Providing Ground Solutions

GPF Lewis Solutions Limited

Land Fronting Stephenson Way (to the Rear of 222 Euston Road Adjacent to 210 Euston Road), London NW1 2DA

Geoenvironmental Interpretative Report

September, 2023

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EXECUTIVE SUMMARY

Card Geotechnics Limited (CGL) has been commissioned by GPF Lewis Solutions Limited to provide a Geoenvironmental Interpretative Report, following supplementary ground investigation, at the site known as Land Fronting Stephenson Way (to the rear of 222 Euston Road adjacent to 210 Euston Road) London, NW1 2DA. The site is in the London Borough of Camden. The proposed development comprises the construction of a student residence with seven above ground storeys, and a single storey basement level. It is understood that the building will cover the majority of the plot, with no soft landscaping currently proposed.

CGL undertook a supplementary ground investigation in July and August 2023 that comprised the drilling of four shallow window sample boreholes. The ground conditions encountered at the site comprised a slightly variable thickness of Made Ground (including a concrete slab) overlying the Lynch Hill Gravel Member which in turn overlies the Weathered London Clay Formation which was proven to a depth of 5.0m below ground level (mbgl).

Groundwater was encountered at 3.0mbgl in one location within the Lynch Hill Gravel Member, with shallow groundwater recorded between 2.33mbgl and 2.57mbgl (27.41mOD and 27.17mOD).

Chemical assessment of representative samples of the Made Ground and natural soils indicate that the soils present a low risk to human health with respect to a residential without home grown produce end use and no specific remediation, with respect to human health, has been recommended. Chemical assessment of shallow soil samples and representative groundwater samples indicates that contaminants within the shallow soils and shallow aquifer present a low risk to controlled waters receptors (Secondary A Aquifer in Lynch Hill Gravel and Principal Aquifer in Thanet Sand Formation and Chalk) and no specific remediation had been recommended.

Based on the limited thickness of Made Ground, the likely removal of majority of the Made Ground during basement excavation and the lack of organic material within the shallow natural soils a ground gas source is unlikely to be present on site and therefore the risk associated with ground gases is considered to be low. The risks to new plants/vegetation, if incorporated in the development, are considered to be low. The risks to new buried water supply pipes indicate that standard polyethylene (PE) pipes are appropriate for use for external water supply, however acceptance should be obtained from the local water supply company due to the brownfield status of the site. Recommendations are also included for materials management, watching brief and health and safety.

1. INTRODUCTION

Card Geotechnics Limited (CGL) has been commissioned by GPF Lewis Solutions Limited (the Client) to provide a Geoenvironmental Interpretative Report (GEIR) following a supplementary ground investigation at Land Fronting Stephenson Way (to the rear of 222 Euston Road adjacent to 210 Euston Road) London, NW1 2DA in London Borough of Camden.

The following reports have previously been produced for the site by CGL:

- CGL (2018) *24 to 32 Stephenson Way, NW1 2HD. Basement Impact Assessment Phase 1 – Screening and Scoping Report*. May 2018. Reference CG/28583[1];
- CGL (2019) *Land to the Rear of 222 Euston Road. Basement Impact Assessment (Revision 2).* April 2019. Reference: CG/28583[2].

The above reports have been used as supporting information in the preparation of this GEIR, and reference should be made to the reports for full details of the investigations and assessments completed for the site.

Additionally, CGL produced a Written Programme of Ground Investigation in July 2023[3] which set out the proposed supplementary ground investigation for submission to the Local Planning Authority.

The objective of this report is to evaluate potential human health and environmental risks and constraints associated with the proposed development and to support the planning permission for the site (reference: 2018/2316/P). The report presents the following:

- A brief summary of the site history, anticipated geology and historical ground investigation data, hydrogeological setting and preliminary risk assessment and site conceptual model;
- A summary of the ground and groundwater conditions encountered on site during the CGL 2023 supplementary ground investigation, and analysis and interpretation of chemical laboratory testing undertaken on representative soil and groundwater samples;

[1] CGL (2018) 24 to 32 Stephenson Way, NW1 2HD. Basement Impact Assessment Phase 1 – Screening and Scoping Report. May 2018. Reference CG/28583
[2] CGL (2019) Land to the Rear of 222 Euston Road. Basement Impact Assessment 9Revision 2). April 2019. Reference: CG/28583
[3] CGL (2023) Land fronting Stephenson Way (to the rear of 222 Euston Road adjacent to 210 Euston Road), London NW1 2DA – Written Programme of Ground Investigation. Reference CG/28583A

- A ground model and source-pathway-receptor risk assessment based on the findings of the intrusive investigation and results of chemical testing and assessment; and
- Recommendations regarding risks to the identified receptors including human health and controlled waters and waste disposal.

It is recommended that this report is submitted to the Local Authority in support of the discharge of Planning Condition 14 Part B of Permission reference: 2018/2316/P for the site. Condition 14 states:

"Prior to any development commencing:

(a) a written programme of ground investigation for the presence of soil and groundwater contamination and landfill gas shall be submitted to and approved by the local planning authority in writing; and

(b) following the approval detailed in paragraph (a) an investigation shall be carried out in accordance with the approved programme and the results and a scheme of remediation (if necessary) shall be submitted to and approved by the Local Planning Authority in writing.

The remediation measures shall be implemented strictly in accordance with the approved scheme and a verification report confirming remediation has been undertaken shall be submitted to and approved by the local planning authority in writing prior to occupation."

1.1 Limitations

The information contained within this report is based on published, unpublished and regulatory information, existing desk study information and ground investigation data and exploratory hole records.

CGL has endeavoured to assess third party information provided but make no guarantees or warranties as to the accuracy or completeness of this information.

The ground conditions reported relate to the point of excavation and do not necessarily guarantee a continuation of the ground conditions across the site and CGL shall not be held liable for the impact of any unforeseen ground conditions which might arise during the course of the works.

2. SITE CONTEXT

2.1 Site Location

The site is located at 24 to 32 Stephenson Way, NW1 2DA. The National Grid coordinates for the approximate centre of the site are 529415E, 182446N and the site is approximately 0.04 hectares in size. A site location plan is shown in Figure 1.

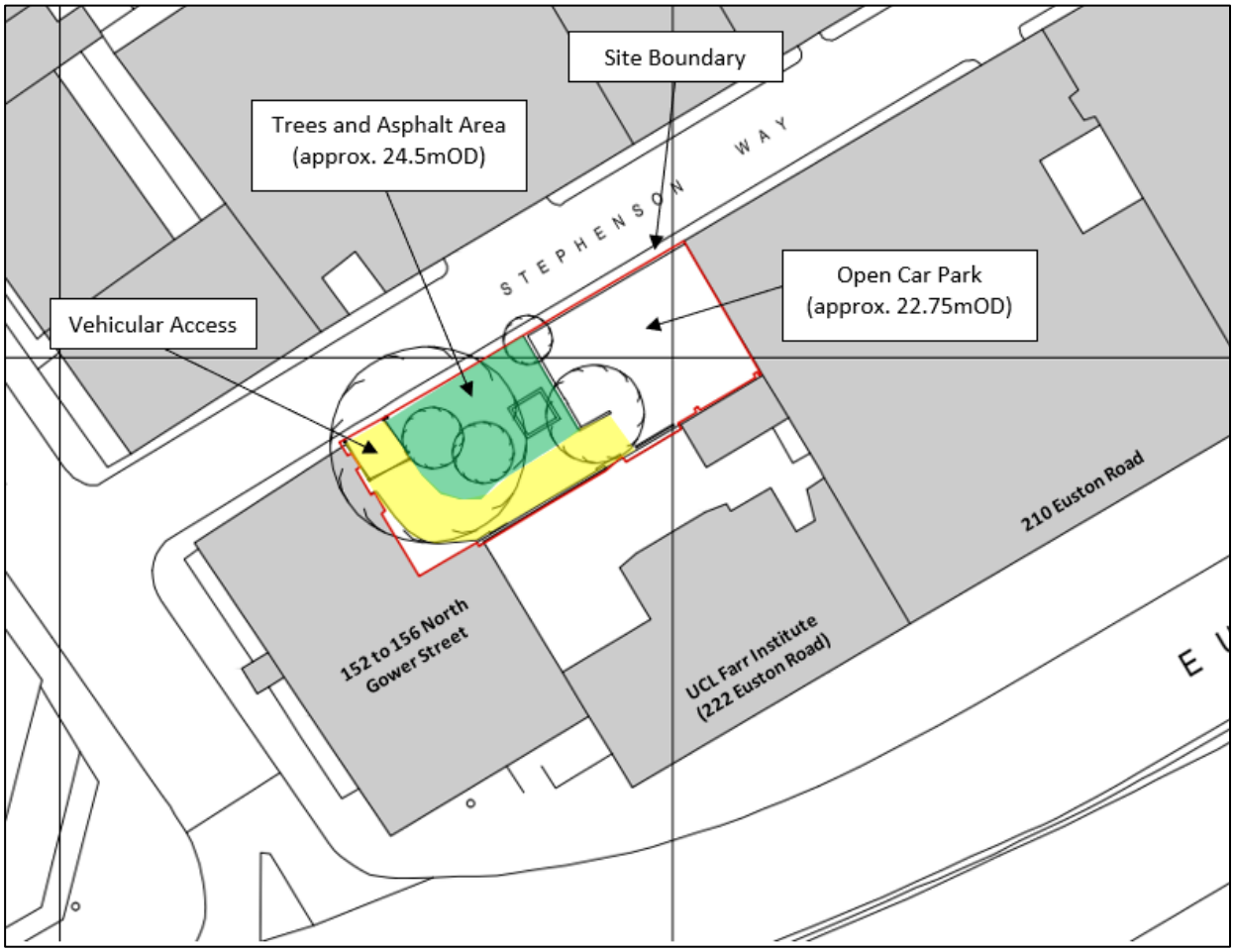
2.2 Site Description

The site comprises a rectangular area of land some 12.5m wide and 32.4m long. It is bounded by the highway of Stephenson Way to the northwest, 210 Euston Road (the Institute of Ismaili Studies) to the northeast, the lower ground floor level buildings and open car park/bin store of 222 Euston Road (the UCL Farr Institute) to the southeast and 152 to 156 North Gower Street (the Euston Square Hotel) to the southwest. The northeastern half of the site consists of an open car park at lower ground floor level (22.67mOD and 22.82mOD), with an access ramp leading along the southeastern and southwestern site boundaries up to street level (24.48mOD to 24.78mOD).

The remaining area, in the northwest of the site, comprises a disused asphalted area with mature trees. Additionally, a steel frame is present in this area, which provides support to the site-facing façade of 152 to 156 North Gower Street. The street and area of trees are supported along the northwestern and southwestern sides of the car park by a concrete retaining wall. A further retaining wall supports the access ramp along the boundary with 222 Euston Road to the southwest.

A site layout plan is included as Plate 1.

Plate 1: Site Layout Plan



2.3 Proposed Development

It is understood that the proposed development will comprise the construction of a student residence with seven above ground storeys, and a single storey basement level – at close to the existing lower ground floor level. A ramp will lead from ground level at Stephenson Way to the basement level. The building footprint is currently proposed to cover the majority of the site with currently no soft landscaping proposed. Proposed development plans are included in Appendix A.

3. SUMMARY OF PREVIOUS INVESTIGATIONS

3.1 Introduction

An historical ground investigation has been undertaken by CGL across the northeastern portion of the site. A summary of the previous information is provided in the following sections. For full details, the original reports should be referred to.

3.2 Site History

A review of the historical development of the site was undertaken by CGL[1] and is summarised below.

The earliest available historical Ordnance Survey map dated 1870 indicated the site to be occupied by terraced properties with rear gardens. No significant change to the site occurred until circa 1993 where the buildings were demolished and later the ramp and car park installed. Since 1870, the surrounding area has undergone much redevelopment with a number of potentially contaminative activities within the surrounding 100m. These included a *Timber Yard, Engineering Works, Printing Works, Non Ferrous Metals Research Works* and several *Garages*.

3.3 Anticipated Ground Conditions

With reference to published geological mapping of the area[4], the site is underlain by superficial deposits of the Lynch Hill Gravel Member, which is in turn underlain by the London Clay Formation. The London Clay Formation in the area is indicated to be approximately 20m thick and is underlain by the Lambeth Group (approximately 20m thick) and in turn by the Thanet Sand Formation and the Chalk group.

3.4 Hydrology and Hydrogeology

The Environment Agency (EA) has produced an aquifer designation system[5] consistent with the requirements of the Water Framework Directive. The designations have been set for superficial and bedrock geologies and are based on the importance of aquifers for potable water supply and their role in supporting surface water bodies and wetland ecosystems.

The Lynch Hill Gravel Member is designated as a Secondary A aquifer and the London Clay Formation is designated as an Unproductive Stratum. The Thanet Sand Formation and Chalk at depth are likely to be in hydraulic continuity and are classed as 'Principal Aquifers', which provide a high level of water storage

[4] British Geological Survey. (*2006*). *North London 256*. England and Wales. Solid and Drift Geology. 1:50,000
[5] MAGIC. (2023) https://magic.defra.gov.uk/MagicMap.aspx [Accessed August 2023]

and support water supply and/or river base flow on a strategic scale. Granular basal layers of the Lambeth Group are also likely to be in hydraulic continuity with the Principal Aquifer.

The site is situated within a Minor Aquifer High classified Groundwater Vulnerability Zone, with high porosity and high permeability within the superficial sand and gravel deposits providing a large storage volume within flood plains.

The closest surface water body to the site is surface water in *Regents Park* approximately 1,100m west of the site, this is located up gradient from the site. According to Barton's (2016) *The Lost Rivers of London*[6] the historical *River Fleet* was located approximately 95m southeast of the site, and is indicated to have run approximately southwest to northeast. It is considered that groundwater flow, if present, onsite will likely be south / southeast towards the historical *River Fleet*.

3.5 Previous Ground Investigations

A ground investigation was undertaken by CGL in 2018[2] to inform a Basement Impact Assessment and included one cable percussive borehole (BH1) to 25 metres below ground level (mbgl) and three foundation inspection pits (TP1 to TP3). The ground conditions encountered during the investigation comprised Made Ground to approximately 1.57m to 1.6mbgl which included a 0.8m to 0.95 thick slab of concrete at the base over superficial deposits of the Lynch Hill Gravel Member. The Lynch Hill Gravel Member was 1.5m thick and subsequently underlain by the London Clay Formation.

Groundwater was encountered during the historical investigation within the Lynch Hill Gravel Member at 2.8mbgl (19.86mOD), in the London Clay Formation at 9.9mbgl (12.76mOD) and in the Lambeth Group at 22.3mbgl (0.36mOD).

[6] Barton, N. and Myers, S. (2016). *The Lost Rivers of London: A Study of Their Effects Upon London and Londoners, and the Effects of London and Londoners on Them. Revised and extended edition*. Historical Publications Ltd, Whitestable, Kent.

4. CGL SUPPLIMENTARY GROUND INVESTIGATION

4.1 Fieldwork

The CGL supplementary ground investigation was undertaken on 31 July and 01 August 2023. The investigation comprised the advancement of four window sample boreholes to a maximum depth of 5.0mbgl.

Prior to breaking ground, each exploratory hole was scanned to confirm the absence of buried services by a specialist utility contractor utilisation a cable avoidance tool (CAT) and signal generator. Additionally, an unexploded ordnance (UXO) briefing and on-site supervision was provided by a specialist UXO contractor to CGL Engineers and subcontractors.

The investigation was undertaken in general accordance with the requirements of BS 5930:2015+A1:2020[7] and BS 10175:2011+A2:2017[8]. The CGL exploratory hole records are included in Appendix B and an exploratory hole location plan in Figure 2.

