



PHASE I AND II GEO-ENVIRONMENTAL ASSESSMENT

SWIFT LANE, BAGSHOT GU19 5NJ

REFERENCE: P1056/R1/V1

REPORT PREPARED FOR: SURREY HEATH BOROUGH COUNCIL

REPORT PREPARED BY: ENVIRONMENTAL PLANNING SOLUTIONS (EPS)

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QUALITY ASSURANCE

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EXECUTIVE SUMMARY	
Site Address	Swift Lane, Bagshot, GU19 5NJ
National Grid Reference	SU922631
Site Area	0.45ha.
Current Site Use	Vacant open land.
Proposed Development	Additional gypsy / traveller provision including five pitches, and a recreation area.
Site History	<p>The site was undeveloped until c. 1978 when it appears to form part of a refuse tip.</p> <p>Nearby historical land uses included a 'Scavenging Depot' (later 'Depot'), 'Household Waste Site' and 'Caravan Site', all to the west. Areas to the north, east and south of the site have all historically been used for agriculture / nurseries.</p>
Environmental Setting	<p>Geology</p> <ul style="list-style-type: none"> ▶ Superficial: Peat (unproductive). ▶ Bedrock: Windlesham Formation (Sand) designated as a Secondary A Aquifer. <p>Groundwater</p> <ul style="list-style-type: none"> ▶ Secondary A Aquifer contained within bedrock. ▶ Not located within a groundwater Source Protection Zone (SPZ). ▶ No potable groundwater abstractions nearby. <p>Surface Waters</p> <ul style="list-style-type: none"> ▶ Windle Brook adjacent to the north.
Conceptual Site Model (CSM)	<p>Potential "Active" Sources</p> <ul style="list-style-type: none"> ▶ Historic Landfilling on site; and ▶ Depot then works and now vehicle maintenance and repair facility adjacent west. <p>Pathways</p> <ul style="list-style-type: none"> ▶ Migration of mobile contaminants on or off site via services, sewers and manmade conduits; ▶ Direct contact, ingestion and inhalation of contaminants on site; ▶ Migration of mobile contaminants into controlled waters; and ▶ Migration of hazardous gases through permeable soils. <p>Human Receptors</p> <ul style="list-style-type: none"> ▶ Future site users (residents); and ▶ Residents of the adjacent existing gypsy/traveller site. <p>Controlled Water Receptors</p> <ul style="list-style-type: none"> ▶ Secondary A aquifer contained within the underlying Windlesham Formation bedrock; and ▶ Windle Brook adjacent to the northern boundary of the site.



Ground Investigation Works	<ul style="list-style-type: none">▶ Four window sample boreholes across the site;▶ Installation of ground gas and groundwater monitoring wells within three locations and two return monitoring visits;▶ Chemical laboratory analysis of soil and groundwater samples.
Summary of Ground Conditions	<ul style="list-style-type: none">▶ Made Ground of between 1.80m and 2.60m in thickness;▶ Windlesham Formation to the full depth of the investigation (5.0mbgl); and▶ Groundwater seepages / strikes at between 0.60m and 2.00mbgl.
Identified Contamination	<ul style="list-style-type: none">▶ Hydrocarbon odour was noted within the Made Ground within WS104;▶ Heavy metals and PAH have been identified within Made Ground soils at concentrations above the relevant human health assessment criteria within two locations;▶ Peak concentrations of carbon dioxide encountered during return monitoring visits indicate that the ground gas regime can be classified as Characteristic Situation 2 (CS2); and▶ Concentrations of some heavy metal and PAH species within samples of perched water collected exceed the environmental quality standards (EQS) and drinking water standards (DWS).
Conclusions	<ul style="list-style-type: none">▶ The proposed presence of hard standing across the majority of the site will break the pollutant pathway between identified soil contamination and future site users;▶ Should any vegetated borders be proposed, it is assumed that a nominal thickness of clean imported soil will be required to act as a suitable growing medium and this would also act as a barrier preventing human health exposure;▶ Basic gas mitigation measures will be required for any enclosed living spaces constructed directly onto the ground. However where enclosed living spaces are raised above the ground allowing ground gases to freely disperse no significant risk will be present;▶ It is not considered that a significant risk to drinking water is present given that the site is not located within a groundwater SPZ and there are no potable groundwater abstractions within influencing distance of the site; and▶ Should a pathway be present for perched water underlying the site to reach the nearby Windle Brook it is considered likely that the following dilution with river water the concentrations would fall below the EQS.





Recommendations

Should the development be progressed beyond the feasibility stage it is recommended that:

- ▶ Further assessment is undertaken in order to confirm that Windle Brook is not significantly affected by contaminants identified within the perched water underlying the site. This could include sampling of river water upstream and downstream of the site;
- ▶ Further ground gas monitoring is undertaken to expand the existing data set and confirm the initial ground gas assessment;
- ▶ Following the above, a remediation strategy and verification plan is prepared for approval by the regulators prior to commencement of development works; and
- ▶ The design of any proposed foundations or roadways should take into consideration the significant thickness of heterogenous Made Ground beneath the site and the potential for chemicals to be present within the ground which could adversely affect concrete structures installed within.



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	P1056-002 Site Investigation Layout Plan
	P1056-003 Proposed Development Plan
Appendix II	Limitations
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Appendix IV	Photographs
Appendix V	Engineering Logs
Appendix VI	Chemical Testing Results
Appendix VII	Ground Gas and Groundwater Monitoring Results





1.0 INTRODUCTION

1.1 Background

Environmental Planning Solution (EPS) Ltd has been commissioned by ET Planning on behalf of Surrey Heath Borough Council (“the Client”) to undertake a Phase I and II Geo-Environmental Assessment at the site known as Swift Lane, Bagshot, Surrey GU19 5NJ. A Site Location Plan is presented in Appendix I, Figure 1.

1.2 Proposed Development

EPS understands that the Client is in the process of determining the feasibility of providing additional allocation for Gypsy, Traveller and Travelling Showpeople at the site. The provisional proposed development plan provided (ref. 2022-52-501, dated 02/11/2022) five additional pitches. Each pitch is indicated to comprise a mobile home, a touring caravan, parking for 1-2 vehicles, waste recycling/storage, an amenity block comprising bath/shower room/ W.C and kitchen/amenity area. This drawing has been presented as drawing P1056-003 within Appendix I.

1.3 Objectives

This Phase I and II Geo-environmental Assessment Report has been commissioned in order to assist with determining the feasibility of developing the site from a contaminated land perspective.

This report has been compiled in accordance with Land Contamination Risk Management (LCRM) guidance produced by the Environment Agency dated October 2020 (updated April 2021).

1.4 Sources of Information

Background information was sought from the following sources:

- ▶ Surrey Heath Local Plan: Preferred Options (2019 – 2038) – Further Gypsy and Traveller and Travelling Showpeople Allocations Regulation 18, dated August 2022;
- ▶ Apple Environmental: Environmental Report – Intrusive Contaminated Land Investigation, ref CL/2244/SH and dated July 2017;
- ▶ Martin Peacock Architectural Services Ltd: Site Layout As Proposed (ref. 2022-52-501 and dated 2nd November 2022);
- ▶ Database Search (report reference: GS-8177802 and GS-8177803), dated 4th November 2022);
- ▶ Historical mapping dated 1870 to 2022. A selection of historical maps pertinent to this report are reproduced in Section 3.1;
- ▶ Online planning records held by the Client;
- ▶ Radon: Guidance on protective measures for new buildings (BRE Document BR 211, 2015)





and HPA Indicative Radon Atlas for England and Wales); and

- ▶ British Geological Survey Online GeoIndex tool; and
- ▶ Online bomb risk maps provided by Zetica (<https://zeticauxo.com/downloads-and-resources/risk-maps>)

1.5 Confidentiality

EPS has prepared this report solely for the use of the Client and those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from EPS. A charge may be levied against such approval.

1.6 Limitations

The full limitations of this report are presented in Appendix II.





2.0 SITE SETTING

2.1 Site Details

The site is located adjacent to the east of the existing gypsy / traveller site at Swift Lane, Bagshot. The site is c. 0.45ha in area and located at approximate National Grid Reference SU922631.

2.2 Current Site Use

A site walkover was undertaken by EPS on Monday 17th November 2022. A selection of site photographs is presented in Appendix IV.

At the time of the site walkover the site comprised a vacant area of land. The topography of the site was relatively level, however a raised vegetated bund was present along the northern boundary of the site. This prevented access to Windle Brook shown on mapping to run adjacent to the northern boundary..

The majority of the site was surfaced with Made Ground, however patches of asphalt hardstanding were noted within the south of the site. Light vegetation was present across much of the site, particularly within the north-east. Localised small scale fly tipping and evidence of burning was observed. Plastic ducting containing a loose electrical cable was observed within the east of the site with further loose electrical cables observed at surface elsewhere.

A wooden fence separated the site from the adjacent gypsy / traveller site, however within two areas the fence line extended onto site, with the areas beyond the fence inaccessible for inspection.

The land immediately to the east of the site also comprises vacant land with light vegetation, with the eastern boundary not clearly marked.

The southern boundary of the site is marked by the presence of a drainage ditch. At the time of the site walkover the ditch was dry with evidence of fly tipping.

The south-western boundary of the site is marked by the presence of concrete blocks, separating the site from the vehicle maintenance and repair facility to the west.

Hazardous Materials Storage

Two partially intermediate bulk containers (IBC) were stored on top of the concrete blocks demarcating the western boundary of the site (see Photograph 6). Whilst the contents could not be identified, residues indicated the possibility of liquid waste associated with the vehicle maintenance facility.





2.3 Surrounding Area

Surrounding land uses are summarised overleaf in Table 2.1.

Table 2.1 Summary of Surrounding Land Uses

Direction	Land Use
North	Existing gypsy/traveller pitches (west) and Windle Brook with woodland beyond (east).
East	Open land.
South	Drainage ditch with open fields beyond.
West	Vehicle maintenance and repair facility (south) and existing gypsy/traveller pitches (north)





3.0 SITE HISTORY

3.1 On-Site Historical Development

A review of historical maps pertinent to the site are summarised below in Table 3.1 below. The site boundary is represented by the blue polygon.

