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VDC LHR21 Limited

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1620013218-007

Environmental Permit Application: Site Condition Report

37-39 North Acton Road, London, NW10 6PF.

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Prepared by	**Lydia Hall / Aakanksha Sinha**
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Description	**Site Condition Report**

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Contents

1. Introduction

Ramboll UK Limited ("Ramboll") was commissioned by VDC LHR21 Limited ("VDC" or the "Client") to provide environmental permitting support in relation to the proposed installation and operation of emergency generators at a planned data centre site. The data centre is to be located at 37-39 North Acton Road, London, NW10 6PF (the "site"). The data centre and associated generators will be operated by VDC.

This site condition report is intended to satisfy the EA's request for such a report as part of the application for an Environmental Permit and has been developed following the guidance and template provided in the EA's Guidance for Applicants (H5) – Site Condition Report document[1], including the application of the tabular format contained within the template.

Reliance and General Limitations

The conclusions presented in this report represent Ramboll UK Limited's best professional judgment based upon the information available and conditions existing as of the date of the review. In performing its assignment, Ramboll UK Limited must rely upon publicly available information, information provided by the client and information provided by third-parties. Accordingly, the conclusions in this report are valid only to the extent that the information provided to Ramboll Limited was accurate and complete. This review is not intended as legal advice, nor is it an exhaustive review of site conditions or facility compliance. Ramboll UK Limited makes no representations or warranties, express or implied, about the condition of the site.

Ramboll UK Limited's scope of work for this assignment did not include collecting samples of any environmental media. As such, this review cannot rule out the existence of latent conditions.

[1] Environmental Permitting: H5 Site Condition Report, Environment Agency, Published 13 May 2013.

2. Site details

Site Details	
Name of Applicant	VDC LHR21 Limited
Activity Address	37-39 North Acton Road, London, NW10 6PF
National Grid Reference	520829, 182995
Document reference and dates for Site Condition Report at permit application and surrender	Site Condition Report at Permit Application: 1620013218-007 LHR21 Site Condition Report, prepared by Ramboll UK Limited, October 2023

3. Condition of the Land at Permit Issue

The table below provides a description of the site's environmental setting from a review of publicly available information previous third-party reports and site investigation reports (a Phase I Environmental Site Assessment, dated November 2021 and a Geo-Environmental Ground Investigation report dated June 2022) produced by Ramboll.

Condition of the Land at Permit Issue	
Environmental setting including: • geology • hydrogeology • surface waters	**3.1 Geology** The Phase I report and Geo-Environmental Ground Investigation report obtained information on the geology for the site from electronic mapping and publicly available borehole records from the British Geological Society (BGS) website. This information is summarised below. The site is underlain by bedrock geology of the London Clay Formation (blue-grey or grey-brown, silty clay with some layers of sandy clay; an Unproductive Strata). No superficial deposits are recorded as being present at the site however, given the site history, it is considered likely that an unknown thickness of Made Ground is present directly above the bedrock. The London Clay Formation is further underlain by the Lambeth Group (clay, silt, sand and gravel) and the White Chalk Subgroup (chalk with flint) to depth. The thickness of the underlying London Clay Formation within the surrounding area is approximately 80m thick. Groundwater within the London Clay Formation is likely to be discontinuous given the unproductive nature of this bedrock geology. A publicly available borehole record (BGS Reference: TQ28SW592) located approximately 36m to the north of the site, indicates the presence of made ground to 1.3m below ground level (BGL) and recorded the underlying London Clay Formation to a depth of approximately 10m bgl (unproven). Between April and May 2022 an intrusive geo-environmental ground investigation was undertaken at the site by Geotechnical Engineering Limited (GEL) (principal contractor) under the technical supervision of Ramboll. The ground investigation comprised drilling of three cable percussion boreholes to a maximum depth of 35.0m bgl and five windowless sample boreholes to depths of up to 5.45m bgl. Nineteen soil and six groundwater samples were collected and analysed by a laboratory for a suite of environmental analysis and a further 315 samples were obtained for geotechnical testing. Ground gas monitoring was

undertaken on three occasions (4th, 11th and 18th May 2022) and groundwater monitoring was undertaken on two occasions (4th and 11th May 2022).

Made Ground was encountered beneath asphalt and concrete hardstanding at typical thicknesses of 1.35m and depth to base of between 0.55 and 2.15m bgl. Hardstanding was not present at two locations. The Made Ground generally comprised brown and grey sand and gravel of red brick, flint and occasional concrete underlain by soft to firm, brown, slightly sandy, slightly gravelly clay. The London Clay Formation was encountered underlying the Made Ground and proven to a maximum depth of 35.5m bgl. Visual and odour evidence of contamination was limited to a slight hydrocarbon odour (in dark grey sandy clay) and fragments of charcoal observed in the made ground at one location (WS01, 0.2-0.6m bgl) and a strong hydrocarbon odour with dark stained clay at another (WS02, 0.6m bgl in dark stained clay).

3.2 Hydrogeology

Information regarding the hydrogeology across the site has been obtained from a review of the 2021 Phase I Report and the 2022 Geoenvironmental Ground Investigation Report; this Site Condition Report should be read in conjunction with these reports for completeness.

3.2.1 Aquifer Designations

The Environment Agency (EA) Aquifer Designation for the London Clay Formation underlying the site is Unproductive Strata. The site is further underlain by a Secondary A Aquifer associated with the Lambeth Group and a Principal Aquifer associated with the Upper Chalk Formation.

The site is not located within an EA designated groundwater source protection zone (SPZ).

The EA does not currently classify the underlying groundwater body at the site under the Water Framework Directive Classification Scheme, likely due to the unproductive nature of the London Clay Formation.

3.2.2 Licensed Groundwater Abstractions

According to a third-party environmental database (Envirocheck), there are two groundwater abstraction locations within a 2km radius of the site, the closest of which is located just under 2 km to the north-east. This abstraction is for 'Schools and Colleges: drinking, cooking, sanitary and washing (small garden)' and is licensed to Brahma Kumaris W S University.

3.2.3 Groundwater Sensitivity

The site is considered to be situated in an area of low sensitivity with respect to groundwater resources due to the underlying Unproductive Strata, Secondary A and Principal Aquifers. The site is not located within a groundwater SPZ. The low permeability London Clay Formation will provide some protection to the underlying Lambeth Group.

3.3 Surface water

3.3.1 Nearest Identified Surface Watercourse

The nearest surface watercourse is the concrete lined Grand Union Canal (Paddington Branch) located 38m north of the site. The EA[2] currently classifies the 'Grand Union Canal, Uxbridge to Hanwell Locks, Slough Arm, Paddington Arm Water Body' as being of 'moderate' ecological quality and it failed its chemical quality assessment under the Water Framework Directive Classification Scheme (2019 dataset). According to 2022 data, the ecological quality has not been classified and the chemical classification item 'does not require assessment'. The site is also located within the catchment of the Lower Brent River which is located some 1.6km north-west of the site. The EA[2] currently classifies the Lower Brent Water Body as being of 'moderate' ecological quality and it failed its chemical quality assessment under the Water Framework Directive Classification Scheme (2019 dataset). According to 2022 data, the ecological quality is classed as 'moderate' and the chemical classification item 'does not require assessment'.

[2] EA Catchment Data Explorer. Available at: https://environment.data.gov.uk/catchment-planning/v/c3-plan. Accessed 19/10/2023.

	According to mapping in the publication The Lost Rivers of London, no lost rivers were recorded at the site. 3.3.2 Licensed Surface Water Abstractions According to a third-party environmental database (Envirocheck), there is one licensed surface water abstraction within 2km of the site located approximately 650m north-west of the site. This abstraction is for 'other industrial/commercial/public services: non-evaporative cooling' and is licensed to the British Waterways Board. 3.3.3 Flood Risk According to publicly available EA flood mapping[3], the site lies within a Flood Zone 1 (Low Probability). This zone comprises land assessed as having a less than 1 in 1000 annual probability of river or sea flooding (<0.1% in any year). The closest area of land recorded as having an elevated risk of flooding is located over 920m north-west of the site. According to the EA Flood Map for Surface Water[4] which presents the theoretical potential for flooding from pluvial sources (i.e., flooding caused by rainwater exceeding capacity of drainage systems), the southern boundary of the site is located in an area of 'low' and 'medium' flooding probability. The site is considered to be in an area of low sensitivity with regards to surface water, due to the distance between the site and the closest identified surface water features (Grand Union Canal and the River Brent (lower)). 3.3.4 Ecological Designated Sites A Local Nature Reserve, Wormwood Scrubs, is located approximately 1.35 km south-east of the site.[5] There are no other statutory designated sites identified within 2km of the site (sites of special scientific interest, special protection areas, special areas of conservation or Ramsar sites).
Pollution history including: • pollution incidents that may have affected land • historical land-uses and associated contaminants	**3.4 Pollution Incidents** A third-party environmental database (Envirocheck) holds no records of pollution incidents on site.

[3] EA Flood Map for Planning. Available at: https://flood-map-for-planning.service.gov.uk/location. Accessed 19/10/2023.
[4] EA Flood Map for Surface Water. Available at: https://check-long-term-flood-risk.service.gov.uk/postcode. Accessed 19/10/2023.
[5] Defra Magic Maps. Available at: https://magic.defra.gov.uk/. Accessed 19/10/2023.

• any visual/olfactory evidence of existing contamination • evidence of damage to pollution prevention measures	A total of 18 pollution incidents to controlled waters have been recorded within 1km of the site. The nearest of these was located approximately 80m east of the site, relating to a release of unknown sewage. The receiving water was not recorded. The incident occurred in May 1999 and, was classified by the EA as a Category 3 - Minor Incident. There have been two substantiated pollution incidents recorded within 1km of the site, as detailed below: • An oil (diesel) spillage occurred approximately 340m north of the site in April 2009. The event was considered to be a Significant Incident – Category 2 (Land); a Minor Incident – Category 3 (Air); and No Impact– Category 4 (Water). • An 'atmospheric pollutant and effects' release occurred approximately 760m east of the site in November 2010. The event was considered to be a Significant Incident – Category 2 (Air); and No Impact– Category 4 (Water and Land). • These incidents pre-date the development of the site for use as a datacentre and are located off-site. They are considered unlikely to have resulted in long-term impacts within the installation boundary. 3.4.1 Contaminated Land Register Entries None recorded within 2km of the site. 3.4.2 Prosecutions or Enforcements There are records of four, Part B Permit Enforcements within 1km of the site, these are located: • Approximately 330m south for 'failure to comply with conditions 26 and 27 of agreement'. Issued: November 2001, Permit Ref: 000155. • Approximately 530m south-west. Issued: December 2000, Permit Ref: 000059. • Approximately 810m south-west for 'lidding of containers and failure to submit upgrading programme'. Issued: December 2000, Permit Ref: 000062. • Approximately 810m south-west for 're-sealing of containers and failure to submit upgrades programme'. Issued: December 2000, Permit Ref: 000014.

3.5 Historical Land Uses

3.5.1 On Site

Historical ordnance survey maps have been obtained from, a third-party environmental database (Envirocheck). A summary of historical land use on-site and in the surrounding area is shown below.

Period	On-site	Surrounding Area
1860s	Vacant land, possibly in agricultural use.	Surroundings were largely undeveloped with the Grand Junction Canal located 30m north-east of the site.
1874	No change.	Largely undeveloped agricultural land with the Grand Junction Canal located 30m north-east, ponds 160m north-east and 170m north, a railway 250m north-east, and a Naptha Works 600m south-east of the site (no longer shown by 1896).
1896	No change.	The Harlesden area 500m-1km north and east of the site had undergone

			significant urbanisation. A metal works was present approximately 430m north. The Willesden railway had expanded from 325m east and a sawmill was shown 600m south-east. Atlas Brick Works was depicted approximately 350m south-east and Willesden Paper and Canvas Works was shown approximately 450m south-east.
	1915	A road was present along the southern boundary of the site.	No change.
	1920s-1930s	Aerial imagery from 1928 shows the site to be undeveloped land. By 1935, a stationary works was present in the western portion of the site and a smaller structure of	Further expansion of Harlesden town centre to the north and east of the site. A power generating station (including associated cooling tanks, chimneys, transformers and several

		unknown use was present in the east of the site.	tanks) was developed 80m north-east of the site. An electrical engineering works was constructed 90m west. A laundry was shown 200m north-west of site. An iron works was located 640m north-west of the site. A brick and lime works with associated tank were located 640m north-west of the site. A biscuit works was located 400m north-west of site and old clay pit was shown 450m south-east. Willesden Workhouse Infirmary was developed 500m west. Several works and a generating station were located >750m south-west of the site.
	1950s-1970s	By 1955, the site was occupied by a bookbinding works and	In the 1950s, a motor vehicle works, and engineering works were

		the number of buildings associated with the bookbinding works had increased in number across the site. By 1967 the bookbinding works had been extended with buildings in the centre and centre-east of the site.	shown adjacent to the north and from 50m north respectively beyond which was a metal plating works. Several works, warehouses and factories 100m-250m west and north-west. A large area of industrial-style units (including engineering works, confectionary works, joinery works, cardboard boxes and packing) is shown to extend 1km south and south-east. Between the 1960s and 1970s, a power station is recorded at the former generating station, 80m north-east. The power station extended onto land immediately adjacent to the east of the site, connected by two bridges over the canal. Three

			large cooling towers are shown 60m, 120m and 130m south-east associated with the power station. In addition, a tank was recorded 130m south-east of the site. Numerous works, warehouses and factories was shown 100m – 250m to the south, west and north-west. A metal planting works was shown 70m north of the site.
	1980s	The site was occupied by works buildings with an electrical substation recorded within the centre of the site.	A row of industrial style Units 'The Royal London Estate' were shown to the north. The power station further to the north of the site was labelled as a 'Grid Station'. Works 50m west of site were redeveloped and identified as a warehouse

			and smaller works.
	1990s	No change.	A freightliner (rail freight) terminal was located 380m to the east forming part of the wider Willesden railway junction.
	2000s	The 1999 aerial map shows a building (with a red roof) present within the center of the site, by 2021 the building was no longer present, and a new building is located.	Power station to the south-east and cooling towers were no longer shown. A commercial style development was shown 50-400m south-east.

3.5.2 Waste Management Facilities

There are no current or former landfill sites recorded in the Envirocheck Database within a 1km radius of the site.

There are records of eight Licensed Waste Management Facilities within 1km of the site, the closest of which are located:

- Approximately 230m south-east, Operator: Quattro (UK) Limited, household, commercial and industrial transfer stations, License Issued: January 1996; Surrendered: July 1999.
- Approximately 410m east, Operator: Skanska U K, Costain Limited & Strabag A G, inert and excavation waste transfer station, License Issued: February 2016 and license status is 'transferred'.
- Approximately 420m north-west, Operator: Pauncefort Guy, household, commercial and

industrial transfer stations, License Issued: June 1992, modified in June 1996. Expired: Unknown Date.
- Approximately 440m south-west, Operator: First Mile Limited, 'HCI Waste TS + treatment', License Issued: March 2017.
- Approximately 500m east, Operator: L Lynch (Plant Hire & Haulage) Limited, transfer stations taking non-biodegradable wastes, License Issued: August 2012; Surrendered: December 2018.

There are no registered waste treatment or disposal sites recorded in the Envirocheck Database within a 1km radius of the site.

There are five registered Waste transfer Sites within 1km of the site:
- Approximately 140m north, License Holder: Drinkwater Sabey Ltd, no known restriction on source of waste, dated September 1997, Authorised Waste: L.W.R.A. Cat A (inert waste), L.W.R.A. Cat B (general waste), max waste permitted by licence-stated, Licence: lapsed/cancelled/defunct/not applicable/surrendered.
- Approximately 150m south-east, License Holder: Quattro (UK) Ltd, no known restriction on source of waste, dated January 1996, Authorised Waste: L.W.R.A. Cat A (inert waste), L.W.R.A. Cat B (Bi Gen.Non-Putresc waste), max waste permitted by licence-stated, License: Surrendered.
- Approximately 380m north-west, License Holder: Guy Pauncefoot, no known restriction on source of waste, dated June 1992, Authorised Waste: L.W.R.A. Cat A (inert waste), L.W.R.A. Cat B (Bi Gen.Non-Putresc waste) and L.W.R.A Cat C (Putresc), max waste permitted by licence-stated, License: site dormant (licence suspended).
- Approximately 590m south-east, License Holder: Bridgemarts Ltd T/A Gowing & Pursey, no known restriction on source of waste, dated April 2001, Authorised Waste: degradable commercial, household and industrial waste and inert materials, max waste permitted by licence-stated, License: site dormant (licence suspended).

- Approximately 590m south-east, License Holder: Bridgemarts Ltd T/A Gowing & Pursey, no known restriction on source of waste, dated August 1994, Authorised Waste: L.W.R.A. Cat A (inert waste) and L.W.R.A. Cat B (Bi Gen.Non-Putresc waste), max waste permitted by licence-stated, License: record superseded.

There are seven Part A(1) Permit records within 2km of the site. The closest of which is licensed to Equinix (UK) Limited, located approximately 210m south-east of the site.

There are no Part A(2) Permits within 1km of the site.

There are 39 Part B Permits within 2km of the site. Permits within 250m of the site include:

- Approximately 70m north-west, Metalion Ltd, power coating processes (including sherardizing), Status: permitted.
- Approximately 160m west, Stonebridge Joinery, manufacture of timber and wood-based products, Status: revoked.
- Approximately 160m west, Stonebridge Joinery, wood combustion processes between 0.4 and 3MW net rated thermal input, Status: revoked.

3.6 Evidence of Historical Contamination

Based on Ramboll's review of historical information sources and in recognition of the site's past industrial uses as both a bookbinding works and a stationary works, it is considered likely that various chemicals, including fuels, oils, inks, glues and solvents were historically used at the site. With the absence of additional information regarding the historical storage and use of chemicals at the site, Ramboll cannot rule out the potential that historical site uses have impacted the subsurface of the site (soils and groundwater).

According to a UXO Pre-Desk Study Assessment for the site obtained by Ramboll from Zetica UXO[6], the site is located within a moderate risk area with regard to unexploded ordinance. Readily available records indicate that, that several high explosive (HE) bombs fell in close proximity to the site during

[6] Further information can be found online at: https://zeticauxo.com/

World War II (WWII). The subsequent Zetica UXO Desk Study and Risk Assessment[7] noted that there are records relating to one HE bomb which reportedly fell on the site on the 30th September 1940 resulting in minor damages to the book binding works (in the western portion of the site). No further bombing or significant sources of UXO hazard were identified as present on the site. Zetica concluded that the site has a low UXO hazard level.

It is understood that the site was initially developed by the mid-1930s, taking place before the general ban of asbestos from use in construction materials in the UK in 1999. Therefore, the presence of asbestos in current building materials and within on-site soils (associated with the demolition of former onsite buildings) cannot be ruled out. A site visit by Ramboll undertaken as part of the 2021 Phase I Environmental Site Assessment recorded that a building had an apex roof formed of asbestos roof tiles.

3.6.1 Previous Use of the Site

Based on information obtained utilising publicly available information sources and information from Ramboll's previous Phase I Environmental Assessment and Geo-Environmental Ground Investigation, the previous on-site activities/uses included:

- possible agricultural use;
- a stationary works;
- a bookbinding works;
- the operation of unknown works and an electricity substation;
- carpentry and painting for production of TV sets/props;
- prop storage for TV;
- vehicle storage in external areas of the site; and
- stockpiling of soil.

Possible ancillary activities in relation to the historical uses of the site are considered likely (not confirmed) to have included waste, fuel, oil storage and possible small-scale chemical storage (i.e. cleaning chemicals, general maintenance chemicals/products) as well as the use of chemicals at the site.

[7] Zetica, 37-39 North Acton Road – UXO Desk Study and Risk Assessment, dated March 2022, Document ref. P11258-21-R1

The site has been occupied by industrial style units since at least 1935. Based on the available information and previous site visits, on-site activities associated with its historic uses may have included some potentially contaminative processes (e.g. chemical storage and use, fuel storage, process wastewater, bookbinding processes and waste storage). According to the 2021 Phase I Environmental Assessment, the general housekeeping of external areas of the site were observed to be poor with large amounts of rubbish in the general eastern area of the site and miscellaneous waste materials in the east and to the north of the western warehouse unit. Several containers housing a variety of chemicals such as Ad Blue, Screen Wash, Brake and Clutch Cleaner, oil, wood preserver, waste solvent and gas oil (empty) were observed being stored directly on hardstanding. Staining was also reported in some areas.

3.6.2 Historical Uses of the Site Surrounds

In general, the surroundings are considered to have a similar, if not greater, contaminative potential than the site. The potential for off-site contaminants to migrate onto site would be dependent on the underlying geological and hydrogeological conditions.

3.7 Baseline Soil and Groundwater Reference Data

Baseline soil and groundwater reference data has been obtained from the 2022 Ramboll Geo-Environmental Ground Investigation Report.

For the purposes of this SCR, fuel (diesel or Hydrotreated Vegetable Oil (HVO))and glycol are the only 'relevant hazardous substances' which will be in use at the site. Each of the diesel or HVO-powered generators to be installed will be fitted with individual belly tanks. There will be no underground bulk fuel storage tanks. In total, 14 emergency generators (over four gantry levels) will be present at the site, each with a rated thermal input of below 15MW. Activities directly associated with the Installation are limited to the handling (e.g. receipt), storage and distribution of fuel, lubrication oils and engine coolants (glycol).

Based on this, the SCR presents baseline reference data for contaminants which have the potential to

be associated with the site's historical uses, and also with the current / future storage of fuel and glycol; namely hydrocarbons and VOCs including:

- Speciated total petroleum hydrocarbons (TPH-CWG) in the carbon range C5 to C44 (aliphatic and aromatic compounds);
- Sixteen commonly occurring speciated polycyclic aromatic hydrocarbons (speciated PAHs);
- Volatile aromatic hydrocarbons (VOCs) including benzene, toluene, ethylbenzene and xylenes (BTEX).

The Geo-Environmental Ground Investigation report is provided in Appendix 3 of this document.

3.7.1 Soil Baseline Reference Data

In summary, the following exploratory locations were in the vicinity of the data centre's planned generator gantry:

- Boreholes WS04, WS05 and BH03.

These exploratory hole logs did not identify field evidence of hydrocarbon contamination (staining, odours), with exception to WS05 where a 'faint hydrocarbon odour' was observed according to the GEL borehole log records.