In-situ Standard Penetration Tests (SPTs) were carried out within each window sampler borehole.

4.2 Groundwater Monitoring

A total of three post investigation groundwater monitoring rounds have been completed by CGL between 8 August and 21 August 2023, with groundwater samples obtained during the first round. A summary of the monitoring wells installed is provided in Table 1, this includes the historical borehole BH1. The CGL monitoring records are included in Appendix C.

Table 1. Summary of Monitoring Well Response Zones

Location ID	*Target Response Stratum*	*Response Zone Top Depth (mbgl)*	*Response Zone Base Depth (mbgl)*
BH1	Lynch Hill Gravel Member	1.5	3.5
WS1		2.0	3.8
WS2		2.0	4.0
WS3		1.0	3.5
WS4		1.0	2.8

[7] British Standards Institution (2015) *Code of practice for ground investigations.* BS 5930:2015+A1:2020.
[8] British Standards Institution (2017) *Investigation of potentially contaminated sites – Code of practice.* BS 10175:2011+A2:2017.

4.3 Laboratory Analysis

4.3.1 Chemical Testing

Representative soil samples were submitted to i2 Analytical (a UKAS and MCERTS accredited laboratory) for chemical soil testing. The analysis included the following determinants and the results are included in Appendix D:

- Soil Organic Matter (SOM);
- Total cyanide;
- Heavy metals including antimony, arsenic, barium, beryllium, boron, cadmium, chromium, copper, lead, mercury, nickel, selenium, vanadium and zinc;
- Polycyclic Aromatic Hydrocarbons (PAH) and Total Petroleum Hydrocarbons (TPH);
- Total Monohydric Phenols;
- BTEX compounds (benzene, toluene, ethylbenzene, xylenes); and
- Asbestos screen and identification (Made Ground samples only).

In addition, groundwater samples were analysed for a similar suite of contaminants to the above soil suite, including hardness but excluding SOM and asbestos. The results of the groundwater testing are also included in Appendix D.

5. GROUND AND GROUNDWATER CONDITIONS

5.1 Summary of Ground Conditions

The ground conditions encountered during the CGL ground investigation are summarised in Table 2.

Table 2. Summary of CGL Ground Conditions

Stratum	*Depth to Top of Stratum (mbgl) [mOD]*	*Typical Thickness (m)*
Asphalt over brown to red brown clayey sandy gravel / sandy gravel. Gravel is angular to rounded fine to coarse of type 1, brick, concrete and flint. Sand is fine to coarse. *Not encountered in WS04.* **[MADE GROUND]**	0.0 [29.74]	0.5 to 0.7
Reinforced concrete. **[MADE GROUND]**	0.0 to 0.7 [29.74 to 29.04]	0.3 to 0.9
Dense to very dense orange brown gravelly SAND and firm to stiff orange brown sandy CLAY / gravelly sandy CLAY / silty CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of flint. **[LYNCH HILL GRAVEL MEMBER]**	0.9 to 1.4 [28.84 to 28.34]	2.3 to 4.1 *(base proven in WS1 and WS3 only)*
Firm to stiff dark grey slightly silty CLAY. *Encountered in WS1 and WS3 only.* **[WEATHERED LONDON CLAY FORMATION]**	3.7 and 4.9 [26.04 and 24.84]	>0.1 (base not proven)

5.2 Made Ground

The Made Ground was encountered from surface at each exploratory hole location and ranged in thickness between 0.9m and 1.4m. The stratum comprised granular soils overlying a 0.3m to 0.9m thick layer of concrete, with the exception of borehole WS4, where concrete was encountered from ground level into natural soils at 0.9mbgl.

5.3 Lynch Hill Gravel Member

The Lynch Hill Gravel Member was encountered below the Made Ground in each exploratory hole location and comprised predominantly granular soils with cohesive horizons. SPT N60 values for the granular Lynch Hill Gravel Member ranged from 23 to 52 corresponding to a relative density range of 'medium dense' to 'very dense'.

5.4 Weathered London Clay Formation

The Weathered London Clay Formation was encountered below the Lynch Hill Gravel Member in boreholes WS1 and WS3 at depths of 3.7m and 4.9m. The base of the stratum was not proven during this investigation.

5.5 Visual and Olfactory Potential Indicators of Contamination

No visual or olfactory signs of potential contamination were noted within the boreholes undertaken.

5.6 Groundwater

Groundwater was encountered during the CGL ground investigation within borehole WS1 only at 3.0mbgl within the Lynch Hill Gravel Member.

A total of three groundwater monitoring rounds have been undertaken following completion of the ground investigation and the monitoring results are summarised in Table 3.

Table 3. Summary of Groundwater Monitoring

Location	*Stratum*	*Groundwater (mbgl) [mOD]*		
		08.08.2023	*14.08.2023*	*21.08.2023*
BH1	Lynch Hill Gravel Member	2.45 [27.29]	2.45 [27.29]	2.44 [27.30]
WS1		2.54 [27.20]	2.57 [27.17]	2.56 [27.18]
WS2		2.44 [27.30]	2.45 [27.29]	2.45 [27.29]
WS3		2.50 [27.24]	2.50 [27.24]	2.50 [27.24]
WS4		2.33 [27.41]	2.38 [27.36]	2.36 [27.38]

5.7 Ground Gas

Ground gas monitoring was not undertaken during this phase of investigation based on a preliminary conceptual site model no indicating a significant risk and due to the removal of majority of the Made Ground for basement excavation.

6. CONTAMINATION ASSESSMENT

6.1 General

The risks to potential receptors at the site have been evaluated from identified chemical contamination. Potential receptors have been identified with reference to the Part 2A regime and associated DEFRA guidance[9]. As with the Part 2A regime, under the planning regime receptors (humans, controlled waters and buildings) have been considered if there is the potential for them to be adversely affected by exposure to contamination. CGL's approach and rationale to assessment criteria adoption for this site is provided in Table E1 in Appendix E.

6.2 Risks to Human Health from Soil Contaminants

A total of eight soil samples were submitted for chemical analysis; five from the Made Ground and three from the natural soils. The results have been compared against human health generic assessment criteria (GAC) for a *residential without homegrown produce* end use based on the proposed development plans.

The risks from soil contaminants to human health have been discussed in the following sections, and the assessment results are summarised in the following tables in Appendix E for the different strata:

- Table E2: Made Ground
- Table E3: Lynch Hill Gravel Member

The soil GAC given in the square brackets in the assessment tables indicate the soil saturation limit (SSL) i.e. the theoretical value at which free product is expected to be present. No free product was noted during the investigation and therefore the SSL values have not been used within the assessment.

6.2.1 Made Ground

The results of the assessment outlined in Table E2 indicate that the contaminant concentrations are below their respective assessment thresholds.

6.2.2 Lynch Hill Gravel Member

The results of the assessment outlined in Table E3 indicate that contaminants concentrations were recorded below their respective assessment thresholds.

[9] DEFRA (2012) *Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance.*

6.2.3 Soil Assessments

Based on the above assessments, the risks to future site users from soil contaminants are considered to be low from both the Made Ground and natural soils. Additionally, it is understood that the majority of Made Ground is to be removed as part of the basement excavation.

The risks to construction workers from contaminants within the underlying soils are considered to be low. It is noted that the risks to construction workers may be further mitigated through appropriate site practices e.g. dust suppression and dampening down during earthworks and the appropriate use of Personal Protective Equipment (PPE).

The risks to off-site human health receptors from contaminants within the Made Ground are considered to be low. The risk to off-site receptors from construction works e.g. dust generation is considered to be low assuming that the implementation of appropriate measures as part of construction management e.g. dust and vapour suppression methods, including dampening down and covering of stockpiles, will be undertaken which will help mitigate the risk to construction workers.

6.3 Risks to Human Health from Dissolved Contaminants (Vapour Pathway)

A total of two groundwater samples have been analysed as part of the CGL investigation from the Lynch Hill Gravel Member. The groundwater chemical analysis results have been compared to assessment criteria for a residential end use and the results of the assessment are summarised in Table E4 in Appendix E. The results of the assessment indicate that the contaminants are below their respective thresholds and therefore the risks from vapours to human health are considered to be low.

6.4 Risks to Human Health/Structures from Ground Gas

Limited Made Ground was encountered during the CGL investigation, and it is understood that it will be removed as part of the proposed basemen excavation. Additionally, no significant organic material was noted within the natural soils. It is therefore considered that the risks to human heath and structures from ground gas is low.

6.5 Risks to Controlled Waters

The potential risks to the Secondary A Aquifer in the Lynch Hill Gravel Member and the Principal Aquifer in the deeper Thanet Sand and Chalk, and the surface water have been assessed based on chemical groundwater analysis.

A total of two samples from the Lynch Hill Gravel Member were scheduled for groundwater analysis. The results of the groundwater assessment are summarised in Table E5 in Appendix E where the

concentrations have been compared to the Environmental Quality Standards (EQS) for freshwater and Drinking Water Values (DWVs).

The results of the assessment indicate that the majority of the groundwater contaminant concentrations are below their respective EQS assessment thresholds with the exception of total cyanide.

The concentration of total cyanide in both samples are marginally elevated above the EQS criteria of 1.0µg/l at 1.3µg/l in borehole BH01 and 1.7µg/l borehole WS01. However, low level free cyanide analysis was also undertaken, indicating concentrations of below the limit of detection of <1.0µg/l.

Based on the freshwater EQS receptor being greater than 1km up gradient of the site, the site will be covered in hardstanding limiting infiltration and that the cyanide exceedances are marginal, the risk to controlled waters is considered to be low.

6.6 Risks to Plants and Vegetation

The risk to vegetation and plants from phytotoxic contaminants is summarised in Table E6 in Appendix E. The results indicate that the concentrations of phytotoxic contaminants within the Made Ground and natural soils present a very low risk to plants and vegetation if they are incorporated in the final development.

6.7 Risks to Buried Water Supplies

With reference to Table E7 in Appendix E, the risks to buried water supply pipes are considered to be very low as contaminant concentrations are below the respective assessment thresholds. It is recommended, however that due to the brownfield nature of the site, the water supply company is contacted to confirm their requirements for water supply pipes.

6.8 Risk Assessment

6.8.1 Introduction

Historical contamination of land may present harm to human health and the environment. Current UK legislation stipulates that the risk associated with potential land contamination is assessed and remediated, if necessary. Under the Town and Country Planning Act 1990 (as amended), potential land contamination is a "material planning consideration" together with the National Planning Policy Framework[10] (revised in July 2021, to replace the 2012 version further revised in 2018 and 2019), which means that a planning authority must consider contamination when they prepare development

[10] Ministry of Housing, Communities and Local Government (2021). National Planning Policy Framework.

plans or consider individual applications for planning permission. It is the responsibility of the developer to carry out the remediation where it is required and satisfy the Local Authority that the remediation has been carried out as agreed.

Additionally, Part 2A of the Environmental Protection Act 1990 requires that a significant source-pathway-receptor linkage exists to determine a site as contaminated land. This means that there has to be a contaminant present, a receptor that could be harmed by this contaminant, and a pathway linking the two. Part 2A deals with the contamination risk from a site in its current use, however, the planning system requires that the proposed use is considered. Where remediation is carried out under the planning system, it should be ensured that the site is in such a condition that it would still not meet the definition of contaminated land under Part 2A.

6.8.2 Conceptual Site Model

A conceptual model has been compiled for the site with respect to the proposed development to identify the potential sources of contamination and the associated potential contaminant linkages.

6.8.2.1 Sources

Contamination sources can include both current and historical activities on site and in the surrounding area. The sources outlined in Table 4 have been identified at the site.

Table 4. Sources

Sources	*Details*
On site Made Ground	Limited Made Ground is expected to be present on site based on limited redevelopment. Generic soil contaminants within Made Ground if present could be total petroleum hydrocarbons (TPH), polycyclic aromatic hydrocarbons (PAH), heavy metals and potentially asbestos containing material. It is understood that the majority of the Made Ground is to be removed during construction.
Off-site historical land uses	Historical off-site activities close to the site include Timber Yard, Engineering Works, Printing Works, Non Ferrous Metals Research Works and several Garages which could have been a source of contaminants including phenols, solvents, PAHs, fuel oils, metals, sulphates and asbestos may have resulted in contamination of the shallow soils and groundwater in this area of the site.
Ground gases / vapour	Made Ground can be a source of ground gas where an appreciable organic content is present. If present, degradation of hydrocarbons/organic chemicals can also produce organic vapours and ground gases. It is understood that the majority of the Made Ground is to be removed during construction.
Groundwater	Shallow groundwater in the Lynch Hill Gravel Member may be a source of contamination resulting from impacts from the current and previous off-site sources. Potential contaminants in perched water would be similar to those present in the soils, as discussed above.

6.8.2.2 Pathways

The potential migration pathways that may be present at the site are outlined in Table 5.

Table 5. Pathways

Sources	*Details*
Ingestion and inhalation	Contamination within the Made Ground and/or shallow natural soils can result in the ingestion or inhalation of contaminated soils (and asbestos fibres if present) and inhalation of ground gases/vapours.
Direct / dermal contact	Direct/dermal contact with contaminated soils or shallow groundwater can result in the uptake of contaminants through the skin or permeation of contaminants through structures.
Lateral and vertical migration	Leaching from potential contamination in the soils may impact the groundwater and off-site controlled waters features.
Ground gas / vapour migration	Lateral migration of ground gases and/or vapours through the soil matrix could lead to accumulation within buildings, posing a risk of asphyxiation or explosion.
Drainage and services	Could provide a preferential pathway for dissolved phase contamination migration and/or ground gases/vapour transport.
Foundation works	Potential creation of contaminant pathway to deeper aquifers via piling as part of the foundation works.

6.8.2.3 Receptors

Based on the proposed end use of the site of residential without plant uptake, the following receptors have been identified at the site and are outlined in Table 6.

Table 6. Potential Receptors

Potential Sources	*Details*
Future site occupants / users	Considered to be at risk from possible contamination associated with the identified sources on site and ground gas/vapour accumulation within buildings.
Construction workers	Considered to be at risk from potential contamination within soils and groundwater during ground works. Such persons are likely to be in close contact with potentially contaminated materials, which may include asbestos.
Off-site residents	Potential contamination risks are associated with wind-blown dust and potential odours.
Controlled waters	The surrounding aquifers and local surface waters are potentially at risk from the leaching of contaminants such as heavy metals from potentially contaminated soils.
Buildings / Infrastructure	Potentially at risk from ground gas migration, aggressive ground conditions and contaminants may permeate through underground services such as water supply pipes.

6.9 Generic Qualitative Risk Assessment

A qualitative risk assessment has been undertaken based on the findings of the conceptual site model and the potential contaminant linkages that may exist at the site in accordance with the October 2020 Land Contamination Risk Management Guidance (LCRM)[11] (replacing Contaminated Land Report (CLR) 11[12]). Using criteria broadly based on those presented in CIRIA Report C552[13], the magnitude of the risk associated with potential contaminant linkages has then been assessed and is summarised in Table 7. The risk assessment methodology is presented in Appendix F.

[11] Environment Agency (2020). *Land Contamination Risk Management (LCRM)*.
[12] Environment Agency (2004). *Model Procedures for the Management of Land Contamination (CLR11).*
[13] CIRIA (2001) Contaminated Land Risk Assessment. A guide to good practice. C552.