Table 3.1 Summary of Historical Land Uses

Map Edition	Historical Land Use	Map Extract
1870 (Scale 1:2,500)	<p>The site is undeveloped.</p> <p>Windle Brook is shown running along the northern boundary of the site and a track is shown running along the southern and eastern boundaries of the site.</p> <p>The surrounding areas are open land and forestry.</p>	
1915 (Scale 1:2,500)	<p>The site remains undeveloped.</p> <p>A 'Scavenging Depot' is shown c. 50m west of the site.</p> <p>The remaining surrounding areas appear to be open land.</p>	
1978 – 1979 (Scale 1:2,500)	<p>The site appears to form part of a wider 'Refuse Tip'.</p> <p>A track (Swift Lane) is shown running along the southern and eastern boundaries of the site.</p> <p>The 'Scavenging Depot' to the west has expanded and is now labelled as a 'Depot'.</p>	





Map Edition	Historical Land Use	Map Extract
1992 (1:2,500)	<p>Mapping indicates that an elongated mound is present across the majority of the site and the area to the north-west.</p> <p>A 'Caravan Site' with a 'Household Waste Site' beyond are shown to the west of the site, broadly matching the current configuration.</p> <p>The 'Depot' to the south-west of the site is now labelled as a 'Works'.</p>	

3.2 Off-Site Historical Development

A review of potentially contaminative land uses identified on historical Ordnance Survey maps and within the environmental database within a 500m radius of the site are summarised below as Table 3.2.

Table 3.2 Summary of Potentially Contaminative Off-Site Historical Land Uses within 500m

Surrounding Feature	Distance (m)	Dates	Direction
Scavenging Depot <i>later</i> Depot <i>later</i> Works	Adjacent	1915 - Present	South-west
Nurseries	Adjacent	1982 - 1991	South
Household Waste Site	80	1985 - Present	West
Fire Station	475	1934 - 1961	West

3.3 Planning History

EPS has undertaken a review of online planning records held by the Surrey Heath Borough Council. No relevant records relating to contaminated land aspects were found.





4.0 ENVIRONMENTAL SETTING

4.1 Geology & Hydrogeology

The British Geological Survey (BGS) memoirs and geological maps with respect to the area indicates the site to be underlain by the following geological sequence:

Table 4.1 Summary of Geological and Hydrogeological Data

Geological Unit	Classification	Description	Aquifer Classification	Permeability	Vulnerability
Peat	Superficial	Peat	Unproductive	Low	N/A
Windlesham Formation	Bedrock	Sand	Secondary A	Medium	Medium

Geological records note that the site is underlain by superficial Peat overlying bedrock of Windlesham Formation.

The nearest historic BGS borehole (ref. SU96SW130) located c. 200m north-west of the site indicates the presence of 0.2m thickness of topsoil, overlying yellow and grey silty clay to a depth of 0.85mbgl, overlying pale green silty sand with stones to in excess of 1.15mbgl.

The nearest groundwater abstraction to the site is a historical abstraction for spray irrigation purposes located c. 1.4km south-west of the site. There are no records of potable groundwater abstractions within 2km of the site and the site is not located within a groundwater Source Protection Zone (SPZ).

The underlying groundwater body of the Chobham Bagshot Beds (Water Body ID: GB40602G601400) is indicated to have an overall rating of poor, a chemical rating of poor and a quantitative rating of good based on data from 2019.

4.2 Ground Stability

Geotechnical data presented within the environmental data search identifies the following risks on site.



**Table 4.3 Summary of Data Search Information**

Hazard	Designation	Comments
Shrink-Swell Clay	Very Low	Ground conditions have been categorised as very low risk based on the published geology of peat overlying sand of the Windlesham Formation.
Running Sand	Very Low	Running sand conditions are considered unlikely and this is not considered to pose a significant constraint to the development.
Compressible Deposits	High	The conditions have been categorised as high based on the published superficial peat geology.
Collapsible Deposits	Negligible	Deposits with potential to collapse when loaded and saturated are believed not to be present.
Landslides	Very Low	Slope instability problems are not likely to occur but consideration to potential problems of adjacent areas impacting on the site should always be considered.
Ground Dissolution	Negligible	Dissolution features are unlikely to be present.

A refuse heap and unspecified disused tip are recorded on site, indicating the presence of made ground.

The site is not indicated to be affected by underground workings or mining.

It should be noted that the above is qualitative and based on anticipated ground conditions only.

4.3 Mining and Ground Workings

Surface works are indicated to have occurred on site in relation to the use as a refuse heap and unspecified disused tip. Cuttings are also indicated to have occurred c. 220m south of the site, relating to the construction of the M3 motorway. No further records of surface or underground ground workings, natural cavities, or mining are indicated within area.

4.4 Hydrology

Windle Brook, part of the Hole/Mill Bourne Water Body (Water Body ID: GB106039017930), runs along the northern boundary of the site. It has an overall rating of moderate, a chemical rating of fail (due to concentrations of Polybrominated diphenyl ethers (PBDE)), and an ecological rating of moderate, based on data from 2019.

A drainage ditch runs along the southern boundary of the site.





4.5 Flooding

The majority of the site is designated as low risk of river and coastal flooding and is within flood zone 2. However, the far north of the site adjacent to Windle Brook is designated as medium and high and is in flood zone 3. The site is designated as having negligible risk of groundwater flooding.

There is a record of a flood event in September 1968 where the channel capacity was exceeded.

4.6 Radon Risk Potential

The UK radon website indicates the site is situated in an area it is estimated that less than 1% of properties exceed the Radon Action Level and therefore no radon protective measures are necessary.

4.7 Unexploded Ordnance

A review of freely available online unexploded ordnance (UXO) risk maps provided by Zetica indicate that the site is located within an area of low bomb risk.

4.8 Sensitive Land Uses

Residential properties (existing gypsy/traveller pitches) are located adjacent to the west of the site.

The site is located within Green Belt. Deciduous woodland designated as a Priority Habitat Inventory is indicated to the north and east of the site. The site is located within a SSSI Impact Risk Zone relating to Colony Bog and Bagshot Heath located c. 900m south-west of the site.

4.9 Site Sensitivity Assessment

The site is considered to be located within a **low-moderate** sensitivity setting for the following reasons:

- ▶ A secondary A aquifer is contained within the underlying Windlesham Formation bedrock;
- ▶ No active groundwater abstractions are located in close proximity to the site and the site is not located within a groundwater SPZ;
- ▶ Windlesham Brook is located adjacent to the north of the site;
- ▶ Residential properties are located adjacent to the site;
- ▶ Deciduous woodland designated as a Priority Habitat Inventory is indicated to the north and east of the site; and
- ▶ The site is located in Green Belt.





5.0 CONSULTATIONS

5.1 Landfill Sites and Waste Treatment Sites

Records indicate that a historic landfill relating to 'Commercial Environmental Permitting Regulations' was first recorded on site in 1925. Historical mapping indicates that the site was used as a refuse tip from c. 1969 to c. 1985.

A Household, Commercial & Industrial Waste Station site, first licensed in 1992, is present c. 80m to the west of the site.

5.2 Regulatory Database

The following information has been obtained from a commercially available environmental database. The summary table below includes records not otherwise detailed in this report.

Table 5.1 Summary of Data

Activity	Distance from site (m)		Details
	0-249	250-500	
Licensed Discharges to Controlled Waters	1	1	Site drainage from Swift Lane Household Waste Recycling Centre discharges into Windle Brook c. 90m west of the site. Process effluent from M3 Junction 2 – 4A site compound was discharged into a tributary of Windle Brook c. 420m north-east of the site between 2016 and 2021.
Pollution Incidents	3	6	The closest, c.10m east of the site in 2006, included significant impact to water. All other incidents included no impact or minor impact to water and land.





6.0 CONCEPTUAL SITE MODEL (CSM)

6.1 Initial CSM

In accordance with Environment Agency, LCRM Published 8th October 2020 (updated April 2021) and BSI 10175 (Code of Practice for Investigation of Potentially Contaminated Land), EPS has developed an initial CSM to identify potential contamination sources, migration pathways and receptors within the study area.

6.2 Contaminant Sources

Based on the information presented in the above sections, the following on and off-site sources of potential contamination have been identified.

On site

Potential sources of contamination identified on site include:

- ▶ **Historic Landfilling** – first recorded in 1925 and historical mapping indicates use of site as refuse tip from c. 1969 to c. 1985; and
- ▶ **Historic use as Nursery** – given that no historic structures are indicated on historic maps it is considered unlikely that any bulk storage of herbicides and pesticides has taken place on site and as such this is not considered to be an active source.

Off site

- ▶ **Depot then works now vehicle maintenance and repair facility** – adjacent west;
- ▶ **Household Waste Site** – c. 80m west. Given the nature of the waste and the anticipated controls this is not considered to be a credible source which may affect the site;
- ▶ **Refrigerator servicing and repair** – c. 50m west. Given the assumed control measures and lack of bulk storage, and the distance from the site this is not considered to be a credible source which may affect the site;
- ▶ **Pollution incident** with significant impact to water c. 10m east of the site in 2006. Given the level of impact and time passed since the incident this is not considered to be a credible source and as such has not been included within the CSM;
- ▶ **Historic Fire Station** – 475m west. Given the distance from the site the pathway is not considered to be active; and
- ▶ **Historic Nurseries** – adjacent south. Given that no historic structures are indicated on historic maps it is considered unlikely that any bulk storage of herbicides and pesticides has taken place as such this is not considered to be an active source.





6.3 Potential Pathways

Receptors may be potentially at risk from the identified potential sources of contamination via the following pathways:

- ▶ Migration of mobile contaminants on or off site via services, sewers and manmade conduits;
- ▶ Direct contact, ingestion and inhalation of contaminants on site;
- ▶ Migration of mobile contaminants into groundwater / transport into surface waters; and
- ▶ Migration of hazardous gases through permeable soils.