Nineteen environmental soil samples were taken from exploratory holes across the site (comprising boreholes and hand excavated areas). Of these, selected samples were analysed for specific substances. A summary of the analytical results is provided below:

- Total PAHs were below the Generic Assessment Criteria (GAC) in all 19 samples detected. PAH concentrations ranged between the laboratory detection limit of <0.8 mg/kg and 633 mg/kg at WS01, concentrations were 121 mg/kg at WS02 and 111 mg/kg at WS04. Total PAH concentrations recorded in the remaining 16 soil samples ranged between the laboratory detection limit of 0.8 mg/kg and 43 mg/kg.
- TPH and BTEX concentrations were below the GAC in all 19 samples tested. Slightly elevated TPH concentrations (>100mg/kg) were detected in Made Ground at five locations only: BH02 (160 mg/kg), WS01 (703 mg/kg), WS02 (190mg/kg), WS04 (150 mg/kg) and WS05 (159 mg/kg).

- VOC concentrations were below the respective GAC for all four soil samples tested.
- Inorganics and metal concentrations were below the GAC in all samples.
- In the 10 samples of made ground tested, asbestos was not detected.

3.7.2 Groundwater Baseline Reference Data

Groundwater was sampled from six wells (BH01, BH03, WS02, WS03, WS04 and WS05) and the results were screened against relevant GACs for controlled waters.

All results for inorganic contaminants, heavy metals, TPH, VOCs, BTEX compounds, phenols, methyl tert-butyl ether, pH and mercury were below the relevant GAC.

Other inorganic compounds (Ammoniacal nitrogen as N) in addition to Metals (Boron, Nickel and Selenium) were in exceedance of GACs for controlled waters. Ammoniacal nitrogen as N and Nickel were in exceedance at all six locations whilst Boron was in exceedance at BH01 and Selenium was in exceedance at BH01 and BH03. The elevated concentrations of inorganic contaminants detected were not considered significant in the context of the site's setting and the conservative assessment criteria for drinking water. Concentrations detected were considered to be reflective of local background groundwater quality.

Due to the site's low sensitivity environmental setting relating to groundwater resources, it was considered that potential for migration of contaminants was reduced, and therefore the potential for impact to controlled waters was considered to be negligible.

Published EA guidance for datacentre operation states "The groundwater monitoring of fuel storage tanks and distribution pipework using GW [groundwater] boreholes is risk based for the site condition report (SCR) and IED 5yearly monitoring. Should GW monitoring be required for underground tanks and/or the SCR, the boreholes should be positioned for whole site surveillance (for the SCR) rather than as a very local control immediately around the buried fuel oil tanks (i.e. not be just an addition to double skinned tanks already protected

	by leak detection and hence ignoring distribution pipework etc)." and, "10-yearly soil sampling under IED is normally not needed but still needs some justification." The site meets the requirements of BAT for above ground fuel storage. All infrastructure associated with the transport and use of fuel is located above ground, in areas of hardstanding with secondary containment which meets BAT. Based on this, and the available baseline data, it is recommended that: • In line with the IED monitoring requirements for groundwater, groundwater monitoring wells are installed within the superficial deposits at most five years after issue of the Environmental Permit. • Should a release of a dangerous substance (diesel/HVO or glycol) occur during the first five years of the installation's life, there may be a requirement to undertake intrusive investigation and install groundwater monitoring wells sooner. • The monitoring wells should be located to provide information on groundwater quality up and down hydraulic groundwater gradient of the generator gantry. • The well locations, drilling and construction should be designed and supervised by a suitably quality environmental professional. Agreement may need to be obtained from the Environment Agency before the wells are installed. • Groundwater monitoring and sampling from the installed wells should be undertaken at a minimum of five yearly intervals and analysed for hydrocarbons; this is envisaged to be speciated TPH-CWG, BTEX compounds and 16 speciated PAHs. • An approach to the data assessment should be developed, which would include comparison against the available baseline groundwater data and against available / relevant water quality standards. There may also be a requirement to undertake statistical assessment and / or trend analysis. • The results of each round of monitoring should be compiled and the site condition report should be updated after each round of monitoring.

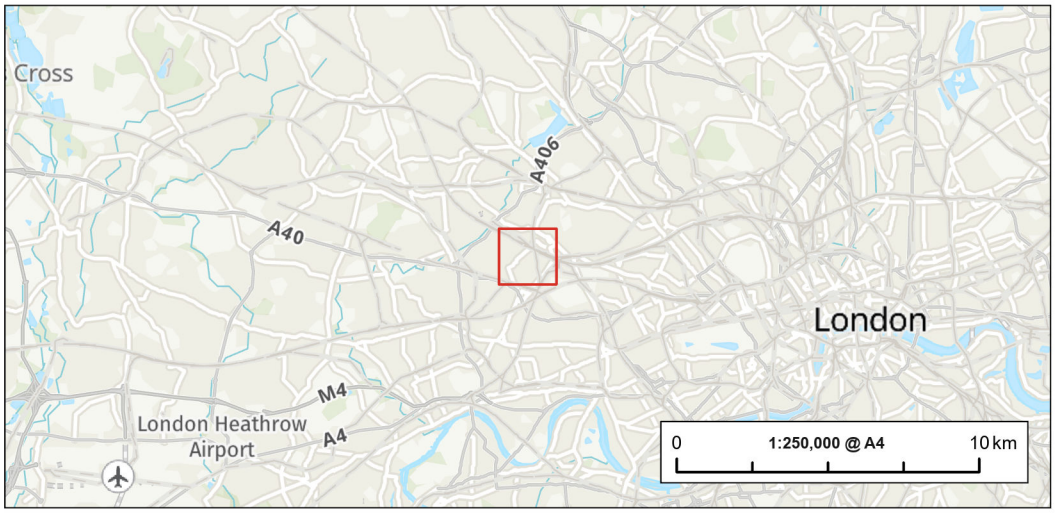
	• A procedure should be developed should the monitoring identify an increase in hydrocarbon concentrations. For example, this may include reviewing fuel storage and handling arrangements and stock records, records of spills / leaks, designing and implementing an enhanced groundwater and (if necessary) soil monitoring programme. • The need for soil sampling would depend on the findings of the groundwater monitoring programme, and also whether there are any releases of a dangerous substance at the installation. The need (or otherwise) for soil sampling will require justification by the operator. • Any soil sampling programme should be designed and supervised by a suitably quality environmental professional. Agreement may need to be obtained from the Environment Agency. The SCR should be updated with the results of any soil sampling. Supporting information and sources: • Site Layout Plans reproduced in Appendix 1 (figures 1-6) • Belly Tank Plan in Appendix 1 (Figure 7), • Site Drainage Plan reproduced in Appendix 1 (Figure 8), • Phase I Environmental Site Assessment, November 2021 (see Appendix 2), • Geo-Environmental Ground Investigation, June 2022 (see Appendix 3), • Environmental Risk Assessment, provided in Appendix 4, • Draft Basis of Design, Work Stage 4, dated 13/01/2023 • Publicly available online geological mapping at www.bgs.ac.uk • Third-party Envirocheck Report, dated November 2021

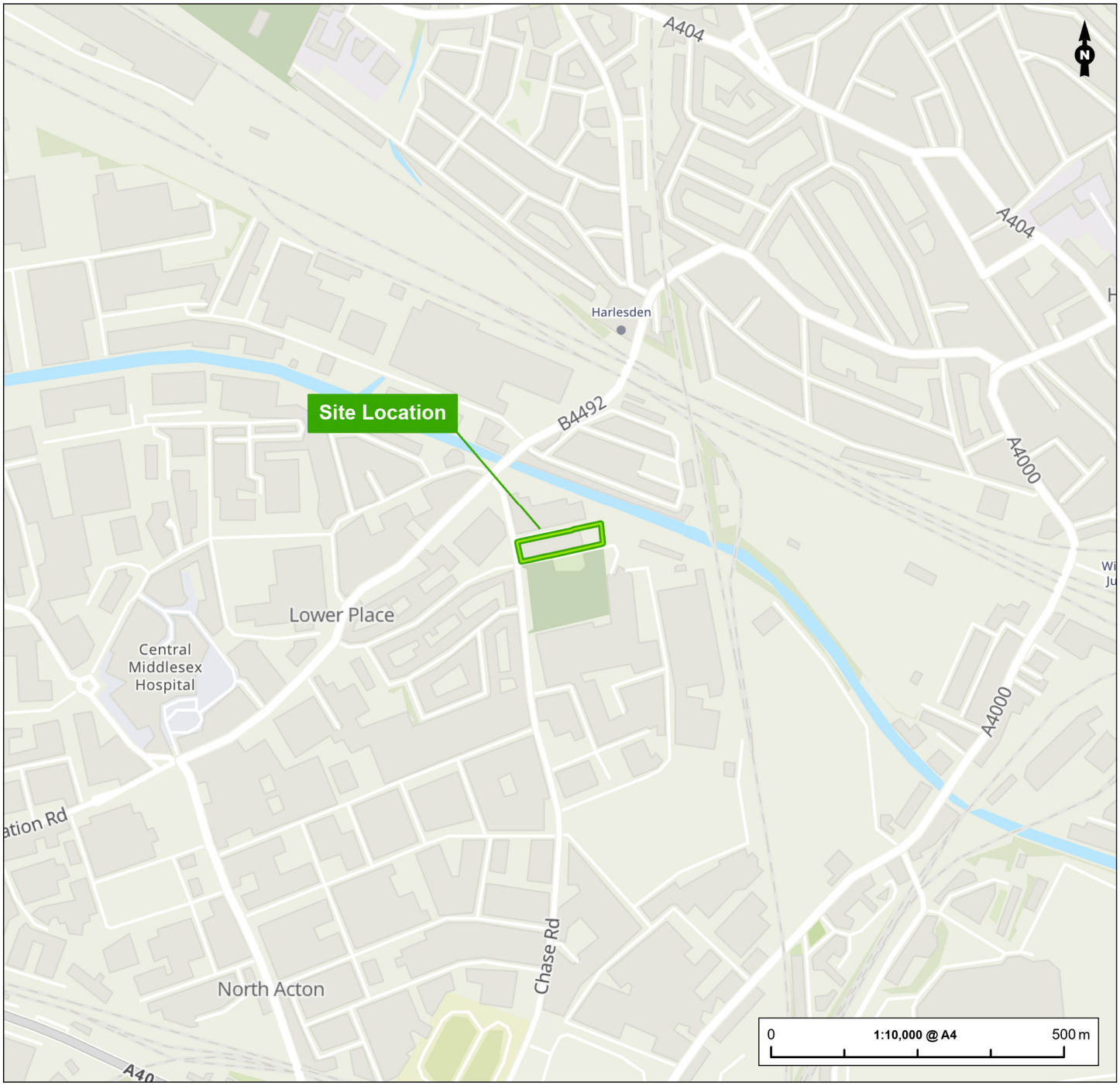
4. Permitted Activities

Details of Activities at the Installation	
Permitted Activities	EPR Schedule 1, Part 2, Chapter 1, Section 1.1 of the Environmental Permitting (England and Wales) Regulations 2016 (as amended) - the

	burning of any fuel in an appliance with a rated thermal input of 50 or more megawatts. The Installation will comprise the operation of 14 HVO fired generators for use as a back-up power supply for a datacentre located over six floor levels. The generators will be housed on a gantry which a abuts the main datacentre building on the site. The Installation will include associated activities of handling (e.g. receipt), storage, and distribution of fuel, lubrication oils and engine coolants.
Non-Permitted Activities Undertaken Document References For: • plan showing activity layout; and • environmental risk assessment.	Operation of the data centre. • Appendix 1 - Site Layout Plan, Figure 1 • Appendix 1 - Belly Tank Details, Figure 2, • Appendix 1 - Site Drainage Plan, Figure 3), • Appendix 4 – Environmental Risk Assessment

Appendix 1
Figures

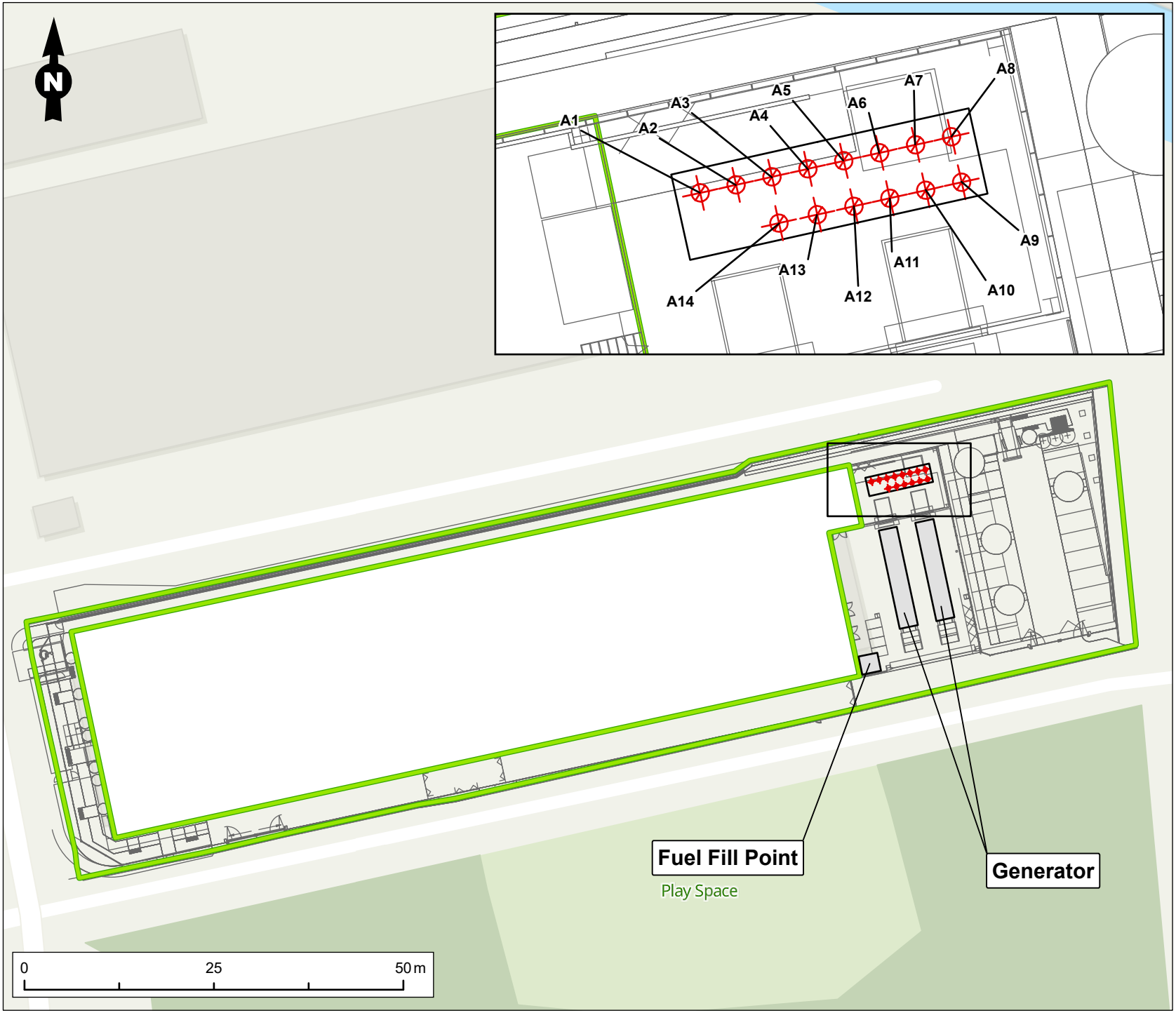




RAMBOLL	Figure Title: Site Location	Project Name: LHR21 Environmental Permitting	Date: October 2023	
			Prepared By: MP	Figure No.: 1
	Client: VDC UK Management Company Limited	Project No./Filery ID: 1620013218-007 / REH2023N01286	Scale: As Shown	Revision: 1.0

1620013218-007-RAM-MA-CS-00001_SiteLoc_01.pagx

Coordinate System: British National Grid. Projection: Transverse Mercator. Datum: OSGB 1936.



Legend

- Site Boundary
- Emission Point to Air

Figure Title
Installation Layout

Project Name
LHR21 Environmental Permitting

Project No./Filery ID
1620013218-007 / REH2023N01286

Date	Figure No.	Revision
November 2023	2	1.0

Prepared By	Scale
MP	1:700 @A4

Client
VDC UK Management Company Limited

RAMBOLL

1620013218-007-RAM-MA-CS-00002_InstalationLayout_01.pagx

Coordinate System: British National Grid. Projection: Transverse Mercator. Datum: OSGB 1936.

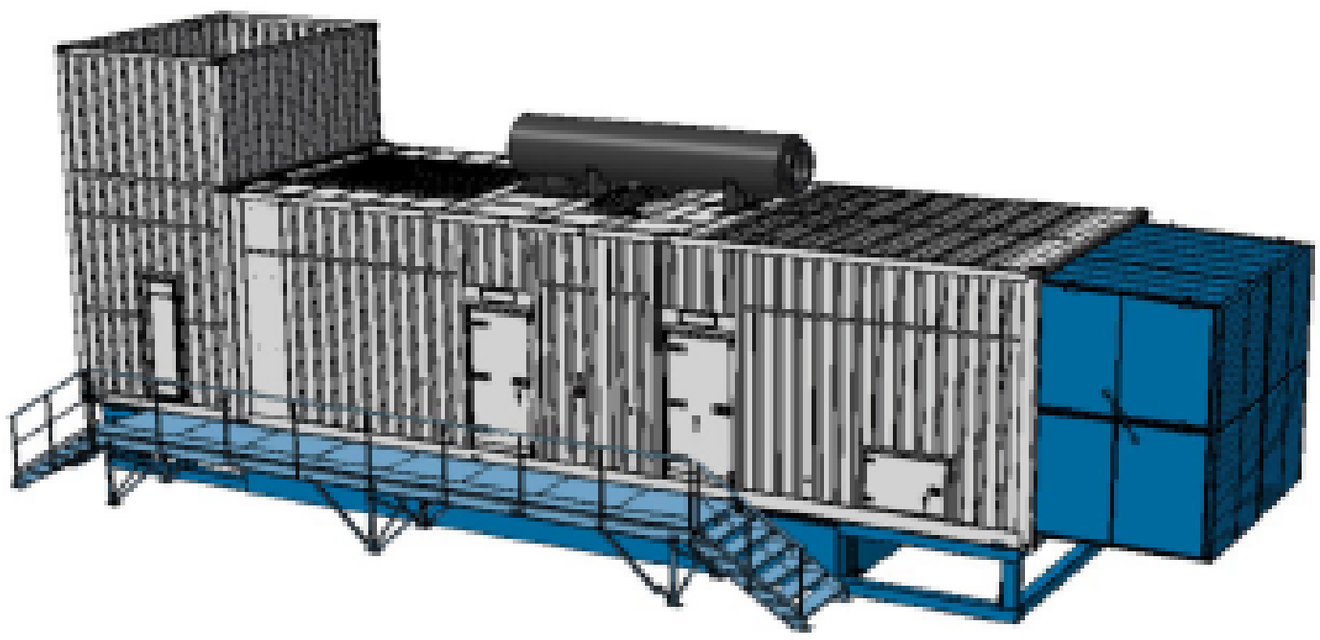
AVI 42342

VANTAGE

BER11

Genset Qty:	6	Execution:	WIC	Voltage (V):	400
GE Model:	KD3500	Power rating(KVA):	3250	F(Hz):	50
Engine:	KD83V16-5CES	Generator:	LSA 54 M90	Neutral Syst.	TNC

Comments/Engineer Visa



Title

Belly Tank Detail Drawing

Comments

Revision History

Rev.	Rev. Date	Created by *(Créé par)*	Checked by *(Vérifié par)*	Approved by *(Approuvé par)*	Description
1	28/04/2021	Le Roux Pierre	Yann Le haret	Eric Berthier	First issue
2	12/08/2021	Le Roux Pierre	Yann Le haret	Eric Berthier	Issue after comments
3	16/05/2022	Xavier Paux	Yann Le haret	Le Roux Pierre	Detail BT modified - As Build
4					
5					
6					
7					
8					
9					
10					

Originator	Status	Format	Lang.	Identification number	Rev.	Date
	FA	A4	E	**42342-00-DD-003**	3 - AB	16/05/2022

18.700 L => Self Climat overfill shut-off
700L loss of non-return valves
Netto usable : 18.700 - 700 = 18.000L

Brimful capacity = 25.900L

BM

BL

Fill 3" + Guillemin Coupling + Guillemin cap
Inside pipe + elbow 90°

Vent + Flame Arrestor 2"

Earthing lug
dia 40, L=40mm
M10x25mm

Fuel polisher return 1 1/2" BSP Female

Fuel polisher suction 1 1/2" BSP Female
+ pipe inside + valve

Level sensor
Welding socket 2" BSP
+ pipe inside

Welding socket 2" BSP
for spare

Welding socket 2" BSP
Spare

Welding socket 2" BSP
+ pipe inside + reducer ring 2" - 1/2" BSP
+ electrical swivel M16x1.5
for sensor

Manhole dia 600mm

Welding socket 1" BSP
for vacuum leak detection

Anchoring plates

Cable tray vertical 2

Cable tray horizontal 1

Pt100 on outside of tank wall

Tube ø26.9mm (3/4") with outsdie BSP tread
welded in blind flange
for engine return

Welding socket 1" BSP
+ Fafnir GWG 83UV overfill prevention

Welding socket 1" BSP
for vacuum leak detection

Tube ø33.7mm (1") with outside BSP tread
welded in blind flange
for engine suction + foot valve 1"

Cable tray vertical 1

Earthing lug
dia 40, L=40mm
M10x25mm

Detail cabinet:

Vacuum leak detection device
Type ASF 8V

Kabinet 600x600x230mm (lxwxh)

Visual level monitoring display
type IFM AX460

Sensor thermostat circuit 1

Sensor thermostat circuit 2

Non-return valve

Electrical junction box

*Positioning of components in the cabinet
may vary depending on available space*

Detail double skin:

Square hollow section 200x200x6mm

Double skin 3mm

Inner tankshell 3mm

Square hollow section 200x200x6mm

BK (1 : 10) Cable tray + cabinet

Corner beam 60x60x6mm

BT (1 : 10)

Tube ø26.9mm (3/4") with outsdie BSP tread
welded in blind flange
for engine return

Welding socket 1" BSP
+ Fafnir GWG 83UV overfill prevention

Tube ø33.7mm (1") with outside BSP tread
welded in blind flange
for engine suction + foot valve 1"

BM (1 : 5) Achoring plates

BL (1 : 2)Earthing lugs

Total Weight = 11.000 kg

Ontwerpgegevens	
- Tekenaar:	SteveA
- Datum:	28/04/2021
- Leeg gewicht:	/
Gegevens klant	
- Item nr.:	
- Project klant:	Berlin
- Opdracht gever:	SDMO

- Titel: General assembly

ETE TANKBOUW www.etetankbouw.be

Revisie	
0	28/04/2021
1	04/05/2021
2	14/07/2021
3	
4	
5	
6	
8	

Formaat: A1

Projectie

Tolerantie: EN ISO 13920-DH

Order: 12000612_Berlin

CDM NOTE

DRAINAGE & SHEET PILE COORDINATION

CONSTRUCTION OF INSPECTION CHAMBERS F05 AND F06 TO BE COORDINATED WITH SHEET PILE AND SECURITY FENCE DESIGNS.