Table 7. Updated Risk Assessment

Potential Source/Medium	*Potential Exposure Route*	*Potential Receptor*	*Severity*	*Probability*	*Risk Rating*	*Comments*
Explosive/ asphyxiating gases/vapours from underlying soils Made Ground and potential off-site sources	Migration of gases and vapours through the surface via permeable soils and drainage & services	Internal building spaces & future occupiers	Medium	Unlikely	Low	Limited Made Ground encountered during the CGL investigation, with limited organic content. It is understood that the Made Ground will be removed during the excavation of the basement and therefore removing the onsite risk and removing the pathway for off-site source migration onto site.
Organic/ inorganic contaminants such as within underlying soils (based on historical off-site sources)	Direct/indirect ingestion of soil and dust, inhalation of particle vapours and asbestos fibres and dermal contact	Construction workers	Medium	Unlikely	Low	Limited Made Ground noted on site, along with no elevated contaminant concentrations within tested soils. Appropriate PPE is recommended to mitigate the risk during remediation works and earthworks.
		Future site users	Medium	Unlikely	Low	Limited Made Ground noted on site, along with no elevated contaminant concentrations within tested soils. It is understood that the Made Ground will be removed during the excavation of the basement and the site will be covered in hardstanding.
		Off-site residents	Medium	Unlikely	Low	Buildings/ hardstanding is proposed across the site which will act as barrier between source and receptor and reduce potential for windblown dust. Assumes appropriate site practices to prevent dust generation during construction e.g. dampening down, covering stockpiles etc.
	Direct contact with underground structures and services	Buildings and structures	Mild	Unlikely	Very Low	Buried concrete should be designed as appropriate for ground conditions. Barrier pipes are not considered to be required based on contaminant concentrations, however it is recommended that due to the brownfield nature of the site, the water supply company is contacted to confirm their requirements for water supply pipes
	Vertical migration	Secondary A Aquifer [Lynch Hill Gravel Member]	Medium	Unlikely	Low	Limited Made Ground noted on site, along with no elevated contaminant concentrations within tested soils, including the natural soils. Marginal exceedance of cyanide in groundwater not reflected in the soil results indicating that limited migration from the soil into the underlying groundwater is taking place. The shallow

Potential Source/Medium	*Potential Exposure Route*	*Potential Receptor*	*Severity*	*Probability*	*Risk Rating*	*Comments*
						groundwater is unlikely to be used a drinking water source and EQS receptor is over 1km upgradient.
		Principal Aquifer [Thanet Sand Formation and Chalk]	Medium	Unlikely	Low	Piled foundations could create a potential pathway to the Principal aquifer if they extend through the base of the London Clay; however, the predominantly impermeable London Clay Formation will act as a barrier to contaminant migration.
Organic/inorganic contaminants within groundwater (groundwater within (Lynch Hill Gravel Member)	Direct contact and ingestion of contaminated groundwater	Future site users	Medium	Unlikely	Low	Unlikely to come into contact with groundwater due to buildings / hardstanding across the site except construction works where contact with shallow water is probable. Considered unlikely that shallow aquifer will be utilised as a drinking water supply for the site.
		Construction workers	Medium	Low Likelihood	Moderate / Low	
		Off-site residents	Medium	Unlikely	Low	
	Inhalation of vapours	Future site users	Medium	Unlikely	Very Low	Hydrocarbon and volatile organic compound levels analysed were found to be below the assessment criteria within the groundwater samples collected on site.
	Vertical migration	Principal Aquifer in Thanet Sand Formation and Chalk	Medium	Unlikely	Low	Piled foundations could create a potential pathway to the Principal aquifer if they extend through the base of the London Clay; however, the predominantly impermeable London Clay Formation will act as a barrier to contaminant migration and there is limited contamination in the shallow aquifer.
	Direct contact with underground structures and services	Buildings and structures	Mild	Low Likelihood	Low	Buried concrete to be designed as appropriate for ground conditions. Based on the site being brownfield, it is recommended that the local water company is contacted in respect to pipe specification.

7. GEOENVIRONMENTAL RECOMMENDATIONS

7.1 General

This section provides geoenvironmental recommendations based on information obtained during the ground investigation and the contamination assessments in Section 6. The risk assessment and conceptual site model indicates that contamination within shallow soils and shallow groundwater pose a very low to low risk to the identified receptors. Recommendations with regards to waste management, provision of a watching brief during earthworks and construction works, and health and safety and environmental controls are provided in the following sections.

7.2 Watching Brief and Discovery Strategy

It is recommended that a watching brief is carried out during the enabling works, earthworks and construction works by the Contractor. Should areas of unexpected contamination, including asbestos, be encountered or suspected, a suitably qualified geoenvironmental engineer should be informed, and the risk associated with the contamination assessed.

Where necessary, an appropriate remediation strategy should be devised and implemented, and the regulators should be informed of additional areas of contamination identified. The regulators should be provided with the risk assessment and proposed remediation methodology for agreement before undertaking such works. Appropriate verification works to be completed if remedial measures are required should also be identified and agreed.

During the redevelopment, precautions should be taken to minimise exposure of workers and the general public to potentially harmful substances. Attention should also be paid to restricting possible off-site nuisance such as dust and odour emissions.

7.3 Materials Management and Waste Characterisation

The Contractor is responsible for the material management and waste classification at the site. The "waste hierarchy" should be used to rank waste management options according to what is best for the environment. Top priority should be given to preventing waste in the first place, for example, during the pre-construction and planning stages of a new development. However, if waste is created, priority should be given to preparing it for re-use, then recycling, then recovery, and last of all disposal.

7.3.1 Re-use, Recycling and Recovery

In order to minimise the volumes of soils being disposed to landfill facilities, it is prudent to consider material management options prior to waste disposal. Screening of uncontaminated natural arisings

may permit recycling/re-use of the material on site or for other sites under the WRAP protocol[14] (uncontaminated granular soils only) or the CL:AIRE protocol[15] and would lead to a reduction in disposal requirements.

Providing that a Remediation Method Statement, including a Materials Management Plan (MMP) compliant with the CL:AIRE protocol[15], is produced which details where materials will arise and how they will be used within the limits of that Code of Practice, there is no requirement to seek an environmental permit to re-use materials within the site. However, the process would require sign off by a Qualified Person in advance of works commencing and a final validation report. This process is not applicable to soils that pose harm to human health or the environment.

7.3.2 Preliminary Waste Characterisation

A preliminary waste characterisation assessment has been carried out on the Made Ground chemical soil data obtained during the CGL ground investigation. The results of the assessment indicate that the soil samples analysed would likely be characterised as "*not hazardous"* with respect to waste disposal. Where the soils have been characterised as *"not hazardous",* the material would be acceptable for disposal to a licensed inert waste facility (subject to Waste Acceptability Criteria (WAC) testing) or to a licensed non-hazardous waste facility.

Uncontaminated natural soils would be acceptable to an inert waste facility without the need for additional WAC testing in accordance with current legislation, assuming that the natural material can be effectively segregated from the Made Ground during construction.

In May/June 2012 HMR&C issued Briefs 15/12 and 18/12 clarifying how construction spoil and excess soils will be assessed for landfill tax purposes. Detailed accurate descriptions of waste are required for all wastes to support the landfill tax assessment. Uncontaminated naturally occurring soils will remain inert by default and eligible for the lower rate of landfill tax. Similarly, 'reworked soils' and demolition 'stone' comprising ONLY materials listed in the Schedule of the Landfill Tax (Qualifying Material) Order 2011 (SI 2011/1017) will also be eligible for the lower rate of landfill tax.

However, Made Ground containing soil and foreign objects such as timber, plastic, rubber, metal, paper, plasterboard, asbestos, etc., regardless of the results of chemical analysis for waste classification purposes, will be eligible for the standard (higher) rate of landfill tax. Therefore, to maximise eligibility

[14] WRAP (n.d.) *The Quality Protocol.*
[15] CL:AIRE (2011) *The Definition of Waste: Development Industry Code of Practice.* Version 2.

for lower rate landfill tax on waste construction spoil/ reworked ground, careful waste segregation and controls are necessary.

7.3.3 Waste Handling

All material intended for off-site disposal should be transported and disposed in accordance with the Environmental Protection (Duty of Care) Regulations, 1991 and the Landfill (England and Wales) Regulations, 2002 (as amended). Waste legislation stipulates that *hazardous* and *non-hazardous* waste should be pre-treated prior to disposal. Pre-treatment can be undertaken either at the site of origin or may be carried out at a licensed off-site facility and can include selective segregation of soils conducted on site.

7.3.4 Asbestos

Asbestos has not been identified at the site during the CGL ground investigation; however, there is the potential that further asbestos material may be present in the existing Made Ground soils.

Where asbestos material is present within the soil matrix, this material would not be acceptable for disposal to an inert waste facility and asbestos quantification would be required to determine whether the material would be acceptable to a licensed non-hazardous waste facility or hazardous waste facility that accepts asbestos material.

If asbestos containing materials (ACMs) rather than fibres are encountered, there is the presumption that asbestos is present at greater than 0.1% in elements of the soil and therefore the soil mix is classified as "*hazardous*" with respect to waste disposal unless appropriate remedial measures are undertaken to segregate the ACMs i.e., hand picking by a suitable qualified person. Precautions should be taken during groundworks to minimise the risk of fibre release and exposure to the same. It will be necessary to wet the sides/bases of the excavations, particularly in dry weather conditions, and to cover excavated spoil to reduce risk of fibre release. Appropriate control measures will be required to protect groundworkers from potential exposure to asbestos and other harmful contaminants.

7.4 Health and Safety and Environmental Controls

It is recommended that precautions are taken to minimise exposure of workers and the general public to potentially harmful substances during earthworks. The risks to contractors should be controlled through the implementation of site safety procedures and the use of suitable personal protective equipment (PPE). Attention should also be paid to restricting possible off-site nuisance such as dust and odour emissions.

All site works should be undertaken in accordance with the guidelines prepared by the Health and Safety Executive (HSE, 1991)[16] and CIRIA Reports 132[17] and 741[18] and all work should also be carried out in accordance with the Contractor's Construction Health and Safety Plan. Health and safety precautions that should be taken to limit the exposure of construction workers and potential off-site in contact with the works should include, but not be limited to:

- Personal hygiene, washing and changing procedures, noise and dust;
- Adequate PPE including disposable overalls, gloves and particulate filter masks/vapour respirators, where required;
- Dust and vapour suppression methods, including dampening down, minimising the working face exposed and covering stockpiles, where required;
- Regular cleaning of all site access routes and public area outside;
- Safe storage of fuel and other potentially polluting liquids and the provision of spill control and clean up facilities; and
- Positive collection and disposal of on-site run-off.

Excavations should be planned and inspected regularly by a competent person. No operatives should be permitted to enter unshored or otherwise protected excavations identified as unstable by a competent person, however shallow they may be. The stockpiled material and excavations should be dampened during all earthworks excavation and earth moving activities and vehicles should be washed before leaving site, with washings contained on site and suitably disposed.

7.4.1 Asbestos Control

Asbestos has not been detected during the current ground investigation; however, there is the potential for undiscovered asbestos fibres and / or asbestos containing materials (ACMs) during future excavations. It is recommended that, where encountered, asbestos containing material should be handled / removed in accordance with current regulations and guidance[19,20,21,22]. ACMs, if

[16] Health and Safety Executive (1991) *Protection of Workers and the General Public during the development of contaminated land.* Guidance Note HS(G)66, Health and Safety Executive, HMSO, 1991.
[17] CIRIA (1996) *A guide for safe working on contaminated sites.* Steeds JE, Shepherd E & Barry DL. CIRIA Report 132.
[18] CIRIA (2005) Environmental good practice – Site guide, 2nd Edition. CIRIA Report C650.
[19] HSG247 (2006) *Asbestos: The licensed contractors' guide.*
[20] Health and Safety Executive (2013) *Managing and working with asbestos. Control of Asbestos Regulations 2012. Approved Code of Practice and guidance.* HSE L143.
[21] Health and Safety Executive (2012) *The Control of Asbestos Regulations*.
[22] Health and Safety Executive (2010) *Asbestos: The Survey Guide*. HSG 264. January 2010.

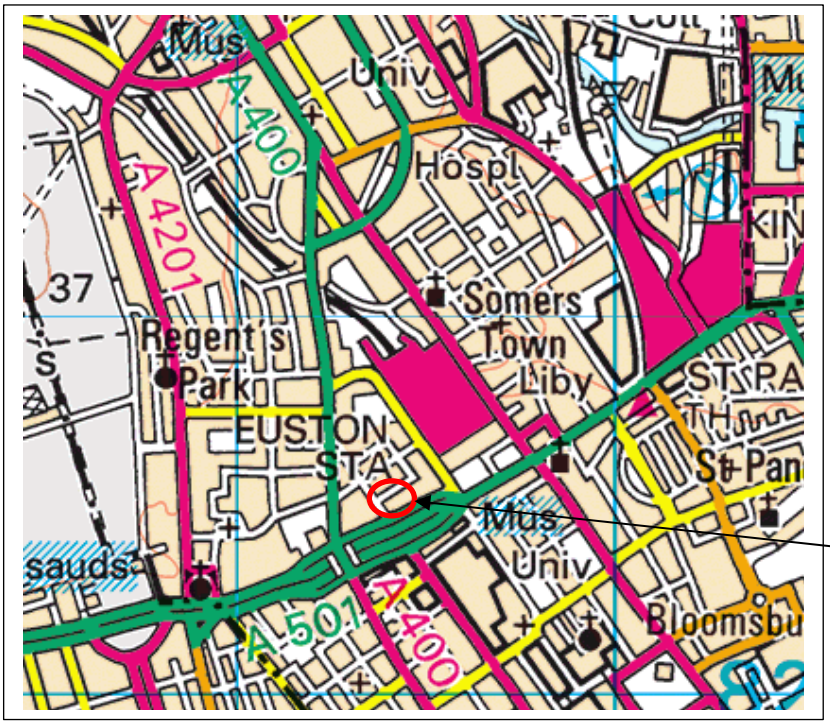
encountered, should be segregated by hand picking by a trained person utilising the appropriate PPE and implementing necessary precautionary measures to minimise expose to construction workers and general public during earthworks. The contractor should be responsible for determining whether the works are notifiable or licensable, and for implementing the appropriate procedures.

Site staff undertaking groundworks should be advised of the potential for asbestos fragments and fibres being present and be trained in basic visual recognition of asbestos. Soils being handled should be dampened, taking care that damping is carried out at the appropriate time and with appropriate amounts of water to suppress dust but not saturate the soils. Soils movement should be minimised, and double handling avoided.