6.4 Potential Receptors

Human Receptors

- ▶ **Future site users** (residents); and
- ▶ **Residents of the adjacent existing gypsy/traveller site.**

Construction workers are not considered to be a plausible receptor as exposure will be managed through the use of appropriate PPE and hygienic working practices, as required under HSE/ CDM regulations. Furthermore, potential exposure to possible contaminants is not expected to be over prolonged work duration thereby limiting any impact to ground workers.

Controlled Waters

- ▶ **Secondary A aquifer** contained within the underlying Windlesham Formation bedrock; and
- ▶ **Windle Brook** adjacent to the northern boundary of the site.

6.5 Risk Assessment

CIRIA 552: Contaminated Land Risk Assessment 'A Guide to Good Practice' provides guidance on risk assessment taking into account factors such as severity of the potential harm that may arise from a successful pollutant linkage, potential magnitude of the hazard, and the sensitivity of the target receptor. Risk assessment is initially assessed by determining the severity of the potential hazard, which takes into account receptor sensitivity and the magnitude of the potential impact as detailed in Tables 6.1 and 6.2 below.





6.5.1 Severity

Table 6.1 Receptor Sensitivity

Category	Human sensitivity	Environmental sensitivity
Very Low	Ground workers	Non-sensitive water course
Low	Commercial / Industrial	Secondary Aquifer
Medium	Residential without plant uptake	Principal Aquifer / Sensitive Watercourse
High	Residential with plant uptake	Groundwater Source Protection Zone

Table 6.2 Magnitude of Impact

Category	Example
No Impact	No identified or potential pollutants present
Slight Impact	Minor leaks and spills from fuel infrastructure, inert landfills / Made Ground
Moderate Impact	Major leaks and spills from fuel infrastructure
Gross Impact	Heavily contaminated industrial sites, hazardous landfills

Severity is subsequently assessed considering the potential receptor and magnitude of impact as outlined within Table 6.3 below.

Table 6.3 Determination of Level of Severity for Potential Hazards

	Receptor Sensitivity			
	Very Low	Low	Medium	High
No Impact	Minor	Minor	Minor	Minor
Slight Impact	Minor	Minor	Minor	Mild
Moderate Impact	Minor	Minor	Mild	Medium
Gross Impact	Minor	Mild	Medium	Severe

6.5.2 Likelihood

The likelihood of an event is assessed while considering the potential for presence of a contaminant, presence of receptor, and the substantiality of the pollutant pathway. Likelihood is broken down into four separate categories within the CSM as shown in Table 6.4 below:

Table 6.4 Definitions of Likelihood Categories

Category	Definition
Unlikely	Pollutant linkage may be present, but the circumstances under which harm would occur are improbable.
Low Likelihood	Pollutant linkage may be present, and there is a possibility of the risk occurring, although there is no certainty that it will do so.
Likely	Pollutant linkage may be present, and it is probable that the risk will occur over the long term.
High Likelihood	Pollutant linkage may be present, and risk is almost certain to occur in long term, or there is evidence of harm to the receptor.





6.5.3 Risk Rating

Table 6.5 demonstrates the methodology used to provide an overall risk rating within the preliminary CSM with respect to any potential sources of contamination that may affect the site. An overall risk rating is assigned to each potential contaminant considering the assessed likelihood and severity as determined using the methodologies within Tables 6.1 to 6.4:

Table 6.5 Level of Risk Rating for Hazard Definition

Likelihood	Severity			
	Minor	Mild	Medium	Severe
Unlikely	Very Low	Very Low	Low	Low / Moderate
Low Likelihood	Very Low	Low	Low / Moderate	Moderate
Likely	Low	Low / Moderate	Moderate	High
High Likelihood	Low / Moderate	Moderate	High	Very High

6.6 Conceptual Site Model

A site specific CSM has therefore been created using the above information and is provided on the following page.





Table 6.6 Conceptual Site Model

Source	Contaminant	Potential migration pathway	Potential Receptors	Likelihood of Occurrence	Severity	Overall Risk Rating	Active / Inactive
On-Site							
Made Ground present as a result of historic landfilling	Asbestos; Heavy Metals & Metalloids; Total Petroleum Hydrocarbons (TPHs); and Polycyclic Aromatic Hydrocarbons (PAHs)	Ingestion of soils Dermal contact with soils Build up and inhalation of vapours	Future site users Adjacent residents	Low	Minor	Very low	Potentially Active – It is recommended that investigation is undertaken to assess the risk.
		Vertical and Lateral Migration	Secondary A Aquifer	Low	Minor	Very Low	Potentially Active – It is recommended that investigation is undertaken to assess the risk.
			Windle Brook	Low	Minor	Very Low	Potentially Active – It is recommended that investigation is undertaken to assess the risk.
	Ground gas generation (CH ₄ and CO ₂) should a significant thickness of Made Ground be present	Build up and inhalation of ground gases	Future Site Users	Likely	Minor	Low	Potentially Active – It is recommended that ground gas monitoring is undertaken to assess the risk.



Source	Contaminant	Potential migration pathway	Potential Receptors	Likelihood of Occurrence	Severity	Overall Risk Rating	Active / Inactive
Off-Site							
Depot then Works then Vehicle Maintenance and Repair Facility	Metals TPH PAH	Lateral Migration within Groundwater	Future site users	Low	Mild	Low / Moderate	Potentially Active – It is recommended that investigation is undertaken to assess the risk.
Vehicle repair, testing and servicing	Metals TPH PAH	Lateral Migration within Groundwater	Future site users	Low	Minor	Very low	Potentially Active – It is recommended that investigation is undertaken to assess the risk.



EPS has utilised the available data to classify the site on the basis of its likely contaminated land liability in relation to the property development. The risk classification definitions are summarised below:

Table 6.7 Risk Classification

Risk	Definition
Very Low	Low likelihood that harm could arise to a receptor. Such harm is unlikely to be any worse than mild.
Low	There are unlikely to be significant contaminated land liabilities associated with the property. Such harm, at worst, would normally be relatively mild. Some limited site investigation maybe required.
Low-Moderate	There are unlikely to be significant contaminated land liabilities associated with the property with regard to the proposed use. However, issues may require further consideration via site investigation in the event of a future redevelopment of the site etc. Remediation works (if required) are likely to be limited in extent.
Moderate	Some potential contaminated land liabilities are likely to affect the property as a result of historical and/or current activities. The risks identified are unlikely to pose an immediate significant issue but the purchaser/developer may wish to make further enquiries of the vendor or undertake further environmental improvements. Redevelopment of the site will likely require further site investigation. Some remedial works maybe required in the long term.
High	Significant potential contaminated land liabilities have been identified at the property. Further assessment including intrusive ground investigation will be required to determine to level of risk and associated liability. Remediation works may be required in the short-term, but likely required in the long term.
Very High	Severe harm to a receptor may already be occurring, or a high likelihood severe harm will arise to a receptor, unless immediate remedial works / mitigation measures are undertaken. The risk if realised is likely to result in substantial liability. Urgent investigation required.

Overall Environmental Risk Assessment

Overall, the preliminary risk classification of the site in relation to the proposed redevelopment is considered to be **very low to moderate**. As such, some limited site investigation work is recommended.





7.0 SITE INVESTIGATION

7.1 Summary of Fieldwork

Ground investigation works were completed on 14th November 2022 and comprised the following scope:

Table 7.1 Summary of Fieldwork

Hole Location	Rationale	Maximum Depth (mbgl)	Monitoring Well Response Zone (mbgl)
WS101	To obtain information on shallow ground conditions, obtain samples for subsequent chemical laboratory analysis, and to install a ground gas and groundwater monitoring well.	3.80	1.00 – 3.00
WS103	To obtain information on shallow ground conditions and obtain samples for subsequent chemical laboratory analysis.	4.00	-
WS104	To obtain information on shallow ground conditions, obtain samples for subsequent chemical laboratory analysis, and to install a ground gas and groundwater monitoring well.	4.00	1.00 – 2.00
WS106	To target potential contamination from the adjacent site, obtain information on shallow ground conditions, obtain samples for subsequent chemical laboratory analysis, and to install a ground gas and groundwater monitoring well.	5.00	1.00 – 3.00

Notes: m bgl – metres below ground level. WS – Window Sample

All samples were collected using appropriate PPE and sampling equipment that was cleaned at each sampling location. A detailed copy of sampling methodology, QA procedures and laboratory chain of custody forms can be provided upon request.

7.2 Site Investigation Standards

All exploratory works, associated sampling, in-situ testing and logging were carried out broadly in accordance with techniques outlined in BS5930:2015 (BS5930: 'Code of Practice for Site Investigation', 2015), BS EN ISO 14688-1, Identification of soil, BS EN ISO 14688-2 classification of soil, BS EN ISO 22475, Sampling methods and groundwater measurements and BS EN ISO 22476 – Field Testing, as appropriate, at positions as near as practicable to those supplied by the client.





8.0 LABORATORY ANALYSIS

8.1 Chemical Laboratory Analysis

Chemical laboratory testing was carried out by Chemtest part of the Eurofins Group who are a UKAS and MCERTS accredited laboratory.

A total of six soil samples were scheduled for the following analyses:

- ▶ Asbestos screen / identification;
- ▶ Heavy metals;
- ▶ Cyanide (total);
- ▶ Organic matter;
- ▶ Total Organic Carbon;
- ▶ TPH Criteria Working Group (CWG);
- ▶ BTEX and MTBE;
- ▶ Speciated PAH; and
- ▶ Phenols.

Three groundwater samples were also scheduled for the following analysis:

- ▶ pH;
- ▶ Heavy metals;
- ▶ Cyanide;
- ▶ Total hardness;
- ▶ TPH Criteria Working Group (CWG);
- ▶ BTEX and MTBE;
- ▶ Speciated PAH; and
- ▶ Phenols.

Chemical test certificates are presented in Appendix VI and the results are discussed in Section 10.





