360	0.22–WS301 (R3) 0.19–WS301 (R2) 0.18–WS301 (R1) 0.13–WS302 (R2)	N/A	No Further Action

SUMMARY OF RESULTS – GROUNDWATER

Off-site water courses are considered to be the primary receptor; therefore the assessment is focussed mainly on risk to surface water receptors. The results indicate contaminant concentrations in exceedance of EQS values for the following contaminants:



Heavy Metals

- Copper
- Nickel
- Zinc



PAH/SVOCs

- Naphthalene
- Fluoranthene
- 1,3-Dichlorobenzene (no available GAC for comparison)
- 2-Nitrophenol (no available GAC for comparison)
- Acenaphthylene (no available GAC for comparison)
- Phenanthrene (no available GAC for comparison)
- Carbazole (no available GAC for comparison)



Petroleum Hydrocarbons

- Aromatic TPH C12-C16
- Aromatic TPH C16-C35



It is noted that Aromatic TPH C5-C6 (benzene) and Aromatic TPH C16-C35 concentrations were also found in exceedance of DWS values in WS105 and WS303, however, due to the reduced sensitivity of the very deep secondary A bedrock aquifer, these exceedances are not considered to pose a significant risk and have therefore not considered further in this assessment.

Groundwater contaminant exceedances for each round of testing are summarised in Drawing No. 14-768-022 (Round 1), Drawing No. 14-768-023 (Round 2), Drawing No. 14-768-024 (Round 3).

It is noted that the highest concentrations of hydrocarbons and semi volatile compounds were predominantly encountered within WS301 and WS303 located to the east of WS105.

WS304 and WS305 were only sampled during the first monitoring visit and were found not to contain any significant concentrations of hydrocarbons or volatile compounds, therefore further sampling of these locations was not considered necessary.

No watercourses have been identified along the southern boundary that may be credible receptors or conduits to other watercourses.

The only surface water course identified within the site boundary or close proximity is a ditch that runs along a section of the northern site boundary, accessible to the northeast of WS105 and WS301-305.

Samples have been taken from the northern ditch for comparative purposes to determine whether there is any pollutant linkage. Results of the comparison are presented in Table 10.



Table 10 Comparison of Groundwater With Tier 1 Screening Levels

DETERMINAND	UNIT	EQS ^{1, 2}	DWS _{3,4}	NO. OF SAMPLES	MAXIMUM CONCENTRATION IN SURFACE WATER			LOCATION OF EXCEEDANCE
		AA			12/12/2023	12/01/2024	30/01/2024	
Arsenic	µg/l	50	10	3	0.66	0.65	1.02	N/A
Cadmium	µg/l	0.08-0.25	5	3	0.03	0.02	0.02	N/A
Chromium (VI)	µg/l	3.4	–	3	<5.0	<5.0	<5.0	N/A
Chromium (III)	µg/l	4.7	50	3	1.2	0.8	1.2	N/A
Copper	µg/l	1	2000	3	3.8	3.1	5.1	Ditch
Total Cyanide	µg/l	1	50	3	<1.0	<1.0	<10	N/A
Lead	µg/l	1.2	10	3	<0.2	<0.2	<0.2	N/A
Mercury	µg/l	–	1.0	3	<0.05	<0.05	<0.05	N/A
Nickel	µg/l	4	20	3	3.1	2	2.3	N/A
Selenium	µg/l	–	10	3	0.6	<0.6	<0.6	N/A
Zinc	µg/l	10.9	–	3	19	11	14	Ditch
pH	6–9			3	7.3	7	7.2	N/A
Naphthalene	µg/l	2	10*	3	<0.01	<0.01	<0.01	N/A
Anthracene	µg/l	0.1	10*	3	<0.01	<0.01	<0.01	N/A
Benzo[b]fluoranthene	µg/l	0.00017*	10*	3	<0.01	<0.01	<0.01	N/A
Benzo[k]fluoranthene	µg/l	0.00017*	10*	3	<0.01	<0.01	<0.01	N/A
Benzo(a)pyrene	µg/l	0.00017*	10*	3	<0.01	<0.01	<0.01	N/A
Indeno(123-cd)pyrene	µg/l	0.00017*	10*	3	<0.01	<0.01	<0.01	N/A
Fluoranthene	µg/l	0.0063	10*	3	<0.01	<0.01	<0.01	N/A
Benzo(ghi)perylene	µg/l	1.7–4	10*	3	<0.01	<0.01	<0.01	N/A
TPH C5-C7 (benzene)	µg/l	10	1	3	<1.0	<1.0	<1.0	N/A
TPH C7-C8 (toluene)	µg/l	74	700	3	<1.0	<1.0	<1.0	N/A
TPH C8-C10 (xylene)	µg/l	30	300	3	<1.0	<1.0	<1.0	N/A
TPH C10-C12 (naphthalene)	µg/l	2	90	3	<10	<10	<10	N/A
TPH C12-C16	µg/l	–	90	3	<10	<10	<10	N/A
TPH C16-C35	µg/l	–	90	3	<10	<10	<10	N/A



DETERMINAND	UNIT	EQS ^{1, 2}	DWS _{3,4}	NO. OF SAMPLES	MAXIMUM CONCENTRATION IN SURFACE WATER			LOCATION OF EXCEEDANCE
		AA			12/12/2023	12/01/2024	30/01/2024	
TPH C5-C6	µg/l	–	1000 ⁵	3	<1.0	<1.0	<1.0	N/A
TPH C6-C8	µg/l	–	1000 ⁵	3	<1.0	<1.0	<1.0	N/A
TPH C8-C10	µg/l	–	300	3	<1.0	<1.0	<1.0	N/A
TPH C10-C12	µg/l	–	300	3	<10	<10	<10	N/A
TPH C12-C16	µg/l	–	300	3	<10	<10	<10	N/A
TPH C16 – C21	µg/l	–	300 ^{**}	3	<10	<10	<10	N/A
TPH C21-C35	µg/l	–	300 ^{**}	3	<10	<10	<10	N/A
Tetrachloroethylene	µg/l	0.4	10	3	-	-	-	N/A
Trichloroethylene	µg/l	10	10	3	-	-	-	N/A
Trichlorobenzene	µg/l	0.4	–	3	-	-	-	N/A
Trichloromethane	µg/l	2.5	–	3	-	-	-	N/A
Dichloromethane	µg/l	20	200	3	-	-	-	N/A
Carbon Tetrachloride	µg/l	12	3	3	<3.0	<3.0	<3.0	N/A
Vinyl Chloride	µg/l	–	0.3	3	<3.0	<3.0	<3.0	N/A

Notes

Solubility <0.01 µg/l

AA – Annual Average

MAC- Maximum Admissible Concentration

* Polycyclic aromatic hydrocarbons (PAH) - Benzo(a)pyrene (BaP), Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(g,h,i)-perylene and Indeno(1,2,3-cd)-pyrene. Benzo(a)pyrene can be considered as a marker for the other PAHs, hence only benzo(a)pyrene needs to be monitored for comparison with the biota EQS or the corresponding AA-EQS in water

** There are no WHO Guideline Values for aliphatic fractions C16-C21 and C21-C35, therefore the guideline value for aliphatic fractions inclusive of C8-C16 (300 µg/l) has been applied

^Over range data, sample was diluted and results are estimated from an extrapolated calibration. Results should be interpreted with care.

R1 – 02/01/24

R2 – 12/01/24

R3 – 30/01/24

1. The Water Environment (Water Framework Directive) (England and Wales) (Amendment) Regulations (2015)
2. Directive establishing a framework for Community action in the field of water policy (Water Framework Directive)
3. Council Directive on pollution caused by certain dangerous substances discharged into the aquatic environment of the Community (Dangerous Substances Directive) - List II substances
4. Council Directive on the quality of water intended for human consumption (Drinking Water Directive)
5. WHO Guidelines for Drinking Water Quality. Third edition (2004)



SUMMARY OF RESULTS – SURFACE WATER

The results indicate only heavy metals (copper and zinc) to be in exceedance of EQS screening values.

An MBAT assessment has been undertaken to determine the risk characterisation ratio (RCR) and whether the concentrations are likely to be bioavailable and thus potentially present a risk to aquatic life in the watercourse. Results are summarised in Table 11.

Table 11 MBAT Assessment

LOCATION	DATE	COPPER RCR	ZINC RCR	MANGANESE RCR	NICKEL RCR
Ditch	12/12/2023	0.08	0.44	0.01	0.14
	12/01/2024	0.11	0.39	0.02	0.10
	30/01/2024	0.15	0.43	0.00	0.12

The RCR value for each heavy metal has been confirmed to be less than 1. This indicates no significant risk.

It should be noted that the ditch was only accessible from a point to the northeast of WS105 and WS301-305 and could not be located/accessed further west in the direction of the Roeacre Brook, suggesting it terminates within or just outside of the boundary and therefore offers no potential to be a migratory pathway/tributary to off-site water courses. The Roeacre Brook is not within influencing distance of the site (50 m), therefore sampling directly from this feature has not been considered necessary.

In addition, during sampling, no discernible flow direction was observed, and the ditch was simply holding a small amount of water. Its main purpose would therefore be to channel excess surface water. This phase of sampling has been undertaken during the winter months under seasonally wet conditions and it is therefore considered the samples are representative of worst-case conditions.

DISCUSSION AND CONCLUSIONS

Several phases of investigation have been completed at the site, which have included soil and groundwater analysis.

Previous groundwater monitoring identified elevated naphthalene and TPH fractions in water samples taken from WS105 located in the west of the main development area. However, this contamination was absent in surrounding wells to the west or north west of WS105, indicating northerly and westerly migration (in the direction of the off-site Roeacre Brook) was not occurring.

Sampling of the on-site drainage ditch, where accessible, during this phase of works has also confirmed the absence of TPH/volatile compound exceedances. Furthermore, this ditch was not observed to be flowing and is considered more likely to hold excess run-off and terminate within the site boundary, rather than acting as a tributary to the off-site watercourse. There is therefore not considered to be a complete pollutant linkage between the groundwater contamination identified at the site and the Roeacre Brook.



Additional monitoring wells (WS301-WS305) have been installed to the south and east of WS105 during this phase of works in an attempt to determine the extent of contamination. TPH fractions, naphthalene and SVOCs have been found in exceedance of GAC values in WS301 and WS303, located to the east of WS105, albeit at lower concentrations than in WS105. Only heavy metals and non-volatile PAH compounds were found to be in exceedance in WS302, WS304 and WS305, suggesting the contamination is not migrating much further south.