ABEYANCE NOTES

2. THE SIPHONIC DRAINAGE IS SUBJECT TO CHANGE FOLLOWING ADDITIONAL COORDINATION WITH THE FIBRE SERVICE AND CONFIRMATION OF THE FINAL DESIGN FROM THE SPECIALIST.
3. DRAINAGE DESIGN ALONG THE SOUTHERN FACE OF THE BUILDING IS SUBJECT TO CHANGE FOLLOWING RECEIPT OF THE DETAILED MV SERVICE DESIGN.
4. FOUL POPUP LOCATIONS TO BE REVIEWED AND CONFIRMED BY RIBA STAGE 5 MECHANICAL ENGINEER.
5. FINAL POSITION OF STORM WATER DRAINAGE SUBJECT TO CHANGE FOLLOWING THE FINAL DESIGN COORDINATION WITH THE MOBILE CRANE DESIGN.
6. FOUL WATER DESIGN TO BE REVIEWED ONCE THE STAIR CORE FOUNDATION DESIGN IS COMPLETE AND READY FOR COORDINATION.
7. FOUL SUMP UNIT IN THE LIFT SHAFT TO BE COORDINATED WITH THE PILE CAP DESIGN AND MEP DESIGN.
8. COVER LEVELS ARE SUBJECT TO CHANGE FOLLOWING THE CLIENT REVIEW PROCESS AND ONGOING EXTERNAL DESIGN COORDINATION WITH THE DESIGN TEAM.

DESIGN NOTES

1. THIS DRAWING MUST BE READ ALONGSIDE THE COMBINED SERVICES LAYOUTS (REF:LHR21-PIN-XX-SP-DR-C-2505 & LHR21-PIN-XX-SP-DR-C-2506), DRAINAGE CONSTRUCTION DETAILS (REF:LHR21-PIN-XX-XX-DR-C-2400 TO 2402) & DRAINAGE LONG SECTIONS (REF:LHR21-PIN-XX-XX-DR-C-2320 TO 2321).
2. THE DRAINAGE DESIGN IS SUBJECT TO CHANGE FOLLOWING ONGOING BELOW GROUND SERVICES COORDINATION AND RECEIPT OF FINAL EXTERNAL SERVICES DESIGNS.
3. ALL DRAINAGE POP UP LOCATIONS ENTERING THE FOUL NETWORK HAVE BEEN REFERENCED FROM THE DRAWING PREPARED FROM BLACK AND WHITE LAYOUT 230616_LHR21-BWE-DC-00-DR-P-002
4. THE ATTENUATION TANK DESIGN HAS BEEN BASED ON THE WAVIN AQUACELL PRODUCT RANGE. ALL ATTENUATION TANKS MUST BE INSTALLED USING THE WAVIN AQUACELL PRODUCT OR AN EQUIVALENT APPROVED PRODUCT. IF AN ALTERNATE CELLULAR STORAGE TANK PRODUCT IS PROPOSED, THE PRODUCT DETAILS AND SPECIFICATIONS MUST BE PASSED TO THE CIVIL ENGINEER FOR APPROVAL

CDM NOTE

SERVICES DESIGN AND COORDINATION

WITH THE EXCEPTION OF STORM WATER AND FOUL WATER DRAINAGE, THE EXTERNAL SERVICES ARE SUBJECT TO DETAILED DESIGN DEVELOPMENT BY OTHERS.

ALL EXTERNAL SERVICES ARE SUBJECT TO A FULL 3D SERVICES COORDINATION REVIEW FOLLOWING THE COMPLETION OF THE DETAILED DESIGN FOR EACH OF THE EXTERNAL SERVICES.

THE DETAILED DESIGN OF THE STORM WATER AND FOUL WATER DRAINAGE HAS BEEN COMPLETED WITHOUT, AND AHEAD OF, THE DETAILED DESIGN INFORMATION OF ANY OTHER EXTERNAL SERVICES.

CDM NOTE

DRAINAGE DESIGN AND COORDINATION

ALL DRAINAGE IS SUBJECT TO CHANGE FOLLOWING DETAILED DESIGN INFORMATION BEING PROVIDED FROM OTHER DESIGN DISCIPLINES.

CDM NOTE

NATIONAL GRID TUNNEL AND EASEMENT

ALL PROPOSED CONSTRUCTION WORKS WITHIN PROXIMITY OF THE NATIONAL GRID TUNNEL AND EASEMENT ARE SUBJECT TO APPROVALS FROM NATIONAL GRID.

TO DATE, PINNACLE HAVE NOT BEEN INVOLVED IN ANY DISCUSSIONS WITH NATIONAL GRID AROUND WORKS IN PROXIMITY TO THEIR ASSET. IT IS UNDERSTOOD THAT GLENCAR HAVE HELD THESE CONVERSATIONS AND WILL ENSURE ALL REQUIRED AGREEMENTS ARE IN PLACE PRIOR TO WORKS STARTING IN PROXIMITY TO NATIONAL GRID ASSETS.

GENERAL NOTES

1. DO NOT SCALE THIS DRAWING. WORK ONLY TO FIGURED DIMENSIONS.
2. FOR ALL RELEVANT NOTES, REFER TO STRUCTURAL AND CIVIL ENGINEERING PERFORMANCE SPECIFICATION.
3. ANY DISCREPANCIES ARE TO BE REPORTED TO PINNACLE CONSULTING ENGINEERS IMMEDIATELY.
4. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ENGINEERS, ARCHITECTS AND SUB-CONTRACTORS DRAWINGS AND DETAILS.
5. THIS DRAWING IS TO BE PRINTED IN COLOUR.
6. EXISTING SITE AND LEVEL INFORMATION TAKEN FROM RAMBOLL TOPOGRAPHICAL SURVEY DRAWING RAM-XX-00-DR-SV-00001' AND 'RAM-XX-00-DR-SV-00002' DATED MARCH 2022.

LEGEND

INDICATIVE SITE BOUNDARY
EXISTING PUBLIC SURFACE WATER SEWER
EXISTING PUBLIC FOUL WATER SEWER
EXISTING PRIVATE FOUL WATER SEWER
PROPOSED PRIVATE SURFACE WATER SEWER
BD — PROPOSED MANHOLE BACKDROP
PROPOSED PRIVATE FOUL WATER SEWER
PROPOSED PRIVATE FOULWATER RISING MAIN
PROPOSED PRIVATE SURFACE WATER SEWER (SIPHONIC)
PROPOSED PRIVATE SIPHONIC BREAK CHAMBER WITH A VENTED COVER
PU — PROPOSED FOUL POPUP
FG — PROPOSED FOUL GULLY
RE — PROPOSED FOUL RODDING EYE
PROPOSED CHANNEL DRAIN
PROPOSED FILTER DRAIN
PROPOSED PETROL INTERCEPTOR
PROPOSED ATTENUATION TANK (CELLULAR STORAGE)
PROPOSED KERB DRAIN
PROPOSED PRIVATE SURFACE WATER FLOW CONTROL CHAMBER
PROPOSED MOBILE CRANE PLATFORM
G — PROPOSED SURFACE WATER GULLY
PROPOSED PERMEABLE PAVING
PROPOSED PERFORATED SURFACE WATER PIPE
SHEET PILES
RWP — RAIN WATER DOWN PIPE
SRWP — SIPHONIC RAIN WATER DOWN PIPE
RE — PROPOSED PERFORATED PIPE RODDING EYE
PROPOSED CHANNEL DRAIN WITH END CAP
PROPOSED NATIONAL GRID TUNNEL AND EASEMENTS - APPROXIMATE POSITION

SCALE 1:100
0 1 2 3 4 5m
DIMENSIONS IN METRES

REV	DESCRIPTION	BY	CHK / APP	DATE
C03	INTERCEPTOR SETTING OUT ADDED TO SCHEDULE.	TWR	JJ	01.09.23
C02	UPDATED FOLLOWING GLENCAR REQUEST TO REMOVE FOUL WATER GULLIES.	DD	RP	25.08.23
C01	UPDATED LAYOUT FOLLOWING BELOW GROUND SERVICES COORDINATION.	RB	RP	14.08.23
P05	S5 - UPDATED FOLLOWING GLENCAR COMMENTS AND DESIGN DEVELOPMENT.	RB	JJ	13.07.23
P04	S5 - CLIENT REVIEW. UPDATED FOLLOWING GLENCAR COMMENTS	RB	MH/TR	30.06.23
P03	S3 - FOR INTERNAL REVIEW AND COMMENT	RB	RP/JJ	16.06.23
P02	S5 - CLIENT REVIEW	JCR	ST	23.03.23
P01	ISSUED FOR INFORMATION	MH	OM	08.03.2023

CLIENT

Glencar

PROJECT

LHR21 DATA CENTRE

DRAWING TITLE

PROPOSED STORM WATER AND FOUL WATER DRAINAGE GENERAL ARRANGEMENT

PINNACLE CONSULTING ENGINEERS

PINNACLE HOUSE,
MAPLE WAY,
BROADLAND GATE,
NORFOLK,
NR13 5HB.
TELEPHONE: 01603 327 170
WELYWN GARDEN CITY ■ LONDON ■ DUBLIN ■ THE HAGUE ■ FRANKFURT

STATUS: CONSTRUCTION

SCALE @ A0+	DATE	DRAWN BY	CHECKED	APPROVED
1:100	MAR '23	MH	RP	JJ

DRG NO. LHR21-PIN-XX-SP-DR-C-2300 REV. C03

PIN REF: 221000230

SURFACE WATER MANHOLE SCHEDULE								
MANHOLE REF.	APPROX. COVER LEVEL	INVERT LVL. OF OUTLET PIPE	APPROX. DEPTH (m)	EASTING	NORTHING	MANHOLE SIZE (mm)	COVER TYPE	REMARKS
SW01	32.861	31.969	0.892	520777.465	182994.886	1050	B125	VENTED MANHOLE FOR SIPHONIC BREAK
SW02	32.793	31.059	1.847	520775.056	182993.743	1050	B125	CELLUAR STORAGE CONNECTION. SEE DRAINAGE DETAILS REF: LHR21-PIN-XX-XX-DR-C-2400. CATCHPIT MANHOLE.
SW03	32.982	31.059	1.923	520778.726	182976.622	1050	B125	CELLUAR STORAGE CONNECTION. SEE DRAINAGE DETAILS REF: LHR21-PIN-XX-XX-DR-C-2400. CATCHPIT MANHOLE.
SW04	33.010	31.032	1.978	520780.952	182976.487	600	B125	INSPECTION CHAMBER
SW05	32.844	30.971	1.873	520781.938	182971.507	600	B125	INSPECTION CHAMBER
SW06	32.926	30.929	1.997	520785.309	182970.262	600	B125	INSPECTION CHAMBER
SW07	32.868	30.710	2.158	520826.760	182979.159	600	D400	INSPECTION CHAMBER
SW08	32.892	30.626	2.266	520842.544	182982.589	600	D400	INSPECTION CHAMBER
SW09	33.057	30.464	2.593	520873.110	182989.701	600	D400	INSPECTION CHAMBER
SW10	33.080	30.307	2.773	520893.264	182994.091	1050	E600	CATCHPIT MANHOLE. ALL MANIFOLD PIPEWORK IS TO BE 150mm DIA.
SW11	33.130	30.283	2.848	520890.250	183012.889	1050	E600	ALL MANIFOLD PIPEWORK IS TO BE 150mm DIA.
SW12	33.096	31.984	1.112	520895.158	182994.433	1050	E600	
SW13	33.135	31.831	1.304	520899.644	182995.394	1050	E600	CATCHPIT MANHOLE
SW14	33.031	30.259	2.772	520895.427	183014.001	1050	D400	CATCHPIT
SW15	32.989	30.218	2.771	520893.359	183022.954	1050	B125	VENTED MANHOLE FOR SIPHONIC BREAK. SIPHONIC DRAINAGE PIPE ENTERING FROM HIGH LEVEL.
SW16	33.235	30.105	3.130	520909.730	183027.298	1050	B125	FLOW CONTROL MANHOLE SET TO MAXIMUM OF 3.5 L/S
SW17	33.510	30.088	3.422	520911.218	183029.408	1200	D400	1,200 dia Type 1B Manhole (B.10-B.11)

FOUL WATER MANHOLE SCHEDULE								
MANHOLE REF.	APPROX. COVER LEVEL	INVERT LVL. OF OUTLET PIPE	APPROX. DEPTH (M)	EASTING	NORTHING	MANHOLE SIZE (MM)	COVER TYPE	REMARKS
F01	33.102	31.829	1.273	520873.9503	182990.7027	600	D400	INCOMING PUMPED CONNECTION. INSPECTION CHAMBER.
F02	33.102	31.806	1.296	520870.5798	182990.0865	600	D400	INSPECTION CHAMBER.
F03	32.960	31.554	1.406	520833.4812	182982.8453	600	D400	INSPECTION CHAMBER.
F04	32.937	31.237	1.700	520795.6987	182974.0900	600	D400	INSPECTION CHAMBER.
F04A	32.956	31.362	1.594	520805.3787	182976.7218	1050	D400	1,200 dia Type2 (B.12)
F05	32.919	31.189	1.730	520793.8248	182970.9364	600	B125	600 dia Type3 (B.17b)
F06	32.892	31.091	1.801	520786.1899	182969.3694	600	B125	INSPECTION CHAMBER.
F07	32.834	31.016	1.818	520780.5808	182971.4242	1200	D400	NON-RETURN VALVE WITHIN MANHOLE CHAMBER. BACK DROP INVERT LEVEL: 32.341

INTERCEPTOR SCHEDULE								
INTERCEPTOR REF.	INLET DIAMETER (mm)	OUTLET DIAMETER (mm)	COVER LEVEL	INVERT LEVEL OF INLET PIPE	INVERT LEVEL OF OUTLET PIPE	SPECIFICATION	EASTING	NORTHING
PI01	225	225	33.053	30.382	30.332	BY-PASS SEPARATOR. SPEL 'STORMCEPTOR' CLASS 1 BY-PASS SEPARATOR MODEL '206 C1/SC' OR EQUIVALENT APPROVED.	520888.622	182993.094
PI02	225	225	33.130	31.715	31.665	FULL RETENTION SEPARATOR. KINGSPAN 'KLARGESTER' CLASS 1 FORECOURT SEPARATOR OR EQUIVALENT APPROVED.	520898.875	182998.787

Appendix 2

37 N Acton Road, London, NW10 6PF, Phase I Environmental Site Assessment

PHASE I ENVIRONMENTAL SITE ASSESSMENT

VANTAGE DATA CENTERS

37-39 NORTH ACTON ROAD, LONDON

Intended for:
Vantage Data Centers

Prepared By:
Ramboll UK Limited

Date
12 November 2021

Project Number
1620013218

Issue
03

RAMBOLL

ENVIRONMENT
& HEALTH

CONTENTS

EXECUTIVE SUMMARY

The Executive Summary provides a summary of various environmental topics with regards to the proposed acquisition and development of LHR-E (Volt) located in Acton, London.

Land Contamination

Ramboll does not consider there to be a significant potential for ground contamination in the context of the proposed development. This conclusion has been reached on the basis of the following:

- Relatively modest historic land uses have occupied the site in the past with respect to land contamination.
- Some evidence of contamination has been found and potential for contamination elsewhere cannot be completely ruled out. However, Ramboll anticipates that industry standard brownfield site remedial measures would be appropriate to mitigate risks.
- The environmental setting is low risk, mainly due to the low permeability London Clay that is directly beneath the site (i.e. will restrict movement of contaminants in the ground and therefore reduce the potential for harm or pollution).
- The proposed development is not especially sensitive to land contamination and would likely remove contaminated soil during development.
- The current investigation has been reasonably light touch and further ground investigations will be required as part of the detailed design. Some abnormal costs can be expected as would be the case with any brownfield site (e.g. increased soil waste disposal costs).

More specific details regarding land contamination are provided below.

The site comprises three industrial units with recent uses likely to have included a packaging supply company and vehicle storage. The site is located in a mixed industrial and residential setting. A public park (Wesley Recreation Ground) is located immediately adjacent to the south. Historical site uses have included book binding/stationary and other unspecified works with an electricity substation. There is some potential for contamination associated with the site's commercial/industrial history and setting.

Overall, the site is considered to be located in a low sensitivity environmental setting in terms of geology, hydrogeology and hydrology. Based on publicly available and third-party information the geology underlying the site is likely to comprise Made Ground over London Clay. Groundwater is unlikely to be present at a shallow depth (London Clay is an unproductive strata). Perched water could be present in the made ground. The nearest identified surface water receptor is the Grand Union Canal located approximately 40m NE of site. This is canalised and unlikely to be in continuity with groundwater. No other sensitive SW receptors identified in near vicinity.

A Phase I 'Preliminary Risk Assessment' and Phase II 'Geoenvironmental and Geotechnical Assessment' were undertaken by JOMAS Associates Ltd in 2020. The Phase II intrusive investigation scope included five window samples to depths of up to 5.45m bgl, two cable percussive boreholes to up to 20.45m bgl and four follow-up monitoring visits to measure ground gas and groundwater levels.

The scope of chemical testing was limited. Whilst eight soil samples were tested for metals, PAH and phenol, only four samples were tested for the presence of TPH and VOCs. Spatial investigation

coverage was limited to external areas of the site and no investigation or sampling was undertaken in the eastern area of the site which shows possible evidence of surface staining to the ground surface on satellite imagery and also neighbours a power station present off-site adjacent to the east.
Ground conditions encountered at the site were reported to comprise Made Ground at thicknesses of up to 2.00m bgl overlying London Clay (proven to 20.45m bgl). Loose fibres of crocidolite and chrysotile asbestos were detected in two samples of Made Ground.
Groundwater was not encountered during the intrusive investigation, albeit perched water assumed to relate to surface infiltration to the wells was measured at depths between 0.99m and 4.75m bgl. Three groundwater samples were obtained and tested for metals, PAH and TPH including BTEX and VOCs. Copper, lead and nickel exceeded EQS. PAH, TPH, BTEX and VOCs low or below detection limits.

Based on four rounds of gas monitoring, the site classified was CS1 'Very Low Risk' in terms of ground gas; albeit it was noted that methane was detected above 1% (this is the threshold at which 'consideration' should be given to a CS2 'Low Risk' classification).

Hazardous Materials

An asbestos survey has been undertaken and asbestos identified in the buildings. No other hazardous material information has been provided.

Whilst asbestos associated with existing buildings is not considered to be a ground contamination issue it will need to be considered during redevelopment and there will be a cost for its removal. Asbestos could also be present in the soil. This would be a demolition consideration and not currently quantified.

Geotechnical

The site is relatively straight-forward with weathered London Clay encountered below the made ground at depths of between 0.4 to 2.0m below ground level. The weathered London Clay transitions into the unweathered London Clay at a depth of between 6.2 to 6.5m below ground level.

In terms of non-geological features which might present geotechnical hazards for the development is the nearby water-course, that does appear to be far enough away from the development not to provide a specific constraint. Based on Ramboll's review we do not see any specific red flags. The following highlight issues which need to be considered, albeit relatively standard considerations:

- It is likely that the granular made ground overlying the London Clay will be water-bearing, this can be fed by surface run off or may be connected to water flow from the nearby canal/river. Construction will include excavation below ground level therefore water flow into excavations will need to be controlled. This can be by a combination of cut-off walls embedded into the London Clay and pumping. Once exposed the high plastic London Clay such as this will soften therefore foundation and construction formations need to be protected.
- The London Clay is of High Shrinkabilty potential, the area round the site is not heavily vegetated so changes in this will not adjust the moisture content of the clay significantly but over time there could be long term movement associated with climate change.
- One of the Window Sample holes was curtailed within the weathered London Clay, Jomas have suggested this may be a man-made obstruction (which should be checked) but the London Clay is also known for the occurrence of claystones (either nodular or tabular), this natural feature could have been the cause of the curtailed hole (WS5). The occurrence of claystones can have an

implication for the construction of piles, either in terms of destabilising the pile bore ahead of concreting or in more rarer occurrences providing obstructions to pile boring equipment.
- In terms of foundation solutions the discussion of the use of piles or pad foundations is appropriate at this stage, a further option could be the use of a raft foundation below the main building footprint bearing on the London Clay.
- Following excavation the London Clay will rebound in response to the removal of soil overburden (weight), if the excavation depth is no more than 2 to 3 metres then the rebound pressure is likely to be counter-acted by the weight of the new building. However, if excavation is deeper the building sub-structure will be subject to upward heave pressures which will need to be accounted for in the design through the use of additional base slab reinforcement, the use of a suspended slab, or the use of tension piles depending on the depth of the excavations on site and the loading pattern imposed by the new building
- The ground investigation is adequate to provide a preliminary view on the ground conditions however given the projected size of the building deeper boreholes are likely to be needed to provide adequate design data and enable the planning of the construction of the foundations. For the purposes of detailed design boreholes should extend to a depth equivalent to 5m below the expected pile toe level. Deeper boreholes will also be needed if a raft/deep basement option is to be considered.
- The BRE Digest classification of the site with respect to sulphate attack of buried concrete is AC-3s at worst, this will require a higher specification of concrete mix to protect against degradation of concrete over time.

Ramboll has not assessed the site location for potential tunnels in the ground below the site, or other buried features. This should be carried out as part of the detailed desk study works, along with a check on the proximity of any abandoned rivers local to the site and a check for the risk presented by unexploded ordnance.