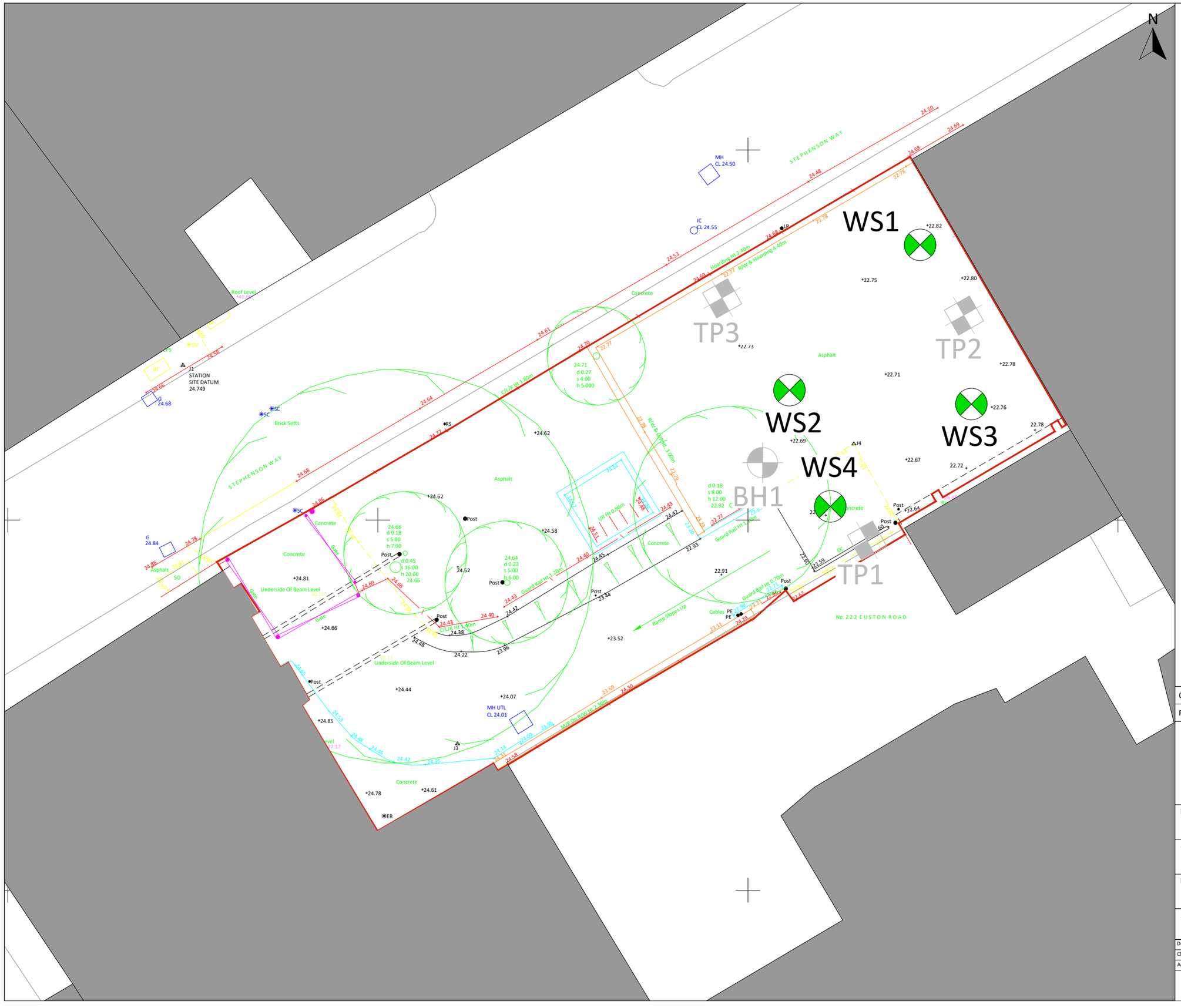
GENERAL REPORT ABBREVIATIONS

ACM	Asbestos Containing Material
AOD	Above Ordnance Datum
BaP	Benzo(a)pyrene
bgl	Below ground level
BGS	British Geological Survey
BIA	Basement impact assessment
BTEX	Benzene, Toluene, Ethylbenzene, Xylenes
BRE	Building Research Establishment
BSI	British Standards Institute
C4SL	Category 4 Screening Level
CAT	Cable Avoidance Tool
CBR	California Bearing Ratio
CGL	Card Geotechnics Limited
CIRIA	Construction Industry Research and Information Association
CL:AIRE	Contaminated Land: Applications in Real Environments
CLEA	Contaminated Land Exposure Assessment
CLR	Contaminated Land Report
CPT	Cone Penetration Test
CS	Characteristic Situation
CSM	Conceptual Site Model
c_u	Undrained Shear Strength
DCP	Dynamic Cone Penetrometer
DEFRA	Department for the Environment, Food and Rural Affairs
DP	Dynamic Probe
DPM	Damp Proof Membrane
DWV	Drinking Water Value
EA	Environment Agency
EHO	Environmental Health Officer
EQS	Environmental Quality Standard
FID	Flame Ionisation Detector
GAC	Generic Assessment Criteria
GSV	Gas Screening Value
GPR	Ground Penetrating Radar
Ha	Hectare
HMRC	HM Revenue & Customs
HSE	Health & Safety Executive
HSV	Hand Shear Vane
kPa	KiloPascals
MMP	Materials Management Plan
NGR	National Grid Reference
OS	Ordnance Survey
OCP	Organochlorine Pesticides
OPP	Organophosphorus Pesticides
PAHs	Polycyclic Aromatic Hydrocarbons
PBET	Physiologically Based Extraction Testing
PCBs	Polychlorinated Biphenyls
PID	Photoionisation detector
ppb	Parts per billion
ppm	Parts per million
PSD	Particle Size Distribution
RIP	Remediation Implementation Plan
RQD	Rock Quality Designation
SGV	Soil Guideline Value
SOM	Soil Organic Matter
SPT	Standard Penetration Test
SSL	Soil Saturation Limit
SSRA	Site Specific Risk Assessment
SPZ	Source Protection Zone
SVOC	Semi-Volatile Organic Compounds
TCR	Total Core Recovery
TPH	Total Petroleum Hydrocarbons
TPHCWG	Total Petroleum Hydrocarbons Criteria Working Group
UKWIR	UK Water Industry Research
UXO	Unexploded Ordnance
VOC	Volatile Organic Compounds
WAC	Waste Acceptance Criteria
WSV	Water Screening Value

FIGURES



Client	Project	Job No
GPF Lewis Solutions Limited	**Land Fronting Stephenson Way London, NW1 2DA**	**CG/28583A**
CGL	Title: **Site Location Plan**	**Figure 1**



KEY

- CGL Window Sample Boreholes (2023)
- CGL Trial Pits (2018)
- CGL Cable Percussion Borehole (2018)

Notes:

1. Final exploratory hole locations are subject to access and locations of buried and above ground utilities.
2. Do not scale from this drawing.
3. Topographical base plan provided to CGL in 2019 "L8147 Topo".

Rev	Date	Comments
0	26/07/2023	First Issue

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Part of the CTS Group

Project: **24 to 32 Stephenson Way**

Client: **GPF Lewis Solution Limited**

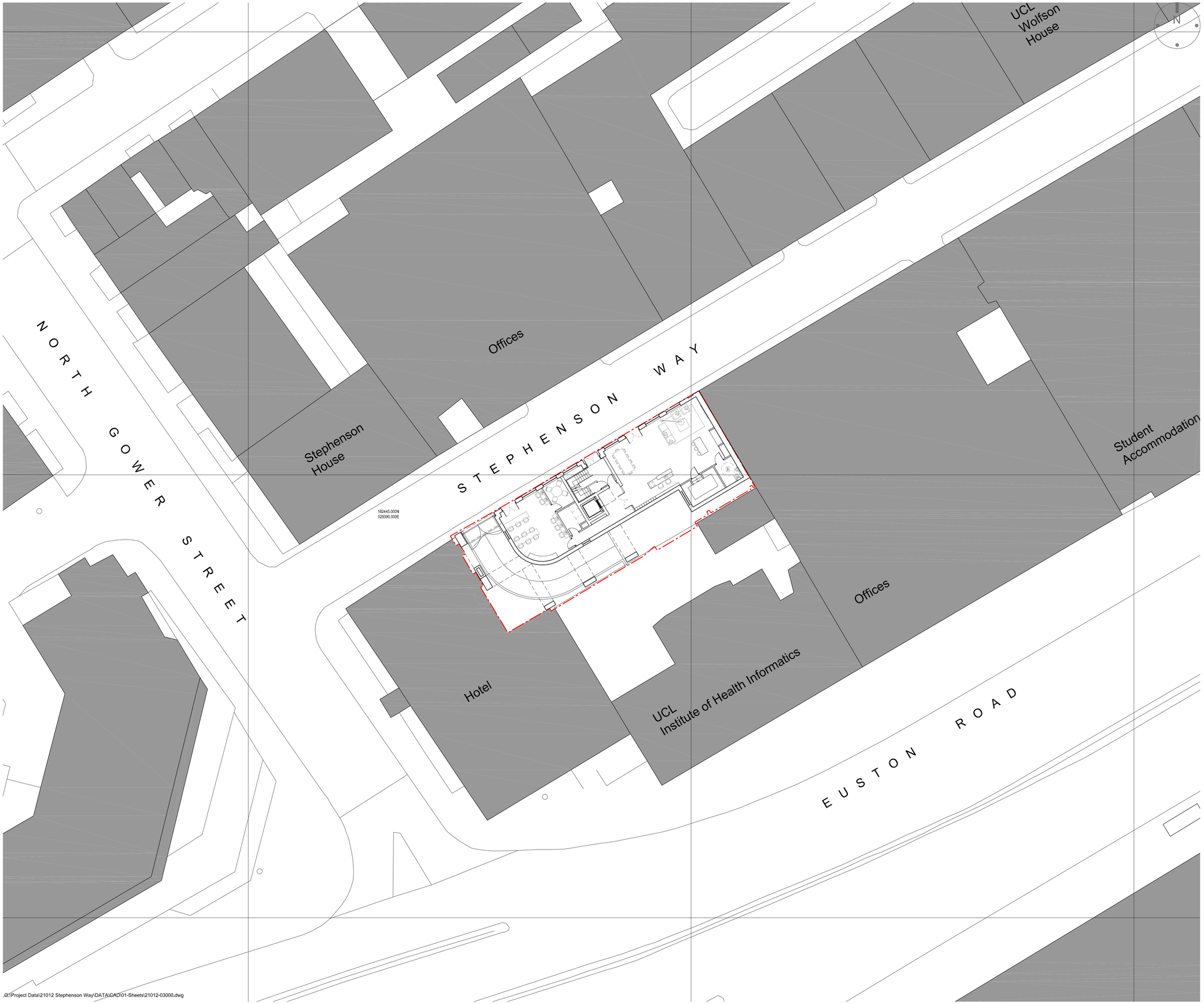
Drawing title: **Figure 2 - Exploratory Hole Location Plan**

Scale(s)	Job No.
NTS	**CG/28583A**

Drawn	ELD	24/07/2023	Dwg No. **CG/28583A-001**	Rev. **0**
Checked	KJP	26/07/2023		
Approved	KJP	26/07/2023		

APPENDIX A

Proposed Development Plan



General Notes

0 2m 10m 20m 24m

Notes

REV	NOTES	DATE	BY	AUTH
P01	Preliminary Issue for Design Team co-ordination and review	21.10.22	SL	UE

DARLING ASSOCIATES
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DRAWING STATUS
Preliminary

TITLE
Proposed Site Plan

PROJECT
Stephenson Way

SCALE AT A1:	SCALE AT A3:
1:200	N.T.S.

JOB NO.	DRAWING	REV.
21012	**03000**	**P01**

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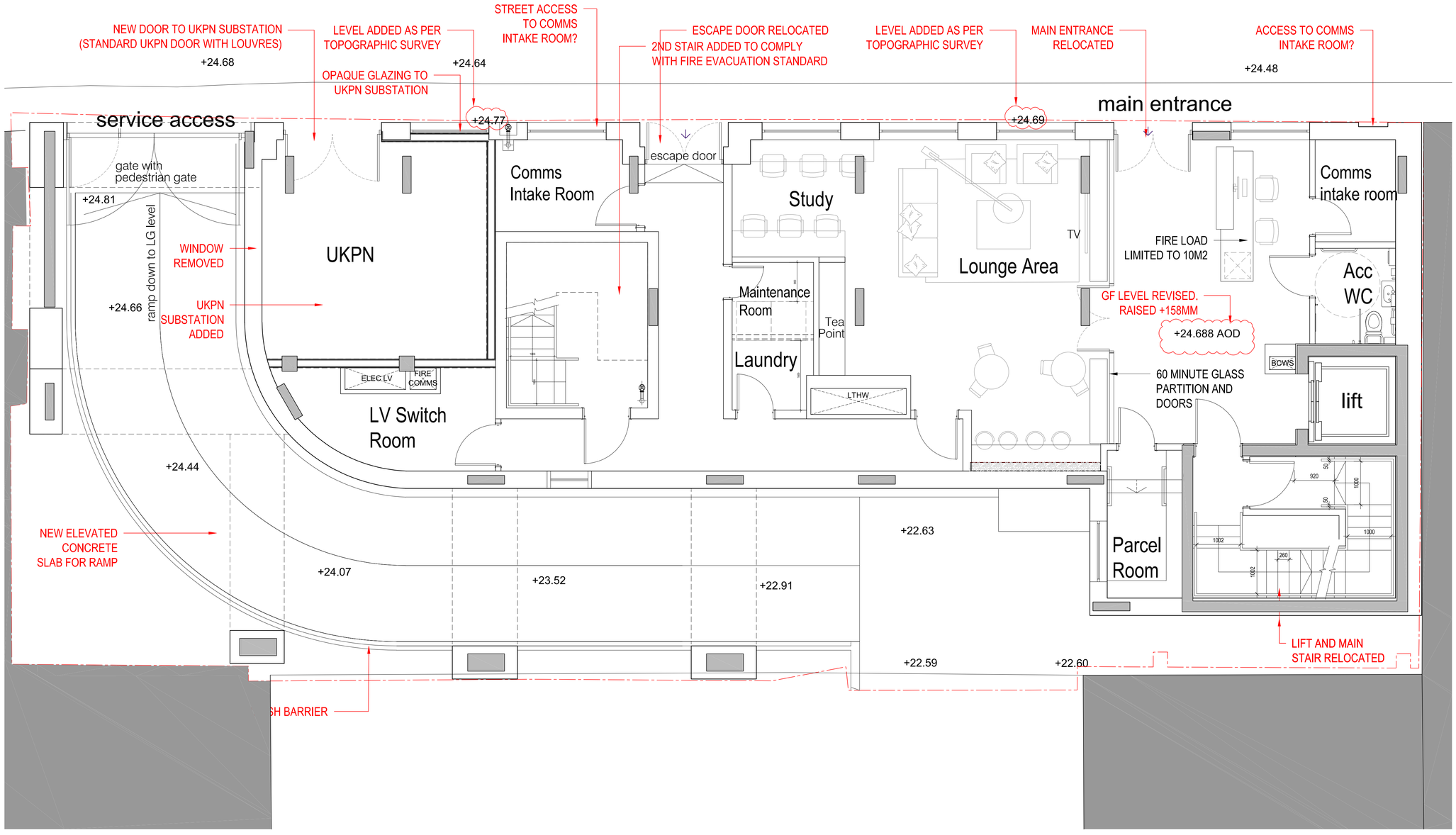

General Notes

0 0.5m 2.5m 5m 6m

PLEASE NOTE THE STRUCTURE LAYOUT IS WIP AND SOME COLUMNS WILL BE RELOCATED.

PLANNING CHANGES ANNOTATED IN RED.