The identified hydrocarbon and volatile contamination in the groundwater (WS105, WS301 and WS303) is located within the area of previously defined visual and olfactory hydrocarbon contamination in soils (refer to drawing no. 14-768-118). It is therefore considered likely that the contamination is confined to the perched water and is directly derived from the soils as a point source. No surface water receptors have been identified within influencing distance of the site to the south or east. There is therefore considered to be no unacceptable degree of risk to controlled waters receptors from the site.

As part of the previous human health risk assessment (E3P Supplementary Site Investigation, ref: 14-768-L4-2, March 2023) it was recommended that remedial treatment would be necessary for the soils to mitigate long term potential vapour accumulation and migration, odour issues, risk to construction workers/end users and potential future risks to controlled waters.

Point source removal and ex-situ treatment of the soils by a specialist contractor is considered the most viable option, with a view to then replacing/re-using the treated material within the development area. This method would remediate the soil impact and as a result remove the point source and result in improved groundwater conditions. The exact treatment method will be defined by the remediation contractor in their Remediation Implementation Plan and Method Statement.

In the absence of any credible controlled waters receptors, specialist in-situ groundwater treatment is not considered necessary. However, it is acknowledged that during the soil point source removal, groundwater in excavations will require pumping and treating prior to discharging to sewers.

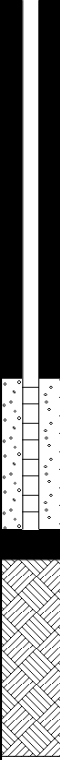
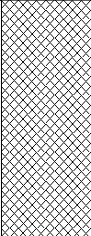
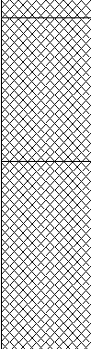
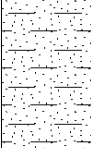
I trust that the above information is sufficient currently, and if you require anything further, please do not hesitate to contact me

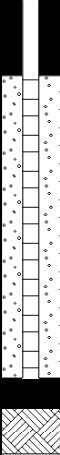
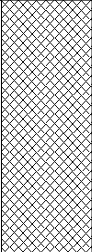
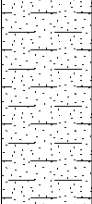
Yours sincerely,
For and on behalf of E3P Ltd

Georgia Calvert
Geo-Environmental Consultant

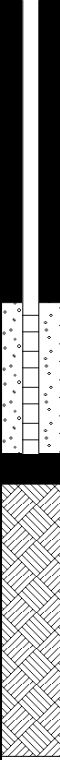
Approved by.
Jessica Sheridan
Senior Geo-Environmental Consultant

Enclosed:
Exploratory Hole Logs
Chemical Analysis Results
Drawing 14-768-005 Exploratory Hole Location Plan
Drawing 14-768-118 Contamination Issues Plan
Drawing 14-768-010 Controlled Waters Conceptual Site Model
Drawing 14-768-022 Controlled Waters Contamination Exceedances Visit 1
Drawing 14-768-023 Controlled Waters Contamination Exceedances Visit 2
Drawing 14-768-024 Controlled Waters Contamination Exceedances Visit 3

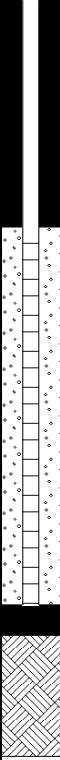
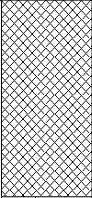
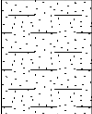
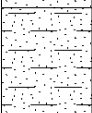
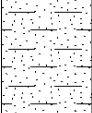
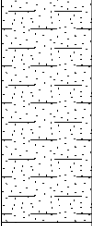
				Borehole Log				Borehole No. WS301 Sheet 1 of 1		
Project Name: Castleton Sidings				Project No. 14768		Co-ords: 387831E - 410079N		Hole Type WS		
Location: Heywood Road, Rochdale						Level:		Scale 1:50		
Client: Kellen Homes						Dates: 12/12/2023		Logged By G. Calvert		
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
		Depth (m)	Type	Results						
	 2.80				1.60			MADE GROUND: Black slightly clayey sandy gravel. Gravel is fine to medium angular to subrounded of sandstone, mudstone with fragments of concrete, clinker and ash inclusions.	1	
					1.75				MADE GROUND: Dark brown slightly gravelly clayey fine to medium sand. Gravel is fine subangular to subrounded of sandstone with fragments of brick, clinker and ash inclusions.	2
					2.70				MADE GROUND: Firm dark grey slightly gravelly sandy clay. Gravel is fine angular to subrounded of sandstone, mudstone and coal with fragments of brick and clinker.	
									MADE GROUND: Black clayey gravel. Gravel is fine angular to subangular of sandstone and mudstone with fragments of brick, clinker and timber. (Strong hydrocarbon odour and oily sheen)	3
					3.95				Greyish brown clayey fine to medium SAND.	4
			5.00		End of Borehole at 5.00m	5				
Remarks 1. Complete. 2. Water strike encountered at 2.80m bgl with an oily sheen. 3. Hydrocarbon odour and an oily sheen encountered between 2.70-3.95m bgl. 4. Monitoring well installed. 5. Response zone 2.50-3.50m bgl.										

				Borehole Log				Borehole No. WS302 Sheet 1 of 1	
Project Name: Castleton Sidings				Project No. 14768		Co-ords: 387786E - 410044N		Hole Type WS	
Location: Heywood Road, Rochdale						Level:		Scale 1:50	
Client: Kellen Homes						Dates: 12/12/2023		Logged By G. Calvert	
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
	 2.30				1.70			MADE GROUND: Black slightly sandy clayey gravel. Gravel is fine subangular to subrounded of mudstone and sandstone with fragments of brick, clinker, concrete and ash inclusions.	1
					2.10			MADE GROUND: Dark grey gravelly clay. Gravel is fine subangular to subrounded of mudstone and coal with fragments of clinker and brick.	2
					2.50			MADE GROUND: Black slightly sandy clayey gravel. Gravel is fine subangular to subrounded of mudstone and sandstone with fragments of brick, clinker, concrete and ash inclusions. (Strong hydrocarbon odour)	3
								Brown pseudo fibrous PEAT.	
					3.60			Brown clayey fine to medium SAND.	4
			5.00			End of Borehole at 5.00m	5		
									6
									7
									8
									9
									10
Remarks 1. Complete. 2. Water strike encountered at 2.30 mbgl with black staining and a strong hydrocarbon odour which rose to 1.00m bgl over drilling time. 3. Hydrocarbon odour noted between 2.10-2.50m bgl. 4. Monitoring well installed. 5. Response Zone 0.50-2.00m bgl. 6. Well collapsed to 4.00m bgl.									

				Borehole Log				Borehole No. WS303 Sheet 1 of 1	
Project Name: Castleton Sidings				Project No. 14768		Co-ords: 387761E - 410059N		Hole Type WS	
Location: Heywood Road, Rochdale						Level:		Scale 1:50	
Client: Kellen Homes						Dates: 12/12/2023		Logged By G. Calvert	

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.15		MADE GROUND: Dark grey clayey gravel with rare rootlets. Gravel is fine to medium subangular to subrounded of sandstone and mudstone with fragments of brick and concrete. MADE GROUND: Light brown sandy gravel. Gravel is fine to medium subangular to subrounded of sandstone.	1	
					1.10		MADE GROUND: Soft dark brown sandy very slightly gravelly clay. Gravel is fine subangular to subrounded of sandstone and coal with fragments of brick, clinker and ash inclusions.		
					1.90		MADE GROUND: Dark grey gravel. Gravel is fine subangular to subrounded of sandstone, mudstone and coal with fragments of brick and clinker.	2	
					2.40		MADE GROUND: Brown sandy clay with rare fragments of clinker and brick. (Black staining present throughout)	3	
					3.80		MADE GROUND: Dark grey gravel. Gravel is fine subangular to subrounded of sandstone, mudstone and coal with fragments of brick and clinker. Brownish grey clayey fine to medium SAND.	4	
					4.20				
					5.00		End of Borehole at 5.00m	5	
								6	
								7	
								8	
							9		
							10		

Remarks 1. Complete. 2. Water strike encountered at 2.00m bgl with a hydrocarbon odour and an oily sheen. 3. Black staining noted between 2.40-3.80m bgl. 4. Monitoring well installed. 5. Response zone 2.00-3.00m bgl.									
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				Borehole Log				Borehole No. WS304 Sheet 1 of 1	
Project Name: Castleton Sidings				Project No. 14768		Co-ords: 387728E - 410039N		Hole Type WS	
Location: Heywood Road, Rochdale						Level:		Scale 1:50	
Client: Kellen Homes						Dates: 12/12/2023		Logged By G. Calvert	
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
	 2.00				1.30			MADE GROUND: Black slightly clayey gravel. Gravel is fine subangular to subrounded of sandstone, mudstone and coal with fragments of brick, clinker, ash inclusions and concrete.	1
					2.10			Brownish grey clayey fine to medium SAND.	2
								Brown clayey fine to medium SAND.	3
									4
					5.00			End of Borehole at 5.00m	5
Remarks 1. Complete. 2. Water strike encountered at 2.00m bgl. 3. Monitoring well installed. 4. Response zone 1.50-4.00m bgl. 5. Well collapsed to 4.00m bgl.									



4041

Jessica Sheridan

e3p
Taylor Road
Urmston
Manchester
M41 7JQ

e: jsheridan@e3p.co.uk



Environmental Science

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404

f: 01923 237404

e: reception@i2analytical.com

Analytical Report Number : 24-78230

Project / Site name:	Castleton Sidings	Samples received on:	12/01/2024
Your job number:	14-768	Samples instructed on/ Analysis started on:	16/01/2024
Your order number:	007182	Analysis completed by:	19/01/2024
Report Issue Number:	1	Report issued on:	19/01/2024
Samples Analysed:	4 water samples		

Signed:

Izabela Wójcik

Izabela Wójcik
Senior Reporting Specialist
For & on behalf of i2 Analytical Ltd.

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

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

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

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

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.