Flood Risk

Flood Risk:
- Site is in Flood Zone 1- very low risk of fluvial flooding
- A slight surface water (SW) flood risk is identified to the east and south of the site but this is likely to be associated with localised topography and the FRA recommends a FFL 300mm above existing ground levels which should reduce the SW flood risk further.
- As such it is considered that flood risk to the site is low or very low.

Surface Water Drainage:
- The SW Drainage Strategy plan identifies a suitable SW capture, transfer and attenuation strategy and does not rely on a pumped drainage solution.
- SW is proposed to be discharged to an existing Thames Water (TW) 600 mm diameter public SW sewer and is noted to require a standard Section 106 application to TW to enable connection.

1. INTRODUCTION

1.1 Scope of Work

Ramboll conducted an environmental review of 37-39 North Acton Road in London, UK. The environmental review relied on the references noted below and included the following tasks:

- A review of publicly available information obtained by Ramboll on behalf of the Client relating to an outline planning application for development of a data centre at the site including site plans, environmental assessments and proposed development schematics.
- A review of the Landmark Envirocheck database, which searches environmental databases for the site and properties within a given radius of the site (Appendix B).
- A review of historical maps, topographic maps, and groundwater maps. Selected historical maps were provided by Landmark and are provided in Appendix C.
- A review of publicly available topographic maps, hydrogeological information, and satellite imagery (e.g., Google Earth™).
- A site visit undertaken by George Black of Ramboll on November 5th, 2021. Discussions were held with Peter Brenton (Investment Director of Linden Hill Capital Management) who has managed the property since 2019 on behalf of the current Landlord. The purpose of the site visit was to assess whether there is potential for contamination from current activities.

As per the Vantage Technical Due Diligence Scope of Work, the Phase I ESA included the following (as far as the information was publicly available in the UK and for the site):

- Identification of the site and the current land use of the site, adjacent to and in the vicinity of the site and reasonably known future developments adjacent to and in the vicinity of the site.
- Review of readily accessible information regarding the topography, soils, geology, and groundwater flow directions in the vicinity of the site.
- Review of content and accuracy of reasonably ascertainable and reviewable regulatory information published by state, local, health, and environmental agencies pertaining to the site and vicinity.
- Review of readily accessible files from regulatory agencies for the site, or area in the vicinity of the site regarding whether the site is listed in the register of contaminated and potentially contaminated sites. Such information can only be accessed with written confirmation from the property owner.
- Review historical data sources for the site and vicinity, including aerial photographs, topographic maps, site investigation reports, contamination remediation reports, and other readily available development data.

1.2 Reliance and General Limitations

This report has been prepared for the exclusive use of Vantage and may not be relied upon by any other person or entity without Ramboll's prior express written permission.

This report is considered current only for a period of 180 days from the site visit. The conclusions presented in this report represent Ramboll's best professional judgment based upon the information available and conditions existing as of the date of the review. In performing its assignment, Ramboll

must rely upon publicly available information, information provided by the client and information provided by third parties. Accordingly, the conclusions in this report are valid only to the extent that the information provided to Ramboll was accurate and complete. This review is not intended as legal advice, nor is it an exhaustive review of site conditions or facility compliance. Ramboll makes no representations or warranties, express or implied, about the conditions of the site.

Ramboll's scope of work for this assignment did not include collecting samples of any environmental media. As such, this review cannot rule out the existence of latent conditions, and is intended, consistent with normal standards of practice and care, to assist the client in identifying the risks of such conditions. Also, the scope of work for this assessment did not include an asbestos survey or inspection. Other issues considered outside the scope of this review include regulatory compliance, radon, lead-based paint, lead in drinking water, wetlands, polychlorinated biphenyls (PCBs) in building materials, cultural and historic resources, ecological resources, endangered species, and high voltage power lines.

2. ENVIRONMENTAL SITE ASSESSMENT

2.1 Site Setting

The site is located on North Acton Road within the mixed commercial and industrial setting of Park Royal. The site is located approximately 1.28km north from the center of North Acton within the London Borough of Ealing, 400m south of Harlesden overground railway station and 1.8km north-east of Acton mainline station (Figure 1).

The Grand Union Canal borders the site to the east and north of the site, with North Action Road to the west. Directly to the east of the site is an electrical substation compound. The north of the site is bound by a commercial bakery (Sweetland London) and food wholesaler (Medfood Wholesale) located within the Royal London Industrial Estate. The south of the site is bound by Wesley Recreation ground with commercial units and warehouses beyond.

The 0.61-hectare site is currently occupied by three commercial units. Buildings currently occupy approximately 70% of the total site area (see Figure 2). The site is accessed from North Acton Road at the southern boundary of the site. A fenced yard area is present in the far east of the site. An area of soft landscaping (scrub and bushes) is present in the northeastern corner of the site. There are no on-site surface water bodies.

A summary of current site occupants based on observations from the site visit is as follows:

Table 3.1: Tenancy Schedule

Unit	Tenant	Activities
Western warehouse unit	Various	Office and creative workspaces, music production and miscellaneous storage
Central warehouse unit	CBS Productions	Carpentry and painting for production of TV sets/props.
Eastern warehouse unit	CBS Production	Prop storage
Eastern Yard Area	N/A	Concrete surfaced external yard area used for vehicle storage.

Table 3.2 provides an overview of physical setting and utility information for the site.

Table 3.2: Physical Setting and Utility Information

Conditions	Source	Description
Topography		
Elevation (above ordinance datum)	Google Earth™	The site lies at an elevation of between approximately 31m above ordinance datum (AOD) across the site.
Topographic Gradient	Google Earth™	The site is relatively flat, with only very minor changes in slope within the hardcover.
Local Land Use	Google Earth™.	The site is located in a mixed industrial and commercial area within the Park Royal estate. North: The site is bound by to the north by a commercial bakery (Sweetland London) and food wholesaler (Medfood Wholesale) comprising part of The Royal London Industrial Estate. Further industrial and commercial land uses including an engineering depot (Conway AECOM Ltd), clothing manufacturer (Merc Clothing) and the Grand Union Canal are present beyond. East: Directly to the east of the site is an electrical substation compound with the Grand Union Canal beyond. South: Wesley Recreation ground with commercial units and warehouses beyond. West: North Action Road beyond which lies an area of industrial/commercial and residential properties. Some of the above activities represent potential off-site sources of contamination that (if present) could potentially migrate beneath the site. The potential for off-site contamination (if present) to migrate beneath the site would be dependent on the underlying geological conditions, which are discussed below.
Nearest Residence	Google Earth™.	The closest residential area is located approximately 20m south-west of the site and comprise terraced properties.
Hydrology		
Surface Water Runoff	Google Earth™.	The majority of the site is occupied by buildings and hard standing (70%) with the exception of an areas of vegetated scrubland adjacent to the northern site boundary. It is anticipated that surface water runoff will enter the on-site surface water drainage system and will also percolate into the limited soft landscaped area.

Table 3.2: Physical Setting and Utility Information

Conditions	Source	Description
Nearest Surface Water Body to the Site	Landmark Envirocheck; Google Earth™; EA mapping[1]; Lost Rivers of London[4]	The nearest surface watercourse is the Grand Union Cancel (Paddington Branch) located 38m north of the site. The Grand Union Canal is concrete lined. The site is located within the catchment of the Lower Brent River which is located some 1.60km northwest of the site. The EA currently classifies the River Brent as being of 'moderate' ecological quality and 'fail' chemical quality under the Water Framework Directive classification scheme (2019 data). According to mapping in the publication The Lost Rivers of London, no lost rivers were recorded at the site.
Flood Plain	EA Flood Map[2]; Landmark Envirocheck	According to the EA website, the site lies in Flood Zone 1 (low probability). This zone comprises land assessed as having a less than 1 in 1000 annual probability of river or sea flooding in any year (<0.1%). According to the EA Flood Map for Surface Water which presents the theoretical potential for flooding from pluvial sources (i.e., flooding caused by rainwater exceeding capacity of drainage systems), the southern boundary of the site is located of 'low' and 'medium' flooding probability. Regulatory flood maps have been developed to be used in strategic planning and are not intended to provide site-specific information. However, the mapping can provide a useful indication of whether further consideration or assessment of flood risks to a site may be required.
Geology and Hydrogeology		
Presumed Direction of Shallow Groundwater Flow	Landmark Envirocheck; BGS geological mapping; Google Earth™	The nearest surface watercourse is the Grand Union Cancel to the 38m north – this is concrete lined so it is considered unlikely that the watercourse will influence shallow groundwater flow. The River Brent (lower) is located approximately km 1.60km of the site and the River Thames is located approximately 5km south. Based on the topographic gradient of the site and the proximity of the rivers, continuous groundwater bodies (where present) are likely to flow towards or following these rivers (i.e., to the north-west, or south). However, shallow groundwater at the site is likely to be discontinuous given published the geological conditions (London Clay – an unproductive strata).

Table 3.2: Physical Setting and Utility Information

Conditions	Source	Description
Depth to Groundwater	BGS geological mapping and borehole logs[3]; Landmark Envirocheck	According to a nearby BGS borehole log [positioned approximately 36m north of the site (TQ28SW592)], shallow groundwater was recorded at 1.30mbgl, recorded within the shallow Made Ground. A third-party site investigation report obtained from the Local Planning Authority recorded groundwater levels at the site to range between 0.99 mbgl and 4.75 mbgl, albeit some wells were noted to be dry and the levels recorded were considered likely to relate to infiltration of surface water. Groundwater within the London Clay Formation is likely to be discontinuous given the unproductive nature of this bedrock geology.
Groundwater Aquifer Quality	Landmark Envirocheck; EA mapping	The site is not located within an EA designated groundwater Source Protection Zone (SPZ) and, there are no groundwater SPZ's within 1km of the site.
On-site Wells	Landmark Envirocheck.	No boreholes were recorded within the Landmark Envirocheck records. Two monitoring boreholes reportedly relating to the site investigation works undertaken by JOMAS were observed during Ramboll's site visit.
Nearest Groundwater Supply Wells and Surface Water Abstractions	Landmark Envirocheck	There is one licensed surface water abstraction located approximately 646m northwest of the site. This abstraction is for 'other industrial/commercial/public services: non-evaporative cooling' and is licensed to the British Waterways Board. There are no licensed groundwater abstractions within a 1km radius of the site however, there are three groundwater abstraction locations within a 2km radius, the closest of which is located approximately 1.95km northeast of the site. This abstraction is for 'Schools and Colleges: drinking, cooking, sanitary and washing (small garden)' and is licensed to Brahma Kumaris W S University.

Table 3.2: Physical Setting and Utility Information

Conditions	Source	Description
Geologic Conditions	BGS geological mapping and borehole logs; Landmark Envirocheck	The site is underlain by bedrock geology of the London Clay Formation (blue-grey or grey-brown, silty clay with some layers of sandy clay; an Unproductive Strata); however, given the site history, it is considered likely that an unknown thickness of Made Ground is present directly above the bedrock. No superficial deposits are recorded. According to a nearby BGS borehole log [positioned approximately 36 m north of the site (TQ28SW592)], Made Ground was encountered between ground level and 1.3mbgl, with the underlying London Clay Formation recorded below to a depth of 10mbgl (unproven). According to Coal Authority data, the site is not located in a Coal Mining Affected Area. The site is located in an area where other (non-coal) mining activities are rare.
Site Sensitivity	Ramboll's findings based on available sources and site visit observations.	The site is considered by Ramboll to be situated in an area of low sensitivity with respect to groundwater resources. The closest groundwater abstraction lies approximately 1.9km northeast of the site. The site is not located within a groundwater SPZ. The site is considered by Ramboll to be in an area of low sensitivity with regards to surface water resources. The nearest surface watercourse is the Grand Union Canal located 38m north of the site. There are three licensed surface water abstractions within 2 km. The closest licensed surface water abstraction is located approximately 646m north-west of the site and relates to abstraction from the Grand Union Canal by the British Waterways Board for non-evaporative cooling purposes.

Table 3.2: Physical Setting and Utility Information

Conditions	Source	Description
Site Utility Information		
Underground pipelines and tunnels	LinesearchbeforeUdig database[5]; Transport for London's Property Asset Register[6]	According to the LinesearchbeforeUdig database, there are no records of underground fuel or oil pipelines on the site or within 250m. However, the site is classified by the National Grid electricity transmission as high-risk due to the presence of the adjacent electrical substation. However, there are records of assets owned by Gtt (multinational telecommunications and internet service provider), National Grid Gas (gas supplier), Scottish and Southern Electricity Networks (electricity supplier), SSE Enterprise Telecoms (telecoms network), UK Power Networks (electricity distribution network operator) and Zayo Group UK Ltd. (communications infrastructure services provider) on or within 820 feet (250m) of the site. The LinesearchbeforeUdig database lists pipelines distributing crude oil and refined hydrocarbon products owned and/or operated by a number of UK pipeline operators, including BPA, BP, ConocoPhillips, Esso, Government Pipelines and Storage System, Sabic, Shell and Total. Transport for London's Property Asset Register[6] does not identify the site as lying within the zone of influence for the London Underground.
Heating and Cooling Equipment	Ramboll site visit.	The unit's hot water supply are understood to be heated by electric heaters. No cooling equipment was observed.
Natural Gas Service	To be confirmed by Ramboll site visit.	The gas supply connection to the western warehouse unit was reportedly cut off several years ago. Decommissioned gas pipes were observed during the site visit.
Use of Fuel Oil for Building Heat	Ramboll site visit.	No external above ground fuel storage tanks were observed by Ramboll.
Power Supplier	N/A	Not determined.
Water Supplier	Ramboll site visit.	It is anticipated that the site is served by a mains water supply. However, no information was made available to Ramboll during the site visit to confirm this.
Sanitary Sewer	Ramboll site visit; drainage plan	The site is served by separate gravity fed foul and surface water drainage systems A drainage drawing was made available for review after Ramboll's site visit. Only the western warehouse is reported to be provided with mains drainage to the municipal foul sewer system via a connection in the south-western corner of the site.

Table 3.2: Physical Setting and Utility Information

Conditions	Source	Description
Septic Systems		The site is served by separate gravity fed foul and surface water drainage systems. No septic tanks are reportedly located on the site and no evidence of such structures was observed by Ramboll during the site visit.
Other		
Unexploded Ordinance	Zetica UXO website	Readily available and reasonably ascertainable records indicate that several bombs fell in close proximity to the site during WWII.

Notes:

[1] EA Catchment Data Explorer: https://environment.data.gov.uk/catchment-planning/

[2] Flood Map for Planning: https://flood-map-for-planning.service.gov.uk/

[3] BGS Geology of Britain Viewer: http://mapapps.bgs.ac.uk/geologyofbritain/home.html

[4] Lost Rivers of London, Barton 1992: https://londonist.com/london/maps/london-s-lost-rivers-mapped-with-the-place-names-they-inspired

[5] LinesearchbeforeUdig database: https://www.linesearchbeforeudig.co.uk/

[6] Transport for London's Property Asset Register: https://tfl.maps.arcgis.com/apps/webappviewer/index.html?id=5129c766255941d3be16a6828faa8f18

2.2 History of Site and Surrounding Properties

2.2.1 Past Uses of the Site

Based on Ramboll's review of historical information sources, the site was undeveloped in the 1860s, and possibly in agricultural use. By 1915, a road was present along the southern boundary of the site. By 1935, a stationary works was present in the western portion of the site and a smaller structure of unknown use was present in the east of the site. By 1955, the stationary works was recorded as a bookbinding works and the number of buildings associated with the bookbinding works had increased in number across the site. By 1967, the site became further developed with the extension of the book binding works to include building in the centre and centre-east of the site. By the 1980s, the site buildings were labelled only as 'works' and an electrical substation was recorded in the center of the site. No further changes were recorded on more recent historic maps dating to the 1990s and 2000s. The site is located within an industrial area, dating back to the early 1900s and is also located in close proximity to a former power station and railway land.

Table 3.3: Summary of Key Observations from Historical Sources for the Subject Site	
Historical Source	**Key Observations Regarding Site History**
Landmark Envirocheck	The site was undeveloped in the 1860s, possibly in agricultural use until 1935 when a stationary works was present on the western portion of the site. Within the eastern boundary of the site a small building (use unknown) was recorded. In 1950s the site became a bookbinding works. Throughout the 1960s and 1970s the site remained a bookbinding works, however several extensions and several more buildings were constructed during this time. By the 1980s the site was named a works, with an electrical substation recorded within the center of the site. No further changes were recorded on the 1990s and 2000s historic maps.
Google Earth™	Aerial imagery from 1928 shows the site to be undeveloped land. The site was occupied by buildings of an industrial appearance in aerial imagery from 1945. In addition, aerial images of the site from 1953 show the industrial buildings onsite. The 1999 aerial map shows a building (with a red roof) present within the center of the site, by 2021 the building was no longer present, and a new building is located.

2.2.2 Past Uses of Adjacent Sites

Table 3.4: Summary of Past Uses of Adjacent Sites	
Date	**Past Uses of Adjacent Sites**
1874	• The site was bound on every side by undeveloped agricultural land. • The Grand Junction Canal was located 30m north-east of the site. • Ponds are shown 160m northeast and 170m north. • A railway was located 250m north-east. • A naptha works was shown 600m south-east.
1896	• There has been significant urbanisation of the Harlesden area 500m – 1km to the north and east of the site. • The naptha works are no longer present. • A metal works was present 430m north of the site. • The Willesden railway junction has expanded with engine sheds and carriage sheds constructed 320m east and 350m east of the site. • A sawmill is present 600m south-east of the site. • The Atlas brick works, associated buildings has been developed 350m south-east of the site • Willesden paper and canvas works are shown 450m south-east.

1920s to 1930s	• Further expansion of the Harlesden area has occurred, to the north and east of the site. • A generating station (Electric Supply Co.), (including associated cooling tanks, chimneys, transformers and several tanks) has been developed 80m north-east of the site. • A generating station, photographic, automobile works and • An electrical engineering works has been constructed 90m west. • A laundry was shown 200m north-west of site. • An iron works was located 640m north-west of the site. • A brick and lime works with associated tank were located 640m north-west of the site. • A biscuit works was located 400m north-west of site. • An old clay pit was shown 450m south-east of the site. • Willesden Workhouse Infirmary was developed 500m west. • Several works and a generating station were located >750m south-west of the site.
1950s	• A motor vehicle works and engineering works were developed adjacent to the north of site and 50m north respectively, with metal plating works beyond. • Numerous works, warehouses and factories are shown 100m – 250m west and north-west. • A large area of industrial-style units (including engineering works, confectionary works, joinery works, cardboard boxes and packing) is shown to extend 1km south and south-east of the site.
1960s to 1970s	• A power station is recorded at the former generating station, 80m north-east of the site beyond the Grand Union Canal. The power station extended on to land immediately adjacent to the east of the site, connected by two bridges over the canal. Three large cooling towers are shown 60m, 120m and 130m south-east of the site associated with the power station. In addition, a tank was recorded 130m south-east of the site. • Numerous works, warehouses and factories are shown 100m – 250m to the south, west and north-west. • A metal planting works was shown 70m north of the site.
1980s	• The buildings adjacent to the north of site have been redeveloped and replaced with a row of industrial-style units identified as The Royal London Estate. • The power station to the north of the site was now labeled as a 'Grid Station'. • Works 50m west of site have been redeveloped and are identified as warehouse and smaller works.
1990s	A freightliner (rail freight) terminal is located 380m east of the site.
2000s	• Power station to the SE no longer shown and cooling towers no longer present. • New large commercial style development shown 50-400m southeast of site.

The above activities represent potential off-site sources of contamination that (if present) could potentially migrate beneath the site. The potential for off-site contamination (if present) to migrate beneath the site would be dependent on the underlying geological conditions, which are discussed in Table 3.2.

2.2.3 Archaeological Desktop Review

Based on information obtained from the Local Planning Authority, a desk-based archaeological assessment was undertaken by Wessex Archaeology in September 2020 (report ref. 237990.01) in relation to the proposed redevelopment of the site. The report concludes there to be limited archaeological interest within the site. Wessex Archaeology recommended that the need for further archaeological surveys should be discussed with the Local Planning Authority. It was noted that if further work is requested then it should be proportionate to the sites archaeological interest, be

limited in scope to areas where made deep made ground deposits were not found and be completed following demolition of the existing buildings.

2.3 Unexploded Ordinance

According to information obtained by Ramboll from the Zetica online UXO map[1], the site is located within a moderate risk area with regard to unexploded ordinance. Moderate-risk regions are those that show a bomb density of between 11 and 50 bombs per 1km^2 and that may contain potential WWII targets. In addition, the site is located adjacent to areas to the east and west noted as targets for the Luftwaffe. Publicly available records obtained from Bomb Sight[2] indicate that several bombs fell in close proximity to the site. The closest bomb to fall near the site was recorded approximately 280m south of the site. Zetica report recommend the completion of a detailed desk study to assess, and potentially zone, the Unexploded Ordnance (UXO) hazard level on the site.

Planning information obtained by Ramboll includes a detailed Unexploded Ordnance Risk Assessment prepared by 1st Line Defence on behalf of Jomas Associates Limited in relation to intrusive ground investigation works undertaken at the site in 2020. 1st Line Defence rated the site a medium risk from items of German aerial delivered and anti-aircraft UXO. There was also an assessed negligible risk from allied ordnance.

1st Line reported that the Municipal Borough of Acton was subject to an overall very high density of bombing, with an average of 162.2 items recorded per 1,000 acres. Bombing in the area of the site can be primarily attributed to nearby strategically important targets including Acton Lane Power Station, located approximately 100m east of the site, as well as Willesden Power Station located approximately 1km south-west of the site. Readily available records indicate that several HE bombs fell in close proximity to the site. The assessment also noted a potential bomb strike within the western portion of the site. This was observed from historic aerial photographs however, due to the quality of the photographs it is unclear.

The Unexploded Ordnance Risk Assessment recommended:

- That a UXO risk management plan and site specific UXO awareness briefings should be implemented for all intrusive works at the site.:
- Open intrusive works (trial pits, service pits, open excavations, shallow foundations etc.) should be undertaken with UXO specialist on-site support.

Boreholes and piled foundations require intrusive magnetometer survey of all borehole and pile locations/clusters down to maximum bomb penetration depth.

2.4 Description of Operations

The site comprises a rectangular plot adjacent to North Acton Road. Three industrial units are situated along the northern boundary of the site, with an access road to the south of the buildings and an external yard / loading area to the east.