REV	NOTES	DATE	BY	AUTH
P05	Preliminary Issue following updates required by fire consultant and structure layout added.	11.01.23	AB	UE
P04	Preliminary Issue following updates required by fire consultant	20.12.22	AB	UE
P03	Preliminary Issue following updates required by fire consultant and building control, as well as co-ordination with M&E consultant	08.12.22	SL	UE
P02	For information only, Second stair introduced to future-proof fire evacuation strategy, Layouts updated accordingly	23.11.22	AB	UE
P01	Preliminary Issue for Design Team co-ordination and review	21.10.22	SL	UE

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DRAWING STATUS
Preliminary

TITLE
Proposed General Arrangement Plan
Ground Floor

PROJECT
Stephenson Way, London

SCALE AT A1: 1:50
SCALE AT A3: 1:100

JOB NO. **21012**
DRAWING **03100**
REV. **P05**

G:\Project Data\21012 Stephenson Way\DATA\CAD\01-Sheets\21012-03100.dwg

APPENDIX B

Exploratory Hole Records

Project Title: 24 - 32 Stephenson Way	Status:	Location ID
Client: GPF Lewis Solutions Limited	**FINAL**	**WS1**

Location Type: Dynamic (windowless) sampler

Coords: 529429.000E/182457.000N Level: 29.743m

Ordnance Survey Great Britain National Grid | Final Depth: **5.00 m**

Orientation: 0° Inclination: 90°

Date Start: 31/07/2023 Date End: 01/08/2023

Card Geotechnics Limited,
4 Godalming Business Centre,
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Sheet 1 of 1

Method and Plant Used

From (m)	To (m)	Type	Plant Used
0.00	1.00	IP	Hand tools and concrete corer
1.00	5.00	WLS	Window Sample Rig

Groundwater

Strike (m)	Time (min)	Rose To
3.00	-	-

Sample Depth (m)	Type/ Ref	Tests/Results	Water Level (m)	Legend /Cover	Strata Depth (m)	Level (m)	Strata Description	WS Run	Diam (mm)	Recovery (%)	Inst/ Backfill	Depth (m)
					0.04	29.70	Asphalt. [MADE GROUND]					
0.20	ES 1				0.50	29.24	Brown slightly sandy gravel. Gravel is angular to subrounded fine to coarse of type 1, concrete and rare brick. Sand is fine to coarse. [MADE GROUND]					
					1.40	28.34	Concrete. [MADE GROUND]					
1.60	ES 2	SPT(C) 2.00m N=31 (7,6/8,7,10,6)			2.70	27.04	Dense orange brown gravelly SAND. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of flint. [LYNCH HILL GRAVEL MEMBER]	1.00 2.00	57	90		
		SPT(C) 3.00m N=22 (3,4/4,5,7,6)	▼		3.00	26.74	Firm dark orange brown slightly sandy CLAY. Sand is fine to medium. [LYNCH HILL GRAVEL MEMBER]	2.00 3.00	57	100		
					3.70	26.04	Medium dense orange brown gravelly SAND. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of flint. [LYNCH HILL GRAVEL MEMBER]	3.00 4.00	45	100		
		SPT(C) 4.00m N=27 (2,3/4,6,8,9)			5.00	24.74	Firm to stiff dark grey slightly silty CLAY. [WEATHERED LONDON CLAY FORMATION]	4.00 5.00	45	100		

EOH at 5.00m - Achieved target depth

Notes:

1. Borehole terminated at target depth of 5.0mbgl.
2. Groundwater encountered at 3.0mbgl.
3. ES = Environmental Sample. SPT = Standard Penetration Test
4. Installation details: 0.0m to 2.0m plain pipe with bentonite seal, 2.0m to 3.8m slotted pipe with gravel filter. Borehole collapse from 3.8m to 5.0m. Fitted with gas tap, bung and flush cover.

Hole Diameter

Depth (m)	Diam (mm)
1.00	76
2.00	66
3.00	66
4.00	56
5.00	56

Casing

Depth (m)	Diam (mm)

Hammer Information

Energy Ratio	Serial No.
62%	DART449

Install Response Zones

Ref	From (m)	To (m)
Pipe1	2.00	3.80

Scale: 1:25

Logged By: ELD
Checked By: HNG
Approved By:
Section ID:

CGL Reference
CG/28583A

Project Title: 24 - 32 Stephenson Way

Client: GPF Lewis Solutions Limited

Status:	Location ID
FINAL	**WS2**

Location Type: Dynamic (windowless) sampler

Coords: 529424.000E/182452.000N Level: 29.743m

Ordnance Survey Great Britain National Grid

Final Depth: **5.00 m**

Orientation: 0° Inclination: 90°

Date Start: 31/07/2023 Date End: 01/08/2023

Card Geotechnics Limited,
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Woolsack Way,
Godalming,
Surrey,
GU7 1XW
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Method and Plant Used

From (m)	To (m)	Type	Plant Used
0.00	1.00	IP	Hand tools and concrete corer
1.00	5.00	WLS	Window Sample Rig

Groundwater

Strike (m)	Time (min)	Rose To

Samples & Tests			Water Level (m)	Legend /Cover	Strata Depth (m)	Level (m)	Strata Description	Window Sampling			Inst/ Backfill	Depth (m)
Sample Depth (m)	Type/ Ref	Tests/Results						WS Run	Diam (mm)	Recovery (%)		
					0.04	29.70	Asphalt. [MADE GROUND]					
0.10	ES 1				0.20	29.54	Red brown sandy gravel. Gravel is angular to rounded fine to coarse of type 1. Sand is fine to coarse. [MADE GROUND]					
0.55	ES 2				0.70	29.04	Dark brown clayey very sandy gravel. Gravel is angular to rounded fine to coarse of flint, brick and concrete. Sand is fine to coarse. Rare rootlets noted. [MADE GROUND]					
					1.00	28.74	Concrete. [MADE GROUND]					
							Medium dense orange brown gravelly SAND. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of flint. [LYNCH HILL GRAVEL MEMBER]	1.00 2.00	57	20		
2.00	ES 3	SPT(C) 2.00m N=26 (10,6/9,7,6,4)										
								2.00 3.00	57	100		
					2.60	27.14	Firm to stiff dark orange brown slightly sandy CLAY. Sand is fine to coarse. [LYNCH HILL GRAVEL MEMBER]					
		SPT(C) 3.00m N=41 (6,8/9,9,11,12)			3.00	26.74	Dense orange brown gravelly SAND. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of flint. [LYNCH HILL GRAVEL MEMBER]	3.00 4.00	45	100		
		SPT(C) 4.00m N=35 (9,7/7,7,10,11)										
								4.00 5.00	45	100		
					5.00	24.74						

EOH at 5.00m - Achieved target depth

Notes:

1. Borehole terminated at target depth of 5.0mbgl.
2. No groundwater encountered.
3. ES = Environmental Sample. SPT = Standard Penetration Test
4. Installation details: 0.0m to 2.0m plain pipe with bentonite seal, 2.0m to 3.3m slotted pipe with gravel filter. Borehole collapse from 3.3m to 5.0m. Fitted with gas tap, bung and flush cover.

Hole Diameter

Depth (m)	Diam (mm)
1.00	76
2.00	66
3.00	66
4.00	56
5.00	56

Casing

Depth (m)	Diam (mm)

Hammer Information

Energy Ratio	Serial No.
62%	DART449

Install Response Zones

Ref	From (m)	To (m)
Pipe1	2.00	3.30

Scale: 1:25

Logged By: ELD

Checked By: HNG

Approved By:

Section ID:

CGL Reference

CG/28583A

Project Title: 24 - 32 Stephenson Way

Client: GPF Lewis Solutions Limited

Status:	Location ID
FINAL	**WS3**

Location Type: Dynamic (windowless) sampler

Coords: 529431.000E/182451.000N Level: 29.743m

Ordnance Survey Great Britain National Grid

Final Depth: **5.00 m**

Orientation: 0° Inclination: 90°

Date Start: 31/07/2023 Date End: 01/08/2023

Card Geotechnics Limited,
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Woolsack Way,
Godalming,
Surrey,
GU7 1XW
www.cgl-uk.com

Method and Plant Used

From (m)	To (m)	Type	Plant Used
0.00	1.00	IP	Hand tools and concrete corer
1.00	5.00	WLS	Window Sample Rig

Groundwater

Strike (m)	Time (min)	Rose To

Sample Depth (m)	Type/ Ref	Tests/Results	Water Level (m)	Legend /Cover	Strata Depth (m)	Level (m)	Strata Description	WS Run	Diam (mm)	Recovery (%)	Inst/ Backfill	Depth (m)
					0.04	29.70	Asphalt. [MADE GROUND]					
0.10	ES 1						Brown slightly clayey very sandy gravel. Gravel is angular to rounded fine to coarse of type 1, brick and concrete. Sand is fine to coarse. [MADE GROUND]					
0.45	ES 2											
0.60	ES 3				0.60	29.14	Concrete. [MADE GROUND]					
1.00	ES 4				1.00	28.74	Very dense orange brown slightly gravelly SAND. Sand is fine to coarse. Gravel is subangular to subrounded fine to medium of flint. [LYNCH HILL GRAVEL MEMBER]	1.00 2.00	57	20		1
		SPT(C) 2.00m N=65 (12,14/17,15,16,17)						2.00 3.00	57	100		2
					2.85	26.89						
		SPT(C) 3.00m N=34 (7,7/6,7,11,10)			3.00	26.74	Firm dark orange brown slightly sandy CLAY. Sand is fine to coarse. [LYNCH HILL GRAVEL MEMBER]					3
							Dense orange brown slightly gravelly SAND. Sand is fine to coarse. Gravel is subangular to subrounded fine to medium of flint. [LYNCH HILL GRAVEL MEMBER]	3.00 4.00	45	100		
		SPT(C) 4.00m N=34 (5,6/6,8,10,10)										4
								4.00 5.00	45	100		
					4.90	24.84	Firm to stiff dark grey slightly silty CLAY. [WEATHERED LONDON CLAY FORMATION]					
					5.00	24.74						5

EOH at 5.00m - Achieved target depth

Notes:

1. Borehole terminated at target depth of 5.0mbgl.
2. No groundwater encountered.
3. ES = Environmental Sample. SPT = Standard Penetration Test
4. Installation details: 0.0m to 1.0m plain pipe with bentonite seal, 1.0m to 2.6m slotted pipe with gravel filter. Borehole collapse from 2.6m to 5.0m. Fitted with gas tap, bung and flush cover.

Hole Diameter

Depth (m)	Diam (mm)
1.00	76
2.00	66
3.00	66
4.00	56
5.00	56

Casing

Depth (m)	Diam (mm)

Hammer Information

Energy Ratio	Serial No.
62%	DART449

Install Response Zones

Ref	From (m)	To (m)
Pipe1	1.00	2.60

Scale: 1:25

Logged By: ELD

Checked By: HNG

Approved By:

Section ID:

CGL Reference

CG/28583A

Project Title: 24 - 32 Stephenson Way

Client: GPF Lewis Solutions Limited

Status: **FINAL**

Location ID: **WS4**

Method and Plant Used

From (m)	To (m)	Type	Plant Used
0.00	1.00	IP	Hand tools and concrete corer
1.00	5.00	WLS	Window Sample Rig

Groundwater

Strike (m)	Time (min)	Rose To

Location Type: Dynamic (windowless) sampler

Coords: 529426.000E/182448.000N Level: 29.743m

Ordnance Survey Great Britain National Grid

Final Depth: **5.00 m**

Orientation: 0° Inclination: 90°

Date Start: 31/07/2023 Date End: 01/08/2023

Card Geotechnics Limited,
4 Godalming Business Centre,
Woolsack Way,
Godalming,
Surrey,
GU7 1XW
www.cgl-uk.com

Sample Depth (m)	Type/ Ref	Tests/Results	Water Level (m)	Legend /Cover	Strata Depth (m)	Level (m)	Strata Description	WS Run	Window Sampling Diam (mm)	Recovery (%)	Inst/ Backfill	Depth (m)
					0.90	28.84	Concrete. [MADE GROUND]					
0.95	ES 1	SPT(C) 1.00m N=51 (4,8/11,9,15,16)			2.80	26.94	Dense to very dense orange brown slightly gravelly SAND. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of flint. [LYNCH HILL GRAVEL MEMBER]	1.00 2.00	57	100		1
		SPT(C) 2.00m N=33 (7,8/10,9,8,6)						2.00 3.00	57	100		2
		SPT(C) 3.00m N=33 (6,10/8,6,7,12)			3.00	26.74	Firm dark orange brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of flint. [LYNCH HILL GRAVEL MEMBER]					3
					3.70	26.04	Dense orange brown slightly gravelly SAND. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of flint. [LYNCH HILL GRAVEL MEMBER]	3.00 4.00	45	100		
		SPT(C) 4.00m N=34 (5,7/7,7,9,11)			4.00	25.74	Firm to stiff dark brown to grey to brown slightly silty CLAY. [LYNCH HILL GRAVEL MEMBER]					4
					5.00	24.74	Dense orange brown slightly gravelly SAND. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse of flint. [LYNCH HILL GRAVEL MEMBER]	4.00 5.00	45	100		

EOH at 5.00m - Achieved target depth

Notes:

1. Borehole terminated at target depth of 5.0mbgl.
2. No groundwater encountered.
3. ES = Environmental Sample. SPT = Standard Penetration Test
4. Installation details: 0.0m to 1.0m plain pipe with bentonite seal, 1.0m to 2.5m slotted pipe with gravel filter. Borehole collapse from 2.5m to 5.0m. Fitted with gas tap, bung and flush cover.

Hole Diameter

Depth (m)	Diam (mm)
1.00	76
2.00	66
3.00	66
4.00	56
5.00	56

Casing

Depth (m)	Diam (mm)

Hammer Information

Energy Ratio	Serial No.
62%	DART449

Install Response Zones

Ref	From (m)	To (m)
Pipe1	1.00	2.50

Scale: 1:25

Logged By: ELD

Checked By: HNG

Approved By:

Section ID:

CGL Reference **CG/28583A**

APPENDIX C

CGL Monitoring Record

GROUNDWATER MONITORING RECORD SHEET

JOB DETAILS			
Site:	24 to 32 Stephenson Way	Job No:	CG/28583A
Date:	08/08/2023	Engineer:	MEM
Time:	08:00 to 16:00	Client	GPF Lewis Solutions Limited
Weather:	Overcast, light rain, wet ground, temperature ~15°C.		

MONITORING & SAMPLING DETAILS								
Well / Borehole reference:	BH01	WS01	WS02	WS03	WS04			
Monitoring details								
Ground elevation (+mOD)	29.74	29.74	29.74	29.74	29.74			
Groundwater depth (mbgl)	2.45	2.54	2.44	2.50	2.33			
Groundwater elevation (+mOD)	27.29	27.20	27.30	27.24	27.41			
Depth to base of well (mbgl)	3.70	3.80	3.25	2.55	2.36			
Diameter of well (mm)	50	30	30	30	30			
Condition of well	Good	Good	Good	Good	Good			
Top of response zone (mbgl)	1.5	2	2	1	1			
Base of response zone (mbgl)	3.5	3.8	3.5	2.6	2.5			
Free product thickness (m)	None	None	None	None	None			
Hydrocarbon sheen noted (Y/N)	No	No	No	N/A	N/A			
Purging details								
Purge method	Bailer	Bailer	Bailer	N/A	N/A			
Purged volume (litres)	8	3	0.5	N/A	N/A			
Recharge (good / poor)	Good	Good	Good	N/A	N/A			
Sampling details								
Sampling method	Bailer	Bailer	Bailer	N/A	N/A			
Volume of water sample taken (litres)	0.68	0.68	0.19	N/A	N/A			
Volume of free product sample taken (litres)	0	0	0	N/A	N/A			
Colour / odours noted*	Cloudy brown	Cloudy brown	Cloudy brown	N/A	N/A			
In-situ measurements								
pH	6.39	6.55	6.70	N/A	N/A			
Temperature (°C)	16.3	17.7	16.6	N/A	N/A			
Dissolved oxygen (%)	10.2	11.9	10.7	N/A	N/A			
Redox potential (mV)	222	165	-80	N/A	N/A			
Electrical conductivity (mS)	0.90	0.80	0.93	N/A	N/A			
Total dissolved solids (ppt)	0.47	0.39	0.48	N/A	N/A			

* Respiratory protective equipment to be worn if odours are noted during initial monitoring & on sites which are potentially contaminated

NOTES

Not enough water in boreholes WS02, WS03, WS04 to obtain a sample.

GROUNDWATER MONITORING RECORD SHEET

JOB DETAILS			
Site:	24 to 32 Stephenson Way	Job No:	CG/28583A
Date:	14/08/2023	Engineer:	MEM
Time:	08:00 to 09:00	Client	GPF Lewis Solutions Limited
Weather:	Cloudy, light rain, wet ground, temperature ~18°C.		