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Environmental Science

Analytical Report Number: 24-78230

Project / Site name: Castleton Sidings

Your Order No: 007182

Lab Sample Number				2928244	2928245	2928246	2928247
Sample Reference				WS301	WS302	WS303	Ditch
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				12/01/2024	12/01/2024	12/01/2024	12/01/2024
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status				

General Inorganics

pH (L099)	pH Units	N/A	ISO 17025	6.3	6.9	6.7	7
Total Cyanide (Low Level 1 µg/l)	µg/l	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0
Dissolved Organic Carbon (DOC)	mg/l	0.1	ISO 17025	5.47	1.78	1.93	6.66
Total Suspended Solids (L004B)	mg/l	2	ISO 17025	61	54	37	17

Total Phenols

Total Phenols (monohydric)	µg/l	1	ISO 17025	4.2	< 1.0	< 1.0	< 1.0
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Heavy Metals / Metalloids

Calcium (dissolved)	mg/l	0.012	ISO 17025	85	130	100	54
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0	< 5.0	< 5.0

Arsenic (dissolved)	µg/l	0.15	ISO 17025	1.36	0.68	0.89	0.65
Cadmium (dissolved)	µg/l	0.02	ISO 17025	0.04	0.05	< 0.02	0.02
Chromium (dissolved)	µg/l	0.2	ISO 17025	< 0.2	< 0.2	< 0.2	0.8
Copper (dissolved)	µg/l	0.5	ISO 17025	7.3	6.5	4.3	3.1
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2	< 0.2	0.2	< 0.2
Manganese (dissolved)	µg/l	0.05	ISO 17025	500	4500	690	16
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05	< 0.05	< 0.05	< 0.05
Nickel (dissolved)	µg/l	0.5	ISO 17025	5.5	4	2.3	2
Selenium (dissolved)	µg/l	0.6	ISO 17025	< 0.6	< 0.6	< 0.6	< 0.6
Zinc (dissolved)	µg/l	0.5	ISO 17025	120	43	19	11

Monoaromatics & Oxygenates

Benzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Toluene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Ethylbenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
p & m-xylene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
o-xylene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0

Petroleum Hydrocarbons

TPH1 (C10 - C40) _{EH_1D_TOTAL_MS}	µg/l	10	ISO 17025	390	< 10	< 10	< 10
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TPH-CWG - Aliphatic >C5 - C6 _{HS_1D_AL}	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C6 - C8 _{HS_1D_AL}	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C8 - C10 _{HS_1D_AL}	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C10 - C12 _{EH_1D_AL_MS}	µg/l	10	NONE	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C12 - C16 _{EH_1D_AL_MS}	µg/l	10	NONE	75	< 10	< 10	< 10
TPH-CWG - Aliphatic >C16 - C21 _{EH_1D_AL_MS}	µg/l	10	NONE	70	< 10	< 10	< 10
TPH-CWG - Aliphatic >C21 - C35 _{EH_1D_AL_MS}	µg/l	10	NONE	30	< 10	< 10	< 10
TPH-CWG - Aliphatic (C5 - C35) _{HS+EH_1D_AL_MS}	µg/l	10	NONE	180	< 10	< 10	< 10



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Time Taken				None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status				
TPH-CWG - Aromatic >C5 - C7 _{HS_1D_AR}	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C7 - C8 _{HS_1D_AR}	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C8 - C10 _{HS_1D_AR}	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C10 - C12 _{EH_1D_AR_MS}	µg/l	10	NONE	15	< 10	< 10	< 10
TPH-CWG - Aromatic >C12 - C16 _{EH_1D_AR_MS}	µg/l	10	NONE	120	< 10	< 10	< 10
TPH-CWG - Aromatic >C16 - C21 _{EH_1D_AR_MS}	µg/l	10	NONE	80	< 10	< 10	< 10
TPH-CWG - Aromatic >C21 - C35 _{EH_1D_AR_MS}	µg/l	10	NONE	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic (C5 - C35) _{HS+EH_1D_AR_MS}	µg/l	10	NONE	210	< 10	< 10	< 10



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Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status				

VOCs

Chloromethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Chloroethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Bromomethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Vinyl Chloride	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0
Trichlorofluoromethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0
1,1-Dichloroethene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Trans 1,2-dichloroethylene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
1,1-Dichloroethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
2,2-Dichloropropane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0
Chloroform	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
1,1,1-Trichloroethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
1,2-Dichloroethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
1,1-Dichloropropene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Cis-1,2-dichloroethene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Benzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Carbontetrachloride	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
1,2-Dichloropropane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Trichloroethene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Dibromomethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Bromodichloromethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Cis-1,3-dichloropropene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Trans-1,3-dichloropropene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Toluene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
1,1,2-Trichloroethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
1,3-Dichloropropane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Dibromochloromethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Tetrachloroethene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
1,2-Dibromoethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Chlorobenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
1,1,1,2-Tetrachloroethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Ethylbenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
p & m-Xylene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Styrene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Bromoform	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
o-Xylene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Isopropylbenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
1,1,2,2-Tetrachloroethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0
Bromobenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
n-Propylbenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
2-Chlorotoluene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
4-Chlorotoluene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
1,3,5-Trimethylbenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
tert-Butylbenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
1,2,4-Trimethylbenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
sec-Butylbenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
1,3-Dichlorobenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
p-Isopropyltoluene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
1,4-Dichlorobenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
1,2-Dichlorobenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0



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Sample Number				None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				12/01/2024	12/01/2024	12/01/2024	12/01/2024
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status				
Butylbenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
1,2-Dibromo-3-chloropropane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
1,2,4-Trichlorobenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Hexachlorobutadiene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
1,2,3-Trichlorobenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0



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Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				12/01/2024	12/01/2024	12/01/2024	12/01/2024
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status				

SVOCs

Aniline	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Phenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
2-Chlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Bis(2-chloroethyl)ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
1,3-Dichlorobenzene	µg/l	0.05	NONE	0.29	< 0.05	< 0.05	< 0.05
1,2-Dichlorobenzene	µg/l	0.05	NONE	1.7	< 0.05	< 0.05	< 0.05
1,4-Dichlorobenzene	µg/l	0.05	NONE	0.37	< 0.05	< 0.05	< 0.05
Bis(2-chloroisopropyl)ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
2-Methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Hexachloroethane	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Nitrobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
4-Methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Isophorone	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
2-Nitrophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
2,4-Dimethylphenol	µg/l	0.05	NONE	0.87	< 0.05	< 0.05	< 0.05
Bis(2-chloroethoxy)methane	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
1,2,4-Trichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Naphthalene	µg/l	0.01	ISO 17025	1	0.3	< 0.01	< 0.01
2,4-Dichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
4-Chloroaniline	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Hexachlorobutadiene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
4-Chloro-3-methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
2,4,6-Trichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
2,4,5-Trichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
2-Methylnaphthalene	µg/l	0.05	NONE	< 0.05	0.2	< 0.05	< 0.05
2-Chloronaphthalene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Dimethylphthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
2,6-Dinitrotoluene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	µg/l	0.01	ISO 17025	0.18	< 0.01	< 0.01	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	3.5	0.44	1.8	< 0.01
2,4-Dinitrotoluene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Dibenzofuran	µg/l	0.05	NONE	0.35	0.14	< 0.05	< 0.05
4-Chlorophenyl phenyl ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Diethyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
4-Nitroaniline	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Fluorene	µg/l	0.01	ISO 17025	0.32	0.16	0.23	< 0.01
Azobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Bromophenyl phenyl ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Hexachlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	0.32	0.16	< 0.01
Anthracene	µg/l	0.01	ISO 17025	< 0.01	0.06	< 0.01	< 0.01
Carbazole	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Dibutyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Anthraquinone	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Fluoranthene	µg/l	0.01	ISO 17025	0.22	0.13	< 0.01	< 0.01
Pyrene	µg/l	0.01	ISO 17025	0.19	0.13	< 0.01	< 0.01
Butyl benzyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01



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Time Taken				None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status				
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01
3&4-Methylphenol	µg/l	0.1	NONE	< 0.10	< 0.10	< 0.10	< 0.10

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected



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Environmental Science

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Water matrix abbreviations:

Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW. (Al, Cu, Fe, Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW, GW, Hg=SW, PW, Al=SW, PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW.	L080-PL	W	ISO 17025
Monohydric phenols in water - LOW LEVEL 1 ug/l	Determination of phenols in water by continuous flow analyser. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	ISO 17025
Suspended solids in water	Determined gravimetrically with GFC filtration papers. Accredited Matrices PW, SW, GW, FSE, PrW, LL	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L004-PL	W	ISO 17025
Semi-volatile organic compounds in water	Determination of semi-volatile organic compounds in leachate by extraction in dichloromethane followed by GC-MS.	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-PL	W	ISO 17025
Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Dissolved Organic Carbon in water	Determination of dissolved inorganic carbon in water by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	ISO 17025
BTEX and MTBE in water (Monoaromatics)	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260. Refer to CoA for analyte specific accreditation	L073B-PL	W	ISO 17025
Low level total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	NONE
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In house method.	L099-PL	W	ISO 17025
TPH1 (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS.	In-house method	L070-PL	W	ISO 17025

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).

For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).

For method numbers ending in 'PL or B' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Analytical Report Number : 24-78230
Project / Site name: Castleton Sidings

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
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Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

Sample Deviation Report



Analytical Report Number : 24-78230

Project / Site name: Castleton Sidings

This deviation report indicates the sample and test deviations that apply to the samples submitted for analysis. Please note that the associated result(s) may be unreliable and should be interpreted with care.

Key: a - No sampling date b - Incorrect container c - Holding time d - Headspace e - Temperature

Sample ID	Other ID	Sample Type	Lab Sample Number	Sample Deviation	Test Name	Test Ref	Test Deviation
Ditch	None Supplied	W	2928247	c	pH at 20oC in water (automated)	L099-PL	c
WS301	None Supplied	W	2928244	c	pH at 20oC in water (automated)	L099-PL	c
WS302	None Supplied	W	2928245	c	pH at 20oC in water (automated)	L099-PL	c
WS303	None Supplied	W	2928246	c	pH at 20oC in water (automated)	L099-PL	c



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Jessica Sheridan

e3p
Taylor Road
Urmston
Manchester
M41 7JQ

e: jsheridan@e3p.co.uk

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 24-80956

Replaces Analytical Report Number: 24-80956, issue no. 1
Client references/information amended.
Sample ID changed for sample 2943252 as per clients request

Project / Site name:	Castlatan	Samples received on:	31/01/2024
Your job number:	14768	Samples instructed on/ Analysis started on:	02/02/2024
Your order number:	007336	Analysis completed by:	07/02/2024
Report Issue Number:	2	Report issued on:	08/02/2024
Samples Analysed:	5 water samples		

Signed:

Izabela Wójcik

Izabela Wójcik
Senior Reporting Specialist
For & on behalf of i2 Analytical Ltd.