9.0 GROUND AND GROUNDWATER CONDITIONS

9.1 Ground Conditions Encountered

The following ground conditions were encountered:

9.1.1 Made Ground

Made Ground was encountered within all exploratory hole locations and varied between 1.80m and 2.60m in thickness. The soils were highly variable, containing both predominantly fine-grained and predominantly coarse-grained soils with varying quantities of secondary constituents. Gravels comprised flint, brick, timber, glass, ceramic, charcoal, plastic, concrete, and combustion products.

A layer of peat with a hydrocarbon odour was present between 0.30m and 0.60m within WS104. A hydrocarbon odour was also noted within the underlying Made Ground gravel layer. Combustion products were also noted within Made Ground within WS106.

No further visual or olfactory evidence of contamination was recorded within Made Ground soils.

9.1.2 Windlesham Formation

Given the absence of natural superficial peat underlying the Made Ground soils, the underlying natural soils have been interpreted as bedrock of the Windlesham Formation, indicated by geological maps to underlie the site.

The Windlesham Formation was highly variable comprising both predominantly fine-grained and predominantly coarse-grained soils with varying quantities of secondary components. Predominantly fine-grained soils were encountered directly underlying the Made Ground within the south (WS104) and west (WS106) of the site with consistency varying between soft and firm, with firm to very stiff CLAY also encountered at the base of the holes within these locations.

Stiff to very stiff light grey slightly sandy slightly gravelly CLAY was encountered at the base of WS104 and

Exploratory hole logs are included in Appendix V.





9.2 Groundwater

Groundwater details are presented in Table 9.1 below:

Table 9.1 Summary of Groundwater Strikes

Location	Depth to Water Strike (mbgl)	Stratum	In flow Rate
WS101	0.60	Made Ground	Slow - seepage
WS104	1.20	Made Ground	Fast - strike
WS106	2.00	Windlesham Formation	Strike

Groundwater levels recorded during return monitoring visits varied between 0.74m and 1.88m bgl. The results of the groundwater level monitoring are presented within Appendix VII.

9.3 In-situ Testing

In-situ Standard Penetration Testing (SPT) was undertaken at regular intervals within natural strata. The results of the in-situ testing are presented on the exploratory hole logs included within Appendix V.

9.4 Land Gas and Groundwater Monitoring

Two initial return monitoring visits were carried out on 22nd and 29th November 2022. During each visit gas flow and gas concentrations of methane, carbon dioxide, oxygen, carbon monoxide and hydrogen sulphide was recorded using an infrared gas analyser. Depth to groundwater and base of borehole were recorded using a water level dip meter. The results of the ground gas and groundwater monitoring are presented in Appendix VII.

During the first round of monitoring carried out on 22nd November 2022, each monitoring standpipe was purged by three well volumes and a groundwater sample was collected using a disposable bailer.





10.0 TIER II GENERIC QUANTITATIVE CONTAMINATED LAND RISK ASSESSMENT

10.1 Human Health

The long term (chronic) toxicity risk to human health is assessed by utilising appropriate and conservative generic assessment criteria (GAC) to determine whether potentially unacceptable risks may be present.

To undertake the Tier II assessment within the context of the development proposal, EPS has determined that the most appropriate GAC values available will be those based upon a residential end use with plant uptake.

Soil Organic Matter varied between 2.3% and 54% with an average of 15.9%. In order to provide a conservative assessment, GAC based on 2.5% soil organic matter have been utilised where applicable.

The following assessment, summarised in Table 10.1, has primarily adopted the S4UL (Suitable for Use Levels) reference values published by LQM/CIIEH in 2015, however for determinants where no S4UL GAC is available, generally either GAC published by EIC/AGS/CL:AIRE or Atkins ATRISK^{soil} soil screening value (SSV) has been used. Due to the absence of a published lead GAC for direct use within the planning regime, the 2014 Defra C4SL (Category 4 Screening Level) has been used as this value is considered to incorporate the latest toxicological, bio-accessibility and exposure modelling research to date.

Table 10.1 Summary of Generic Human Health Toxicity Assessment for Residential End Use (with plant uptake)

Determinand	Units	GAC	GAC Source	No.	[mc]	Location / Stratum	Primary Pathways	Assessment
Inorganics								
Antimony	mg/kg	550	(ii)	6	3.3	N/A	1, 2, 3	No Further Action
Arsenic	mg/kg	40	(i)	6	70	MG in WS103	1	See discussion
Barium	mg/kg	1,300	(ii)	6	150	N/A	1, 2	No further action
Cadmium	mg/kg	85	(i)	6	0.46		1, 2	
Chromium	mg/kg	910	(i)	6	60		1, 2, 3	
Chromium (VI)	mg/kg	6	(i)	6	<0.50		1, 2, 3	
Copper	mg/kg	7,100	(i)	6	110		1, 2	
Lead	mg/kg	310	(iv)	6	170		1, 2	
Mercury [Inorganic]	mg/kg	56	(i)	6	0.52		1, 2	
Nickel	mg/kg	180	(i)	6	52		1	
Selenium	mg/kg	430	(i)	6	0.61		1, 2	
Vanadium	mg/kg	1,200	(i)	6	30		1, 2	
Zinc	mg/kg	40,000	(i)	6	340		1, 2	
Cyanide (Total)	mg/kg	34	(iii)	6	6.1		1	
Asbestos	-	D.	-	6	N.D		3	



Organics – PAHs and Phenol								
Phenols	mg/kg	690	(i)	6	<0.10	N/A	2	No Further Action
Acenaphthene	mg/kg	4,700	(i)	6	0.31		2	
Acenaphthylene	mg/kg	4,600	(i)	6	0.31		2	
Anthracene	mg/kg	35,000	(i)	6	0.84		2	
Benzo(a) Anthracene	mg/kg	14	(i)	6	2.40		1	
Benzo(a)Pyrene	mg/kg	3.20	(i)	6	3.8	MG within WS103, WS104 and WS106.	1	See discussion
Benzo(b) Fluoranthene	mg/kg	4.0	(i)	6	1.4	N/A	1	No Further Action
Benzo(ghi) Perylene	mg/kg	360	(i)	6	3.2		1	
Benzo(k) Fluoranthene	mg/kg	110	(i)	6	1.4		1	
Chrysene	mg/kg	31	(i)	6	2.3		1	
Dibenzo(a,h) Anthracene	mg/kg	0.32	(i)	6	<0.10		1	
Fluoranthene	mg/kg	1,600	(i)	6	5.1		1, 2	
Fluorene	mg/kg	3,800	(i)	6	0.36		2	
Indeno (123-cd)Pyrene	mg/kg	46	(i)	6	2.9		1	
Naphthalene	mg/kg	2.3	(i)	6	1.3		4	
Phenanthrene	mg/kg	1,500	(i)	6	2.0		2	
Pyrene	mg/kg	3,800	(i)	6	5.0	1, 2		
BTEX								
Benzene	ug/kg	700	(i)	6	<1.0	N/A	1	No Further Action
Toluene	ug/kg	1,900,000	(i)	6	<1.0		1	
EthylBenzene	ug/kg	190,000	(i)	6	<1.0		1	
M-Xylene	ug/kg	190,000	(i)	6	<1.0		1	
P-Xylene	ug/kg	180,000	(i)	6	<1.0		1	
O-Xylene	ug/kg	210,000	(i)	6	<1.0		1	
Methyl tert-Butyl Ether	ug/kg	120,000	(ii)	6	<1.0		1	
TPH								
Aliphatic C5-C6	mg/kg	78	(i)	6	<1.0	N/A	4	No Further Action
Aliphatic C6-C8	mg/kg	230	(i)	6	<1.0		4	
Aliphatic C8-C10	mg/kg	65	(i)	6	<1.0		4	
Aliphatic C10-C12	mg/kg	330	(i)	6	19		4	
Aliphatic C12-C16	mg/kg	2,400	(i)	6	290		1,4	
Aliphatic C16-C35	mg/kg	9,200	(i)	6	1,430		1	
Aliphatic C35-C44	mg/kg	92,000	(i)	6	<1.0		1	
Aromatic C5-C7	mg/kg	690	(i)	6	<1.0		4	
Aromatic C7-C8	mg/kg	1,800	(i)	6	<1.0		4	
Aromatic C8-C10	mg/kg	110	(i)	6	<1.0		4	
Aromatic C10-C12	mg/kg	590	(i)	6	22		4	
Aromatic C12-C16	mg/kg	2,300	(i)	6	310		1,4	
Aromatic C16-C21	mg/kg	1,900	(i)	6	67		1	
Aromatic C21-C35	mg/kg	1,900	(i)	6	1,100		1	
Aromatic C35-C44	mg/kg	1,900	(i)	6	15		1	

**Key**

MG	Made Ground
[mc]	Maximum Concentration Recorded
D.	Detected
N.D.	None Detected (Limit of Detection = <0.0001%)

Primary Pathways

- 1 Ingestion of soil and indoor dust and / or oral background exposure;
- 2 Consumption of home-grown produce and attached soil;
- 3 Inhalation of dust (background and indoor);
- 4 Inhalation of vapour (background and indoor).

Generic Assessment Criteria (GAC) Source

- (i) LQM/CIEH Suitable For Use Level (S4UL) (2015);
- (ii) EIC/AGS/CL:AIRE;
- (iii) Atkins ATRISK^{soil} soil screening value (SSV);
- (iv) Defra Category 4 Screening Level (2014);

The following exceedances to the relevant GAC have been identified:

- ▶ **Arsenic** – within a sample of Made Ground collected from WS103 at 0.30 – 0.50m bgl; and
- ▶ **Benzo(a)Pyrene** – within samples of Made Ground collected from WS103 at 0.30 – 0.50m bgl, from WS104 at 0.30 – 0.50m bgl, and from WS106 at 0.40 – 0.60mbgl.

Whilst exceedances have been identified in only two locations, given the limited number of sample locations and the inherent heterogenous nature of Made Ground soils, it is considered likely that further exceedances will be present within locations not yet investigated. As such, it is considered that the Made Ground soils across the site may pose a risk to human health.