[1] https://zeticauxo.com/downloads-and-resources/risk-maps/

[2] http://bombsight.org/

Limited information relating to site operations is included in a Preliminary Risk Assessment (desk-study) report produced by JOMAS Associates Limited (Jomas) in 2020. This was obtained by Ramboll from the Local Planning Authority's online application register. At the time of Jomas' reporting the westernmost unit was unoccupied, and the middle unit was used for storage of vehicles. Jomas also noted a large number of vehicles to be stored externally in the access road and yard area in the east of the site. The western unit was reported to be of brick construction with the central and eastern units being constructed from fabricated steel.

Observations from Ramboll's site visit (5 November 2021) noted current uses of the site to comprise:

- Western Warehouse Unit: a large open warehouse with a mezzanine area located in the western end of the building. The warehouse is located in the west of site, adjacent to North Acton Road. The site contact reported that the building was constructed in the 1930s and used as a book-binding factory. The building is of brick construction with a rendered texture to the burgundy red exterior walls, an apex roof formed of asbestos roof tiles, and it is supported by an internal steel beam structure. The site contact reported that the eastern edge of building was damaged during WW2, before finally demolished between 2005 and 2006. The building is sub-leased to approximately 19 tenants, with the open floor of the warehouse hosting 18 converted shipping containers used as multi-purpose spaces including for music production, as office spaces and for the storage of props. The containers are stood on concrete hardstanding, which has evidence of staining. There are two shipping containers on the northern exterior side of the warehouse, one on the north-west corner, and the other on the north-east corner. The building is approximately 7,000 sqft;
- Central Warehouse Unit: a single storey open warehouse located in the centre of site, adjacent to the 1930s warehouse. The building was constructed between 2005 and 2006 and extended over the demolished former eastern edge of the western warehouse. The building has a light blue steel structural frame, with metal cladding, and with two main loading bay entrances on the southern side, and two fire exit doors on the rear northern side. The building is currently used by 'CBS Productions' as a painting and carpentry workshop for the construction of props on the set of 'Tinkertown'. The building is approximately 8,500 sqft;
- Eastern Warehouse Unit: a single storey open storage warehouse, with a small temporary office space in the south-east corner. The building was approximately constructed in the 1990s and is of a grey steel structural frame, with metal cladding, and one main loading bay entrance on the southern wall. The metal sheeting on the northern exterior wall is damaged. There are no additional doors/entrances on the other sides of the building. The building is used for the storage of props used on set by 'CBS Productions'. The building is approximately 4,500 sqft; and

The external areas of the site include a hard surfaced, damaged concrete slab of a demolished warehouse (to the east of the eastern warehouse and is elevated by 1m relative to this warehouse), hard-surfaced service yards/ vehicle loading bays on the southern edge of all three warehouses, a concrete road which services all areas of site along the southern site boundary, brickwork flooring outside the front of the western warehouse with soft landscaping and car parking spaces, an external portable toilet block adjacent to the south-west corner of eastern warehouse, managed by 'Davlav', exterior storage spaces surrounding the warehouses, and a large amount of overgrown vegetation

(2m to 3m high) along the entire northern boundary of site, excluding the northern area of the western warehouse. Buildings occupy approximately 65% of the site area, with 25% comprising hardstanding and approximately 10% soft landscaping.

The concrete slab of the demolished warehouse is reportedly sub-let by a vehicle dealership, and used for vehicle storage.

2.5 Database Review and Regulatory Information

Ramboll reviewed the results of an environmental database procured from the Landmark Information Group (see Appendix C). Database listings pertaining to geological or hydrogeological conditions are not discussed in this section; however, pertinent information from these listings has been incorporated in applicable sections of the report.

- There are no contaminated land register entries or notices recorded on the site or within a 1km radius.
- There are no current or former landfill sites recorded within an 250m radius of the site (i.e., the "planning consultation zone").
- There are records of eight Licensed Waste Management Facilities within 1km of the site. The closest of which is a household, commercial and industrial transfer station located approximately 410m east of the site, operated by Willesden Freight Terminal. It should be noted that the former Acton Lane Power Station, located approximately 227m south-east from the site was the closest however, his license has now been surrendered.
- There are 22 records of Environmental Permits to operate Part A(1) Installations issued under the Industrial Emissions Directive[3] within 1km of the site. The closest of which is licensed to Equinix (UK) Limited, located 209m southeast of the site.
- There are no Environmental Permits to operate a Part A(2) Installation issued under the Industrial Emissions Directive[4], within 1km of the site.
- There are 39 records of Environmental Permits to operate Part B Installations issued under the Industrial Emissions Directive[5] within 1km of the site. The closest 60m south-west is licensed to Metalion Limited, for power coating processes, including sherardizing.
- There are 16 Radioactive Consents registered within 1km of the site. The closest of which is registered to Hammersmith Medicines Research Limited, located approximately 538m south-west of the site. *NB Due to public security restrictions, certain information on closed or mobile radioactive substance authorizations has been removed from the public register and is not available to Ramboll.*
- There are two Control of Major Accident Hazard (COMAH) sites located within 1km) of the site. The closest COMAH site is Inco Europe Limited (lower tier), located 523m south of the site.
- There are no Explosive Sites, within 1km of the site.

[3] Formerly referred to as Integrated Pollution Prevention and Control (IPPC) Authorisations, or Pollution Prevention and Control (PPC) Authorisations.

[4] Formerly referred to as Local Authority IPPC Authorisations.

[5] Formerly referred to as Local Air Pollution Prevention and Control Authorisations

- There is no Planning Hazardous Substance Consent within 1km of the site.
- There have been no prosecutions relating to authorized processes within 1km of the site.
- There are five Environmental Permits held with the Environment Agency for water discharge activities (formerly referred to as Discharge Consents) within a 1km radius of the site. The nearest (approximately 83m east) is held by Cegb, for the discharge of cooling water.
- A total of 18 pollution incidents to controlled waters has been recorded within 1km of the site. The nearest of these was located 83m east of the site and related to a release of sewage, the receiving water was not recorded. The incident occurred in May 1999 and, was classified by the Environment Agency as a Category 3 - Minor Incident.
- The site is located in an area where less than 1% of residential properties are above the action level for Radon set by Public Health England. No radon protection measures are considered necessary by the British Geological Survey. *The Action Level for commercial properties is 400Bq/m3 and assessment of potential worker exposure is the responsibility of the occupant.*
- There are three fuel station entries within a 1km radius. The nearest open fuel station is located 780m south-west from the site. The fuel station is an Asda Park Royal Automat.
- There are no other ecologically sensitive sites within a 1km radius of the subject site.

Local Planning Authority

Ramboll has obtained a planning history of the site from the Planning Department of the London Borough of Ealing Council's online planning portal[6]. Relevant applications are summarized as follows:

- 204979OPDCOB: Outline planning permission with the details of access, appearance, landscaping, layout and scale reserved for later determination for demolition and redevelopment to comprise a data center (Use Class B8) of up to 25,000 sqm gross external, including ancillary offices, internal plant and equipment (including flues), and substation. In addition to the above the Development may also include car parking; car parking; provision of external plant and equipment (including flues) and fuel storage; creation of servicing areas and provision of associated services, including waste, refuse, cycle storage, and lighting; and for the laying out of the buildings; routes and open spaces within the development; and all associated and ancillary works and operations including but not limited to demolition; engineering operations. Development shall be in accordance with the approved Development Parameters Schedule and Plans (Consultation from OPDC). 2020. Decision: raise no objection.
- 173753OPDFUL: Erection of an electrical substation, 2017. Conditional consent granted. No further information available.
- 179021OPDFUL: Erection of an electrical substation, 2018. Conditional consent granted. No further information available.
- P/2004/1022: Erection of a single-storey warehouse building, 2004. Conditional consent granted.
- P/2000/3415: Details of drainage pursuant to condition 4 of the planning permission 07422/13 dated 17/01/2000 for the erection of three business class units with ancillary offices, car parking and servicing (total floorspace 17,015 sqm). | Powergen Site North Acton Road London NW10. Status: withdrawn.

[6] https://pam.ealing.gov.uk/online-applications/ accessed on 19 October 2021

- 07625/9: Erection of a single-storey warehouse building. Status: Conditional Consent.
- 07625/1: alterations to industrial buildings to form four units. No additional information provided. Status: Not Development.
- A24250: Extension to store. No additional information provided. Status: approved.
- 07625/8: Erection of industrial building. No additional information provided. Status: approved.
- A22750: Erection of Nissen hut for storage. No additional information provided. Status: conditional consent.
- A29875: Erection of first floor office extension. No additional information provided. Status: approved.
- A28886: Erection of extension to storage building. No additional information provided. Status: approved.
- A26674: Erection of two-storey building and additions to existing buildings. No additional information provided. Status: approved.
- A26251: Erection of covered way. No additional information provided. Status: approved.
- A25875: Erecting a bookstore. No additional information provided. Status: approved.
- A26160: Addition to bookstore. No additional information provided. Status: conditional consent.
- 07625/7: Erection of storage building. No additional information provided. Status: conditional consent.
- 07625/6: Use of industrial building for warehouse purposes. No additional information provided. Status: conditional consent.
- 07625/5: Erection of single-storey lean-to extension to factory. No additional information provided. Status: conditional consent.
- 07625/4: Use of factory premises as warehouse. No additional information provided. Status: conditional consent.
- 07625/3: Use of factory premises as warehouse unit. No additional information provided. Status: conditional consent.
- 07625/2: Erection of single-storey extension to factory units (outline). No additional information provided. Status: conditional consent.
- 07625: Alterations to entrance to factory. No additional information provided. Status: permitted development.

Information obtained from the Old Oak and Park Royal Development Corporation (OPDC)[7] in relation to application ref. 204979OPDCOB confirms that an outline planning application (referred to as the 'proposed development' herein) has recently been made for demolition of existing buildings and redevelopment of the subject site to comprise a data centre (Use Class B8) of up to 25,000 sqm gross external, including ancillary offices, internal plant and equipment (including flues) and a substation. The application was made to OPDC on 02/10/2020 and is currently listed as 'Pending Consideration'.

Planning Enforcement and Environment Team

An information request was submitted on 19 October 2021. The London Borough of Ealing Council's (LBE) Planning Enforcement and Environment Team responded on 16 November 2021. LBE noted that the site has not been identified for inspection or for further review under the councils contaminated land strategy.

[7] http://planningregister.opdc.london.gov.uk/

LBE informed Ramboll that in view of the historical uses at the site and in the near vicinity of the site, (due to the site being located within an industrial estate dating back from 1890's) it is possible that there will be potentially contaminative sources at the site. However, LBE have noted that there are no known contamination issues associated with the site or in the near vicinity. In addition, LBE informed Ramboll that they do not hold any records of intrusive investigations at the site or in the near vicinity.

LBE hold no records of any current or historic landfills within 250 metres of the site. In addition, LBE hold no records of radon gas concentrations within the onsite buildings or within 100 metres of the site. The LBE noted no current or former nuisance issues, prosecutions or enforcements associated with the site or on adjoining properties. No known water supplies were recorded on the LBE private water supply register within a 2 km radius of the site.

LBE noted that a Part B environmental permit is located 288 metres south from the site. The permit relates to a commercial property (named Solus (London) Ltd, postcode: NW10 6LX), where they respray road vehicles PG6/34.

Environmental Agency (EA)

An information request was sent on the 27 October 2021. The EA responded on the 24 November 2021. The EA do not hold any records of any current or historic landfill sites within 250 metres of the site. The EA do not hold any records of any pollution incidents onsite, however, the EA have provided a spreadsheet of all the pollution incidents within 250 metres of the site boundary. the most recent pollution incident recorded by the EA occurred approximately 140 m northwest (TQ 20644 83014) from the site. The pollution incident was recorded as a category 3 (minor) incident. The incident was recorded as a pipe failure below ground (noted as suspended solids).

The EA groundwater and contaminated land team do not hold any information regarding contamination of soil or groundwater within 250 metres of the site. There are no authorisations, registrations, permits or licences for industrial processes regulated by the EA within 250 meters of the site. The EA do not hold any records of any of complaints regarding issues such as odour, noise or nuisance onsite.

Petroleum Officer

An enquiry was sent to the Petroleum Officer at London Fire Brigade (LFB) in order to establish if the site is currently or has previously been licensed for the bulk storage of petroleum products. The LFB responded on the 2 November 2021. The LFB undertook a through search of current and historical files and database which revealed no petroleum tank information for the site.

2.6 Protected and Invasive Species

The site is largely occupied by buildings and hardstanding which act to reduce the likelihood of the presence of protected or invasive species.

Whilst Ramboll has not undertaken an ecological survey of the site, no suspected invasive species listed under Schedule 9 to the Wildlife and Countryside Act 1981 (such as Japanese Knotweed or Giant Hogweed) were identified at the site or in the immediate vicinity during the site visit.

2.7 Materials Storage

Underground Storage Tanks (USTs)

Site personnel were not aware of the current or former presence of USTs at the site and no visual evidence of USTs, such as fill points, pumps, gauges, or signage, markings, concrete scarring, plinths or bunds indicative of such potential uses was identified during the visit.

Above Ground Storage Tanks (ASTs)

Site personnel were not aware of the current or former presence of ASTs at the site and no visual evidence of ASTs were observed.

Other Bulk Chemical Storage

All other bulk chemical storage observed on site is described in Table 3.5 below:

Table 3.5 Summary of Other Storage

Item	Location	Containment and other comments
Ad Blue	To the east of the eastern warehouse, in the south-west corner of the concrete slab	1,000 litre Intermediate Bulk Container (IBC) used to store Ad Blue fuel additive stood directly on concrete surfacing externally without secondary containment for the container or the dispensing point. Staining was observed around the container, with the concrete slab in a notably poor condition in this area. Adjacent to the IBC container was approximately thirty 30 litre AdBlue containers stacked to two storeys high, directly on concrete hardstanding with no secondary containment. Staining was observed in this area. A large amount of rubbish is present the general eastern area of site, with some 25 litre containers of Ad Blue present amongst the overgrown vegetation on the north-east corner. Any potential staining is obscured.
Screen Wash	To the east of the eastern warehouse, adjacent to Ad Blue IBC	One 5 litre container is stored directly on concrete hardstanding, adjacent to the dispensing point of the Ad Blue IBC. Staining was observed in the vicinity.
Brake and Clutch Cleaner	To the east of the eastern warehouse, adjacent to Ad Blue IBC	One 5 litre container is stored directly on concrete hardstanding, adjacent to the dispensing point of the Ad Blue IBC and screen wash container. Staining was observed in the vicinity.
Oil Cylinder and Pump	South-west exterior corner of the eastern warehouse	One 30 litre rusty oil metal container with a built-in hand pump, stored on concrete hardstanding. No evidence of staining.
Wood Preserver Spray Containers	On the eastern wall	Seven7 litre Hozelock Permasol spray containers containing what the site contact stated was wood treatment solution. This was stored directly on

	of the central warehouse	concrete hardstanding, with minor staining noted in the vicinity. The concrete was noted to be in a good condition.
Paint	On the eastern wall of the central warehouse	At least ten 10 litre plastic containers of black paint, stored on a shelving unit. Paint that is actively being used by staff is stored on the concrete hardstanding. Staining is quite common across the warehouse concrete floor from the painting activities that occur on site.
French Polish	On the eastern wall of the central warehouse	Eleven 5 litre jerry containers of Myland French Polish stored on a shelving unit. Staining was observed on the shelf itself.
Waste Solvent	To the immediate west of the western shutter of the central warehouse	1,000 litre IBC used to store waste solvent, managed by Hazgreen, stood directly on concrete hardstanding surfacing externally without secondary containment for the container or the dispensing point. No staining was observed.
Gas Oil	Northern exterior storage area of western warehouse	Four 205 litre metal drums, labelled to contain gas oil. These were empty. They are stood on concrete hardstanding, and there is no evidence of staining. A separate 205 litre blue plastic is also present adjacent to the metal drums, stood on concrete hardstanding. There was no evidence of staining.
Gas Cylinder	South-west exterior corner of western warehouse	x4 13kg gas cylinders stored on concrete hardstanding. No evidence of staining.

A shed adjacent to the eastern exterior wall of the eastern storage warehouse may have contained chemicals, but this was locked and so couldn't be accessed.

2.8 Wastewater and Storm Water Discharges

During Ramboll's site visit, the site representative reported water to be supplied from the municipal supply and used for sanitary and welfare purposes in the western warehouse unit. The mains supply was reportedly extended beyond the western warehouse unit in 2019 by an aboveground pipe which enters the central warehouse through the western wall to provide water for a make-shift toilet and kitchen area.

A drainage drawing for the site was made available for review after Ramboll's site visit. Only the western warehouse is reported to be provided with mains drainage to the municipal foul sewer system, which is on the south-west corner of the site. The aboveground sewage pipe extension implemented in 2019 appears to connect the central warehouse to the foul sewer system. There do not appear to be any drains beyond the eastern edge of the western warehouse unit. No oil-water interceptors were reported by the site contact or identified on-site by Ramboll during the site visit; however, an interceptor is identified on the site drainage plan just outside the south-west corner of the site boundary.

The site representative reported that any foul wastewater generated by the portable 'Davlav' toilets observed in the eastern warehouse unit is stored in an AST and collected regularly.

Two large, decommissioned water tanks were present at height on either end of the western warehouse. The site contact reported redundant 'plant' machinery associated with previous uses of the site to have been removed.

The site contact had no knowledge of any legionella management exercise or whether a legionella risk assessment has been carried out.

Under the Health and Safety at Work Act 1974 and subsequent regulations, the dutyholder is required to assess the risk of Legionella exposure and put in place any necessary measures. The dutyholder may be the employer, or a person in control of the premises.

No current issues in relation to flooding were reported by the site contact during the site visit.

Hardstanding on-site appeared in an average condition along the southern edge of the warehouses and only the western warehouse was served by road gullies for surface water drainage. These were in average condition, with one area noted to be infilled with gravel. Such drainage gullies are also present at the front entrance to the western warehouse on the western site boundary where the warehouse meets North Acton Road. Drainage was noted too be poor in the east of site, with a large puddle present on the concrete slab of the demolished warehouse.

2.9 Air Emissions

No significant emissions to air were noted during the site visit. The site does not utilise any gas boilers; all heating and hot water is provided by electric water heaters. According to the site representative the gas supply connection in the western warehouse has been cut off for several years and decommissioned gas pipes were observed during the site visit.

2.10 Waste Management

Ramboll's site visit noted wastes generated on-site to predominantly comprise domestic waste, packaging, film props and paper. Waste from the eastern and central unit is stored in wheeled bins and skips at the front of each warehouse and removed under separate contracts (arranged by the various tenants). A large red waste skip labelled 'recyclables' was observed on the south-east corner of the eastern warehouse unit, although on inspection this appeared to contain general waste. General wastes and recyclables from the eastern and central warehouse units are collected in bins managed by FJL Recycling, stored in the external area between the eastern and central warehouse units on their southern side. A visibly corroded green waste skip was present in front of the eastern shutter door to the central warehouse unit; its content was not known. An additional unknown contents large blue skip was present adjacent to the south-west of the central warehouse unit. Two large, wheeled bins for general waste and mixed recyclables labelled as managed by KP Waste were present adjacent to the south-east of the western warehouse.

No visual evidence of staining or leaching from waste storage areas onto unsurfaced ground was noted. A review of waste documentation was outside the scope of this review.

Overall, housekeeping at the site was observed to be poor. Quantities of miscellaneous waste materials were observed across the site, particularly in external areas in the east, around the eastern and central warehouses units, and in storage yard to the north of the western warehouse unit.

A review of waste documentation was outside the scope of this review.

2.11 Polychlorinated Biphenyls

Based on a review of historical mapping, an electricity substation was present on the site since between the 1980s to 1990s. The September 2020 ground investigation by JOMAS Associates Limited found no Polychlorinated Biphenyl (PCB) above the laboratory method detection limit.

No on-site electricity substations, or other potential PCB-containing equipment were identified during Ramboll's site visit.

Under the Polychlorinated Biphenyls Regulations 2000, the holder of equipment that contains PCBs must ensure it is decontaminated to less than 0.05% unless within an electrical transformer, which requires annual registration with the regulatory authorities.

2.12 Contaminated Building Materials

Given the age of the western warehouse unit (reportedly dating to the early-mid 1900s) and the fact that the site has been redeveloped on at least one occasion, the presence of contaminated building materials such as asbestos, polycyclic aromatic hydrocarbons or artificial mineral fibres cannot be discounted. Asbestos roof tiles were identified during the site visit and confirmed by the site contact. The presence of asbestos containing materials within shallow Made Ground at the site can also not be discounted.

An Asbestos Refurbishment Survey[8] was made available for review after Ramboll's site visit. Key findings are summarised below:

- The warehouse is constructed of solid brickwork internally lined with plasterboard and timber, with an asbestos cement corrugated roof.
- Asbestos was positively identified within the following locations: board to the under stairs cupboard, in the ceiling tiles and board within the entrance hall, within the vinyl and bitumen floor tiles and adhesive of the ladies, gents and warehouse toilets, within the bitumen adhesive below linoleum in the gents toilet and within the paint of the gents toilet, within the textiles flash guards pad in the storage room, in the cement redundant downpipe of the warehouse, in the vinyl floor tile and the vinyl and bitumen floor tiles (grey and white, and adhesive) on the mezzanine floor, and in the cement corrugated roof sheet and cement flue pipe and cowls of the roof.
- The fourteen identified ACMs were considered by Courtney Lang to have a low or very low potential to release fibres if disturbed. Courtney Lang recommended to remove all of these items, with the exception of the cement corrugated roof sheet, where it was recommended to manage, label, encapsulate and remove if prior to demolition.
- The wrapped pipework and beam within the warehouse and metal safe on the mezzanine floor could not be accessed at the time of the survey.
- The site contact reported to Ramboll personnel during the site visit that all ACMs, with the exception of ACMs in the roof, had been removed as part of refurbishment works undertaken in 2020.

[8] Courtney Lang (2020), Refurbishment Survey Report of 37-39 North Acton Road, London, NW10 6PF. (Ref: 7683).

Under the Control of Asbestos Regulations (2012), the dutyholder must manage the risk from asbestos on a premises and to develop and implement an ACM management plan, with review and updating as appropriate. The dutyholder is the party who has, by virtue of contract or tenancy, the main responsibility for maintenance or repair of the building.