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

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

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

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

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 24-80956
Project / Site name: Castlatan

Your Order No: 007336

Lab Sample Number	2943249	2943250	2943251	2943252	2943253
Sample Reference	WS301	WS302	WS303	WS105	N Ditch
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled	30/01/2024	30/01/2024	30/01/2024	30/01/2024	30/01/2024
Time Taken	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status		

General Inorganics

pH (L099)	pH Units	N/A	ISO 17025	6.6	7.1	7.1	6.7	7.2
Total Cyanide	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10	< 10
Dissolved Organic Carbon (DOC)	mg/l	0.1	ISO 17025	8.95	2.26	2.62	9.81	7.79
Total Suspended Solids (L004B)	mg/l	2	ISO 17025	19	81	110	2700	93

Total Phenols

Total Phenols (monohydric)	µg/l	10	ISO 17025	< 10	< 10	< 10	66	19
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Heavy Metals / Metalloids

Calcium (dissolved)	mg/l	0.012	ISO 17025	99	160	120	71	48
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0

Arsenic (dissolved)	µg/l	0.15	ISO 17025	1.45	0.74	0.33	1.32	1.02
Cadmium (dissolved)	µg/l	0.02	ISO 17025	0.02	0.05	0.07	0.02	0.02
Chromium (dissolved)	µg/l	0.2	ISO 17025	< 0.2	< 0.2	< 0.2	< 0.2	1.2
Copper (dissolved)	µg/l	0.5	ISO 17025	3.9	5.3	6.7	2.2	5.1
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2	0.6	0.2	< 0.2	< 0.2
Manganese (dissolved)	µg/l	0.05	ISO 17025	650	4600	900	640	2.6
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Nickel (dissolved)	µg/l	0.5	ISO 17025	3.6	4.3	4.4	11	2.3
Selenium (dissolved)	µg/l	0.6	ISO 17025	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6
Zinc (dissolved)	µg/l	0.5	ISO 17025	66	41	39	30	14

Monoaromatics & Oxygenates

Benzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	6.8	< 3.0
Toluene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	6.1	< 3.0
Ethylbenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
p & m-xylene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
o-xylene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0

Petroleum Hydrocarbons

TPH1 (C10 - C40) _{EH, 1D, TOTAL, MS}	µg/l	10	ISO 17025	210	< 10	< 10	230	< 10
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TPH-CWG - Aliphatic >C5 - C6 _{HS, 1D, AL}	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C6 - C8 _{HS, 1D, AL}	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C8 - C10 _{HS, 1D, AL}	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C10 - C12 _{EH, 1D, AL, MS}	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C12 - C16 _{EH, 1D, AL, MS}	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C16 - C21 _{EH, 1D, AL, MS}	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C21 - C35 _{EH, 1D, AL, MS}	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic (C5 - C35) _{HS+EH, 1D, AL, MS}	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10

TPH-CWG - Aromatic >C5 - C7 _{HS, 1D, AR}	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	5.6	< 1.0
TPH-CWG - Aromatic >C7 - C8 _{HS, 1D, AR}	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	5.2	< 1.0
TPH-CWG - Aromatic >C8 - C10 _{HS, 1D, AR}	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	7.7	< 1.0
TPH-CWG - Aromatic >C10 - C12 _{EH, 1D, AR, MS}	µg/l	10	NONE	20	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C12 - C16 _{EH, 1D, AR, MS}	µg/l	10	NONE	95	< 10	< 10	100	< 10
TPH-CWG - Aromatic >C16 - C21 _{EH, 1D, AR, MS}	µg/l	10	NONE	80	< 10	< 10	120	< 10
TPH-CWG - Aromatic >C21 - C35 _{EH, 1D, AR, MS}	µg/l	10	NONE	15	< 10	< 10	15	< 10



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Environmental Science

Analytical Report Number: 24-80956

Project / Site name: Castlatan

Your Order No: 007336

Lab Sample Number				2943249	2943250	2943251	2943252	2943253
Sample Reference				WS301	WS302	WS303	WS105	N Ditch
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				30/01/2024	30/01/2024	30/01/2024	30/01/2024	30/01/2024
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					
TPH-CWG - Aromatic (C5 - C35) H5+EH_1D_AR_MS	µg/l	10	NONE	210	< 10	< 10	250	< 10

VOCs

Chloromethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Chloroethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Bromomethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Vinyl Chloride	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Trichlorofluoromethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,1-Dichloroethene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Trans 1,2-dichloroethylene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,1-Dichloroethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
2,2-Dichloropropane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Chloroform	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,1,1-Trichloroethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,2-Dichloroethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,1-Dichloropropene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Cis-1,2-dichloroethene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Benzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	6.8	< 3.0
Carbontetrachloride	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,2-Dichloropropane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Trichloroethene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Dibromomethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Bromodichloromethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Cis-1,3-dichloropropene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Trans-1,3-dichloropropene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Toluene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	6.1	< 3.0
1,1,2-Trichloroethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,3-Dichloropropane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Dibromochloromethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Tetrachloroethene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,2-Dibromoethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Chlorobenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,1,1,2-Tetrachloroethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Ethylbenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
p & m-Xylene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Styrene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Bromoform	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
o-Xylene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Isopropylbenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,1,2,2-Tetrachloroethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Bromobenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
n-Propylbenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
2-Chlorotoluene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
4-Chlorotoluene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,3,5-Trimethylbenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
tert-Butylbenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,2,4-Trimethylbenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
sec-Butylbenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,3-Dichlorobenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
p-Isopropyltoluene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0



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Environmental Science

Analytical Report Number: 24-80956

Project / Site name: Castlatan

Your Order No: 007336

Lab Sample Number				2943249	2943250	2943251	2943252	2943253
Sample Reference				WS301	WS302	WS303	WS105	N Ditch
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				30/01/2024	30/01/2024	30/01/2024	30/01/2024	30/01/2024
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					
1,4-Dichlorobenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,2-Dichlorobenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Butylbenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,2-Dibromo-3-chloropropane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,2,4-Trichlorobenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Hexachlorobutadiene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,2,3-Trichlorobenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0

SVOCs

Aniline	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Phenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2-Chlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Bis(2-chloroethyl)ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
1,3-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
1,2-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
1,4-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Bis(2-chloroisopropyl)ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2-Methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Hexachloroethane	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Nitrobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
4-Methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Isophorone	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2-Nitrophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2,4-Dimethylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	12	< 0.05
Bis(2-chloroethoxy)methane	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
1,2,4-Trichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Naphthalene	µg/l	0.01	ISO 17025	0.96	< 0.01	< 0.01	< 0.01	< 0.01
2,4-Dichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
4-Chloroaniline	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Hexachlorobutadiene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
4-Chloro-3-methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2,4,6-Trichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2,4,5-Trichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2-Methylnaphthalene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2-Chloronaphthalene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Dimethylphthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2,6-Dinitrotoluene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	µg/l	0.01	ISO 17025	0.14	< 0.01	< 0.01	0.29	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	5.9	< 0.01	< 0.01	2.7	< 0.01
2,4-Dinitrotoluene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Dibenzofuran	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	0.63	< 0.05
4-Chlorophenyl phenyl ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Diethyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
4-Nitroaniline	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluorene	µg/l	0.01	ISO 17025	0.87	< 0.01	< 0.01	1.1	< 0.01
Azobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Bromophenyl phenyl ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Hexachlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Carbazole	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	1.7	< 0.05
Dibutyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05

Analytical Report Number: 24-80956
Project / Site name: Castlatan

Your Order No: 007336

Lab Sample Number				2943249	2943250	2943251	2943252	2943253
Sample Reference				WS301	WS302	WS303	WS105	N Ditch
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				30/01/2024	30/01/2024	30/01/2024	30/01/2024	30/01/2024
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					
Anthraquinone	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluoranthene	µg/l	0.01	ISO 17025	0.26	< 0.01	< 0.01	< 0.01	< 0.01
Pyrene	µg/l	0.01	ISO 17025	0.22	< 0.01	< 0.01	< 0.01	< 0.01
Butyl benzyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
3&4-Methylphenol	µg/l	0.1	NONE	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

Analytical Report Number : 24-80956
Project / Site name: Castlatan

Water matrix abbreviations:

Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW.	L080-PL	W	ISO 17025
Monohydric phenols in water	Determination of phenols in water by continuous flow analyser. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	ISO 17025
Suspended solids in water	Determined gravimetrically with GFC filtration papers.Accredited Matrices PW, SW, GW, FSE, PrW, LL	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L004-PL	W	ISO 17025
Semi-volatile organic compounds in water	Determination of semi-volatile organic compounds in leachate by extraction in dichloromethane followed by GC-MS.	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-PL	W	ISO 17025
Total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Dissolved Organic Carbon in water	Determination of dissolved inorganic carbon in water by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	ISO 17025
BTEX and MTBE in water (Monoaromatics)	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260. Refer to CoA for analyte specific accreditation	L073B-PL	W	ISO 17025
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In house method.	L099-PL	W	ISO 17025
TPH1 (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS.	In-house method	L070-PL	W	ISO 17025

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).

For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).

For method numbers ending in 'PL or B' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Analytical Report Number : 24-80956
Project / Site name: Castlatan

Water matrix abbreviations:

Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Acronym	Descriptions				
HS	Headspace Analysis				
MS	Mass spectrometry				
FID	Flame Ionisation Detector				
GC	Gas Chromatography				
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))				
CU	Clean-up - e.g. by Florisil®, silica gel				
1D	GC - Single coil/column gas chromatography				
2D	GC-GC - Double coil/column gas chromatography				
Total	Aliphatics & Aromatics				
AL	Aliphatics				
AR	Aromatics				
#1	EH_2D_Total but with humics mathematically subtracted				
#2	EH_2D_Total but with fatty acids mathematically subtracted				
-	Operator - understore to separate acronyms (exception for +)				
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total				



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Jessica Sheridan

e3p
Taylor Road
Urmston
Manchester
M41 7JQ

e: jsheridan@e3p.co.uk

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 23-74783

Project / Site name:	Castleton Sidlings	Samples received on:	13/12/2023
Your job number:	14-768	Samples instructed on/ Analysis started on:	13/12/2023
Your order number:	006999	Analysis completed by:	21/12/2023
Report Issue Number:	1	Report issued on:	21/12/2023
Samples Analysed:	1 water sample		

Signed:

Joanna Wawrzeczko
Senior Reporting Specialist
For & on behalf of i2 Analytical Ltd.