The primary pathway for both arsenic and benzo(a)pyrene is via ingestion of soil and indoor dust and / or oral background exposure. Within areas of proposed hard standing, understood to occupy the vast majority of the site based on current proposals, the pathway will be effectively broken and no significant risk will be posed to future site users.

Should any vegetated borders be proposed, it is assumed that a nominal thickness of clean imported soil will be required to act as a suitable growing medium. This would also act as a barrier breaking the contamination pathway to future site users. It is also suggested that a no dig membrane is placed between any clean imported soil and underlying Made Ground to prevent accidental exposure in the event of unauthorised alterations. This is understood to be of increased likelihood given the proposed use of the site.

10.2 Controlled Waters

The results of groundwater analysis carried out on samples collected from WS101, WS104 and WS106 have been compared with freshwater Environmental Quality Standards (EQS), UK Drinking Water Standards (DWS) and the World Health Organization (WHO) DWS, as summarised within Table 10.2, overleaf:





Table 10.2 Groundwater Analysis Results and Comparison with Generic Assessment Values

Determinand	Units	Environmental Quality Standard	UK DWS	WHO DWS	WS101	WS104	WS106
Arsenic	µg/l	50	10	10	0.99	2.0	0.56
Boron	µg/l	2,000	1,000	1,000	1900	1400	270
Cadmium	µg/l	0.08	5	3	< 0.08	< 0.08	< 0.08
Chromium VI	µg/l	3.4	50	50	< 20	< 20	< 20
Chromium III	µg/l	4.7	50	50	< 0.50	< 0.50	< 0.50
Copper	µg/l	1	2,000	2000	1.3	1.7	< 0.50
Lead	µg/l	1.2	10	10	< 0.50	< 0.50	< 0.50
Mercury	µg/l	0.07	1	6	< 0.05	< 0.05	< 0.05
Nickel	µg/l	4	20	70	10	73	48
Vanadium	µg/l	20	-	-	0.79	< 0.50	< 0.50
Zinc	µg/l	10.9	-	-	< 2.5	150	9.1
Cyanide (Total)	µg/l	1	50	-	< 0.050	< 0.050	< 0.050
Phenol	µg/l	7.7	-	-	< 0.030	< 0.030	< 0.030
Anthracene	µg/l	0.1	-	0.05	< 0.10	< 0.10	0.74
Naphthalene	µg/l	2	-	-	< 0.10	< 0.10	< 0.10
Benzo(a)Pyrene	µg/l	0.27	0.010	0.7	< 0.10	< 0.10	< 0.10
Benzo[b]fluoranthene	µg/l	0.017	-	-	< 0.10	< 0.10	< 0.10
Benzo[k]fluoranthene	µg/l	0.017	-	-	< 0.10	< 0.10	< 0.10
Benzo(ghi)perylene	µg/l	0.0082	-	-	< 0.10	< 0.10	1.2
Fluoranthene	µg/l	0.0063	-	-	< 0.10	< 0.10	3.9
TPH Ali (C5-C6)	µg/l	-	-	1	< 0.10	< 0.10	< 0.10
TPH Ali (C6-C8)	µg/l	-	-	1	< 0.10	< 0.10	< 0.10
TPH Ali (C8-C10)	µg/l	-	-	300	< 0.10	< 0.10	< 0.10
TPH Ali (C10-C12)	µg/l	-	-	90	< 0.10	< 0.10	< 0.10
TPH Ali (C12-C16)	µg/l	-	-	90	< 0.10	< 0.10	< 0.10
TPH Ali (C16-C21)	µg/l	-	-	90	< 0.10	< 0.10	< 0.10
TPH Ali (C21-C35)	µg/l	-	-	90	< 0.10	< 0.10	< 0.10
TPH Aro (C5-C7)	µg/l	-	-	1	< 0.10	< 0.10	< 0.10
TPH Aro (C7-C8)	µg/l	-	-	1	< 0.10	< 0.10	< 0.10
TPH Aro (C8-C10)	µg/l	-	-	300	< 0.10	< 0.10	< 0.10
TPH Aro (C10-C12)	µg/l	-	-	90	< 0.10	< 0.10	< 0.10
TPH Aro (C12-C16)	µg/l	-	-	90	< 0.10	< 0.10	< 0.10
TPH Aro (C16-C21)	µg/l	-	-	90	< 0.10	< 0.10	< 0.10
TPH Aro (C21-C35)	µg/l	-	-	90	< 0.10	< 0.10	< 0.10

In cases where the concentration is below the limit of detection (LOD) however the LOD is greater than the screening criteria this has not been considered as an exceedance.

The results of this direct comparison indicates that the screening criteria have been exceeded for the following determinants:





- ▶ **Boron** – UK / WHO DWS exceeded for within all locations;
- ▶ **Copper** – EQS exceeded within WS101 and WS104;
- ▶ **Nickel** – EQS and UKDWS exceeded within all locations;
- ▶ **Zinc** – EQS exceeded within WS104;
- ▶ **Anthracene** – EQS and WHO DWS exceeded within WS106;
- ▶ **Benzo(ghi)perylene** – EQS exceeded within WS106; and
- ▶ **Fluoranthene** - EQS exceeded within WS106.

Whilst the UK/WHO DWS have been exceeded for boron, nickel and anthracene, given that the site is not located within a groundwater SPZ and that no drinking water abstractions are present within 2km of the site, this is not considered to pose a significant risk to drinking water.

The freshwater EQS have been exceeded for several metals and PAH, however these concentrations are considered to be largely representative of perched water within the Made Ground which is likely to be somewhat locally confined.

In the event that an active pathway to the nearby Hale/Mill Bourne (referred to as Windle Brook within this location) is present, it is considered that the concentrations of identified contaminants would be significantly diluted prior to and upon reaching the identified surface water receptor. As such, it is considered that concentrations of identified contaminants within the surface watercourse are not likely to be of significant concern, particularly given that the watercourse is indicated to have a chemical rating of fail. Additionally, it is not considered that the proposed development would introduce any additional pathways or cause any increase the risk.

10.3 Ground Gas

In accordance with BS8485:2015+A1:2019, the worst-case hazardous gas flow rates (Q_{hg}) of 0.0094l/h has been calculated by multiplying the maximum recorded stabilised flow (0.1l/h) in any standpipe in a stratum with the maximum peak gas concentration (9.4%) in any other standpipe in that stratum. This would indicate that the ground gas regime could be classified as Characteristic Situation 1 (CS1).

However, given that steady concentrations of carbon dioxide of greater than 5% have been consistently encountered within the two boreholes with unsaturated response zones it is considered that classification of Characteristic Situation 2 (CS2) with **low** hazard potential is more appropriate. This classification should be confirmed via undertaking of further gas monitoring prior to determining appropriate mitigation measures for the proposed development.

It is understood that the majority of proposed enclosed living spaces are likely to be raised above ground such that any ground gas emanating from the soils beneath (eg. touring caravans and mobile homes) would take the path of least resistance and naturally disperse laterally rather than migrate into the structures above. However, for any enclosed living spaces constructed directly onto the ground, the risk will need to be mitigated by the incorporation of suitable gas mitigation measures.





10.4 Developed Conceptual Site Model

EPS has utilised the above investigation findings to develop the site Conceptual Site Model (CSM) and identify unacceptable risks to receptors within the study area as detailed in Table 10.3 below:

Table 10.3 Developed Conceptual Site Model

Source	Containment	Receptors	Migration Pathway	Risk
Heavy metal and PAH contamination within Made Ground	On-site	Future Site Users	Ingestion of soils Dermal contact with soils	In areas of proposed hardstanding the pathway will be broken. Should any vegetated borders be proposed, it is assumed that a nominal thickness of clean imported soil will be required to act as a suitable growing medium and this would also act as a barrier preventing human health expose.
Ground gases	On-site	Future site users	Build up and inhalation of gases within enclosed living spaces	No risk is present where structures are raised allowing free dispersal of ground gas beneath. Where structures are constructed directly onto the ground gas mitigation measures will be required.
Heavy metal and PAH within perched water	On-site	Windle Brook	Lateral migration	The relatively low concentrations identified within perched water are likely to significantly reduce following dilution and as such are unlikely to pose a significant risk.
		Secondary Aquifer	Vertical and lateral migration	Given that the site is not located within a groundwater SPZ and that no drinking water abstractions are present within 2km of the site, this is not considered to pose a significant risk to drinking water.



11.0 CONCLUSIONS AND RECOMMENDATIONS

11.1 Conclusions

Based on the findings of this report, the following conclusions have been made:

- ▶ The proposed presence of hard standing across the majority of the site will break the pollutant pathway between identified soil contamination and future site users;
- ▶ Should any vegetated borders be proposed, it is assumed that a nominal thickness of clean imported soil will be required to act as a suitable growing medium and this would also act as a barrier preventing human health exposure;
- ▶ Basic gas mitigation measures will be required for any enclosed living spaces constructed directly onto the ground. However, where enclosed living spaces are raised above the ground allowing ground gases to freely disperse no significant risk will be present;
- ▶ It is not considered that a significant risk to drinking water is present given that the site is not located within a groundwater SPZ and there are no potable groundwater abstractions within influencing distance of the site; and
- ▶ Should a pathway be present for perched water underlying the site to reach the nearby Windle Brook it is considered likely that the following dilution with river water the concentrations would fall below the EQS.

11.1 Recommendations

Should the development be progressed beyond the feasibility stage it is recommended that:

- ▶ Further assessment is undertaken in order to confirm that Windle Brook is not significantly affected by contaminants identified within the perched water underlying the site. This could include sampling of river water upstream and downstream of the site;
- ▶ Further ground gas monitoring is undertaken in accordance with published guidance to expand the existing data set and confirm the initial ground gas assessment;
- ▶ Following the above, a remediation strategy and verification plan is prepared for approval by the regulators prior to commencement of development works; and
- ▶ The design of any proposed foundations or roadways should take into consideration the significant thickness of heterogenous Made Ground beneath the site and the potential for chemicals to be present within the ground which could adversely affect concrete structures installed within.