The site contact reported that it was assumed that no asbestos was used in the construction of the central (constructed in 2005-2006) and eastern (constructed around 1999) warehouse units; therefore, asbestos surveys have not been undertaken for these two buildings and there are no associated asbestos management plans. Building construction documentation has not been provided to Ramboll for review.

An asbestos survey has not been undertaken by Ramboll. A **refurbishment and demolition** survey will be required for redevelopment of the site.

2.13 Other Issues

Based on discussions with the site representative during Ramboll's site visit, there is no known history of complaints, enforcements or other regulatory actions regarding the site or immediate surrounding properties related to environmental conditions. No fire or spill events were reported. No flooding of the site is known to have occurred historically.

2.14 On-Site Soil and Groundwater Conditions

The principal law on contaminated land in the UK is Part 2A of the Environmental Protection Act 1990; introduced by the Environment Act in 1995 and coming into force on the 1st April 2000. Contaminated land is defined in Part 2A as follows:

> *"any land which appears to the local authority in whose area it is situated to be in such a condition, by reason of substances in, on, or under the land that:*
>
> *(a) significant harm is being caused or there is a significant possibility of such harm being caused; or*
>
> *(b) pollution of controlled waters is being or is likely to be caused".*

Local Authorities have a duty under the act to identify land within their area that is likely to fall under this definition. If following investigation, the land is formally determined as being contaminated, the Local Authority must ensure that it is remediated to an acceptable standard.

Formal determination that land is contaminated is based on identifying what are known as significant pollutant linkages between sources of contamination and receptors via an existing migration pathway (i.e., the pollution can reach someone or something and cause them or it harm). It should be noted that Part 2A only considers current land use and existing migration pathways. The authority must demonstrate that there is a significant possibility of significant harm (SPOSH) being caused to a receptor (e.g., water, land, humans, ecology, property), or that actual harm is occurring.

Under the UK planning regime, it is the responsibility of the developer or site owner to ensure that the site is fit for the purpose for which planning permission is being sought. The local authority also has a duty to ensure that a site will not meet the definition of Contaminated Land under Part 2A once it has passed through the planning system. This is typically enforced by the local authority by applying

conditions specifically relating to contaminated land to the planning permission. The local authority also incorporates guidance set out in various planning policy statements and guidelines, including Planning Policy Statement 23 (PPS23): Planning and Pollution Control, which provides guidance to the English Regional and Local Planning Authorities (LPA) on how the management of contaminated land should be considered for planning application and site development.

The Building Regulations ensure that the health and safety of people in and around buildings by providing functional requirements for building design and construction. Contamination is covered by Requirement C2 which requires precautions to be taken to avoid danger to health and safety caused by substances on or in the ground.

2.14.1 Prior Environmental Assessments

Previous Reports

The following reports have been obtained from the Local Planning Authority's[9] online application register:

- JOMAS Associates Limited, August 2020 - Desk study/Risk Assessment Report, 37-39 North Action Road. Report reference: P2970J2030/JWT; and
- JOMAS Associates Limited, September 2020 – Geo-environmental and Geotechnical Assessment, Ground investigation Report for 37-39 North Action Road. Report reference: P2970J2030/SC.

Desk study/Risk Assessment Report, 37-39 North Action Road (JOMAS Associates Limited, August 2020)[10]

A desk study report was undertaken by JOMAS Associates Limited (Jomas) in August 2020. A brief overview of the desk study findings is presented below. Reference should be made to the full report for further information.

A review of historical mapping undertaken by Jomas identified several potentially contaminative past site uses including:

- A former stationary works, including loading areas which were on-site from 1935;
- A bookbinding works which were on-site from 1950s;
- An unspecified works which was present on-site from the 1980s;
- An electricity substation which was shown within the centre of the site from the 1980s; and
- An unspecified commercial/industrial building which were present on-site from the 1980s; and
- Industrial buildings which were present on-site from the 1990s.

Potentially contaminative uses identified in the near surrounds by Jomas included a power station (adjacent to the east of site), tanks (16m west and 57m north), a canal (41m north-east) along with

[9] Old Oak and Park Royal Planning and Development Corporation (http://planningregister.opdc.london.gov.uk)

[10] JOMAS Associates Limited, August 2020 - Desk study/Risk Assessment Report, 37-39 North Action Road. Report reference: P2970J2030/JWT

various works, factories and warehouses. Current uses identified by Jomas included commercial units and storage areas for vehicles.

Jomas noted that the site is directly underlain by solid deposits of the London Clay Formation, identified as an unproductive stratum. No superficial or artificial deposits are reported within the site. Jomas stated that no source protection zones were present within 500m of the site and that closet controlled water receptor was the nearby canal. The potential risks identified by Jomas to receptors (such as future site users, construction/maintenance workers, building foundations, including buried services and the nearby Canal) included:

- Potential for contaminated ground associated with previous site use;
- Potential for Made Ground associated with previous development operations;
- Potential for asbestos impacted soils as a result of demolition of previous structures;
- Potential asbestos containing materials within existing buildings; and
- Current and previous industrial uses off site.

Jomas noted that the potential pathways to receptors included ingestion and dermal contact with contaminated soils, inhalation or contact with contaminated dusts or vapours, leaching through permeable soils and the potential migration within the vadose zone, horizontal and vertical migration of contaminants within groundwater, accumulation and migration of soil gases and permeation of water supply pipes and attack on concreate foundations.

Overall, Jomas indicated a low to moderate contamination risk at the site on the basis that asbestos maybe present and due to the current and former uses at the site. Jomas recommended that an intrusive investigation should be undertaken to clarify potential risks to the identified receptors (such as future site users, construction/maintenance workers, building foundations, including buried services and the nearby Canal) and assess the extent of Made Ground soils present. Jomas noted the potential presence of asbestos within the existing buildings on site, therefore Jomas recommended that an asbestos survey should be undertaken.

Ramboll Comments

Based on the above reviewed report, Ramboll is in general agreement with the findings of Jomas' assessment. There is some potential for contamination to be present based on the identified current and historical uses of the site and near surrounds; albeit, the site is considered to be located in a low sensitivity environmental setting.

Ramboll notes that there are some data gaps in Jomas' assessment. Details of the site inspection included in Jomas' report are limited to a basic summary of on-site activities not all units were inspected internally. No information regarding potential sources of contamination identified (e.g. storage of fuels, chemicals or wastes), the condition of the site or other key environmental considerations (for example: drainage, asbestos containing materials, invasive species) is provided and no consideration is given to discussion of these topics in the report. Whilst Ramboll considers that the inclusions of this information would be unlikely to significantly alter the findings of the assessment, it is noted that identification of potential sources of contamination is an important consideration to be taken into account when designing ground investigation works.

Overall, Ramboll agrees that while the site remains in its current commercial use, the risk to receptors from contamination is low to moderate and an investigation is required for redevelopment (see below).

Geo-environmental and Geotechnical Assessment, Ground investigation Report for 37-39 North Action Road. (JOMAS Associates Limited, September 2020)[11]

A Geo-environmental and Geotechnical Assessment ground investigation report was produced by Jomas Associates Limited (Jomas) in September 2020. A brief overview of the findings of this ground investigation is presented below. Reference should be made to the full report for further information.

The ground investigation comprised five window sample boreholes (WS1 to WS5 to depths of up to 5.45 meters below ground level (mbgl)) and two cable percussion boreholes (BH1 and BH2, to depths of up to 20.45 mbgl). Three wells (WS3, BH1 and BH2) were installed for ground gas and groundwater monitoring. The response zones of the monitoring wells all targeted the London Clay. No rationale is given for the location of the site investigation points.

The ground conditions encountered were reported to comprise Made Ground (ground level to 2 mbgl), overlying the London Clay Formation (0.40 mbgl – 2.00 mbgl to 20.45 mbgl); the thickness of the clay was not proven. During the ground investigation ash was recorded within the Made Ground at WS3 at 0.10 mbgl to 0.40 mbgl and within WS5 at 0.10 mbgl to 1.50 mbgl.

Eight soil samples were collected. Whilst all eight soil samples were tested for metals, PAH and phenol, only four samples were tested for the presence of TPH and VOCs. The soil results were compared to a Soil Guideline Values (SGVs) for a commercial end use. In the absence of any published SGVs Jomas used the LQM/CIEH S4Uls values. No exceedances of GAC for the protection of human health within a commercial scenario were found. Asbestos was detected within two of the eight soil samples tested. The asbestos was detected within WS3 at 0.15mbgl (crocidolite loose fibres) and WS5 at 0.20 mbgl (chrysotile loose fibres). Both samples were noted to a have an asbestos content of below 0.1%. Polychlorinated biphenyls (PCBs) were not recorded above the laboratory method detection limit.

Three groundwater samples were obtained and tested for metals, PAH and TPH including BTEX and VOCs. Groundwater analysis recorded elevated concentrations of lead, nickel and copper which were found to exceed environmental quality standards. No potentially volatile contaminants (PAH, TPH, BTEX, VOCs) were reported above laboratory detection limits.

Four rounds of groundwater monitoring were undertaken across the site. Groundwater levels of between 0.99 mbgl and 4.75 mbgl were recorded. In addition, some wells were recorded as 'dry'. Jomas considered that the groundwater monitored within the wells represents surface water that has infiltrated the well and which has been unable to drain away through the relatively impermeable London Clay Formation.

Four rounds of ground gas monitoring were undertaken by Jomas. During these visits atmospheric conditions ranged between 999mb and 1022mb. In addition, these visits were undertaken during falling, static and rising pressures. Based on the calculated GSVs, and in consideration of the

[11] JOMAS Associates Limited, September 2020 – Geo-environmental and Geotechnical Assessment, Ground investigation Report for 37-39 North Action Road. Report reference: P2970J2030/SC.

conceptual site model, the site is classified as Characteristic Situation 1 (CS1), therefore Jomas noted that no formal gas protection measures were considered to be necessary at the site. Jomas also undertook a water supply assessment and based on the concentration of hydrocarbons compounds C10-C16, upgraded pipe work may be required.

Ramboll Comments

Based on the above reviewed report, Ramboll considers that the scope of Jomas' investigation to have been relatively limited. Further ground investigations will be required as part of the detailed development design. Several data gaps were noted as follows:

- A site-specific rationale provided for location of investigation points is not provided (e.g. potential sources of contamination do not appear to have been identified or targeted).
- The designs of the three monitoring wells utilised for assessment of ground gases do not screen the appropriate strata (Made Ground).
- Limited spatial investigation coverage (no coverage in eastern/north-eastern areas of site and limited coverage within building footprints).
- Limited soil testing undertaken within the Made Ground and natural strata.
- No leachate testing undertaken across the site.
- No PCB testing undertaken within the groundwater samples.
- Only one round of groundwater monitoring was undertaken.

Ramboll considers that further investigation works should include coverage of the soft cover areas and the eastern portion of site. In addition, should the current buildings be demolished as part of the site's development, additional ground investigation locations should be located beneath the former buildings. Further ground gas and groundwater monitoring should be undertaken to confirm the ground gas risk assessment and groundwater levels. New monitoring wells appropriate for monitoring of ground gas conditions should be installed.

Overall, some evidence of contamination has been found and potential for contamination elsewhere cannot be completely ruled out. However, Ramboll anticipates that industry standard brownfield site remedial measures would be appropriate to mitigate risks.

2.14.2 Known Site Conditions

Based on the factors noted, there is no known significant contamination present at the site. The presence or absence of potential soil and groundwater impairments related to any of the above listed conditions can only be evaluated via additional intrusive site investigation (e.g., soil, soil gas, and/or groundwater sampling).

2.14.3 Potential Site Conditions

Based on current information and conditions at the site, Ramboll considers the likelihood of significant undiscovered soil or groundwater contamination to be low to moderate.

- **Historical Use of the Site.** Based on Ramboll's review of historical sources of information, the site was undeveloped in the 1860s, possibly in agricultural use. By 1915, a road was present along the southern boundary of the site. By 1935, a stationary works was present on the western portion of the site. Within the eastern boundary of the site a small building (use unknown was recorded). By 1955, the stationary works was recorded as a bookbinding works. In addition, the number of buildings associated with the bookbinding works has increased in number across the site. By 1967, the site became further developed with buildings within the western portion of the site, associated with the bookbinding works. By the 1980s, the site buildings were named works

with an electrical substation recorded within the center of the site. No further changes were recorded on the 1990s and 2000s historic maps. The potential for chemicals including fuels, oils and solvents having been stored or used at the site cannot be discounted. With the absence of additional information regarding the historical storage and use of chemicals at the site, Ramboll cannot rule out the potential that historical site uses have impacted the subsurface of the site (soils and groundwater).

- **Demolition of Existing Buildings**. Based on a review of historical information, Ramboll understands that the site was initially developed in the 1930s, before the general ban of asbestos from use in construction materials in the UK in 1999. Therefore, the presence of asbestos in current building materials and within on-site soils (associated with the demolition of former on-site buildings) cannot be ruled out. Asbestos has been identified in the site buildings.
- **Current Use of the Site.** The site is currently used for a mix of businesses. Based on Ramboll's site inspection, substantial storage or use of substances that are likely to have caused significant ground contamination was not observed.
- **Prior Environmental Assessments.** Based on information obtained from publicly available planning records, previous Preliminary Risk Assessment (Phase I) and Geoenvironmental Risk Assessment (Phase II) assessments have been prepared for the subject site in relation to a recent planning application. Overall, some evidence of contamination has been found and potential for contamination elsewhere cannot be completely ruled out. However, Ramboll anticipates that industry standard brownfield site remedial measures would be appropriate to mitigate risks. There are some data gaps associated with the assessments and further ground investigations will be required as part of the detailed design. Some abnormal costs can be expected as would be the case with any brownfield site (e.g. increased soil waste disposal costs).

The presence or absence of undiscovered potential soil and groundwater impairments related to any of the above listed conditions can only be evaluated via intrusive site investigation (e.g. soil, soil gas, and/or groundwater sampling).

While the site remains in its current ongoing commercial/industrial use, regulatory drivers for the requirement of investigation and/or remediation of contamination (if present) would not be reasonably anticipated. As the site is to be redeveloped, further action such as additional intrusive investigation and/or remedial action is likely to be required as part of the planning process and detailed development design.

FIGURES

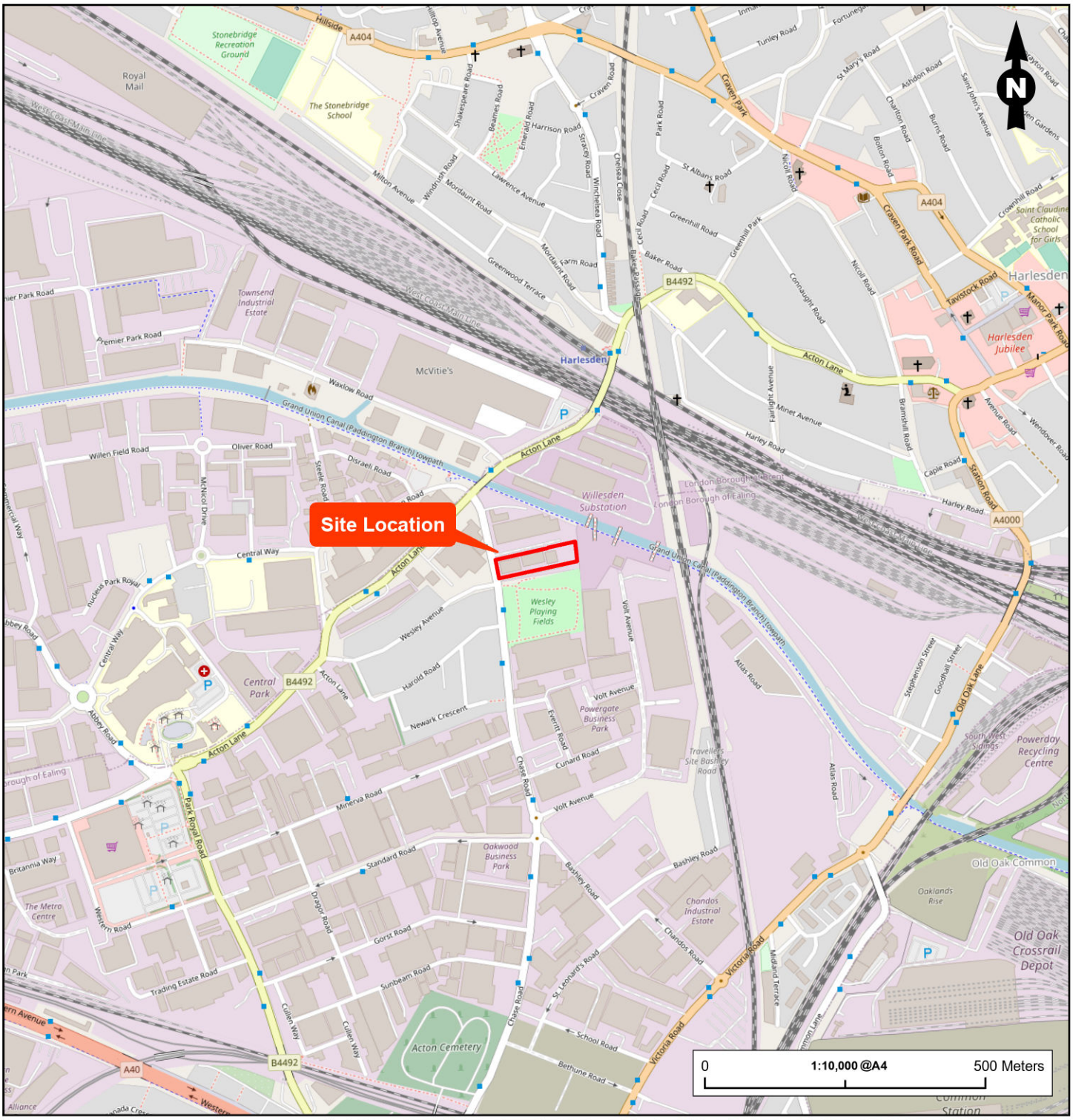


Figure Title: Figure 1: Site Location	Project Name: 37-39, North Acton Road, London, NW10 6PF	Date: October 2021		RAMBOLL
		Scale: As shown		
Project Number: 1620013218	Client: Northtree Investment Management	Issue: 1	Prepared By: BVK	

Legend

Site Boundary

Figure Title

Figure 2: Site Layout

Project Name

37-39, North Acton Road, London, NW10 6PF

Project Number	Figure No.
1620013218	2
Date	**Prepared By**
October 2021	BVK
Scale	**Issue**
1:1,000 @A4	1

Client: Northtree Investment Management

RAMBOLL

Appendix 3
Geo-Environmental Ground Investigation (Phase II GI Report)

Intended for
Vantage Data Centers

Date
June 2022

Project Number
1620013218-002

LHR21: 37-39 NORTH ACTON ROAD
GEO-ENVIRONMENTAL GROUND INVESTIGATION

RAMBOLL

LHR21: 37-39 NORTH ACTON ROAD
GEO-ENVIRONMENTAL GROUND INVESTIGATION

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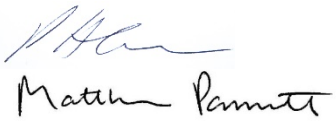

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Version Control Log

Revision	Date	Made by	Checked by	Approved by	Description
1.0	10/06/2022	HC/IB	CC/IB	MP	Draft Issue to Client (Environmental Findings)
2.0	06/07/2022	HC/IB	CC/SM	MP	Second Issue to Client (with Geotechnical Findings)
3.0	21/03/2023	HC/CC	CC/SM	MP	Third Issue to Client (response to OPDC comments)

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EXECUTIVE SUMMARY

This report presents the findings and conclusions of a geotechnical and environmental (herein 'geo-environmental') ground investigation at a property known as 37-39 North Acton Road, Park Royal, London, NW10 6SN ("LHR-2" or the "site"). Ramboll UK Limited ("Ramboll") was instructed by Vantage Data Centers (herein the 'Client'), in accordance with Ramboll's proposal ref. RUK2021N00705-RAM-PO-00001 and statement of work ref. RUK2021N00705-RAM-AD-00001, dated 9th May 2022. It is understood that the Client intends to redevelop the site for commercial use to comprise a data centre.

The 0.61-hectare site is currently occupied by three vacant commercial units.

The ground investigation works were undertaken by Geotechnical Engineering Limited (GEL) under Ramboll's supervision. GEL has produced a factual report on the investigation which is provided as an appendix to this report.

The ground investigation scope included drilling of three cable percussion boreholes to depths of up to 35.5 metres below ground level (m bgl) and five shallow windowless sample boreholes to depths of up to 5.45m bgl. Electrical and thermal resistivity tests were also undertaken.

Nineteen soil and six groundwater samples were collected and analysed by a laboratory for a suite of environmental analysis. Geotechnical sampling and laboratory testing were also carried out.

Investigation Findings

Made Ground was encountered at thicknesses ranging from 0.55m to 2.15m. The composition was variable, comprising hardstanding across much of the site, underlain by 'hardcore' type fill (crushed brick, concrete and stone), and cohesive fill (re-worked clay). The London Clay formation was proven beneath the Made Ground, to a maximum depth of 35.5m bgl. The base of the stratum was not proven although publicly available BGS borehole records located approximately 400m to the south-west of the site indicate that the base of the stratum is at 85m bgl.

Perched groundwater was encountered at some locations during the investigation and was not found to be continuous across the site. Groundwater strikes during drilling appeared to represent perched water confined within the Made Ground and the upper horizon of the London Clay in BH01, and localised groundwater encountered in a band of gravel which formed part of the London Clay from 5.1 and 5.9m bgl at BH03. Groundwater or potential water bearing strata were not encountered during drilling at any other locations. Accumulation of water in other wells is assumed to represent infiltration of perched water from Made Ground and associated seepage from softer upper horizons of London Clay.

Field observations of contamination in soils and groundwater were limited to a slight hydrocarbon odour and charcoal fragments in Made Ground at WS01 (0.2-0.6m) and dark stained clay with a strong hydrocarbon odour in Made Ground at WS02 (0.6m).

Soil chemical analysis did not identify any exceedances of commercial use screening criteria. Where detected, concentrations of contaminants detected are not considered to pose a risk to the future commercial development and the design of the proposed development is considered sufficient to mitigate exposure pathways.

Asbestos was not identified in soil at any of the ten samples obtained by Ramboll; however, previous investigation undertaken at the site in 2020 recorded loose asbestos fibres in Made Ground at two locations. Whilst significant risk to future site users have not been identified (the site will be capped), consideration to the potential presence of asbestos and other typical brownfield contaminants during the construction phase is required and will necessitate information being held on the site safety file or future maintenance events.