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

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

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

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

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.



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Analytical Report Number: 23-74783
Project / Site name: Castleton Sidlings

Your Order No: 006999

Lab Sample Number				2910302
Sample Reference				SW-Drainage-101
Sample Number				None Supplied
Depth (m)				None Supplied
Date Sampled				12/12/2023
Time Taken				None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status	

General Inorganics

pH (L099)	pH Units	N/A	ISO 17025	7.3
Total Cyanide (Low Level 1 µg/l)	µg/l	1	NONE	< 1.0
Dissolved Organic Carbon (DOC)	mg/l	0.1	ISO 17025	11.2
Total Suspended Solids (L004B)	mg/l	2	ISO 17025	44

Total Phenols

Total Phenols (monohydric)	µg/l	1	ISO 17025	1.6
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Heavy Metals / Metalloids

Calcium (dissolved)	mg/l	0.012	ISO 17025	45
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0

Arsenic (dissolved)	µg/l	0.15	ISO 17025	0.66
Cadmium (dissolved)	µg/l	0.02	ISO 17025	0.03
Chromium (dissolved)	µg/l	0.2	ISO 17025	1.2
Copper (dissolved)	µg/l	0.5	ISO 17025	3.8
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2
Manganese (dissolved)	µg/l	0.05	ISO 17025	7.3
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05
Nickel (dissolved)	µg/l	0.5	ISO 17025	3.1
Selenium (dissolved)	µg/l	0.6	ISO 17025	0.6
Zinc (dissolved)	µg/l	0.5	ISO 17025	19

Monoaromatics & Oxygenates

Benzene	µg/l	3	ISO 17025	< 3.0
Toluene	µg/l	3	ISO 17025	< 3.0
Ethylbenzene	µg/l	3	ISO 17025	< 3.0
p & m-xylene	µg/l	3	ISO 17025	< 3.0
o-xylene	µg/l	3	ISO 17025	< 3.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	3	ISO 17025	< 3.0



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Analytical Report Number: 23-74783
Project / Site name: Castleton Sidlings

Your Order No: 006999

Lab Sample Number				2910302
Sample Reference				SW-Drainage-101
Sample Number				None Supplied
Depth (m)				None Supplied
Date Sampled				12/12/2023
Time Taken				None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status	

Petroleum Hydrocarbons

TPH1 (C10 - C40) EH_ID_TOTAL_MS	µg/l	10	ISO 17025	< 10
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TPH-CWG - Aliphatic >C5 - C6 HS_ID_AL	µg/l	1	ISO 17025	< 1.0
TPH-CWG - Aliphatic >C6 - C8 HS_ID_AL	µg/l	1	ISO 17025	< 1.0
TPH-CWG - Aliphatic >C8 - C10 HS_ID_AL	µg/l	1	ISO 17025	< 1.0
TPH-CWG - Aliphatic >C10 - C12 EH_ID_AL_MS	µg/l	10	NONE	< 10
TPH-CWG - Aliphatic >C12 - C16 EH_ID_AL_MS	µg/l	10	NONE	< 10
TPH-CWG - Aliphatic >C16 - C21 EH_ID_AL_MS	µg/l	10	NONE	< 10
TPH-CWG - Aliphatic >C21 - C35 EH_ID_AL_MS	µg/l	10	NONE	< 10
TPH-CWG - Aliphatic (C5 - C35) HS+EH_ID_AL_MS	µg/l	10	NONE	< 10

TPH-CWG - Aromatic >C5 - C7 HS_ID_AR	µg/l	1	ISO 17025	< 1.0
TPH-CWG - Aromatic >C7 - C8 HS_ID_AR	µg/l	1	ISO 17025	< 1.0
TPH-CWG - Aromatic >C8 - C10 HS_ID_AR	µg/l	1	ISO 17025	< 1.0
TPH-CWG - Aromatic >C10 - C12 EH_ID_AR_MS	µg/l	10	NONE	< 10
TPH-CWG - Aromatic >C12 - C16 EH_ID_AR_MS	µg/l	10	NONE	< 10
TPH-CWG - Aromatic >C16 - C21 EH_ID_AR_MS	µg/l	10	NONE	< 10
TPH-CWG - Aromatic >C21 - C35 EH_ID_AR_MS	µg/l	10	NONE	< 10
TPH-CWG - Aromatic (C5 - C35) HS+EH_ID_AR_MS	µg/l	10	NONE	< 10

VOCs

Chloromethane	µg/l	3	ISO 17025	< 3.0
Chloroethane	µg/l	3	ISO 17025	< 3.0
Bromomethane	µg/l	3	ISO 17025	< 3.0
Vinyl Chloride	µg/l	3	NONE	< 3.0
Trichlorofluoromethane	µg/l	3	NONE	< 3.0
1,1-Dichloroethene	µg/l	3	ISO 17025	< 3.0
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	3	ISO 17025	< 3.0
Trans 1,2-dichloroethylene	µg/l	3	ISO 17025	< 3.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	3	ISO 17025	< 3.0
1,1-Dichloroethane	µg/l	3	ISO 17025	< 3.0
2,2-Dichloropropane	µg/l	3	ISO 17025	< 3.0
Chloroform	µg/l	3	ISO 17025	< 3.0
1,1,1-Trichloroethane	µg/l	3	ISO 17025	< 3.0
1,2-Dichloroethane	µg/l	3	ISO 17025	< 3.0
1,1-Dichloropropene	µg/l	3	ISO 17025	< 3.0
Cis-1,2-dichloroethene	µg/l	3	ISO 17025	< 3.0
Benzene	µg/l	3	ISO 17025	< 3.0
Carbontetrachloride	µg/l	3	ISO 17025	< 3.0
1,2-Dichloropropane	µg/l	3	ISO 17025	< 3.0
Trichloroethene	µg/l	3	ISO 17025	< 3.0
Dibromomethane	µg/l	3	ISO 17025	< 3.0
Bromodichloromethane	µg/l	3	ISO 17025	< 3.0
Cis-1,3-dichloropropene	µg/l	3	ISO 17025	< 3.0
Trans-1,3-dichloropropene	µg/l	3	ISO 17025	< 3.0
Toluene	µg/l	3	ISO 17025	< 3.0
1,1,2-Trichloroethane	µg/l	3	ISO 17025	< 3.0
1,3-Dichloropropane	µg/l	3	ISO 17025	< 3.0
Dibromochloromethane	µg/l	3	ISO 17025	< 3.0
Tetrachloroethene	µg/l	3	ISO 17025	< 3.0



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Analytical Report Number: 23-74783
Project / Site name: Castleton Sidlings

Your Order No: 006999

Lab Sample Number				2910302
Sample Reference				SW-Drainage-101
Sample Number				None Supplied
Depth (m)				None Supplied
Date Sampled				12/12/2023
Time Taken				None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status	
1,2-Dibromoethane	µg/l	3	ISO 17025	< 3.0
Chlorobenzene	µg/l	3	ISO 17025	< 3.0
1,1,1,2-Tetrachloroethane	µg/l	3	ISO 17025	< 3.0
Ethylbenzene	µg/l	3	ISO 17025	< 3.0
p & m-Xylene	µg/l	3	ISO 17025	< 3.0
Styrene	µg/l	3	ISO 17025	< 3.0
Bromoform	µg/l	3	ISO 17025	< 3.0
o-Xylene	µg/l	3	ISO 17025	< 3.0
Isopropylbenzene	µg/l	3	ISO 17025	< 3.0
1,1,2,2-Tetrachloroethane	µg/l	3	ISO 17025	< 3.0
Bromobenzene	µg/l	3	ISO 17025	< 3.0
n-Propylbenzene	µg/l	3	ISO 17025	< 3.0
2-Chlorotoluene	µg/l	3	ISO 17025	< 3.0
4-Chlorotoluene	µg/l	3	ISO 17025	< 3.0
1,3,5-Trimethylbenzene	µg/l	3	ISO 17025	< 3.0
tert-Butylbenzene	µg/l	3	ISO 17025	< 3.0
1,2,4-Trimethylbenzene	µg/l	3	ISO 17025	< 3.0
sec-Butylbenzene	µg/l	3	ISO 17025	< 3.0
1,3-Dichlorobenzene	µg/l	3	ISO 17025	< 3.0
p-Isopropyltoluene	µg/l	3	ISO 17025	< 3.0
1,4-Dichlorobenzene	µg/l	3	ISO 17025	< 3.0
1,2-Dichlorobenzene	µg/l	3	ISO 17025	< 3.0
Butylbenzene	µg/l	3	ISO 17025	< 3.0
1,2-Dibromo-3-chloropropane	µg/l	3	ISO 17025	< 3.0
1,2,4-Trichlorobenzene	µg/l	3	ISO 17025	< 3.0
Hexachlorobutadiene	µg/l	3	ISO 17025	< 3.0
1,2,3-Trichlorobenzene	µg/l	3	ISO 17025	< 3.0

SVOCs

Aniline	µg/l	0.05	NONE	< 0.05
Phenol	µg/l	0.05	NONE	< 0.05
2-Chlorophenol	µg/l	0.05	NONE	< 0.05
Bis(2-chloroethyl)ether	µg/l	0.05	NONE	< 0.05
1,3-Dichlorobenzene	µg/l	0.05	NONE	< 0.05
1,2-Dichlorobenzene	µg/l	0.05	NONE	< 0.05
1,4-Dichlorobenzene	µg/l	0.05	NONE	< 0.05
Bis(2-chloroisopropyl)ether	µg/l	0.05	NONE	< 0.05
2-Methylphenol	µg/l	0.05	NONE	< 0.05
Hexachloroethane	µg/l	0.05	NONE	< 0.05
Nitrobenzene	µg/l	0.05	NONE	< 0.05
4-Methylphenol	µg/l	0.05	NONE	< 0.05
Isophorone	µg/l	0.05	NONE	< 0.05
2-Nitrophenol	µg/l	0.05	NONE	< 0.05
2,4-Dimethylphenol	µg/l	0.05	NONE	< 0.05
Bis(2-chloroethoxy)methane	µg/l	0.05	NONE	< 0.05
1,2,4-Trichlorobenzene	µg/l	0.05	NONE	< 0.05
Naphthalene	µg/l	0.01	ISO 17025	< 0.01
2,4-Dichlorophenol	µg/l	0.05	NONE	< 0.05
4-Chloroaniline	µg/l	0.05	NONE	< 0.05
Hexachlorobutadiene	µg/l	0.05	NONE	< 0.05
4-Chloro-3-methylphenol	µg/l	0.05	NONE	< 0.05
2,4,6-Trichlorophenol	µg/l	0.05	NONE	< 0.05