END OF REPORT





APPENDIX I

DRAWINGS





APPENDIX II – LIMITATIONS

1. This report and its findings should be considered in relation to the terms of reference and objectives agreed between EPS and the Client.
2. For the work, reliance has been placed on publicly available data obtained from the sources identified. The information is not necessarily exhaustive and further information relevant to the site may be available from other sources. When using the information, it has been assumed it is correct. No attempt has been made to verify the information.
3. This report has been produced in accordance with current UK policy and legislative requirements for land and groundwater contamination which are enforced by the local authority and the Environment Agency. Liabilities associated with land contamination are complex and requires advice from legal professionals.
4. During the site walkover reasonable effort has been made to obtain an overview of the site conditions. However, during the site walkover no attempt has been made to enter areas of the site that are unsafe or present a risk to health and safety, are locked, barricaded, overgrown, or the location of the area has not be made known or accessible.
5. Site sensitivity assessments have been made based on available information at the time of writing and are ultimately for the decision of the regulatory authorities.
6. The executive summary, conclusions and recommendations sections of the report provide an overview and guidance only and should not be specifically relied upon without considering the context of the report in full.
7. EPS cannot be held responsible for any use of the report or its contents for any purpose other than that for which it was prepared. The copyright in this report and other plans and documents prepared by EPS is owned by them and no such plans or documents may be reproduced, published or adapted without written consent. Complete copies of this may, however, be made and distributed by the client as is expected in dealing with matters related to its commission. Should the client pass copies of the report to other parties for information, the whole report should be copied, but no professional liability or warranties shall be extended to other parties by EPS in this connection without their explicit written agreement there to by EPS.
8. New information, revised practices or changes in legislation may necessitate the re-interpretation of the report, in whole or in part.





APPENDIX III – GLOSSARY

TERMS

AST	Above Ground Storage Tank
BGS	British Geological Survey
BSI	British Standards Institute
BTEX	Benzene, Toluene, Ethylbenzene, Xylenes
CIEH	Chartered Institute of Environmental Health
CIRIA	Construction Industry Research Association
CLEA	Contaminated Land Exposure Assessment
CSM	Conceptual Site Model
DNAPL	Dense Non-Aqueous Phase Liquid (chlorinated solvents, PCB)
DWS	Drinking Water Standard
EA	Environment Agency
EQS	Environmental Quality Standard
GAC	General Assessment Criteria
GL	Ground Level
GSV	Gas Screening Value
HCV	Health Criteria Value
ICSM	Initial Conceptual Site Model
LNAPL	Light Non-Aqueous Phase Liquid (petrol, diesel, kerosene)
ND	Not Detected
LMRL	Lower Method Reporting Limit
NR	Not Recorded
PAH	Poly Aromatic Hydrocarbon
PCB	Poly-Chlorinated Biphenyl
PID	Photo Ionisation Detector
QA	Quality Assurance
SGV	Soil Guideline Value
SPH	Separate Phase Hydrocarbon
Sp.TPH (CWG)	Total Petroleum Hydrocarbon (Criteria Working Group)
SPT	Standard Penetration Test
SVOC	Semi Volatile Organic Compound
UST	Underground Storage Tank
VCCs	Vibro Concrete Columns
VOC	Volatile Organic Compound
WTE	Water Table Elevation





APPENDIX IV

PHOTOGRAPHS





Photograph 1 – View towards western boundary of site.



Photograph 2 – Centre of site looking north.





Photograph 3 – Evidence of burning within north of site.



Photograph 4 – View south-west from north-east corner of site





Photograph 5 – Looking west (off-site) from south of site.



Photograph 6 – IBC containing unknown liquids stored on concrete blocks forming western boundary of site.





Photograph 7 – Window sample run between 1.2m and 2.0m bgl within WS106.



Photograph 8 – Window sample run between 2.0m and 3.0m bgl within WS106.





APPENDIX V

ENGINEERING LOGS





Excavation Method Drive-in Windowless Sampler	Dimensions	Ground Level (mOD) 51.36	Client Surrey Heath Borough Council	Job Number P1056
	Location (dGPS) Noth-east of site	Dates 14/11/2022	Engineer Tim Conibear	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.40-0.60	ES1		Slow. (1) at 0.60m.		(1.00)	Firm dark brown slightly sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is very angular to subrounded fine to coarse flint, brick, concrete, charcoal, plastic, glass, cermaic and metal. Cobbles are subangular brick and concrete. (MADE GROUND) ...at 0.60mbgl: seepage of perched water. Below recovered as slightly clayey sandy gravel with slight organic odour.		∇1	
				50.36	1.00 (0.50)	Soft to firm greyish brown to yellowish brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse flint. (MADE GROUND)			
				49.86	1.50 (1.10)	Dark grey clayey sandy GRAVEL with pockets of silty clay. Sand is fine to coarse. Gravel is very angular to subrounded flint, brick, glass, and charcoal. (MADE GROUND) ...between 2.00m and 2.20mbgl: pocket of brown fine to medium sand.			
2.80-3.00	ES2			48.76	2.60 (0.60)	Dark grey fine to medium silty SAND. (WINDLESHAM FORMATION)			
3.00-3.45	SPT(C) N=25		4,3/3,5,6,11						
				48.16	3.20 (0.60)	Medium dense greenish grey slightly gravelly fine to medium SAND. Gravel is subangular to subrounded fine to medium flint. (WINDLESHAM FORMATION)			
3.80-3.99	SPT(C) 25*/90 50/100		15,10/40,10	47.56	3.80	Complete at 3.80m			

Remarks HDPE standpipe (50mm internal diameter) installed to 3.00mbgl; plain pipe from ground level to 1.00mbgl and slotted pipe from 1.00m to 3.00mbgl. Hole collapsed to 3.00mbgl following completion of drilling. Hole terminated due to refusal at 3.80mbgl. Seepage of perched water at 0.60mbgl.	Scale (approx)	Logged By
	1:25	TC
	Figure No. P1056.WS101	



Site Swift Lane	Number WS103
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Excavation Method Drive-in Windowless Sampler	Dimensions	Ground Level (mOD) 51.28	Client Surrey Heath Borough Council	Job Number P1056
	Location North-east of site.	Dates 14/11/2022	Engineer Tim Conibear	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr	
0.30-0.50	ES1				(1.10)	Brown clayey SAND and GRAVEL with low cobble content. Sand is fine to coarse. Gravel is very angular to rounded fine to coarse flint, brick, timber, glass, plastic, ceramic and charcoal. Cobbles are subrounded brick and concrete. (MADE GROUND)				
1.30-1.50	ES2			50.18	1.10	Firm greenish grey slightly sandy slightly gravelly CLAY with rare glass cobble. Sand is fine to coarse. Gravel is very angular to subangular fine to coarse glass, flint, brick, ceramic and plastic. (MADE GROUND)				
				49.68	1.60	Dark brown silty sandy GRAVEL. Sand is fine to coarse. Gravel is very angular to subrounded fine to coarse glass, flint, brick, ceramic, timber and charcoal. (MADE GROUND)				
				49.28	2.00	No recovery.				
4.00-4.43	SPT(C) 37/280		11,13/13,13,11		(1.00)					
					48.28	3.00	Light greenish grey silty fine to medium SAND with frequent organic matter and organic odour. (WINDLESHAM FORMATION)			
					47.58	3.70	Light grey sandy GRAVEL with occasional organic matter. Gravel is angular to well rounded fine to coarse flint. (WINDLESHAM FORMATION)			
				47.28	4.00	Complete at 4.00m				

Remarks No groundwater encountered. Hole backfilled with arisings.	Scale (approx)	Logged By
	1:25	TC
	Figure No. P1056.WS103	



Excavation Method Drive-in Windowless Sampler	Dimensions	Ground Level (mOD) 50.98	Client Surrey Heath Borough Council	Job Number P1056
	Location Centre of site	Dates 14/11/2022	Engineer Tim Conibear	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.30-0.50	ES1			50.68	(0.30)	Dark grey slightly silty sandy GRAVEL with medium cobble content. Sand is fine to coarse. Gravel is very angular to subrounded fine to coarse flint, brick, glass, ceramic, metal, wood, plastic, and charcoal. Cobbles are subangular concrete and brick. (MADE GROUND)			
				50.38	(0.30)	Dark reddish brown slightly sandy slightly gravelly psuedofibrous compressible PEAT with hydrocarbon odour. Sand is fine to coarse. Gravel is very angular to subrounded fine to coarse flint, wood and glass. (MADE GROUND)			
1.00-3.45	SPT(C) N=30		12,16/11,9,6,4 Fast.(1) at 1.20m.		(1.10)	Dark grey slightly clayey slightly sandy GRAVEL with medium cobble content, pockets of clay and hydrocarbon odour. Sand is fine to coarse. Gravel is very angular to subrounded fine to coarse flint, wood, brick, glass, charcoal and concrete. Cobbles are subangular to subrounded brick. (MADE GROUND)		▽1	
				49.28	(0.30)	Reddish brown slightly silty SAND and GRAVEL. Sand is fine to medium. Gravel is very angular to rounded fine to coarse flint, brick and glass. (MADE GROUND)			
				48.98	(0.80)	Soft grey slightly sandy slightly gravelly slightly organic SILT with occasional relic rootlets. Sand is fine to medium. Gravel is subangular to subrounded fine to medium flint. (WINDLESHAM FORMATION) ...below 2.30mbgl: light greenish grey mottled brown and sandy.			
3.00-3.45	SPT(C) N=28		5,7/7,7,7,7	48.18	(0.40)	Medium dense light greenish grey slightly silty slightly gravelly fine to medium SAND. Gravel is subangular to subrounded fine to coarse flint. (WINDLESHAM FORMATION)			
				47.78	(0.70)	Grey silty sandy GRAVEL. Sand is fine to coarse. Gravel is angular to well rounded fine to coarse flint. (WINDLESHAM FORMATION)			
4.00-4.45	SPT(C) N=50		6,9/11,13,13,13	47.08 46.98	3.90 (0.10) 4.00	Stiff to very stiff light grey slightly sandy slightly gravelly silty CLAY. Sand is fine to medium. Gravel is subangular to rounded fine to coarse flint. (WINDLESHAM FORMATION) Complete at 4.00m			