A continuous groundwater body was not encountered at the site. Whilst some elevated contaminants were identified in discontinuous perched water encountered in Made Ground, the concentrations are not

considered significant due to the absence of soil impact and the low hydrogeological and hydrological sensitivity of the site. The concentrations are considered to be reflective of background water quality in an area with an industrial legacy.

Ground gas monitoring was undertaken on three occasions and classified the site as Characteristic Situation 1: Very Low Risk. Gas protection measures are not deemed necessary for the proposed development. Ramboll's gas monitoring is consistent with previous third-party assessment which included a further four rounds of monitoring.

The Made Ground does not form a suitable founding stratum for supporting structural column loads,due to its engineering characteristics and inherent variability in composition and distribution. It is recommended that structural foundations for the proposed development are founded within the London Clay. The upper part of the London Clay is of relatively low strength due to weathering and softening and therefore is not considered suitable for supporting column loads such as pad foundations. The London Clay beneath a depth of 2.0 - 3.5 metres depth (varies across the site) is appropriate as a founding stratum, although because of the depth of excavation required, and because of the substantial loads likely to be exerted by the data centre structure, piled foundations are likely to be appropriate.

Key geotechnical risks include the potential for encountering buried obstructions, geochemical aggressivity of the ground and the potential for perched groundwater.

Recommendations – Contamination: The proposed development will need to consider typical precautions of redeveloping a brownfield site, including among other things appropriate health and safety management for construction workers, waste soil classification, and method statements for unexpected contamination:

1. **The Local Authority** may require an intrusive environmental investigation as a condition of planning. This report should be submitted to the Local Authority in that regard and agreement reached on the scope of further actions (as outlined below).
2. **Watching Brief:** It is possible that as-yet unidentified sources of contamination may be present at the site. A watching brief should be maintained for environmental purposes during the development works to record ground conditions in areas of the site that were not accessible during the current phase of investigation (for example within the footprints of existing buildings). This could take the form of a watching brief (and soil sampling if required) to be executed by a suitably qualified environmental consultant during the demolition and site clearance phase of the development works.
3. **Unexpected Contamination:** It cannot be discounted that 'unexpected finds' or 'hotspots' of contamination requiring management may be encountered during development. An 'unexpected contamination procedure' should be implemented to allow groundworkers to act appropriately upon encountering or suspecting the presence of previously unidentified ground contamination.
4. **Health and Safety:** Appropriate health and safety management precautions should be followed prior to and during the construction phase. This report and the generic assessment criteria (GAC) consider long term and chronic risk to humans based on defined exposure scenarios set out in CLR11. In some cases, contaminants may also pose acute hazards to workers at a site and a worker's short exposure is not considered when deriving the GAC. Asbestos in soil is not considered by CLR11 and will need to be considered for the redevelopment works. The data generated by the investigation should therefore be considered in the appropriate pre-works health and safety assessment, together with the appropriate shorter exposure times for construction workers and more direct contact with the ground. It is anticipated that these short-term risks can be appropriately addressed through the use of appropriate, health and safety plans, safe working procedures and the use of personal protective equipment (PPE), in line with relevant legislation and

guidance. Groundworks undertaken by the contractor should be given to CAR 2012 (or CAR-SOIL guidance) when undertaking works at the site

5. **Materials management** plans should be prepared if, for example, excess material is to be retained or re-used on-site. Further testing may also be required to confirm the suitability of any material imported or re-used.
6. **Waste Management:** It is recommended that waste classification and material disposal is considered ahead of any groundworks to provide an efficient and sustainable method of managing waste soil.
7. **Landscaping:** If landscaping is planned a separate assessment should be undertaken to confirm that soil in landscaped areas is suitable for use. Soils for landscaped areas should be demonstrated to be suitable for use and not to provide a risk to future site users; soils should also comply with British Standard for Topsoil (BS3882:2015).
8. **Water Supply Pipes:** Future water supply pipes should be selected based on appropriate material selection criteria given the brownfield nature of the site.

Recommendations – Geotechnical: The following recommendations are made for geotechnical design and aim to mitigate the identified risks associated with the ground and groundwater conditions:

1. **Foundation Design:** The London Clay Formation is recommended as the founding stratum for foundations supporting structural column loads from the proposed development. The upper part of the London Clay is weathered and unsuitable for supporting substantial loads. Excavation depths for conventional foundations are likely to be impractical, and piled foundations are likely to be the most appropriate foundation solution for the proposed structure.
2. **Geotechnical Design:** A Geotechnical Design Report (GDR) should be produced for the project, compliant with requirements set out in Eurocode 7. The report shall include full details on the interpretation of design data and justification for foundation and earthworks design.
3. **Piling Specification:** A performance piling specification should be developed, to specify the design requirements for a specialist piled foundation designer.
4. **Earthworks Specification:** An earthwork/s specification should be developed to specify the requirements for material re-use and excavations within the site.
5. **Resistivity Testing:** Design development of the utilities and services associated with the development should consider the thermal and resistivity test data. Ramboll has not undertaken interpretation of the results as part of this report.

1. INTRODUCTION

1.1 Instruction

This report presents the findings and conclusions of a geotechnical and environmental (herein 'geo-environmental') ground investigation undertaken by Ramboll at a property known as 37-39 North Acton Road, Park Royal, London, NW10 6SN ("LHR-21" or the "site"). Ramboll UK Limited ("Ramboll") was instructed by Vantage Data Centers (herein the 'Client'), in accordance with Ramboll's proposal ref. RUK2021N00705-RAM-PO-00001 and statement of work ref. RUK2021N00705-RAM-AD-00001, dated 9th May 2022.

Plans showing the site location and layout are presented as Figure 1 and Figure 2 (see Appendix 1).

1.2 Background Information

The site is located on within the mixed commercial and industrial setting of Park Royal. The site is located approximately 1.28km north from the center of North Acton within the London Borough of Ealing, 400m south of Harlesden overground railway station and 1.8km north-east of Acton mainline station (see Appendix 1, Figure 1).

The Grand Union Canal borders the site to the east and north of the site, with North Action Road to the west. Directly to the east of the site is an electrical substation compound. The north of the site is bound by a commercial bakery (Sweetland London) and food wholesaler (Medfood Wholesale) located within the Royal London Industrial Estate. The south of the site is bound by Wesley Recreation ground with commercial units and warehouses beyond.

The 0.61-hectare site is currently occupied by three vacant commercial units. Buildings currently occupy approximately 70% of the total site area. The site is accessed from North Acton Road at the western site boundary. A concrete surfaced yard area is present in the far east of the site. An area of soft landscaping (scrub and bushes) and a soil bund is present in the north-eastern corner of the site. There are no on-site surface water bodies.

1.3 Proposed Development

Ramboll understands that the client intends to demolish existing buildings and redevelop the site to comprise a data centre of up to 25,000 sqm, including ancillary offices, internal plant and equipment and an electricity substation. In addition to the above the development may also include: car parking, provision of external plant and equipment and fuel storage, creation of servicing areas and provision of associated services, including waste, refuse, cycle storage, and lighting.

1.4 Phase I ESA

An initial Phase I Environmental Site Assessment (ESA) was commissioned by the Client and issued by Ramboll in November 2021[1] in relation to the Client's proposed purchase of the site. The assessment included a desk-based review and site walkover. On the basis of Ramboll's previous assessments, the overall risk from soil and groundwater contamination at the site in the context of redevelopment for commercial use was considered to be moderate. It was recommended that an intrusive environmental site investigation be undertaken to assess whether contamination is present in the shallow soils and (if present) shallow groundwater which could pose a risk to the proposed use of the site. The findings of the Phase I assessment are summarised in Section 2 of this report.

[1] Ramboll, Phase I Environmental Site Assessment, Vantage Data Centers, 37-39 North Acton Road, London, dated November 2021, project number: 1620013218

1.5 Phase II Geo-Environmental Investigation

The scope of the investigation was based on the preliminary development layout provided by the Client, the preliminary conceptual site model (Section 4) and a previous site investigation (Section 3). The investigation comprised a combined geotechnical and environmental investigation.

The scope of the investigation is summarised in Table 1.1 below:

Table 1.1 Scope of Works

Item	Description
Windowless sample boreholes	5 No. windowless sample boreholes to depths of up to 5.45m for environmental and geotechnical testing.
Cable percussion boreholes	3 No. boreholes to depths up to 35.5m for environmental and geotechnical testing.
In-situ geotechnical testing	Standard Penetration Tests (SPT) in each of the 3 No. cable percussion boreholes.
Installation of monitoring wells	5 No. windowless sample boreholes installed with monitoring wells to depths of up to 5.45m. 3 No. cable percussion boreholes installed with monitoring wells to depths up to 35.5m.
Thermal resistivity tests	Thermal resistivity tests at 3 No. Cable percussion borehole locations. Laboratory soil resistivity tests were carried out to correlate to in-situ values.
Electrical resistivity tests	In-situ soil resistivity tests across 2 arrays.
Laboratory analysis: environmental	19 No. Soil and 6 No. groundwater samples analysed for a range of contaminants including metals, cyanide, speciated petroleum hydrocarbons, phenol, polycyclic aromatic hydrocarbons and asbestos. Selected samples were analysed for polychlorinated biphenyls, volatile and semi-volatile organic compounds.
Laboratory analysis: geotechnical	Geotechnical laboratory analysis was undertaken including classification, strength and geochemical testing.
Ground gas monitoring	Three rounds of ground gas monitoring of 8 installed monitoring wells.
Interpretation of previous investigation data	A previous investigation (see Section 3) provided valuable information on geotechnical and environmental conditions and supplements Ramboll's investigation work.

The Ground Investigation was undertaken in accordance with the following standards:

- BS EN 1997-2:2007, Eurocode 7 – Geotechnical design – Part 2: Ground investigation and testing (BSI, 2007);
- BS 5930:2015, Code of practice for ground investigations (BSI, 2015a);
- BS 1377 series, Methods of test for soils for civil engineering purposes;
- BS 10175:2011, Investigation of potentially contaminated sites.

1.6 Limitations

This report has been prepared by Ramboll UK Limited ("Ramboll") exclusively for the intended use by Vantage Data Centers (the "Client") in accordance with the agreement (proposal reference number RUK2021N00705-RAM-PO-00001 and statement of work ref. RUK2021N00705-RAM-AD-00001, dated 9th May 2022) between Ramboll and the client defining, among others, the purpose, the scope and the terms and conditions for the services. No other warranty, expressed

or implied, is made as to the professional advice included in this report or in respect of any matters outside the agreed scope of the services or the purpose for which the report and the associated agreed scope were intended, or any other services provided by Ramboll.

In preparation of the report and performance of any other services, Ramboll has relied upon publicly available information, information provided by the client and information provided by third parties. Accordingly, the conclusions in this report are valid only to the extent that the information provided to Ramboll was accurate, complete and available to Ramboll within the reporting schedule.

Ramboll's services are not intended as legal advice, nor an exhaustive review of site conditions and / or compliance. This report and accompanying documents are initial and intended solely for the use and benefit of the client for this purpose only and may not be used by or disclosed to, in whole or in part, any other person without the express written consent of Ramboll. Ramboll neither owes nor accepts any duty to any third party, unless formally agreed by Ramboll through that party entering into, at Ramboll's sole discretion, a written reliance agreement.

Unless otherwise stated in this report, the scope of services, assessment and conclusions made assume that the site will be developed for commercial use as per the proposed development figure provided within Appendix 1, without significant changes either on-site or off-site.

The findings and opinions in the report are based upon information derived from a variety of information sources. Ramboll believe these information sources to be reliable.

It should be noted that some of the aspects considered in this study are subject to change with time. Therefore, changes to relevant legislation or site conditions should be considered at the time of future development.

The site investigation works were undertaken during a discrete period of time. The findings and conclusions presented in this report are accordingly factually limited by these circumstances and, unless stated otherwise in the report, are preliminary. The field investigations were restricted to a level of detail necessary to meet the stated objectives of the services. The results of any measurements taken may vary spatially or with time and further confirmatory measurements should be made after any significant period of time has elapsed since the sampling took place. The interpretation of the geological and environmental quality conditions is based on extrapolation from point-source data in a heterogeneous environment. Accordingly, more detailed investigation may be appropriate dependent upon the client objectives.

This report provides information on the distribution and concentration of contaminants identified as part of Ramboll's investigation and is not a method statement or risk assessment on how to deal with asbestos.

2. BACKGROUND INFORMATION – PHASE I

2.1 Background Information

The following information has been prepared utilising publicly available information sources and information from Ramboll's previous Phase I assessment.

Table 2.1 Summary of Site Information

Item	Description
Site History	• The site was undeveloped in the 1860s, and possibly in agricultural use. • By 1915 a road was present along the southern boundary of the site. • By 1935 a stationary works was present in the western portion of the site and a smaller structure of unknown use was present in the east of the site. • By 1955 the stationary works was recorded as a bookbinding works and the number of buildings associated with the bookbinding works had increased in number across the site. • By 1967 the site became further developed with the extension of the book binding works to include buildings in the centre and centre-east of the site. By the 1980s, the site buildings were labelled only as 'works' and an electrical substation was recorded in the centre of the site. • No further changes were recorded on more recent historic maps dating to the 1990s and 2000s. • The site is located within an industrial area, dating back to the early 1900s and is also located in close proximity to a former power station and railway land.
Surrounds History	• The immediate surrounds were undeveloped in the 1870s, possibly in agricultural use. The Grand Junction Canal was located 30m north-east of the site. A railway was located 250m north-east. A naptha works was shown 600m south-east. • By 1896, significant urbanisation in the Harlesden area 500m-1km to the north/east of the site was apparent. The naptha works was no longer present. A metal works was present 430m north of the site. Willesden railway junction had expanded to include engine and carriage sheds approximately 325m to the east of the site. A brick works was present 350m south-east of the site and a paper and canvas works was located 450m to the south-east. A sawmill was present 600m south-east of the site. • Further expansion of Harlesden town centre into the surrounds to the north and east of the site occurred during the 1920s and 1930s. A power generating station (including associated cooling tanks, chimneys, transformers and several tanks) was developed 80m north-east of the site. A biscuit works was located 400m north-west of site and old clay pit was shown 450m south-east. • By the 1950s a motor vehicle works and engineering works had been developed adjacent to the north of site and 50m north respectively, with metal plating works beyond. Numerous works, warehouses and factories were located in the near surrounds 100m-250m west and north-west. A large area of industrial-style units (including engineering works, confectionary works, joinery works, cardboard boxes and packing) is shown to extend 1km south and south-east of the site. • By the 1980s, buildings adjacent to the north of site formerly associated with the power generating station had been redeveloped and replaced with a row of industrial-style units identified as The Royal London Estate and the power station further to the north of the site was now labelled as a 'Grid Station'. The works 50m to the west of the site had been redeveloped and were labelled as a warehouse and smaller works. • By the early 1990s a rail freight terminal was located 380m east of the site forming part of the wider Willesden railway junction. • By the 2000s, power station adjacent to the south-east of the site was no longer present and a new development of commercial appearance was present 50m to the south-east of the site.
Recent Use	The site is currently developed to comprise three warehouse style commercial units. All three units were untenanted and vacant at the time of the ground investigation. Recent on-site activities are understood to have included: • Office and creative workspaces, music production and miscellaneous storage in the warehouse unit in the west of the site.

	• Carpentry and painting for production of TV sets/props in the warehouse unit in the east of the site. • Prop storage for TV in the warehouse unit in the east of the site. • Vehicle storage in the concrete surfaced external yard area in the east of the site. An area of dense vegetation and a stockpile/bund of soil is present in the north-eastern corner of the site. Current surrounding uses include: • North: commercial units associated with the Royal London Industrial Estate located at 29-35 North Acton Road. Occupants include a bakery, food and clothing wholesalers. • East: A National Grid electricity substation and depot and Powergate Business Park beyond to the east/south-east. • South: A public park known as Wesley Playing Fields. • West: North Acton Road beyond which lies an area of industrial/commercial development associated with the wider Park Royal industrial area.
Environmental Setting	The British Geological Survey (BGS) Map for Park Royal, 1:50,000 scale, Sheet 256, North London indicates that the site is underlain by the London Clay Formation comprising 'blue-grey or grey-brown silt and clay' (approximate thickness 80m), underlain by the Lambeth Group (clay, silt and sand) (approximate thickness 20m) and the White Chalk Subgroup (chalk with flint) to depth. The Environment Agency classifies the strata as follows: • London Clay: - Unproductive Stratum. • The Lambeth Group (clay, sands and gravels) (Secondary A Aquifer) • Upper Chalk Formation (white chalk) (a Principal Aquifer). Given the site history, Made Ground may be present directly above the bedrock. A shallow widespread or continuous groundwater body is considered unlikely to be present underlying the site. Perched water may, however, be present. The site is not within or near a groundwater Source Protection Zone (SPZ). The nearest surface watercourse is the Grand Union Cancel (Paddington Branch) located 38m north-east of the site, although this is noted to be concrete lined. There are no other named surface water courses within 1km of the site.
Other	According to Environment Agency information, the site lies in Flood Zone 1 (low probability). This zone comprises land assessed as having a less than 1 in 1000 annual probability of river or sea flooding in any year (<0.1%). According to the EA Flood Map for Surface Water which presents the theoretical potential for flooding from pluvial sources (i.e. flooding caused by rainwater exceeding capacity of drainage systems), the centre of the site (i.e. the access road) is located in an area of 'high' flooding probability. This zone comprises land assessed as having a 1 in 30 or greater annual probability of pluvial (rainwater) flooding (>3.3% in any year).

2.2 Unexploded Ordnance

According to a UXO Pre-Desk Study Assessment obtained by Ramboll from Zetica UXO[2], the site is located within a moderate risk area with regard to unexploded ordinance. Moderate-risk regions are defined as those that show a bomb density of between 11 and 50 bombs per 1km^2 and that may contain potential World War Two targets. In addition, the site is located adjacent to areas to the east and west noted as targets for the Luftwaffe.

The following strategic targets were reportedly located in the vicinity of the site during WWII:

- Transport infrastructure and public utilities.
- Industries important to the war effort, including engineering works and aircraft factories.

[2] https://zeticauxo.com/downloads-and-resources/risk-maps/

- Military camps and training areas.
- Anti-invasion defences.

Zetica recommended the completion of a detailed desk study to assess, and potentially zone, the Unexploded Ordnance (UXO) hazard level on the site in advance of any intrusive investigation works.

Ramboll subsequently commissioned Zetica to undertake a UXO Desk Study and Risk Assessment[3]. The report did not identify any records of bombing or military activity at the site during Word War One. During World War Two the main strategic targets in the vicinity of the Site included, aircraft manufacturing, engineering and motor works, major transport infrastructure and public utilities, including the Willesden Power Station. Records were found indicating that one HE (high explosive) bomb fell on the Site on the 30th September 1940 and exploded causing minor damage to buildings associated with the book binding works in the west of the site. No further bombing was identified and no other significant sources of UXO hazard were identified on the Site. Zetica concluded that the site has a low UXO hazard level.

2.3 Geotechnical Considerations

The site is underlain by bedrock geology of the London Clay Formation; however, given the site history, it is considered likely that an unknown thickness of Made Ground is present directly above the bedrock. No superficial deposits were recorded on published mapping. Preliminary geotechnical considerations identified as part of Ramboll's Phase I assessment are as follow:

- In terms of non-geological features which might present geotechnical hazards for the development, the nearby watercourse (Grand Union Canal) appears to be far enough away from the development not to present a specific constraint.
- It is likely that the granular made ground overlying the London Clay will be water-bearing. This can be fed by surface runoff or may be connected to water flow from the nearby canal. Construction will include excavation below ground level therefore water flow into excavations will need to be controlled. Once exposed the high plastic London Clay will soften therefore foundation and construction formations need to be protected.
- The London Clay is of high shrinkabilty potential. The area round the site is not heavily vegetated so changes in this will not adjust the moisture content of the clay significantly but over time there could be long term movement associated with climate change.
- London Clay is also known for the occurrence of claystones. The occurrence of claystones can have an implication for the construction of piles, either in terms of destabilising the pile bore ahead of concreting or in more rarer occurrences providing obstructions to piling equipment.
- Following excavation, the London Clay may rebound in response to the removal of soil overburden (weight). If excavation depths are no more than 2 to 3 metres, then the rebound pressure is likely to be counter-acted by the weight of the new building. However, if excavation is deeper the building sub-structure will be subject to upward heave pressures which will need to be accounted for in the design through the use of additional base slab reinforcement, the use of a suspended slab, or the use of tension piles depending on the depth of the excavations on site and the loading pattern imposed by the new building.
- The BRE Digest classification of the site with respect to sulphate attack of buried concrete is AC-3s at worst, this will require a higher specification of concrete mix to protect against degradation of concrete over time.
- Consideration should be given to the potential presence of tunnels in the ground below the site, or other buried features.

[3] Zetica, 37-39 North Acton Road – UXO Desk Study and Risk Assessment, dated March 2022, Document Ref. P11258-21-R1

3. PREVIOUS INVESTIGATION

A Phase I 'Desk Study / Preliminary Risk Assessment'[4] and Phase II 'Geo-environmental and Geotechnical Assessment'[5] were prepared by JOMAS Associates Ltd in 2020 in support of an outline planning application for redevelopment of the site to comprise a five-storey commercial property for use as a data centre.

3.1 JOMAS Associates Desk Study / Preliminary Risk Assessment Report

3.1.1 Ground Contamination

The JOMAS Phase I assessment was similar in nature to Ramboll's as discussed in Section 2 of this report. JOMAS' Phase I included a walkover inspection undertaken in August 2020. At the time of inspection the site was reported to comprise three warehouse type industrial units located in the east, centre and west of the site. The western unit was reportedly vacant and the central unit was used for vehicle storage. The easternmost unit was reportedly used for storage but could not be accessed. Further vehicle storage was observed in the open yard area in the far east of the site. No evidence of historical uses, bulk fuel or chemical storage was reported.

JOMAS recommended intrusive investigation to clarify potential risks to the identified receptors and assess the extent of Made Ground soils present.