Analytical Report Number: 23-74783
Project / Site name: Castleton Sidings

Your Order No: 006999

Lab Sample Number				2910302
Sample Reference				SW-Drainage-101
Sample Number				None Supplied
Depth (m)				None Supplied
Date Sampled				12/12/2023
Time Taken				None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status	
2,4,5-Trichlorophenol	µg/l	0.05	NONE	< 0.05
2-Methylnaphthalene	µg/l	0.05	NONE	< 0.05
2-Chloronaphthalene	µg/l	0.05	NONE	< 0.05
Dimethylphthalate	µg/l	0.05	NONE	< 0.05
2,6-Dinitrotoluene	µg/l	0.05	NONE	< 0.05
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01
2,4-Dinitrotoluene	µg/l	0.05	NONE	< 0.05
Dibenzofuran	µg/l	0.05	NONE	< 0.05
4-Chlorophenyl phenyl ether	µg/l	0.05	NONE	< 0.05
Diethyl phthalate	µg/l	0.05	NONE	< 0.05
4-Nitroaniline	µg/l	0.05	NONE	< 0.05
Fluorene	µg/l	0.01	ISO 17025	< 0.01
Azobenzene	µg/l	0.05	NONE	< 0.05
Bromophenyl phenyl ether	µg/l	0.05	NONE	< 0.05
Hexachlorobenzene	µg/l	0.05	NONE	< 0.05
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01
Anthracene	µg/l	0.01	ISO 17025	< 0.01
Carbazole	µg/l	0.05	NONE	< 0.05
Dibutyl phthalate	µg/l	0.05	NONE	< 0.05
Anthraquinone	µg/l	0.05	NONE	< 0.05
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01
Pyrene	µg/l	0.01	ISO 17025	< 0.01
Butyl benzyl phthalate	µg/l	0.05	NONE	< 0.05
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01
Chrysene	µg/l	0.01	ISO 17025	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01
3&4-Methylphenol	µg/l	0.1	NONE	< 0.10

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

Analytical Report Number : 23-74783

Project / Site name: Castleton Sidlings

Water matrix abbreviations:

Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW.	L080-PL	W	ISO 17025
Monohydric phenols in water - LOW LEVEL 1 ug/l	Determination of phenols in water by continuous flow analyser. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	ISO 17025
Suspended solids in water	Determined gravimetrically with GFC filtration papers.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L004-PL	W	ISO 17025
Semi-volatile organic compounds in water	Determination of semi-volatile organic compounds in leachate by extraction in dichloromethane followed by GC-MS.	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-PL	W	ISO 17025
Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Dissolved Organic Carbon in water	Determination of dissolved inorganic carbon in water by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	ISO 17025
BTEX and MTBE in water (Monoaromatics)	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260. Refer to CoA for analyte specific accreditation	L073B-PL	W	ISO 17025
Low level total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	NONE
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In house method.	L099-PL	W	ISO 17025

Analytical Report Number : 23-74783

Project / Site name: Castleton Sidlings

Water matrix abbreviations:

Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
TPH1 (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS.	In-house method	L070-PL	W	ISO 17025

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).

For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).

For method numbers ending in 'PL or B' analysis have been carried out in our laboratory in Poland.

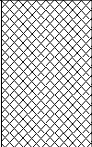
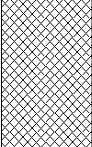
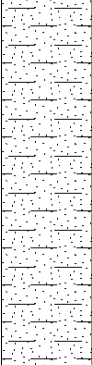
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30°C.

Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
-	Operator - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

				Borehole Log				Borehole No. WS305 Sheet 1 of 1	
Project Name: Castleton Sidings				Project No. 14768		Co-ords: 387812E - 410046N		Hole Type WS	
Location: Heywood Road, Rochdale						Level:		Scale 1:50	
Client: Kellen Homes						Dates: 12/12/2023		Logged By G. Calvert	
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					1.00			MADE GROUND: Black slightly clayey sandy gravel. Gravel is fine to medium angular to subrounded of sandstone, mudstone with fragments of concrete, clinker and ash inclusions.	1
					2.10			MADE GROUND: Brown clayey gravel. Gravel is fine angular to subangular of mudstone, coal and sandstone with fragments of brick, ash inclusions, clinker, concrete and rare timber.	2
					2.30			Brown clayey fine to medium SAND with occasional organics and rare rootlets.	
								Brownish grey clayey fine to medium SAND.	3
					5.00			End of Borehole at 5.00m	5
Remarks 1. Complete. 2. Water strike encountered at 3.40m bgl. 3. Monitoring well installed. 4. Response zone 0.50-2.00m bgl.									



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Jessica Sheridan

e3p
Taylor Road
Urmston
Manchester
M41 7JQ

e: jsheridan@e3p.co.uk



Environmental Science

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404

f: 01923 237404

e: reception@i2analytical.com

Analytical Report Number : 24-76886

Project / Site name:	Castleton Sidings	Samples received on:	03/01/2024
Your job number:	14-768	Samples instructed on/ Analysis started on:	03/01/2024
Your order number:	007096	Analysis completed by:	09/01/2024
Report Issue Number:	1	Report issued on:	09/01/2024
Samples Analysed:	4 water samples		

Signed:

Joanna Wawrzeczko
Senior Reporting Specialist
For & on behalf of i2 Analytical Ltd.

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

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

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

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

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.



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Environmental Science

Analytical Report Number: 24-76886
Project / Site name: Castleton Sidings

Your Order No: 007096

Lab Sample Number				2921879	2921880	2921881	2921882
Sample Reference				WS301	WS303	WS304	WS305
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				02/01/2024	02/01/2024	02/01/2024	02/01/2024
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status				

General Inorganics

pH (L099)	pH Units	N/A	ISO 17025	6.6	7	7	7
Total Cyanide (Low Level 1 µg/l)	µg/l	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0
Dissolved Organic Carbon (DOC)	mg/l	0.1	ISO 17025	4.19	1.39	5.74	1.01
Total Suspended Solids (L004B)	mg/l	2	ISO 17025	82	26	37	3

Total Phenols

Total Phenols (monohydric)	µg/l	1	ISO 17025	6.2	2.4	2.3	2.2
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Heavy Metals / Metalloids

Calcium (dissolved)	mg/l	0.012	ISO 17025	75	120	68	100
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0	< 5.0	< 5.0

Arsenic (dissolved)	µg/l	0.15	ISO 17025	4.35	0.84	1.06	0.3
Cadmium (dissolved)	µg/l	0.02	ISO 17025	0.07	0.03	0.06	0.1
Chromium (dissolved)	µg/l	0.2	ISO 17025	< 0.2	< 0.2	0.3	< 0.2
Copper (dissolved)	µg/l	0.5	ISO 17025	1.6	1.9	6.2	3.5
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2	< 0.2	0.3	< 0.2
Manganese (dissolved)	µg/l	0.05	ISO 17025	610	660	420	180
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05	< 0.05	< 0.05	< 0.05
Nickel (dissolved)	µg/l	0.5	ISO 17025	9	2.2	6.8	3.8
Selenium (dissolved)	µg/l	0.6	ISO 17025	0.8	< 0.6	1.5	< 0.6
Zinc (dissolved)	µg/l	0.5	ISO 17025	160	25	13	34

Monoaromatics & Oxygenates

Benzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Toluene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Ethylbenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
p & m-xylene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
o-xylene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0



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Environmental Science

Analytical Report Number: 24-76886
Project / Site name: Castleton Sidings

Your Order No: 007096

Lab Sample Number				2921879	2921880	2921881	2921882
Sample Reference				WS301	WS303	WS304	WS305
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				02/01/2024	02/01/2024	02/01/2024	02/01/2024
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status				

Petroleum Hydrocarbons

TPH1 (C10 - C40) EH_1D_TOTAL_MS	µg/l	10	ISO 17025	93	49	< 10	< 10
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TPH-CWG - Aliphatic >C5 - C6 HS_1D_AL	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C6 - C8 HS_1D_AL	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C8 - C10 HS_1D_AL	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C10 - C12 EH_1D_AL_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C12 - C16 EH_1D_AL_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C16 - C21 EH_1D_AL_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C21 - C35 EH_1D_AL_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic (C5 - C35) HS+EH_1D_AL_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10

TPH-CWG - Aromatic >C5 - C7 HS_1D_AR	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C7 - C8 HS_1D_AR	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C8 - C10 HS_1D_AR	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C10 - C12 EH_1D_AR_MS	µg/l	10	NONE	28	13	< 10	< 10
TPH-CWG - Aromatic >C12 - C16 EH_1D_AR_MS	µg/l	10	NONE	65	22	< 10	< 10
TPH-CWG - Aromatic >C16 - C21 EH_1D_AR_MS	µg/l	10	NONE	< 10	14	< 10	< 10
TPH-CWG - Aromatic >C21 - C35 EH_1D_AR_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic (C5 - C35) HS+EH_1D_AR_MS	µg/l	10	NONE	93	49	< 10	< 10



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Environmental Science

Analytical Report Number: 24-76886
Project / Site name: Castleton Sidings

Your Order No: 007096

Lab Sample Number				2921879	2921880	2921881	2921882
Sample Reference				WS301	WS303	WS304	WS305
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				02/01/2024	02/01/2024	02/01/2024	02/01/2024
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status				

VOCs

Chloromethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Chloroethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Bromomethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Vinyl Chloride	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0
Trichlorofluoromethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0
1,1-Dichloroethene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Trans 1,2-dichloroethylene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
1,1-Dichloroethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
2,2-Dichloropropane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Chloroform	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
1,1,1-Trichloroethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
1,2-Dichloroethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
1,1-Dichloropropene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Cis-1,2-dichloroethene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Benzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Carbontetrachloride	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
1,2-Dichloropropane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Trichloroethene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Dibromomethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Bromodichloromethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Cis-1,3-dichloropropene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Trans-1,3-dichloropropene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Toluene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
1,1,2-Trichloroethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
1,3-Dichloropropane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Dibromochloromethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Tetrachloroethene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
1,2-Dibromoethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Chlorobenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
1,1,1,2-Tetrachloroethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Ethylbenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
p & m-Xylene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Styrene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Bromoform	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
o-Xylene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Isopropylbenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
1,1,2,2-Tetrachloroethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Bromobenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
n-Propylbenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
2-Chlorotoluene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
4-Chlorotoluene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
1,3,5-Trimethylbenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
tert-Butylbenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
1,2,4-Trimethylbenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
sec-Butylbenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
1,3-Dichlorobenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
p-Isopropyltoluene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
1,4-Dichlorobenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
1,2-Dichlorobenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0