Remarks Groundwater strike at 1.20mbgl. HDPE standpipe (50mm internal diameter) installed to 2.00mbg; plain pipe from ground level to 1.00mbgl and slotted pipe from 1.00m to 2.00mbgl. Finished with a flush fitting cover.	Scale (approx)	Logged By
	1:25	TC
	Figure No. P1056.WS104	



Excavation Method Drive-in Windowless Sampler	Dimensions	Ground Level (mOD) 51.00	Client Surrey Heath Borough Council	Job Number P1056
	Location South-west of site.	Dates 14/11/2022	Engineer Tim Conibear	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.40-0.60	ES1				(1.40)	Dark brown slightly clayey sandy GRAVEL with low cobble content. Sand is fine to coarse. Gravel is very angular to well rounded fine to coarse flint, concrete, brick, ceramic, plastic, charcoal and combustion products. Cobbles are subangular concrete and brick. (MADE GROUND)			
1.20-1.30	ES2			49.60	1.40	Soft greenish grey to dark grey slightly sandy slightly gravelly silty CLAY with frequent organic matter and relic rootlets, Sand is fine to medium. Gravel is very angular to subrounded fine to coarse flint, glass, and combustion products. (MADE GROUND)			
				49.20	1.80	Soft to firm greenish grey mottled brown slightly sandy slightly gavelly silty CLAY with occasional relic rootlets. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse flint. (WINDLESHAM FORMATION)			
				48.70	2.30	...at 2.00mbgl: cobble sized fragment of wood encountered. Possible tree root. Very sandy below.			
3.00-3.45	SPT(C) N=5	1,2/2,1,1,1			(1.50)	Loose greenish grey slightly silty fine to medium SAND with occasional organic matter. (WINDLESHAM FORMATION)			
4.00-4.45	SPT(C) N=11	1,2/3,3,3,2		47.20	3.80	Firm light grey CLAY with frequent partings of fine to medium sand. (WINDLESHAM FORMATION)			
				47.00	4.00	No recovery.			
					(1.00)				
5.00-5.45	SPT(C) N=22	4,4/5,6,5,6		46.00	5.00				

Remarks

Groundwater strike at 2.00mbgl.
HDPE standpipe (50mm internal diameter) installed to 3.00mbgl; plain pipe from ground level to 1.00mbgl and slotted pipe from 1.00m to 3.00mbgl.

Scale (approx)	Logged By
1:25	TC

Figure No. P1056.WS106



APPENDIX VI

CHEMICAL TESTING RESULTS





Final Report

Report No.: 22-44321-1
Initial Date of Issue: 15-Dec-2022
Client: Environmental Planning Solutions (eps)
Client Address: 39 East Drive
Garshalton
SM5 4PA
Contact(s): Stuart Phillips
Tim Conibear
Project: EPS Project Number (P1056)
Quotation No.: Q22-27382 **Date Received:** 18-Nov-2022
Order No.: P1056-05-EC-SwiftLane **Date Instructed:** 18-Nov-2022
No. of Samples: 6
Turnaround (Wkdays): 10 **Results Due:** 01-Dec-2022
Date Approved: 15-Dec-2022

Approved By:

Details: Stuart Henderson, Technical
Manager

Results - Soil

Project: EPS Project Number (P1056)

Client: Environmental Planning Solutions (eps)		Chemtest Job No.:		22-44321	22-44321	22-44321	22-44321	22-44321	22-44321	
Quotation No.: Q22-27382		Chemtest Sample ID.:		1548229	1548230	1548231	1548232	1548233	1548234	
		Client Sample ID.:		ES1	ES2	ES1	ES2	ES1	ES1	
		Sample Location:		WS101	WS101	WS103	WS103	WS104	WS106	
		Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	
		Top Depth (m):		0.40	2.80	0.30	1.30	0.30	0.40	
		Bottom Depth (m):		0.60	3.00	0.50	1.50	0.50	0.60	
		Date Sampled:		14-Nov-2022	14-Nov-2022	14-Nov-2022	14-Nov-2022	14-Nov-2022	14-Nov-2022	
		Asbestos Lab:		DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	
Determinand	Accred.	SOP	Units	LOD						
ACM Type	U	2192		N/A	-	-	-	-	-	
Asbestos Identification	U	2192		N/A	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	
Moisture	N	2030	%	0.020	18	21	16	20	49	18
Boron (Hot Water Soluble)	U	2120	mg/kg	0.40	2.8	4.1	2.2	4.6	3.9	1.6
Cyanide (Total)	U	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	6.1
Arsenic	U	2455	mg/kg	0.5	13	6.2	70	15	4.8	11
Barium	U	2455	mg/kg	0	150	38	130	96	42	100
Beryllium	U	2455	mg/kg	0.5	0.6	< 0.5	0.7	0.5	< 0.5	< 0.5
Cadmium	U	2455	mg/kg	0.10	0.46	< 0.10	0.24	0.41	0.11	0.36
Chromium	U	2455	mg/kg	0.5	19	12	60	20	9.5	20
Antimony	N	2455	mg/kg	2.0	3.3	< 2.0	2.8	2.4	2.2	4.0
Copper	U	2455	mg/kg	0.50	50	9.0	110	42	15	80
Mercury	U	2455	mg/kg	0.05	0.52	0.12	0.24	0.17	0.06	0.15
Nickel	U	2455	mg/kg	0.50	16	4.3	15	12	52	14
Lead	U	2455	mg/kg	0.50	170	49	140	110	26	110
Selenium	U	2455	mg/kg	0.25	0.61	0.55	0.55	0.44	0.30	0.52
Vanadium	U	2455	mg/kg	0.5	29	19	30	28	12	22
Zinc	U	2455	mg/kg	0.50	340	29	160	210	52	220
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Organic Matter	U	2625	%	0.40	5.8	2.3	3.7	23	54	9.0
Total Organic Carbon	U	2625	%	0.20	3.4	1.4	2.2	14	32	5.2
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C8-C10	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C10-C12	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	19	< 1.0
Aliphatic TPH >C12-C16	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	290	< 1.0
Aliphatic TPH >C16-C21	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	790	< 1.0
Aliphatic TPH >C21-C35	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	640	120
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0	< 5.0	< 5.0	1700	120
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C8-C10	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C10-C12	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	22	< 1.0
Aromatic TPH >C12-C16	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	310	< 1.0

Results - Soil

Project: EPS Project Number (P1056)

Client: Environmental Planning Solutions (eps)		Chemtest Job No.:		22-44321	22-44321	22-44321	22-44321	22-44321	22-44321
Quotation No.: Q22-27382		Chemtest Sample ID.:		1548229	1548230	1548231	1548232	1548233	1548234
		Client Sample ID.:		ES1	ES2	ES1	ES2	ES1	ES1
		Sample Location:		WS101	WS101	WS103	WS103	WS104	WS106
		Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
		Top Depth (m):		0.40	2.80	0.30	1.30	0.30	0.40
		Bottom Depth (m):		0.60	3.00	0.50	1.50	0.50	0.60
		Date Sampled:		14-Nov-2022	14-Nov-2022	14-Nov-2022	14-Nov-2022	14-Nov-2022	14-Nov-2022
		Asbestos Lab:		DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM
Determinand	Accred.	SOP	Units	LOD					
Aromatic TPH >C16-C21	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	67	< 1.0
Aromatic TPH >C21-C35	N	2680	mg/kg	1.0	< 1.0	< 1.0	220	1100	1100
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	15
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0	220	1500	1200
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	< 10	< 10	220	3300	1300
Benzene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
m & p-Xylene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-Xylene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Methyl Tert-Butyl Ether	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Naphthalene	U	2800	mg/kg	0.10	1.3	1.1	0.87	0.64	0.59
Acenaphthylene	N	2800	mg/kg	0.10	0.23	< 0.10	0.23	< 0.10	0.30
Acenaphthene	U	2800	mg/kg	0.10	0.31	< 0.10	< 0.10	< 0.10	0.13
Fluorene	U	2800	mg/kg	0.10	0.36	< 0.10	< 0.10	< 0.10	0.22
Phenanthrene	U	2800	mg/kg	0.10	1.9	< 0.10	0.94	1.0	1.2
Anthracene	U	2800	mg/kg	0.10	0.35	< 0.10	0.34	0.28	0.84
Fluoranthene	U	2800	mg/kg	0.10	3.5	< 0.10	3.5	2.2	4.3
Pyrene	U	2800	mg/kg	0.10	3.1	< 0.10	3.1	1.8	5.0
Benzo[a]anthracene	U	2800	mg/kg	0.10	2.2	< 0.10	2.0	0.91	2.4
Chrysene	U	2800	mg/kg	0.10	1.8	< 0.10	1.8	0.86	1.8
Benzo[b]fluoranthene	U	2800	mg/kg	0.10	3.3	< 0.10	2.2	1.3	4.3
Benzo[k]fluoranthene	U	2800	mg/kg	0.10	1.0	< 0.10	1.4	0.34	1.3
Benzo[a]pyrene	U	2800	mg/kg	0.10	2.6	< 0.10	3.5	1.1	3.8
Indeno(1,2,3-c,d)Pyrene	U	2800	mg/kg	0.10	1.6	< 0.10	2.9	0.55	2.5
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene	U	2800	mg/kg	0.10	1.5	< 0.10	3.2	< 0.10	1.2
Total Of 16 PAH's	N	2800	mg/kg	2.0	25	< 2.0	26	11	30
Total Phenols	U	2920	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10

Test Methods

SOP	Title	Parameters included	Method summary
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Alkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2455	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2680	TPH A/A Split	Aliphatics: >C5-C6, >C6-C8,>C8-C10, >C10-C12, >C12-C16, >C16-C21, >C21-C35, >C35- C44Aromatics: >C5-C7, >C7-C8, >C8- C10, >C10-C12, >C12-C16, >C16- C21, >C21- C35, >C35- C44	Dichloromethane extraction / GCxGC FID detection
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.
2800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-MS	Acenaphthene*; Acenaphthylene; Anthracene*; Benzo[a]Anthracene*; Benzo[a]Pyrene*; Benzo[b]Fluoranthene*; Benzo[ghi]Perylene*; Benzo[k]Fluoranthene; Chrysene*; Dibenz[ah]Anthracene; Fluoranthene*; Fluorene*; Indeno[123cd]Pyrene*; Naphthalene*; Phenanthrene*; Pyrene*	Dichloromethane extraction / GC-MS
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.