MONITORING & SAMPLING DETAILS								
Well / Borehole reference:	BH01	WS01	WS02	WS03	WS04			
Monitoring details								
Ground elevation (+mOD)	29.74	29.74	29.74	29.74	29.74			
Groundwater depth (mbgl)	2.45	2.57	2.45	2.50	2.38			
Groundwater elevation (+mOD)	27.29	27.17	27.29	27.24	27.36			
Depth to base of well (mbgl)	3.70	3.78	3.23	2.55	2.40			
Diameter of well (mm)	50	30	30	30	30			
Condition of well	Good	Good	Good	Good	Good			
Top of response zone (mbgl)	1.5	2	2	1	1			
Base of response zone (mbgl)	3.5	3.8	3.5	2.6	2.5			
Free product thickness (m)	None	None	None	None	None			
Hydrocarbon sheen noted (Y/N)	N/A	N/A	N/A	N/A	N/A			

NOTES

GROUNDWATER MONITORING RECORD SHEET

JOB DETAILS			
Site:	24 to 32 Stephenson Way	Job No:	CG/28583A
Date:	21/08/2023	Engineer:	CGH
Time:	10:30 to 11:30	Client	GPF Lewis Solutions Limited
Weather:	Fair ~20°C		

MONITORING & SAMPLING DETAILS								
Well / Borehole reference:	BH01	WS01	WS02	WS03	WS04			
Monitoring details								
Ground elevation (+mOD)	29.74	29.74	29.74	29.74	29.74			
Groundwater depth (mbgl)	2.44	2.56	2.45	2.50	2.36			
Groundwater elevation (+mOD)	27.30	27.18	27.29	27.24	27.38			
Depth to base of well (mbgl)	3.70	3.78	3.23	2.55	2.40			
Diameter of well (mm)	50	30	30	30	30			
Condition of well	Good	Good	Good	Good	Good			
Top of response zone (mbgl)	1.5	2	2	1	1			
Base of response zone (mbgl)	3.5	3.8	3.5	2.6	2.5			
Free product thickness (m)	None	None	None	None	None			
Hydrocarbon sheen noted (Y/N)	N/A	N/A	N/A	N/A	N/A			

NOTES

APPENDIX D

Laboratory Chemical Analysis Results

Eloise Davies
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4 Godalming Business Centre
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GU7 1XW

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f: 01483 527285
e: eloised@cgl-uk.com

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 : 23-48621

Project / Site name:	Stephenson Way	**Samples received on:**	02/08/2023
Your job number:	CG 28583A	**Samples instructed on/ Analysis started on:**	02/08/2023
Your order number:	POP014006	**Analysis completed by:**	10/08/2023
Report Issue Number:	1	**Report issued on:**	10/08/2023
Samples Analysed:	8 soil samples		

Signed:

Anna Goc
PL Head of Reporting Team
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.

Analytical Report Number: 23-48621
Project / Site name: Stephenson Way
Your Order No: POP014006

Lab Sample Number				2768493	2768494	2768495	2768496	2768497
Sample Reference				WS1	WS1	WS2	WS2	WS3
Sample Number				1	2	1	2	2
Depth (m)				0.20	1.60	0.10	0.55	0.45
Date Sampled				31/07/2023	01/08/2023	31/07/2023	31/07/2023	31/07/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	47	< 0.1	60	< 0.1	41
Moisture Content	%	0.01	NONE	6.9	2.4	3.6	6.9	3.4
Total mass of sample received	kg	0.001	NONE	0.8	0.8	0.9	0.8	0.8
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	-	Not-detected	Not-detected	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	DSO	N/A	DSO	DSO	DSO
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	9.7	9.1	9.5	8.9	8.9
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Sulphate as SO4	mg/kg	50	MCERTS	68	< 50	57	580	360
Organic Matter (automated)	%	0.1	MCERTS	< 0.1	< 0.1	< 0.1	0.3	0.3
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	0.11	0.15
Anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	0.3	0.33
Pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	0.27	0.3
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	0.16	0.17
Chrysene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	0.17	0.17
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	< 0.05	< 0.05	< 0.05	0.21	0.26
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	< 0.05	< 0.05	< 0.05	0.12	0.06
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	0.19	0.18
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	0.11	0.11
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	0.14	0.14
Coronene	mg/kg	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Total PAH								
Total WAC-17 PAHs	mg/kg	0.85	NONE	< 0.85	< 0.85	< 0.85	1.78	1.87
Heavy Metals / Metalloids								
Antimony (aqua regia extractable)	mg/kg	1	ISO 17025	1.8	1.2	< 1.0	< 1.0	< 1.0
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	2.2	6.8	3	8	7.5
Barium (aqua regia extractable)	mg/kg	1	MCERTS	45	6.5	64	540	240
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	0.21	0.2	0.27	0.35	0.44
Boron (water soluble)	mg/kg	0.2	MCERTS	0.3	0.3	0.3	0.3	0.5
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	1	0.7
Chromium (hexavalent)	mg/kg	1.2	NONE	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Chromium (III)	mg/kg	1	NONE	7.1	7.4	6.1	9.4	10
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	7.1	7.5	6.1	9.4	10
Copper (aqua regia extractable)	mg/kg	1	MCERTS	50	6.2	13	22	23
Lead (aqua regia extractable)	mg/kg	1	MCERTS	6.6	3.1	7.6	38	33
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	7.8	8.7	5.8	9.7	11
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	33	12	31	18	22
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	32	10	35	120	110

Analytical Report Number: 23-48621
Project / Site name: Stephenson Way
Your Order No: POP014006

Lab Sample Number				2768493	2768494	2768495	2768496	2768497
Sample Reference				WS1	WS1	WS2	WS2	WS3
Sample Number				1	2	1	2	2
Depth (m)				0.20	1.60	0.10	0.55	0.45
Date Sampled				31/07/2023	01/08/2023	31/07/2023	31/07/2023	31/07/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Monoaromatics & Oxygenates								
Benzene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Toluene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Ethylbenzene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
p & m-xylene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
o-xylene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	NONE	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Petroleum Hydrocarbons								
TPH-CWG - Aliphatic >EC5 - EC6 $_{HS\_1D\_AL}$	mg/kg	0.1	NONE	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
TPH-CWG - Aliphatic >EC6 - EC8 $_{HS\_1D\_AL}$	mg/kg	0.1	NONE	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
TPH-CWG - Aliphatic >EC8 - EC10 $_{HS\_1D\_AL}$	mg/kg	0.1	NONE	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
TPH-CWG - Aliphatic >EC10 - EC12 $_{EH\_CU\_1D\_AL}$	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16 $_{EH\_CU\_1D\_AL}$	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
TPH-CWG - Aliphatic >EC16 - EC21 $_{EH\_CU\_1D\_AL}$	mg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0
TPH-CWG - Aliphatic >EC21 - EC35 $_{EH\_CU\_1D\_AL}$	mg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0
TPH-CWG - Aliphatic (EC5 - EC35) $_{EH\_CU+HS\_1D\_AL}$	mg/kg	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >EC5 - EC7 $_{HS\_1D\_AR}$	mg/kg	0.1	NONE	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
TPH-CWG - Aromatic >EC7 - EC8 $_{HS\_1D\_AR}$	mg/kg	0.1	NONE	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
TPH-CWG - Aromatic >EC8 - EC10 $_{HS\_1D\_AR}$	mg/kg	0.1	NONE	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
TPH-CWG - Aromatic >EC10 - EC12 $_{EH\_CU\_1D\_AR}$	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >EC12 - EC16 $_{EH\_CU\_1D\_AR}$	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0	2.5
TPH-CWG - Aromatic >EC16 - EC21 $_{EH\_CU\_1D\_AR}$	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >EC21 - EC35 $_{EH\_CU\_1D\_AR}$	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic (EC5 - EC35) $_{EH\_CU+HS\_1D\_AR}$	mg/kg	10	NONE	< 10	< 10	< 10	12	18

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

Analytical Report Number: 23-48621
Project / Site name: Stephenson Way
Your Order No: POP014006

Lab Sample Number				2768498	2768499	2768500
Sample Reference				WS3	WS3	WS4
Sample Number				3	4	1
Depth (m)				0.60	1.00	0.95
Date Sampled				31/07/2023	01/08/2023	01/08/2023
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**			
Stone Content	%	0.1	NONE	40	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	3.2	4.2	7.5
Total mass of sample received	kg	0.001	NONE	0.7	0.9	0.8
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	-	-
Asbestos Analyst ID	N/A	N/A	N/A	DSO	N/A	N/A
General Inorganics						
pH - Automated	pH Units	N/A	MCERTS	9.1	9.5	10.5
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Total Sulphate as SO4	mg/kg	50	MCERTS	380	180	380
Organic Matter (automated)	%	0.1	MCERTS	0.4	< 0.1	< 0.1
Total Phenols						
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Speciated PAHs						
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	0.18	< 0.05	< 0.05
Anthracene	mg/kg	0.05	MCERTS	0.06	< 0.05	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	0.38	< 0.05	< 0.05
Pyrene	mg/kg	0.05	MCERTS	0.3	< 0.05	< 0.05
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.19	< 0.05	< 0.05
Chrysene	mg/kg	0.05	MCERTS	0.19	< 0.05	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	0.2	< 0.05	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	0.14	< 0.05	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	0.2	< 0.05	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.14	< 0.05	< 0.05
Coronene	mg/kg	0.05	NONE	< 0.05	< 0.05	< 0.05
Total PAH						
Total WAC-17 PAHs	mg/kg	0.85	NONE	1.98	< 0.85	< 0.85
Heavy Metals / Metalloids						
Antimony (aqua regia extractable)	mg/kg	1	ISO 17025	2.3	< 1.0	< 1.0
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	7.4	9.2	9
Barium (aqua regia extractable)	mg/kg	1	MCERTS	240	29	16
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	0.37	0.26	0.25
Boron (water soluble)	mg/kg	0.2	MCERTS	0.5	0.5	0.6
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.7	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	1.2	NONE	< 1.2	< 1.2	< 1.2
Chromium (III)	mg/kg	1	NONE	11	13	11
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	11	13	11
Copper (aqua regia extractable)	mg/kg	1	MCERTS	25	18	57
Lead (aqua regia extractable)	mg/kg	1	MCERTS	33	6.8	5.1
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	12	13	14
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	15	18	16
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	110	20	19

Analytical Report Number: 23-48621
Project / Site name: Stephenson Way
Your Order No: POP014006

Lab Sample Number				2768498	2768499	2768500
Sample Reference				WS3	WS3	WS4
Sample Number				3	4	1
Depth (m)				0.60	1.00	0.95
Date Sampled				31/07/2023	01/08/2023	01/08/2023
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**			
Monoaromatics & Oxygenates						
Benzene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0
Toluene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0
Ethylbenzene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0
p & m-xylene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0
o-xylene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	NONE	< 5.0	< 5.0	< 5.0
Petroleum Hydrocarbons						
TPH-CWG - Aliphatic >EC5 - EC6 $_{HS\_1D\_AL}$	mg/kg	0.1	NONE	< 0.10	< 0.10	< 0.10
TPH-CWG - Aliphatic >EC6 - EC8 $_{HS\_1D\_AL}$	mg/kg	0.1	NONE	< 0.10	< 0.10	< 0.10
TPH-CWG - Aliphatic >EC8 - EC10 $_{HS\_1D\_AL}$	mg/kg	0.1	NONE	< 0.10	< 0.10	< 0.10
TPH-CWG - Aliphatic >EC10 - EC12 $_{EH\_CU\_1D\_AL}$	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16 $_{EH\_CU\_1D\_AL}$	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0
TPH-CWG - Aliphatic >EC16 - EC21 $_{EH\_CU\_1D\_AL}$	mg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0
TPH-CWG - Aliphatic >EC21 - EC35 $_{EH\_CU\_1D\_AL}$	mg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0
TPH-CWG - Aliphatic (EC5 - EC35) $_{EH\_CU+HS\_1D\_AL}$	mg/kg	10	NONE	< 10	< 10	< 10
TPH-CWG - Aromatic >EC5 - EC7 $_{HS\_1D\_AR}$	mg/kg	0.1	NONE	< 0.10	< 0.10	< 0.10
TPH-CWG - Aromatic >EC7 - EC8 $_{HS\_1D\_AR}$	mg/kg	0.1	NONE	< 0.10	< 0.10	< 0.10
TPH-CWG - Aromatic >EC8 - EC10 $_{HS\_1D\_AR}$	mg/kg	0.1	NONE	< 0.10	< 0.10	< 0.10
TPH-CWG - Aromatic >EC10 - EC12 $_{EH\_CU\_1D\_AR}$	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >EC12 - EC16 $_{EH\_CU\_1D\_AR}$	mg/kg	2	MCERTS	2.5	< 2.0	< 2.0
TPH-CWG - Aromatic >EC16 - EC21 $_{EH\_CU\_1D\_AR}$	mg/kg	10	MCERTS	< 10	< 10	< 10
TPH-CWG - Aromatic >EC21 - EC35 $_{EH\_CU\_1D\_AR}$	mg/kg	10	MCERTS	< 10	< 10	< 10
TPH-CWG - Aromatic (EC5 - EC35) $_{EH\_CU+HS\_1D\_AR}$	mg/kg	10	NONE	15	< 10	< 10

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

Analytical Report Number : 23-48621
Project / Site name: Stephenson Way

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

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

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2768493	WS1	1	0.2	Brown gravelly sand with stones.
2768494	WS1	2	1.6	Brown sand with gravel.
2768495	WS2	1	0.1	Brown gravelly sand with stones and vegetation.
2768496	WS2	2	0.55	Brown clay and sand with gravel and vegetation.
2768497	WS3	2	0.45	Brown loam and sand with stones and vegetation.
2768498	WS3	3	0.6	Brown loam and sand with stones and vegetation.
2768499	WS3	4	1	Brown sand with gravel.
2768500	WS4	1	0.95	Brown clay and sand with gravel.