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Analytical Report Number: 24-76886
Project / Site name: Castleton Sidings

Your Order No: 007096

Lab Sample Number				2921879	2921880	2921881	2921882
Sample Reference				WS301	WS303	WS304	WS305
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				02/01/2024	02/01/2024	02/01/2024	02/01/2024
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status				
Butylbenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
1,2-Dibromo-3-chloropropane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
1,2,4-Trichlorobenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Hexachlorobutadiene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
1,2,3-Trichlorobenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0



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Environmental Science

Analytical Report Number: 24-76886
Project / Site name: Castleton Sidings

Your Order No: 007096

Lab Sample Number				2921879	2921880	2921881	2921882
Sample Reference				WS301	WS303	WS304	WS305
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				02/01/2024	02/01/2024	02/01/2024	02/01/2024
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)				Units	Limit of detection	Accreditation Status	

SVOCs

Aniline	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Phenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
2-Chlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Bis(2-chloroethyl)ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
1,3-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
1,2-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
1,4-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Bis(2-chloroisopropyl)ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
2-Methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Hexachloroethane	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Nitrobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
4-Methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Isophorone	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
2-Nitrophenol	µg/l	0.05	NONE	< 0.05	< 0.05	0.48	< 0.05
2,4-Dimethylphenol	µg/l	0.05	NONE	0.99	< 0.05	< 0.05	< 0.05
Bis(2-chloroethoxy)methane	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
1,2,4-Trichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Naphthalene	µg/l	0.01	ISO 17025	3.8	< 0.01	< 0.01	< 0.01
2,4-Dichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	0.39	< 0.05
4-Chloroaniline	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Hexachlorobutadiene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
4-Chloro-3-methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
2,4,6-Trichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
2,4,5-Trichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
2-Methylnaphthalene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
2-Chloronaphthalene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Dimethylphthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
2,6-Dinitrotoluene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	µg/l	0.01	ISO 17025	0.25	< 0.01	< 0.01	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	3.5	0.84	< 0.01	< 0.01
2,4-Dinitrotoluene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Dibenzofuran	µg/l	0.05	NONE	0.48	< 0.05	< 0.05	< 0.05
4-Chlorophenyl phenyl ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Diethyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
4-Nitroaniline	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Fluorene	µg/l	0.01	ISO 17025	0.58	0.2	< 0.01	< 0.01
Azobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Bromophenyl phenyl ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Hexachlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Phenanthrene	µg/l	0.01	ISO 17025	0.26	0.26	< 0.01	< 0.01
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01
Carbazole	µg/l	0.05	NONE	0.43	< 0.05	< 0.05	< 0.05
Dibutyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Anthraquinone	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Fluoranthene	µg/l	0.01	ISO 17025	0.21	< 0.01	< 0.01	< 0.01
Pyrene	µg/l	0.01	ISO 17025	0.18	< 0.01	< 0.01	< 0.01
Butyl benzyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01



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Analytical Report Number: 24-76886
Project / Site name: Castleton Sidings

Your Order No: 007096

Lab Sample Number				2921879	2921880	2921881	2921882
Sample Reference				WS301	WS303	WS304	WS305
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				02/01/2024	02/01/2024	02/01/2024	02/01/2024
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status				
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01
3&4-Methylphenol	µg/l	0.1	NONE	< 0.10	< 0.10	< 0.10	< 0.10

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected



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Environmental Science

Analytical Report Number : 24-76886

Project / Site name: Castleton Sidings

Water matrix abbreviations:

Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW.	L080-PL	W	ISO 17025
Monohydric phenols in water - LOW LEVEL 1 ug/l	Determination of phenols in water by continuous flow analyser. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	ISO 17025
Suspended solids in water	Determined gravimetrically with GFC filtration papers.Accredited Matrices PW, SW, GW, FSE, PrW, LL	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L004-PL	W	ISO 17025
Semi-volatile organic compounds in water	Determination of semi-volatile organic compounds in leachate by extraction in dichloromethane followed by GC-MS.	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-PL	W	ISO 17025
Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Dissolved Organic Carbon in water	Determination of dissolved inorganic carbon in water by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	ISO 17025
BTEX and MTBE in water (Monoaromatics)	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260. Refer to CoA for analyte specific accreditation	L073B-PL	W	ISO 17025
Low level total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	NONE
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In house method.	L099-PL	W	ISO 17025



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Environmental Science

Analytical Report Number : 24-76886

Project / Site name: Castleton Sidings

Water matrix abbreviations:

Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
TPH1 (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS.	In-house method	L070-PL	W	ISO 17025

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).

For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).

For method numbers ending in 'PL or B' analysis have been carried out in our laboratory in Poland.

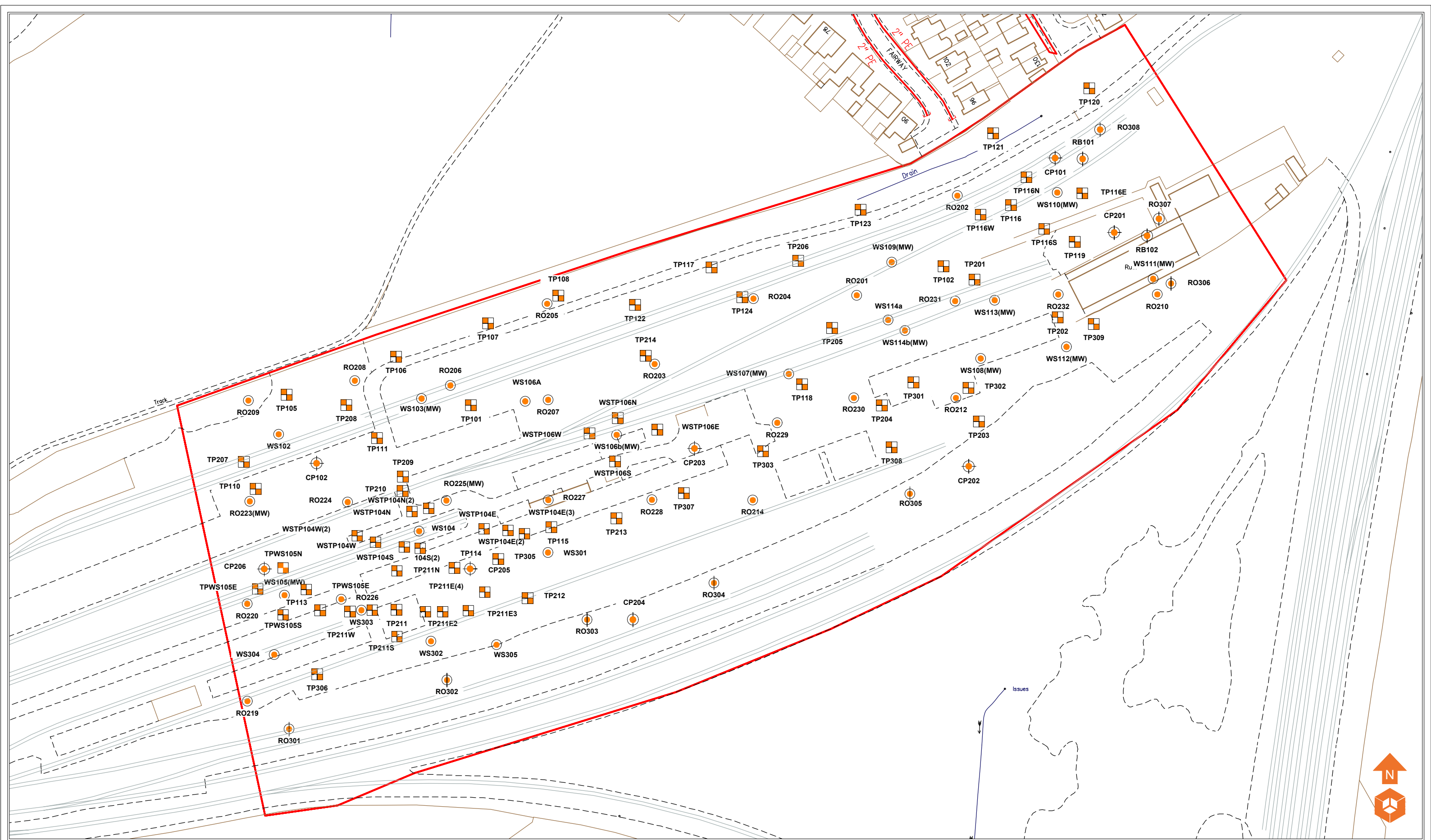
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total



Location Symbols

	Approximate Window Sample Probehole Location (March 2021)		Approximate Cable Percussive Borehole Location (March 2021)
	Approximate Window Sample Probehole Location with Install (March 2021)		Approximate Cable Percussive Borehole Location (June 2023)
	Approximate Trial Pit Location (March 2021)		Approximate Window Sample Probehole Location (December 2023)
	Approximate Rotary Borehole Location (March 2021)		
	Approximate Trial Pit Location (June 2021)		
	Approximate Rotary Borehole Location (July 2021)		
	Approximate Hand Dug Pit Location (July 2021)		
	Approximate Stockpile Sample Location (July 2021)		
	Approximate Location of Rotary Borehole		

Notes:

P1	REVI	14.12.2023	OW	JS
P1	REVG	29.08.2023	LM	JS
P1	REVG	30.01.2023	EB	JS
P1	REVI	16.01.2023	HM	JS
P1	REVE	12.12.2022	HM	EC
P1	REVD	19.10.2022	HM	EC
P1	REVC	30.03.2022	EB	JS
P1	REVB	11.03.2022	HM	JS
P1	REVA	25.03.2021	EB	EF
Phase	Issue	Date	Drawn	Checked

Client:

Kellen Homes

Job Title:

Heywood Road,
Castleton

Job No:

14-768

Drawing No:

005

Drawing Title:

Exploratory Hole
Location Plan

Date:

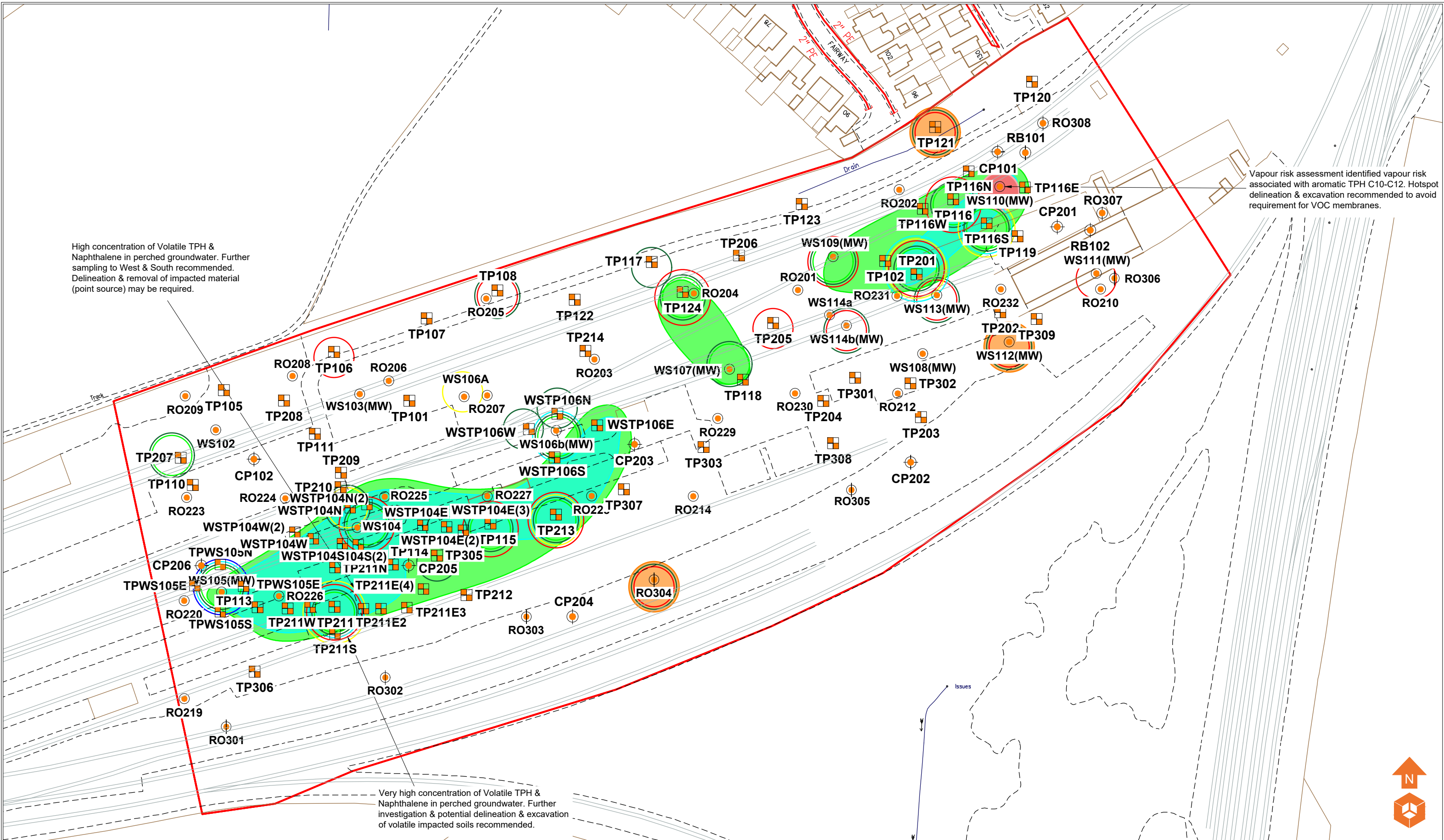
14.12.2023

Scale:

NTS @ A3

Environmental Engineering
Partnership Ltd
Taylor Road, Trafford Park
Urmston, Manchester, M41 7JQ
Tel: 0161 707 9612
E-mail: info@e3p.co.uk
Website: www.e3p.co.uk

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Location Symbols

Approximate Window Sample Probehole Location (March 2021)

Approximate Window Sample Probehole Location with Install (March 2021)

Approximate Trial Pit Location (March 2021)

Approximate Rotary Borehole Location (March 2021)

Approximate Trial Pit Location (June 2021)

Approximate Rotary Borehole Location (July 2021)

Approximate Hand Dug Pit Location (July 2021)

Approximate Stockpile Sample Location (July 2021)

Approximate Location of Rotary Borehole

Approximate Cable Percussive Borehole Location (March 2021)

Approximate Cable Percussive Borehole Location (June 2023)

Soil Contaminants

Heavy metals

Mercury (volatile)

Asbestos (chrysotile <0.001% wt/wt)

Napathalene (volatile)

Non-volatile PAH

TPH C10-C16 (volatile)

TPH C16-C21 (non-volatile)

Groundwater Contaminants

Volatile TPH & Naphthalene in Groundwater Sample.

Vapour Risk (TPH C10-C12 Aromatic)

Napathalene Impacted Soils

TPH Impacted Soils

Volatile Mercury

Notes:

P1	REVH	30.08.2023	LM	JS
P1	REVG	31.02.2023	EB	JS
P1	REVF	17.01.2023	HM	JS
P1	REVE	13.12.2022	HM	EC
P1	REVD	30.03.2022	EB	JS
P1	REVC	24.02.2022	LM	JS
P1	REVB	30.04.2021	EB	EF
P1	REVA	15.04.2021	EB	EF
Phase	Issue	Date	Drawn	Checked

Client:

Kellen Homes

Job No:

14-768

Date:

30.08.2023

Drawing No:

118

Scale:

NTS @ A3

Job Title:

Heywood Road, Castleton

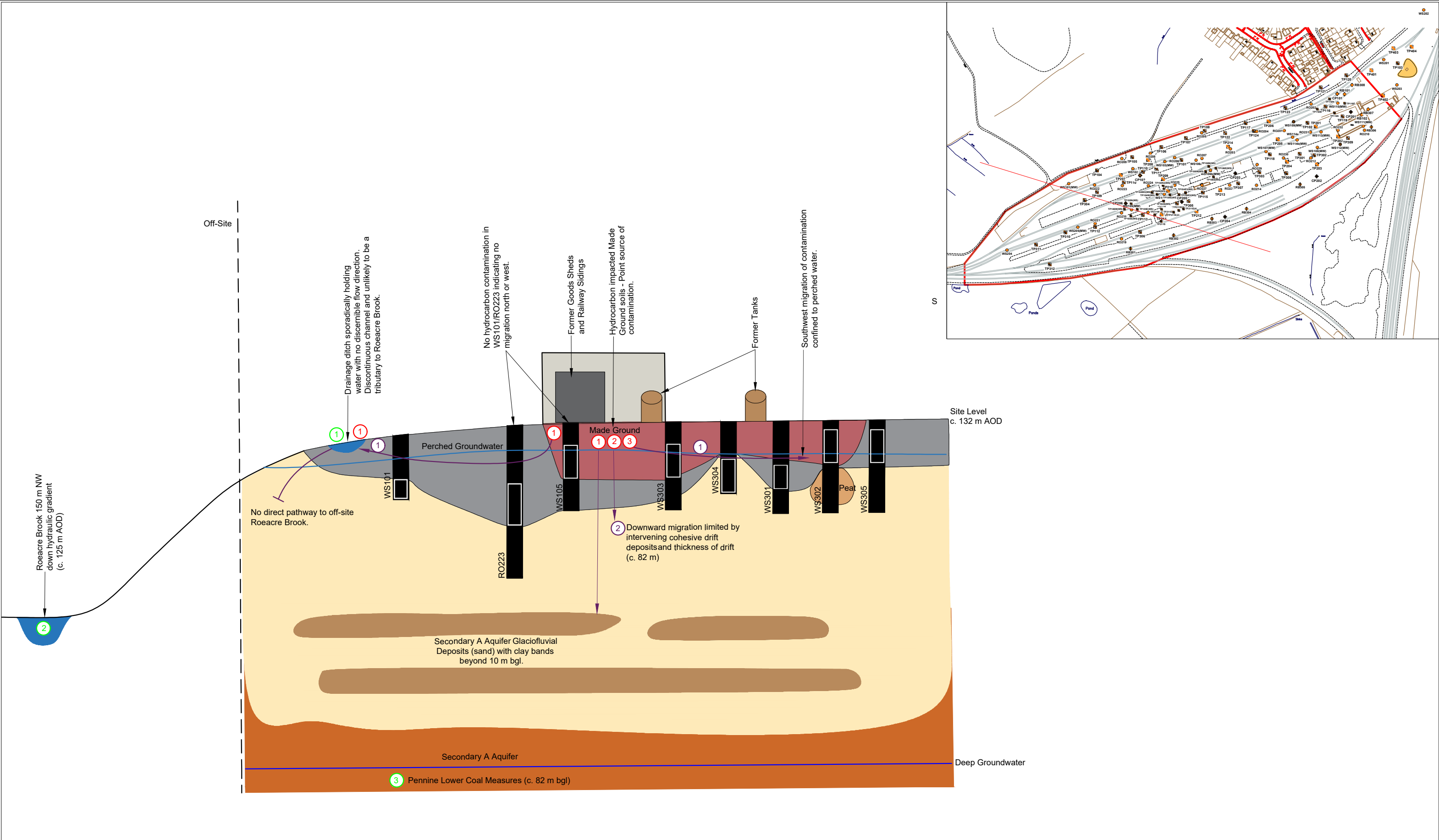
Drawing Title:

Contamination Issues Plan

e3p

Environmental Engineering Partnership Ltd
Taylor Road, Trafford Park
Urmston, Manchester, M41 7JQ
Tel: 0161 707 9612
E-mail: info@e3p.co.uk
Website: www.e3p.co.uk

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Geology Key Sandstone Sand Made Ground Peat	Sources/Contaminants ① Heavy Metals ② SVOCs ③ TPH	Receptors ① Drainage Ditch (on-site) ② Roeacre Brook (off-site) ③ Deep Groundwater / Secondary A Bedrock Aquifer	Pathways ① Lateral Migration ② Vertical Migration	Notes:					Client: Kellen Homes		Job No: 14-768	Date: 26.02.2024	e3p Environmental Engineering Partnership Ltd Taylor Road, Trafford Park Urmston, Manchester, M41 7JQ Tel: 0161 707 9612 E-mail: info@e3p.co.uk Website: www.e3p.co.uk
											Drawing No: 010	Scale: 1:1000 @ A3	
				P1 P1 Phase					REVB REVA Issue	26.02.2024 15.05.2020 Date	OW CB Drawn	JS MD Checked	