Report Information

Key

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

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

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

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

All Asbestos testing is performed at the indicated laboratory

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

Sample Deviation Codes

A - Date of sampling not supplied

B - Sample age exceeds stability time (sampling to extraction)

C - Sample not received in appropriate containers

D - Broken Container

E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 30 days from the date of receipt

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

Charges may apply to extended sample storage

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

customerservices@chemtest.com

Results - Water

Project: EPS Project Number (P1056) Swift Lane

Client: Environmental Planning Solutions (eps)		Chemtest Job No.:		22-45293	22-45293	22-45293	
Quotation No.: Q22-29573		Chemtest Sample ID.:		1552209	1552210	1552211	
		Sample Location:		WS101	WS103	WS106	
		Sample Type:		WATER	WATER	WATER	
		Date Sampled:		22-Nov-2022	22-Nov-2022	22-Nov-2022	
Determinand	Accred.	SOP	Units	LOD			
pH	U	1010		N/A	7.1	7.0	7.0
Cyanide (Total)	U	1300	mg/l	0.050	< 0.050	< 0.050	< 0.050
Total Hardness as CaCO3	U	1270	mg/l	15	1700	930	510
Arsenic (Dissolved)	U	1455	µg/l	0.20	0.99	2.0	0.56
Boron (Dissolved)	U	1455	µg/l	10.0	1900	1400	270
Barium (Dissolved)	U	1455	µg/l	5.00	69	23	64
Beryllium (Dissolved)	U	1455	µg/l	1.00	< 1.0	< 1.0	< 1.0
Chromium (Dissolved)	U	1455	µg/l	0.50	< 0.50	< 0.50	< 0.50
Copper (Dissolved)	U	1455	µg/l	0.50	1.3	1.7	< 0.50
Mercury (Dissolved)	U	1455	µg/l	0.05	< 0.05	< 0.05	< 0.05
Nickel (Dissolved)	U	1455	µg/l	0.50	10	73	48
Lead (Dissolved)	U	1455	µg/l	0.50	< 0.50	< 0.50	< 0.50
Antimony (Dissolved)	U	1455	µg/l	0.50	2.6	5.8	< 0.50
Selenium (Dissolved)	U	1455	µg/l	0.50	2.5	1.8	0.89
Vanadium (Dissolved)	U	1455	µg/l	0.50	0.79	< 0.50	< 0.50
Zinc (Dissolved)	U	1455	µg/l	2.5	< 2.5	150	9.1
Cadmium (Dissolved)	N	1455	µg/l	0.08	< 0.08	< 0.08	< 0.08
Chromium (Hexavalent)	U	1490	µg/l	20	< 20	< 20	< 20
Aliphatic TPH >C5-C6	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C6-C8	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C8-C10	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C10-C12	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C12-C16	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C16-C21	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C21-C35	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C35-C44	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Total Aliphatic Hydrocarbons	N	1675	µg/l	5.0	< 5.0	< 5.0	< 5.0
Aromatic TPH >C5-C7	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aromatic TPH >C7-C8	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aromatic TPH >C8-C10	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aromatic TPH >C10-C12	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aromatic TPH >C12-C16	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aromatic TPH >C16-C21	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aromatic TPH >C21-C35	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aromatic TPH >C35-C44	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Total Aromatic Hydrocarbons	N	1675	µg/l	5.0	< 5.0	< 5.0	< 5.0
Total Petroleum Hydrocarbons	N	1675	µg/l	10	< 10	< 10	< 10
Benzene	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
Toluene	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0

Results - Water

Project: EPS Project Number (P1056) Swift Lane

Client: Environmental Planning Solutions (eps)		Chemtest Job No.:		22-45293	22-45293	22-45293
Quotation No.: Q22-29573		Chemtest Sample ID.:		1552209	1552210	1552211
		Sample Location:		WS101	WS103	WS106
		Sample Type:		WATER	WATER	WATER
		Date Sampled:		22-Nov-2022	22-Nov-2022	22-Nov-2022
Determinand	Accred.	SOP	Units	LOD		
m & p-Xylene	U	1760	µg/l	1.0	< 1.0	< 1.0
o-Xylene	U	1760	µg/l	1.0	< 1.0	< 1.0
Naphthalene	U	1800	µg/l	0.10	< 0.10	< 0.10
Acenaphthylene	U	1800	µg/l	0.10	< 0.10	< 0.10
Acenaphthene	U	1800	µg/l	0.10	< 0.10	< 0.10
Fluorene	U	1800	µg/l	0.10	< 0.10	< 0.10
Phenanthrene	U	1800	µg/l	0.10	< 0.10	1.8
Anthracene	U	1800	µg/l	0.10	< 0.10	0.74
Fluoranthene	U	1800	µg/l	0.10	< 0.10	3.9
Pyrene	U	1800	µg/l	0.10	< 0.10	3.9
Benzo[a]anthracene	U	1800	µg/l	0.10	< 0.10	0.61
Chrysene	U	1800	µg/l	0.10	< 0.10	0.52
Benzo[b]fluoranthene	U	1800	µg/l	0.10	< 0.10	< 0.10
Benzo[k]fluoranthene	U	1800	µg/l	0.10	< 0.10	< 0.10
Benzo[a]pyrene	U	1800	µg/l	0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene	U	1800	µg/l	0.10	< 0.10	< 0.10
Dibenz(a,h)Anthracene	U	1800	µg/l	0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene	U	1800	µg/l	0.10	< 0.10	1.2
Total Of 16 PAH's	U	1800	µg/l	2.0	< 2.0	13
Total Phenols	U	1920	mg/l	0.030	< 0.030	< 0.030

Test Methods

SOP	Title	Parameters included	Method summary
1010	pH Value of Waters	pH	pH Meter
1270	Total Hardness of Waters	Total hardness	Calculation applied to calcium and magnesium results, expressed as mg l-1 CaCO ₃ equivalent.
1300	Cyanides & Thiocyanate in Waters	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Continuous Flow Analysis.
1455	Metals in Waters by ICP-MS	Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc	Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS).
1490	Hexavalent Chromium in Waters	Chromium [VI]	Automated colorimetric analysis by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazine.
1675	TPH Aliphatic/Aromatic split in Waters by GC-FID(cf. Texas Method 1006 / TPH CWG)	Aliphatics: >C5-C6, >C6-C8, >C8-C10, >C10-C12, >C12-C16, >C16-C21, >C21-C35, >C35-C44 Aromatics: >C5-C7, >C7-C8, >C8-C10, >C10-C12, >C12-C16, >C16-C21, >C21-C35, >C35-C44	Pentane extraction / GCxGC FID detection
1760	Volatile Organic Compounds (VOCs) in Waters by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics. (cf. USEPA Method 8260)	Automated headspace gas chromatographic (GC) analysis of water samples with mass spectrometric (MS) detection of volatile organic compounds.
1800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Waters by GC-MS	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Pentane extraction / GCMS detection
1920	Phenols in Waters by HPLC	Phenolic compounds including: Phenol, Cresols, Xylenols, Trimethylphenols Note: Chlorophenols are excluded.	Determination by High Performance Liquid Chromatography (HPLC) using electrochemical detection.

Report Information

Key

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

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

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

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

All Asbestos testing is performed at the indicated laboratory

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

Sample Deviation Codes

A - Date of sampling not supplied

B - Sample age exceeds stability time (sampling to extraction)

C - Sample not received in appropriate containers

D - Broken Container

E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 30 days from the date of receipt

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

Charges may apply to extended sample storage

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

customerservices@chemtest.com



APPENDIX VII

GROUND GAS AND GROUNDWATER MONITORING RESULTS



Project no: P1056

Project: Swift Lane

Client: Surrey Heath Borough Council

Monitored by: Tim Conibear



Date	Time	Hole Location	Response zone (m)	Depth m		Relative Pressure (mbar)	Flow Rate (l/h)		Methane CH ₄ (% v/v)		Carbon dioxide CO ₂ (% v/v)		Oxygen % v/v (Low)	Carbon monoxide CO ppm (Peak)	Hydrogen sulphide H ₂ S ppm (Peak)	Comments
				Water	Base		Initial	Steady	Peak	Steady	Peak	Steady				
22/11/2022	10:45am	WS101	1.00 - 3.00	1.24	2.79	-	<0.1	<0.1	0.3	0.3	8.4	8.4	4.4	<1	<1	Silty at base.
22/11/2022	10:20am	WS104	1.00 - 2.00	1.78	2.08	-	<0.1	<0.1	0.2	0.2	7.7	7.7	0.3	<1	<1	
22/11/2022	11:10am	WS106	1.00 - 3.00	0.74	2.50	-	-9.0	-9.0	<0.1	<0.1	2.8	2.8	19.9	4	<1	Discount gas readings as response zone flooded.
29/11/2022	10:00am	WS101	1.00 - 3.00	1.57	2.86	-0.02	0.1	<0.1	0.1	0.1	9.4	9.4	0.8	<1	<1	
29/11/2022	10:20am	WS104	1.00 - 2.00	1.88	2.11	0.07	0.1	-0.1	<0.1	<0.1	7.1	7.1	2.2	<1	<1	
29/11/2022	10:35am	WS106	1.00 - 3.00	0.77	2.47	-1.12	-7.7	-7.2	<0.1	<0.1	2.9	2.9	20.3	4	<1	Discount gas readings as response zone flooded.