Analytical Report Number : 23-48621
Project / Site name: Stephenson Way

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 soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
Speciated WAC-17 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270.	L064-PL	D	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS. Individual components MCERTS accredited	In-house method based on USEPA8260	L073B-PL	W	MCERTS
Cr (III) in soil	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-PL	W	MCERTS
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
Hexavalent chromium in soil (Lower Level)	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	NONE

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 : 23-48621
Project / Site name: Stephenson Way

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

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

UKAS TESTING
4041

Environmental Science

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Analytical Report Number : 23-49983

Project / Site name:	Stephenson Way	**Samples received on:**	09/08/2023
Your job number:	CG 28583A	**Samples instructed on/ Analysis started on:**	09/08/2023
Your order number:	POP014043	**Analysis completed by:**	18/08/2023
Report Issue Number:	1	**Report issued on:**	18/08/2023
Samples Analysed:	2 water samples		

Signed:

Dominika Warjan
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 i2 Environmental Science

Analytical Report Number: 23-49983
Project / Site name: Stephenson Way

Your Order No: POP014043

Lab Sample Number				2775967	2775968
Sample Reference				BH01	WS01
Sample Number				1	1
Depth (m)				2.45	2.54
Date Sampled				08/08/2023	08/08/2023
Time Taken				None Supplied	None Supplied
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**		
General Inorganics					
pH (L099)	pH Units	N/A	ISO 17025	7.7	8
Total Cyanide (Low Level 1 µg/l)	µg/l	1	ISO 17025	1.3	1.7
Free Cyanide (Low Level 1 µg/l)	µg/l	1	ISO 17025	< 1.0	< 1.0
Sulphate as SO4	µg/l	45	ISO 17025	60400	61200
Ammoniacal Nitrogen as N	µg/l	15	ISO 17025	31	35
Dissolved Organic Carbon (DOC)	mg/l	0.1	ISO 17025	2.04	2.9
Hardness - Total	mgCaCO3/l	1	ISO 17025	259	198
Total Phenols					
Total Phenols (monohydric)	µg/l	1	ISO 17025	< 1.0	< 1.0
Speciated PAHs					
Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Total PAH					
Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16	< 0.16
Heavy Metals / Metalloids					
Boron (dissolved)	µg/l	10	ISO 17025	160	130
Calcium (dissolved)	mg/l	0.012	ISO 17025	85	70
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0
Chromium (III)	µg/l	5	NONE	< 5.0	< 5.0
Magnesium (dissolved)	mg/l	0.005	ISO 17025	12	5.4

UKAS TESTING
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Analytical i2 Environmental Science

Analytical Report Number: 23-49983
Project / Site name: Stephenson Way

Your Order No: POP014043

Lab Sample Number				2775967	2775968
Sample Reference				BH01	WS01
Sample Number				1	1
Depth (m)				2.45	2.54
Date Sampled				08/08/2023	08/08/2023
Time Taken				None Supplied	None Supplied
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**		
Antimony (dissolved)	µg/l	0.4	ISO 17025	1	1.1
Arsenic (dissolved)	µg/l	0.15	ISO 17025	1.84	1.91
Barium (dissolved)	µg/l	0.06	ISO 17025	44	39
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1	< 0.1
Cadmium (dissolved)	µg/l	0.02	ISO 17025	0.03	< 0.02
Chromium (dissolved)	µg/l	0.2	ISO 17025	0.5	0.8
Copper (dissolved)	µg/l	0.5	ISO 17025	5.8	6.8
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2	< 0.2
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05	< 0.05
Nickel (dissolved)	µg/l	0.5	ISO 17025	3.4	2.4
Selenium (dissolved)	µg/l	0.6	ISO 17025	1.4	16
Vanadium (dissolved)	µg/l	0.2	ISO 17025	0.6	0.9
Zinc (dissolved)	µg/l	0.5	ISO 17025	2.9	3.5
Monoaromatics & Oxygenates					
Benzene	µg/l	3	ISO 17025	< 3.0	< 3.0
Toluene	µg/l	3	ISO 17025	< 3.0	< 3.0
Ethylbenzene	µg/l	3	ISO 17025	< 3.0	< 3.0
p & m-xylene	µg/l	3	ISO 17025	< 3.0	< 3.0
o-xylene	µg/l	3	ISO 17025	< 3.0	< 3.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	3	ISO 17025	< 3.0	< 3.0
Petroleum Hydrocarbons					
TPH-CWG - Aliphatic >C5 - C6## $_{HS\_1D\_AL}$	µg/l	1	ISO 17025	< 1.0	< 1.0
TPH-CWG - Aliphatic >C6 - C8 $_{HS\_1D\_AL}$	µg/l	1	ISO 17025	< 1.0	< 1.0
TPH-CWG - Aliphatic >C8 - C10## $_{HS\_1D\_AL}$	µg/l	1	ISO 17025	< 1.0	< 1.0
TPH-CWG - Aliphatic >C10 - C12 $_{EH\_1D\_AL\_MS}$	µg/l	10	NONE	< 10	< 10
TPH-CWG - Aliphatic >C12 - C16 $_{EH\_1D\_AL\_MS}$	µg/l	10	NONE	< 10	< 10
TPH-CWG - Aliphatic >C16 - C21 $_{EH\_1D\_AL\_MS}$	µg/l	10	NONE	< 10	< 10
TPH-CWG - Aliphatic >C21 - C35 $_{EH\_1D\_AL\_MS}$	µg/l	10	NONE	< 10	< 10
TPH-CWG - Aliphatic (C5 - C35) $_{HS+EH\_1D\_AL\_MS}$	µg/l	10	NONE	< 10	< 10
TPH-CWG - Aromatic >C5 - C7 $_{HS\_1D\_AR}$	µg/l	1	ISO 17025	< 1.0	< 1.0
TPH-CWG - Aromatic >C7 - C8 $_{HS\_1D\_AR}$	µg/l	1	ISO 17025	< 1.0	< 1.0
TPH-CWG - Aromatic >C8 - C10 $_{HS\_1D\_AR}$	µg/l	1	ISO 17025	< 1.0	< 1.0
TPH-CWG - Aromatic >C10 - C12 $_{EH\_1D\_AR\_MS}$	µg/l	10	NONE	< 10	< 10
TPH-CWG - Aromatic >C12 - C16 $_{EH\_1D\_AR\_MS}$	µg/l	10	NONE	< 10	< 10
TPH-CWG - Aromatic >C16 - C21 $_{EH\_1D\_AR\_MS}$	µg/l	10	NONE	< 10	< 10
TPH-CWG - Aromatic >C21 - C35 $_{EH\_1D\_AR\_MS}$	µg/l	10	NONE	< 10	< 10
TPH-CWG - Aromatic (C5 - C35) $_{HS+EH\_1D\_AR\_MS}$	µg/l	10	NONE	< 10	< 10

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

Analytical Report Number : 23-49983
Project / Site name: Stephenson Way

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-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
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
Boron in water	Determination of boron in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM	L039-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
Total Hardness of water	Determination of hardness in waters by calculation from calcium and magnesium. Accredited Matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045-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
Speciated EPA-16 PAHs in water	Determination of PAH compounds in water by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards. Accredited matrices: SW PW GW	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
Sulphate in water	Determination of sulphate in water after filtration by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-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
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	L073B-PL	W	ISO 17025
Ammoniacal Nitrogen as N in water	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the discrete analyser (colorimetric) salicylate/nitroprusside method. Accredited matrices SW, GW, PW, FSE, LL.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Cr (III) in water	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
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	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

Analytical Report Number : 23-49983
Project / Site name: Stephenson Way

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
Free cyanide (low level) in water	Determination of free cyanide by distillation followed by colorimetry.Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-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

- Quality control parameter has a high recovery (outside of limit); however the associated result is below the reporting limit, other checks applied prior to reporting the data have been accepted. The result should be considered as being deviating and may be compromised.

APPENDIX E

Contamination Assessment Tables

ASSESSMENT CRITERIA

Table E1 below sets out CGL's rationale for generic assessment criteria (GAC) adoption in order to evaluate risks posed to potential receptors at Land Fronting Stephenson Way (to the Rear of 222 Euston Road adjacent to 210 Euston Road), London NW1 2DA from identified chemical contamination. Potential receptors have been identified with reference to the Part IIA regime and associated DEFRA guidance. As with the Part IIA regime, under the planning regime all receptors (humans, controlled waters, ecology, crops/livestock and buildings) have been considered if there is the potential for them to be adversely affected by exposure to contamination. The results of the assessment for Land Fronting Stephenson Way (to the Rear of 222 Euston Road adjacent to 210 Euston Road), London NW1 2DA are then presented in Tables E2 to E7 of this appendix.

Table E1. Rationale for Assessment Criteria Adoption

Source / Media	CGL's Approach & Rationale
Risks to Human Health (long-term chronic risks)	
Soil contaminants	• Laboratory test results have been compared against Generic Assessment Criteria (GACs) derived in-house by CGL using the Contaminated Land Exposure Assessment (CLEA) model and version 1.071 of the CLEA software. Where Soil Guideline Values (SGVs) have been published previously by the Environment Agency, the CGL GACs have updated these based on current exposure parameters (e.g. updated inhalation rates). • The GACs have been generated assuming a sandy loam soil type and a Soil Organic Material of 1% for the Made Ground and natural soils. • In the event impacts are identified on a site above the GAC level for arsenic, cadmium, chromium VI, benzene or benzo(a)pyrene, the results have been compared to the applicable Category 4 Screening Level (C4SL) published by DEFRA to further assess risks. • The exception to the above relates to lead. The SGV for lead has been withdrawn and the C4SL for lead is used by CGL directly as a first tier of assessment. • The CGL GACs represent conservative screening criteria (set at acceptable or minimal risk) and have generally been calculated using the default parameters for the standard land use scenarios set out in the CLEA technical report and toxicological inputs in line with the requirements of Science Report SC050021/SR2 and, in the case of petroleum hydrocarbons, Science Report P5-080/TR3. • Where a CGL GAC has not been derived alternative assessment criteria will be sourced from current commercially-available sources (including international standards where no suitable UK assessment criteria exists). • Concentrations of cyanide above the laboratory reporting limit are assessed against a Soil Screening Value (SSV) developed by Atkins. Atkins have based this assessment criteria on acute exposure to a 0 to 6 year old child. • Where the dataset is of appropriate size, assessment against the applicable GAC or C4SL is carried out at the 95th percentile of the sample mean (designated US_{95}), which is considered to represent a reasonable worst-case scenario. An assessment of the normality of the data has been undertaken. Where datasets are normally distributed the one sample t-test has been applied to calculate the US_{95}. In the case of non-parametric datasets, the Chebychev Theorem has been applied. The Grubbs Test has also been used to identify potential outliers within datasets. • It is noted that the British Geological Survey has published background levels for a number of organic and inorganic constituents. In the event that the C4SL or a GAC is found to be exceeded, the risk may still be considered to be low, unlikely to meet the definition of contaminated land under Part IIA and potentially suitable for use from a development perspective, if the contaminant concentrations are below local background levels, assuming no other contributing factors. • At this time an authoritative GAC is not available for asbestos fibres in soil. A positive identification of asbestos fibres in a soil sample by the laboratory is considered sufficient to warrant additional assessment of risks. Laboratory identification and quantification by microscopy may be required subject to source of material.

Source / Media	CGL's Approach & Rationale
Dissolved contaminants	• Concentrations of organic constituents detected above the laboratory reporting limit in shallow groundwater or perched water have been assessed against groundwater vapour generic assessment criteria (GAC_{gwvap}) developed by the Society of Brownfield Remediation Risk Assessment (SoBRA). These assess chronic risks to human health via the indoor and outdoor air inhalation pathway only. The values assume a sand soil type, a soil organic matter of 1% and a depth below ground level of 650mm.
Ground gas	• Concentrations and flow rates of carbon dioxide and methane in ground gas are converted to Gas Screening Values (GSVs) in accordance with CIRIA (2007). Potential risks associated with gas chemistry are evaluated in accordance with guidance presented in CIRIA (2007), NHBC (2007), BSI (2007).
Radon	• Risks from the radon content of soil gas are evaluated in accordance with BRE (2011).
Risks to Controlled Waters	
Soil contaminants	• Results from any eluted liquids have been directly compared to Environmental Quality Standards (EQS) and Drinking Water Values (DWV) as an initial screen of water quality. These are considered to be conservative screening criteria.
Dissolved contaminants	• Results have been directly compared to Environmental Quality Standards (EQS) and Drinking Water Values (DWV) as an initial screen of water quality. These are considered to be conservative screening criteria.
Risks to Buildings & Structures	
Water supply pipes	• The evaluation of water supply pipe requirements at the site has been undertaken in general accordance with guidance and criteria produced by the UK Water Industry (2011).
Sulfate & pH conditions	• The evaluation of risks to buried concrete has followed the guidance and criteria produced by BRE (2005).
Risks to Vegetation & Plants	
Soil contaminants	• Risks to plant growth (i.e. phytotoxicity) have been assessed for specific contaminants where the limits for phytotoxic effect proposed (e.g. by BS 3882) are significantly lower than the health GAC.

Table E2. Data assessment summary - potential soil risks to human health					
Land Use Category:	**Residential WITHOUT plant uptake**			**SOM:**	1.00%
Stratum:	**Made Ground**			**No. Samples**	5
Determinand	**GAC** mg/kg	**Min recorded (mg/kg)**	**Max recorded (mg/kg)**	**No. Samples tested for determinand**	**No. Samples exceeding GAC**
Arsenic (aqua regia extractable)	30	2.2	8	5	0
Beryllium (aqua regia extractable)	1.72	0.21	0.44	5	0
Boron (Water Soluble)	10800	0.3	0.5	5	0
Cadmium (aqua regia extractable)	85	<0.2	1	5	0
Chromium (III)	887	6.1	11	5	0
Chromium (hexavalent)	5.75	<1.2	<1.2	5	0
Copper (aqua regia extractable)	7130	13	50	5	0
Lead (aqua regia extractable)	310	6.6	38	5	0
Mercury (aqua regia extractable)	75.3	<0.3	<0.3	5	0
Nickel (aqua regia extractable)	182	5.8	12	5	0
Selenium (aqua regia extractable)	596	<1	<1	5	0
Vanadium (aqua regia extractable)	651	15	33	5	0
Zinc (aqua regia extractable)	40400	32	120	5	0
Benzene	0.448	<0.005	<0.005	5	0
Toluene	1010	<0.005	<0.005	5	0
Ethylbenzene	274	<0.005	<0.005	5	0
o-Xylene	97.9	<0.005	<0.005	5	0
Total Phenols (monohydric)	1180	<1	<1	5	0
Total Cyanide	34	<1	<1	5	0
TPH-CWG - Aliphatic >EC5 - EC6	39.7	<0.1	<0.1	5	0
TPH-CWG - Aliphatic >EC6 - EC8	85	<0.1	<0.1	5	0
TPH-CWG - Aliphatic >EC8 - EC10	18.7	<0.1	<0.1	5	0
TPH-CWG - Aliphatic >EC10 - EC12	93.3	<1	<1	5	0
TPH-CWG - Aliphatic >EC12 - EC16	797	<2	<2	5	0
TPH-CWG - Aliphatic >EC16 - EC21	129000	<8	<8	5	0
TPH-CWG - Aliphatic >EC21 - EC35	129000	<8	<8	5	0
TPH-CWG - Aromatic >EC5 - EC7	0.448	<0.1	<0.1	5	0
TPH-CWG - Aromatic >EC7 - EC8	1010	<0.1	<0.1	5	0
TPH-CWG - Aromatic >EC8 - EC10	30.1	<0.1	<0.1	5	0
TPH-CWG - Aromatic >EC10 - EC12	159	<1	<1	5	0
TPH-CWG - Aromatic >EC12 - EC16	758	<2	2.5	5	0
TPH-CWG - Aromatic >EC16 - EC21	1940	<10	<10	5	0
TPH-CWG - Aromatic >EC21 - EC35	1940	<10	<10	5	0
Naphthalene	2.53	<0.05	<0.05	5	0
Acenaphthylene	2060	<0.05	<0.05	5	0
Acenaphthene	2120	<0.05	<0.05	5	0
Fluorene	2170	<0.05	<0.05	5	0
Phenanthrene	1360	<0.05	0.18	5	0
Anthracene	27400	<0.05	0.06	5	0
Fluoranthene	1500	<0.05	0.38	5	0
Pyrene	3600	<0.05	0.3	5	0
Benzo(a)anthracene	12.4	<0.05	0.19	5	0
Chrysene	30.7	<0.05	0.19	5	0
Benzo(b)fluoranthene	4	<0.05	0.26	5	0
Benzo(k)fluoranthene	106	<0.05	0.14	5	0
Benzo(a)pyrene	3.19	<0.05	0.2	5	0
Indeno(1,2,3-cd)pyrene	45.2	<0.05	0.11	5	0
Di-benzo(a,h)anthracene	0.33	<0.05	<0.05	5	0
Benzo(ghi)perylene	357	<0.05	0.14	5	0
Asbestos in Soil	2	0	0	5	0
pH	14	8.9	9.7	5	0

Table E3. Data assessment summary - potential soil risks to human health					
Land Use Category:	**Residential WITHOUT plant uptake**			**SOM:**	1.00%
Stratum:	**Natural Soils**			**No. Samples**	3
Determinand	**GAC** mg/kg	**Min recorded (mg/kg)**	**Max recorded (mg/kg)**	**No. Samples tested for determinand**	**No. Samples exceeding GAC**
Arsenic (aqua regia extractable)	30	6.8	9.2	3	0
Beryllium (aqua regia extractable)	1.72	0.2	0.26	3	0
Boron (Water Soluble)	10800	0.3	0.6	3	0
Cadmium (aqua regia extractable)	85	<0.2	<0.2	3	0
Chromium (III)	887	7.4	13	3	0
Chromium (hexavalent)	5.75	<1.2	<1.2	3	0
Copper (aqua regia extractable)	7130	6.2	57	3	0
Lead (aqua regia extractable)	310	3.1	6.8	3	0
Mercury (aqua regia extractable)	75.3	<0.3	<0.3	3	0
Nickel (aqua regia extractable)	182	8.7	14	3	0
Selenium (aqua regia extractable)	596	<1	<1	3	0
Vanadium (aqua regia extractable)	651	12	18	3	0
Zinc (aqua regia extractable)	40400	10	20	3	0
Benzene	0.448	<0.005	<0.005	3	0
Toluene	1010	<0.005	<0.005	3	0
Ethylbenzene	274	<0.005	<0.005	3	0
o-Xylene	97.9	<0.005	<0.005	3	0
Total Phenols (monohydric)	1180	<1	<1	3	0
Total Cyanide	34	<1	<1	3	0
TPH-CWG - Aliphatic >EC5 - EC6	39.7	<0.1	<0.1	3	0
TPH-CWG - Aliphatic >EC6 - EC8	85	<0.1	<0.1	3	0
TPH-CWG - Aliphatic >EC8 - EC10	18.7	<0.1	<0.1	3	0
TPH-CWG - Aliphatic >EC10 - EC12	93.3	<1	<1	3	0
TPH-CWG - Aliphatic >EC12 - EC16	797	<2	<2	3	0
TPH-CWG - Aliphatic >EC16 - EC21	129000	<8	<8	3	0
TPH-CWG - Aliphatic >EC21 - EC35	129000	<8	<8	3	0
TPH-CWG - Aromatic >EC5 - EC7	0.448	<0.1	<0.1	3	0
TPH-CWG - Aromatic >EC7 - EC8	1010	<0.1	<0.1	3	0
TPH-CWG - Aromatic >EC8 - EC10	30.1	<0.1	<0.1	3	0
TPH-CWG - Aromatic >EC10 - EC12	159	<1	<1	3	0
TPH-CWG - Aromatic >EC12 - EC16	758	<2	<2	3	0
TPH-CWG - Aromatic >EC16 - EC21	1940	<10	<10	3	0
TPH-CWG - Aromatic >EC21 - EC35	1940	<10	<10	3	0
Naphthalene	2.53	<0.05	<0.05	3	0
Acenaphthylene	2060	<0.05	<0.05	3	0
Acenaphthene	2120	<0.05	<0.05	3	0
Fluorene	2170	<0.05	<0.05	3	0
Phenanthrene	1360	<0.05	<0.05	3	0
Anthracene	27400	<0.05	<0.05	3	0
Fluoranthene	1500	<0.05	<0.05	3	0
Pyrene	3600	<0.05	<0.05	3	0
Benzo(a)anthracene	12.4	<0.05	<0.05	3	0
Chrysene	30.7	<0.05	<0.05	3	0
Benzo(b)fluoranthene	4	<0.05	<0.05	3	0
Benzo(k)fluoranthene	106	<0.05	<0.05	3	0
Benzo(a)pyrene	3.19	<0.05	<0.05	3	0
Indeno(1,2,3-cd)pyrene	45.2	<0.05	<0.05	3	0
Di-benzo(a,h)anthracene	0.33	<0.05	<0.05	3	0
Benzo(ghi)perylene	357	<0.05	<0.05	3	0
pH	14	9.1	10.5	3	0

Table E4. Data assessment summary – potential groundwater vapour risk to human health (Residential land use)

Contaminant	Residential GAC_{gwvap} (µg/l)	Measured range (µg/l)	No. of samples exceeding assessment criteria
Benzene	210	<3.0	<3.0
Toluene	230,000	<3.0	<3.0
Ethylbenzene	10,000	<3.0	<3.0
Total Xylene	9,500	<3.0	<3.0
Methyl tertiary butyl ether (MTBE)	83,000	<3.0	<3.0
TPH aromatic >EC5 to EC7[1]	210,000	<1.0	<1.0
TPH aromatic >EC7 to EC8	220,000	<1.0	<1.0
TPH aromatic >EC8 to EC10	1,900	<1.0	<1.0
TPH aromatic >EC10 to EC12	6,800	<10	<10
TPH aromatic >EC12 to EC16	39,000	<10	<10
TPH aliphatic EC5 to EC6	1,900	<1.0	<1.0
TPH aliphatic >EC6 to EC8	1,500	<1.0	<1.0
TPH aliphatic >EC8 to EC10	57	<1.0	<1.0
TPH aliphatic >EC10 to EC12	37	<10	<10
Acenaphthene	170,000Error! Bookmark not defined.	<0.01	<0.01
Acenaphthylene	220,000Error! Bookmark not defined.	<0.01	<0.01
Fluorene	210,000Error! Bookmark not defined.	<0.01	<0.01
Naphthalene	220	<0.01	<0.01

1. Assessment criteria for TPH Aromatic >EC5 to EC7 should also be compared to assessment criteria for benzene to account for genotoxic mutagenic affects.

Table E5. Data assessment summary - potential risks to groundwater							
Water Body		**Freshwater**					
Determinand	**Freshwater EQS[1] (µg/l)**	**EC Drinking Water Value (µg/l)**	**Min recorded (µg/l)**	**Max recorded (µg/l)**	**Bioavailable concentration (µg/l)**	**No. Samples Exceeding EQS**	**No. Samples Exceeding DWV**
Arsenic	50	10	1.84	1.91	-	0 of 2	0 of 2
Cadmium	0.25	5	<0.02	0.03	-	0 of 2	0 of 2
Chromium (VI)	3.4	50	< 5.0	< 5.0	-	0 of 2	0 of 2
Chromium (III)	4.7	50	< 5.0	< 5.0	-	0 of 2	0 of 2
Lead	7.2	10	< 0.2	< 0.2	-	0 of 2	0 of 2
Mercury	0.07	1	< 0.05	< 0.05	-	0 of 2	0 of 2
Selenium	*	10	1.4	16	-	-	0 of 2
Boron	*	1000	130	160	-	-	0 of 2
Copper	1	2000	5.8	6.8	0.82 to 0.87	0 of 2	0 of 2
Nickel	4	20	2.4	3.4	1.0 to 1.32	0 of 2	0 of 2
Zinc	10.9	5000	2.9	3.5	1.66 to 1.77	0 of 2	0 of 2
Barium	*	1000	39	44	-	-	0 of 2
Beryllium	15	*	<0.1	<0.1	-	0 of 2	-
Total Phenols (monohydric)	7.7	0.5	< 1.0	< 1.0	-	0 of 2	0 of 2
Total Cyanide	1	50	1.3	1.7	-	2 of 2	0 of 2
Total Sulphate as SO4 (mg/l)	*	250	60400	61200	-	-	0 of 2
TPH	*	10	<10	<10	-	-	0 of 2
PAH	*	0.1	< 0.16	< 0.16	-	-	0 of 2
Anthracene	0.1	*	< 0.01	< 0.01	-	0 of 2	-
Benzo(a)pyrene	0.02	0.01	< 0.01	< 0.01	-	0 of 2	0 of 2
Fluoranthene	0.1	*	< 0.01	< 0.01	-	0 of 2	-
Naphthalene	2	*	< 0.01	< 0.01	-	0 of 2	-
Benzene	10	1	< 3.0	< 3.0	-	0 of 2	0 of 2
Toluene	74	*	< 3.0	< 3.0	-	0 of 2	-
Total ammonia/ ammoniacal nitrogen as NH4	*	500	31	35	-	-	0 of 2
Hardness (mg CaCO3/l)	*	*	198	259	-	-	-
pH	6 to 9	6.5 to 10	7.7	8	-	0 of 2	0 of 2

Notes:

1 Annual Averages prescribed within The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015.

2 EQS for Cadmium varies with water hardness where range given. Evaluated against appropriate band.

3 EC Drinking Water Values for Chromium relate to total chromium.

4 * = No values defined or given.

5 Copper, Nickel, Zinc screened against the bioavailable fraction of the dissolved concentration of copper, nickel and zinc. “bioavailable” means the fraction of the dissolved concentration of zinc, nickel and copper likely to result in toxic effects as determined using the UKTAG Metal Bioavailability Assessment Tool.

6 Zinc value of 10.9 µg/l is bioavailable plus ambient background concentration (µg/l) dissolved. Ambient background concentrations for dissolved zinc in freshwaters in England and Wales to be used in conjunction with item 6.

7 Zinc EC DWV concentration formerly prescribed within the Water Supply (Water Quality) Regulations 1989.

8 Freshwater EQS value for Beryllium is Dutch Indication Level of Serious Contamination.

9 Drinking water standard based on total cyanide, EQS value based on Free Cyanide.

10 PAH is the sum concentration of 4 PAH comprising benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(ghi)perylene and indeno(1,2,3-cd)pyrene.

11 The previous published value for benzo(a)pyrene and fluoranthene is given in the table, and the current published value is given in square brackets. The square

Table E6. Data assessment summary – potential soil risk to vegetation and plants

Determinant	Assessment Criteria (mg/kg)	Measured range (mg/kg)	Maximum Concentration > Assessment Criteria? (Y/N) #- outlier detected
Copper[1]	135	6.2 to 57	N
Zinc[1]	200	10 to 120	N
Nickel[1]	75	5.8 to 14	N
Boron (water soluble)[2]	5	0.3 to 0.6	N

[1] BSI, (2015). *Specification for topsoil and requirements for use. BS 3882:2015*. Values taken for pH 6-7

[2] Limit for phytotoxic effect. Nable, Banuelos and Paul, (1997). *Boron Toxicity*. Plant and Soil, Volume 193, pp 181-198

Table E7. Standard Water Supply Pipe Assessment

Test Group[1]	Testing Required?	PE threshold (mg/kg)	Metal Pipes / Barrier Pipe	Laboratory Detection Limit (mg/kg)	Testing UKAS accredited Y/N	Maximum concentration at proposed pipeline depth[2] (mg/kg)	Maximum site concentration[3] (mg/kg)	Locations and depths where concentrations exceed proposed pipeline threshold.
Total BTEX & MTBE	**Where Preliminary Risk Assessment (PRA) has identified land potentially affected by contamination**	**0.1**	**Pass**	5	Y	<5	<5	N/A
EC5–EC10 aliphatic and aromatic hydrocarbons		**2**	**Pass**	0.1	Y	<0.1	<0.1	N/A
EC10-EC16 aliphatic and aromatic hydrocarbons		**10**	**Pass**	2	Y	<2	2.5	N/A
EC16-EC40 aliphatic and aromatic hydrocarbons		**500**	**Pass**	10	Y	<8	<10	N/A
Phenols		**2**	**Pass**	1	Y	<1	<1	N/A

[1] Tests Groups as per Appendix G of UKWIR Guidance.
[2] Water pipes are normally laid 0.75-1.35 metres below finished ground level.
[3] State if liquid free product is present in soil or groundwater.

APPENDIX F

Risk Assessment Methodology

CGL Risk Assessment Methodology

The following risk Assessment methodology is based on CIRIA C552 (2001) Contaminated Land Risk Assessment – A Guide to Good Practice[1], in order to quantify potential risk via risk estimation and risk evaluation, which can be adopted at the Phase I stage. This will then determine an overall risk category which can be used to identify likely actions. This methodology uses qualitative descriptors and therefore is a qualitative approach and is undertaken for each potential pollution linkage (source-pathway-receptor) identified for the site in accordance with Land Condition Risk Management[3].

The methodology requires the classification of:

- The magnitude of the consequence (severity) of a risk occurring, and
- The magnitude of the probability (likelihood) of a risk occurring.

The potential consequences of contamination risks occurring at this site are classified in accordance with Table 1 below, which is adapted from the CIRIA guidance[1].

Table 1. Classifications of Consequence ratings

Classification	*Definition of Consequence*	*Examples*
Severe	Short-term (acute) risks to human health.	High concentration of cyanide on the surface of an informal recreation area
	Short-term (acute) risk of pollution of sensitive water resource or ecosystem.	Major spillage of contaminants from site into controlled waters
	Catastrophic damage to crops/buildings/property/infrastructure, including off-site soils.	Explosion causing building collapse
Medium	Long-term (chronic) risks to human health	Concentrations of a contaminant from site exceeding the generic or site specific assessment criteria
	Long-term (chronic) pollution of sensitive water resource	Leaching of contaminants from a site into a major or minor aquifer
	Significant change in an ecosystem/contamination of off-site soils	Death of a species within a designated nature reserve
Mild	Pollution of non-sensitive water resource	Pollution of a non-classified groundwater
	Significant damage to crops/ buildings/property/infrastructure	Damage to a building rendering it unsafe to occupy (e.g. foundation damage resulting in instability)
	Damage to an ecosystem or sensitive buildings/structures/services	
Minor	Easily preventable non-permanent health effects	Presence of contamination at concentrations which require the use of personal protective equipment during site work
	Harm, although not necessarily significant harm, which may result in financial loss or expenditure to resolve	Loss of plants in a landscaping scheme/discolouration of concrete
	Easily repairable effects of damage to buildings/structures/services	

[1] CIRIA, (2001). *Contaminated Land Risk Assessment. A Guide to Good Practice*. CIRIA C552.

[2] M.J. Carter Associates, (1995*). Prioritisation and Categorisation Procedure for Sites Which May Be Contaminated*. Contaminated Land Report 6. Department of the Environment. C

[3] Land Condition Risk Management - https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm

The potential probability of the risks being realised are classified in accordance with the ratings set out in Table 2 which are adapted from the CIRIA guidance[1]. It should be noted that where a pollutant linkage has not been identified the likelihood is considered to be zero.

Table 2. Classifications of probability ratings

Classification	*Definition*
High likelihood	There is a pollution linkage and an event that either appears very likely in the short term and almost inevitable in the long term, or there is evidence at the receptor that an event has occurred
Likely	There is a pollution linkage and all the elements are present and in the right place which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short term and likely over the long term
Low likelihood	There is a pollution linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such an event would take place and is less likely in the short term.
Unlikely	There is a pollutant linkage but circumstances are such that it is improbable that an event would occur even in the very long term

In accordance with C552 the risk classification for each pollution linkage are classified in accordance with the matrix for consequence and probability set out in Table 3. The definitions for the risk classifications are presented in Table 4.

Table 3. Risk classification matrix

		Consequence			
		Severe	***Medium***	***Mild***	***Minor***
Probability	**High likelihood**	Very High	High	Moderate	Moderate / Low
	Likely	High	Moderate	Moderate / Low	Low
	Low likelihood	Moderate	Moderate / Low	Low	Very Low
	Unlikely	Moderate / Low	Low	Very Low	Very Low

Table 4. Risk classification definitions

Classification	*Definition*
Very High	There is a high probability that severe harm could arise to a designated receptor from the identified hazard or there is evidence that severe harm is currently happening. This risk, if realised, is likely to result in substantial liability. Urgent investigation (if not already undertaken) and remediation are likely to be required.
High	Harm is likely to arise to a designated receptor from the identified hazard. Realisation of the risk is likely to result in substantial liability. Urgent investigation (if not already undertaken) and remediation are likely to be required.
Moderate	It is possible that harm could arise to a designated receptor from the identified hazard. However, it is either relatively unlikely that such harm would be severe or if any harm were to occur it is more likely that the harm would be relatively mild. Urgent investigation (if not already undertaken) is normally required to clarify the potential risk and to determine the potential liability. Some remedial works may be required in the longer term.
Low	It is possible that harm could arise to a designated receptor from the identified hazard, but it is considered likely that this harm, if realised, would at worse normally be mild.
Very Low	There is a low possibility that harm could arise to a designated receptor from the identified hazard. In the event of such harm being realised it is not likely to be severe.