3.1.2 Geotechnical Considerations

The JOMAS desk study identified a number of potential geotechnical hazards associated with the proposed development including:

- A moderate risk of shrink swell deposits existing immediately beneath the site.
- The need to remove existing hardstanding and foundations ahead of the development.
- Advice that foundations should not be formed within Made Ground or organic rich material due to the unacceptable risk of total and differential settlement.
- The need to design foundations so as not to load nor undermine adjacent boundary walls and buildings.
- The presence of Made Ground derived from demolition material may be a source of
- elevated sulphate, associated with plaster from the previous structures.
- BGS records of disseminated pyrite within the London Clay Formation which may indicate elevated levels of sulphate.
- The potential requirement for a suspended floor slab associated with the thickness of Made Ground and the potential for clays beneath the proposed footprint.

JOMAS recommended a geotechnical investigation to inform foundation design.

3.2 JOMAS Associates Geo-environmental and Geotechnical Assessment, Ground Investigation Report

JOMAS' Phase II intrusive investigation scope included five window samples to depths of up to 5.45m bgl, two cable percussive boreholes to up to 20.45m bgl and four follow-up monitoring visits to measure ground gas and groundwater levels.

[4] JOMAS Associates Limited, August 2020 - Desk Study / Preliminary Risk Assessment Report for 37-39 North Acton Road. Report reference: P2970J2030/JWT
[5] JOMAS Associates Limited, September 2020 – Geo-environmental and Geotechnical Assessment, Ground investigation Report for 37-39 North Action Road. Report reference: P2970J2030/SC.

Ground conditions encountered at the site were reported to comprise Made Ground at thicknesses of between 0.4m and 2.0m bgl overlying London Clay (proven to 20.45m bgl). The London Clay was reported to be weathered to depths between 6.2m and 6.5m below ground level.

3.2.1 Ground Contamination

Eight soil samples were collected and tested for metals, PAH and phenol. Four selected samples were tested for the presence of TPH and VOCs and one sample of Made Ground was tested for PCBs. The soil results were compared to a Soil Guideline Values (SGVs) for a commercial end use. In the absence of published SGVs, JOMAS used LQM/CIEH S4Uls values. No exceedances of GAC for the protection of human health in a commercial use scenario were found. Asbestos was detected in Made Ground within two of the eight soil samples tested, within WS3 at 0.15m bgl (crocidolite loose fibres) and WS5 at 0.20m bgl (chrysotile loose fibres), albeit at concentrations below 0.1%. Polychlorinated biphenyls (PCBs) were not recorded above the laboratory method detection limit.

A continuous groundwater body was not encountered during the intrusive investigation, however perched water assumed to relate to surface infiltration to the wells was measured at depths between 0.99m and 4.75m bgl. Groundwater levels were measured on one occasion only. Three groundwater samples were obtained and tested for metals, PAHs, TPH including BTEX and VOCs. Concentrations of PAHs, TPH, BTEX and VOCs were low or below detection limits. Exceedances of GAC were limited to copper, lead and nickel.

Based on four rounds of gas monitoring, the site classified was CS1 'Very Low Risk' in terms of ground gas; albeit it was noted that methane was detected above 1% (this is the threshold at which 'consideration' should be given to a CS2 'Low Risk' classification).

Ramboll's review of JOMAS's report considered the scope of JOMAS's investigation to have been relatively limited and recommended that additional investigation should be undertaken to inform the detailed design of the proposed development.

3.2.2 Geotechnical Considerations

The objectives of the JOMAS report included: 'To obtain geotechnical parameters to inform preliminary foundation design'.

The report provides an evaluation of geotechnical parameters, and foundation design recommendations including indicative allowable bearing pressures and pile capacities. The information contained within the report is appropriate for feasibility/preliminary design assessments. However, for detailed scheme design, further intrusive investigation is necessary, to appropriately mitigate geotechnical design and construction risk in terms of potential variability in soil properties and depths across the site, and to achieve compliance with industry standard guidance (Eurocode 7, Geotechnical Design).

4. PRELIMINARY CONCEPTUAL SITE MODEL

4.1 Introduction

A preliminary Conceptual Site Model (CSM) has been developed to assess ground contamination risks at the site, which have been assessed in line with the current UK guidance. For a risk of pollution or environmental harm to occur as a result of ground contamination, all of the following elements must be present:

- A contaminant, i.e. a substance that is capable of causing pollution or harm;
- A receptor, i.e. something which could be adversely affected by the contaminant; and
- A pathway, i.e. a route by which the contaminant can reach the receptor.

If one of these elements is absent there can be no significant risk. If all are present then the magnitude of the risk is a function of the magnitude and mobility of the source, the sensitivity of the receptor and the nature of the migration pathway.

The CSM takes into account the known information from the site, surroundings and the environmental setting and is a simplified representation of the possible environmental conditions at and in the vicinity of the site, and is used to initially identify potential sources, potentially sensitive receptors, pathways, and pollutant linkages. The CSM will be refined by taking into account the specific ground conditions and measured concentrations of contaminants identified during the site investigation and assessment.

4.2 Preliminary Conceptual Site Model

The preliminary contaminant source and pathway linkages (assuming a future commercial end-use scenario) are presented in Table 4.1 and receptor analysis in Table 4.1 below.

Table 4.1: Preliminary Conceptual Site Model

Potential Sources of Contamination: - The site has been developed and in commercial use since at least the 1930s. Uses have included a stationery and bookbinding works, creative workspaces, carpentry and TV prop manufacture and vehicle storage. The possibility that various chemicals, including fuels, oils, and solvents were historically used at the site cannot be discounted. - Made Ground and asbestos containing materials associated with existing buildings and previous development works. - A vegetated stockpile/bund of soil is present in the north-eastern corner of the site. An area of dark staining is present on hardstanding in the concrete surfaced yard area in the east of the site.
Geology: Previous investigations have encountered Made Ground at thicknesses of between 0.4m and 2.0m bgl overlying London Clay (proven to 20.45m bgl). Geological mapping indicates the natural geology at the site to comprise the London Clay formation (blue-grey or grey-brown silt and clay) to an approximate thickness 80m underlain by the Lambeth Group (clay, silt and sand) (approximate thickness 20m) and the White Chalk Subgroup (chalk with flint) to depth.
Hydrogeology: The site is situated in an area of low sensitivity with respect to groundwater resource due to the underlying Unproductive Strata of London Clay. The site is not located within an EA designated groundwater Source Protection Zone (SPZ) and there are no groundwater SPZs within 1km of the site. The thickness of the London Clay (anticipated to be around 80m) is considered to provide protection from site derived contaminants to the Chalk Principal Aquifer, present underlying the clay at depth.
Hydrology: The site is in an area of low sensitivity with regards to surface water resources. The nearest surface water receptor is the Grand Union Canal located approximately 38m north-east of the site, although this is noted to be concrete lined. There are no other named surface watercourses within 1km of the site.

Potential Receptors to Contamination (if present)			Receptor Present
Human Health (future Commercial Users and construction workers)	On-site	The site is proposed for redevelopment for a commercial end use.	Yes
	Off-site	The site is located within an area of mixed commercial and residential use in Park Royal.	Yes
Water Environment	On-site	Groundwater: perched/and or shallow groundwater may be present in the Made Ground	Yes
	Off-site	Groundwater: The site is underlain by an Unproductive Strata.	No
	Off-site	Surface Water: There are no sensitive surface water receptors within 1km of the site.	No
Built Environment	On-site	The site will be redeveloped for commercial use.	Yes
Ecology	On and off-site	There are no designated ecological sites (e.g. SSSI, RAMSAR, SPA) within 1km of the site.	No

Background information relating to the preliminary CSM can be found in Ramboll's Phase I report.

5. GEO-ENVIRONMENTAL SITE INVESTIGATION

5.1 Investigation Scope of Work

Geotechnical Engineering Limited (GEL) was engaged to carry out the ground investigation works and acted in the capacity of Principal Contractor. Ramboll supervised the works on a full-time basis. Before proceeding with intrusive works, GEL confirmed the absence of underground services at each location, with boreholes located at least 1.5m away from identified services or known underground features.

The intrusive site investigation was undertaken between the 19th April and 27th April 2022 and was supervised by Charles Collins and Hans Christiansen of Ramboll. Three rounds of ground gas monitoring were undertaken on 4th, 11th and 18th May 2022 and groundwater samples were obtained on 4th and 11th May 2022.

A summary of the investigation scope is presented in Table 5.1. Exploratory locations and borehole logs (including monitoring well details) have been provided within GEL's factual report included as Appendix 2.

Table 5.1 Summary of Intrusive Works

Item	No.	Comments
Service Location Survey	1	Utility plans were obtained and a specialist survey to locate below ground services
Windowless Sample Borehole Locations	5	Five windowless sample boreholes were advanced to a maximum depth of 5.45m bgl. All boreholes (WS01, WS02, WS03, WS04, WS05) were installed with monitoring wells for groundwater and ground gas monitoring to depths of 1.0-2.0m. In situ (SPT) testing was undertaken at each location.
Cable Percussion Boreholes	3	Three cable percussion boreholes were drilled to a maximum depth of 35.0m bgl. All boreholes (BH01, BH02, BH03) were installed with groundwater and ground gas monitoring wells to depths ranging from 8.0m to 35.0m bgl. In situ (SPT) testing was undertaken at each location.
Thermal and electrical resistivity testing	15	In-situ thermal resistivity testing was undertaken at three depths within the inspection pit of each windowless sample borehole (15No. total), using a hand-held probe with the needle sensor inserted into the side of the pit. In-situ electrical resistivity testing was undertaken, comprising 2No. arrays across the central section of the site. The results are reported within GEL's factual report.
Headspace testing	36	Selected soil samples were tested on-site for the presence of VOCs using a photo-ionisation detector (PID), calibrated in accordance with Ramboll's Quality Management procedures. Each soil sample tested was placed into a sealed plastic bag and agitated. The PID was then inserted into the headspace and the total VOC reading recorded. The PID screens for a wide range of VOCs but does not indicate a specific compound; therefore, the results of the PID screening provide a semi-quantitative indication of the concentration of VOCs present in soil pore spaces.
Soil Sampling and Analysis	19 (env)	Samples were collected in accordance with BS 10175:2011+A2:2017 and were stored within appropriate sample containers and forwarded to an independent Ramboll approved UKAS/MCERTS accredited analytical laboratories (i2 Analytical Ltd) for environmental testing. Up to three soil samples from each sampling location were submitted for laboratory analysis. Selected soil samples were analysed for a predetermined suite of contaminants, designed to be reflective of the site's historic uses.
	315 (geo)	Geotechnical soil samples were sent to GEL's soil testing laboratory. Selected samples were scheduled for classification, strength, compressibility and geochemical tests.

Table 5.1 Summary of Intrusive Works		
Groundwater Sampling and Analysis	6	Groundwater samples were obtained from six monitoring wells in total. This comprised six wells installed by Ramboll that contained sufficient water to sample (BH03, BH01, WS02, WS03, WS04 and WS05). Following development of the wells, they were purged of more than three times their volume and groundwater was subsequently sampled. Purging and groundwater sampling was undertaken using dedicated clean disposable sampling equipment. Samples were stored within appropriate containers and forwarded to a UKAS accredited independent analytical laboratory (i2 Analytical Ltd). The six samples were analysed for a suite of contaminants designed to be reflective of the site's historic uses.

5.2 Sample Location Rationale

The rationale for positioning the sampling locations is described in Table 5.2 below.

Table 5.2: Exploratory Hole Rationale

Exploratory Hole	Rationale	Depth achieved (m bgl)	Installed as Monitoring Well?
BH01	To determine soil and groundwater conditions in the north-west of the site.	35.5	Yes
BH02	To determine soil and groundwater conditions in the centre-south of the site.	20.0	Yes
BH03	To determine soil and groundwater conditions in the east of the site.	20.0	Yes
WS01	To determine shallow soil, groundwater and ground gas conditions in the south-west of the site.	4.45	Yes
WS02	To determine shallow soil groundwater and ground gas conditions in the north-west of the site.	4.51	Yes
WS03	To determine shallow soil, groundwater and ground gas conditions in the centre of the site.	5.45	Yes
WS04	To determine shallow soil, groundwater and ground gas conditions in a storage area adjacent to one of the units in the east of the site where surface staining was observed.	4.45	Yes
WS05	To determine shallow soil, groundwater and ground gas conditions in the north-east of the site.	4.45	Yes
BUND1	Hand excavated soil sample obtained to determine the potential presence of contaminants in the soil bund located in north-eastern corner of site.	NA	NA

5.3 Chemical Analysis

Table 5.3 presents the analytical schedule for soil and groundwater samples.

Table 5.3: Analytical Strategy

Analytical Suite	Rationale	Number of soil samples submitted	Number of groundwater samples submitted
Total Petroleum Hydrocarbons Criteria Working Group (TPH CWG) including benzene, toluene, ethylbenzene, xylene (BTEX)	Typically associated with fuels and oils that are generally associated with historical industrial uses identified on site and in the immediate surrounds.	19	5
Polycyclic Aromatic Hydrocarbons (PAH)	Typically associated with fuels and oils, and often found in Made Ground. Could be anticipated to be present given historical uses of the site.	19	5
Volatile Organic Compounds (VOCs)	Often associated with industrial processes and scheduled at locations where headspace testing recorded elevated readings.	4	5
Polychlorinated Biphenyls (PCBs)	Often associated with oil filled electrical equipment such as substations and transformers. A substation was located on site historically and power generation infrastructure has been identified off-site in the near surrounds.	4	1
Total Phenols & Cyanide	Often associated with industrial processes.	4	5
Metals	Often encountered in Made Ground, waste deposits and industrial facilities.	19	5
Asbestos (Quantification)	Commonly associated with Made Ground including demolition materials.	10 (0)	N/A

5.4 Ground Gas Monitoring

Three rounds of ground gas monitoring were undertaken on 4th, 11th and 18th May 2022. Ground gas monitoring was completed using a calibrated GFM430 Monitor with reference to CIRIA C665 and BS 8576:2013 Guidance on Investigations for Ground Gas. The following parameters were monitored:

- Methane (% vol);
- Carbon dioxide (% vol);
- Oxygen (% vol);
- Carbon Monoxide (ppm);
- Hydrogen Sulphide (ppm); and,
- Flow rate (l/hr).

Gas flow rates were measured at all monitoring boreholes and Ramboll recorded the range in flow rates until a steady state was reached. The results of the ground gas monitoring are discussed in Section 7.

5.5 Geotechnical Laboratory Testing

Samples collected from the exploratory holes were scheduled by Ramboll for geotechnical laboratory testing at GEL's UKAS accredited laboratory. The testing is summarised in Table 5.4, and the results have been used to inform the Ground Model described in Section 5.

Table 5.4 Summary of Geotechnical Laboratory Testing

Laboratory Test	No. Tests	Comments
Moisture Content	10	-
Atterberg Limits	10	-
Quick Undrained Triaxial	28	Single stage using 100mm diameter samples
Oedometer and swelling determination	10	5-stage one-dimensional consolidation test and determination of swelling pressure
BRE Full Suite D	13	-

5.6 Groundwater Level Monitoring

Standpipe groundwater-monitoring installations were constructed within eight boreholes, with standpipe response zones installed at a variety of depths across the Made Ground and solid geology strata, with a view to characterising any shallow and deeper groundwater.

Three rounds of groundwater monitoring have been completed. The results have been used to inform the Geotechnical Ground Model, described in Section 11.

5.7 Data Quality Assurance

The laboratory selected to perform the analysis is accredited by UKAS to ISO 17025 and MCerts standards. Internal quality assurance checks are carried out by the laboratory data prior to the laboratory certificates being issued.

6. GEO-ENVIRONMENTAL SITE INVESTIGATION FINDINGS

6.1 Ground Conditions

The ground conditions encountered during the site investigation are summarised in Table 6.1. A full lithological description is recorded on the logs included in Appendix 2.

Table 6.1 Summary of Ground Conditions

Strata	Description	Depth to Base (m bgl)	Typical Thickness (m)
Concrete/Asphalt	Hardstanding was present at all locations with the exception of BH02 and WS02, and typically comprised concrete and asphalt or brick pavement over concrete. Ground cover at BH02 was Made Ground (slightly sandy slightly gravelly clay) and at WS02 grass over slightly sandy slightly gravelly silty clay.	0 – 0.5	0.2
Made Ground	Made Ground was encountered at all locations and typically comprised brown and grey sand and gravel of red brick, flint and occasional concrete underlain by soft to firm, brown, slightly sandy, slightly gravelly clay.	0.55 – 2.15	1.35
Bedrock Geology: London Clay Formation	London Clay was present beneath the made ground at all locations. London Clay was present to the full depth of all boreholes and as such the depth to base was not proven. The material was described as clay (primary constituent), sometimes with subordinate constituents of silt, sand or gravel. The consistency (which is typically related to strength) varied, but generally increased from soft at the top of the stratum, increasing though the range from firm to stiff within the window sample holes, which terminated at approximately 4.5m bgl. In the CP boreholes, which were taken to 35m bgl, the consistency of the London Clay was seen to increase with depth to very stiff, in places being described as a 'Claystone'.	Not proven	Not Proven

The ground conditions encountered across the site are comparable to the geology described in the British Geological Survey (BGS) map of the area. The London Clay Formation was encountered underlying the Made Ground and proven to maximum depth of 35.5m bgl. The base of the stratum was not proven, although a publicly available borehole record located approximately 400m to the south-west of the site, accessed via the BGS Online 'Geology of Britain viewer', indicates the base of the stratum is at 85m bgl.

6.2 Groundwater

Groundwater was encountered at two locations during drilling, as described in Table 4.2.

Table 4.2 Summary of Groundwater Strikes

Location	Depth (m bgl)	Description
BH01	1.1	A seepage of water was encountered in soft slightly sandy silty clay within the Made Ground, at 1.1m bgl. The water may have been associated with surface infiltration from concrete coring flush associated with drilling and concrete sawing undertaken to facilitate plate load tests nearby.
BH03	5.1	Groundwater was encountered in a band of gravel (weathered claystone), which formed part of the London Clay from 5.1 to 5.9m bgl. The water rose from 5.1m to 5.0m in 20 minutes.

The following boreholes were installed with monitoring wells:

- BH01, BH02, BH03, WS01, WS02, WS03, WS04, WS05.

Groundwater levels are presented in Appendix 5, as recorded during gas monitoring undertaken on 4th, 11th and 18th May 2022. Recorded groundwater depths ranged from 0.565m (WS02 – well flooded to slotted section at 0.5m bgl) and 18.395m (BH03).

Groundwater well development and sampling was undertaken on 4th and 11th May 2022:

- Groundwater was encountered at six locations during well development. Groundwater samples were obtained from monitoring wells BH01, BH03, WS02, WS03, WS04 and WS05.
- Groundwater was not observed in monitoring wells BH02 and WS01.

6.3 Field Evidence of Contamination

Observations of field evidence of contamination in soils and groundwater recorded during the investigation were limited to:

- WS01 – pockets of dark grey sandy clay with a slight hydrocarbon odour and fragments of charcoal were observed in the Made Ground depths between 0.2-0.6m.
- WS02 – dark stained clay with a strong hydrocarbon odour was observed at a depth of 0.6m.

No other visual or olfactory evidence of contamination was recorded during the investigation. No field observations of suspected asbestos containing materials were recorded during drilling and sampling of the Made Ground.

Soil headspace screening for VOCs was undertaken using a PID for selected soil samples. Samples recorded VOC concentrations greater than 5ppm only at one location. Samples obtained from 0.6m recorded concentrations of 15.8ppm at WS02.

PID readings recorded in soil samples from other investigation locations did not exceed 0.2ppm.

7. CHEMICAL RESULTS - HUMAN HEALTH ASSESSMENT

The soil and groundwater results have been screened against Ramboll Generic Assessment Criteria (GAC) for a future commercial use.

The analytical certificates for soil and groundwater are presented in in Appendix 3 and screening tables are presented in Appendix 4. Exceedance of a Ramboll GAC does not infer that an unacceptable risk is present; the outcome of the screening is assessed further in the context of a qualitative source-pathway-receptor risk assessment presented in Section 8.

7.1 Soil Analytical Results

As indicated in Section 3, 19 soil samples were analysed in total; of these, 17 were samples of Made Ground or re-worked natural soils.

7.1.1 Soil Results Below GAC

All of the analytical results were below the respective GAC and many results were below the laboratory method detection limits (see Appendix 4):

- Inorganics and metals: all 19 results were below the GAC. Concentrations were generally low.
- PAHs: concentrations of all PAHs were below GAC in all 19 samples tested. Total PAH concentrations ranged between the laboratory detection limit of <0.8 mg/kg and 633 mg/kg at WS01 (0.3-0.6m). This slightly elevated concentration corresponds with the presence of charcoal fragments observed in Made Ground at this location. The next highest total PAH concentrations were 121 mg/kg at WS02 (0-0.3m) and 111 mg/kg at WS04 (0.6m). Total PAH concentrations recorded in the remaining 16 soil samples ranged between the laboratory detection limit of 0.8 mg/kg and 43 mg/kg. *Note: A surrogate marker approach has been used for the assessment of PAHs.*
- TPH and BTEX: concentrations were below the GAC in all 19 samples tested. Slightly elevated total TPH concentrations of over 100mg/kg were detected in Made Ground from five locations: BH02 (160 mg/kg at 0.50m), WS01 (703 mg/kg at 0.3-0.6m), WS02 (190mg/kg at 0.0-0.3m), WS04 (150 mg/kg at 0.6m) and WS05 (159 mg/kg at 0.6-0.8m).
- VOCs: concentrations were below the respective GAC for in all four soil samples tested.

7.1.2 Soil Results - Asbestos (No GAC)

Asbestos was not detected by laboratory testing any of the 10 samples of Made Ground tested.

7.2 Groundwater (Human Health)

Six groundwater samples were analysed and the results were screened against human health assessment criteria for a volatilisation pathway. All results including for inorganics, TPHs, PAHs, VOCs and mercury[6] were below respective screening criteria.

Groundwater analytical certificates are presented in Appendix 3.

[6] Metals other than mercury have not been screened as there are no groundwater (human health volatilisation) screening criteria for metals, because metals are not volatile.

8. WATER ENVIRONMENT ASSESSMENT

8.1 Assessment Approach

There are no relevant published water assessment criteria and therefore groundwater results have been compared to commonly accepted UK guidelines including the Water Supply (Water Quality) (England) Regulations 2000 (DWS) and the Environmental Quality Standards (EQS) defined in European legislation such as the Water Framework Directive (WFD) (2000/60/EC).

Exceedance of screening criteria does not infer that an unacceptable risk is present; the outcome of the screening is assessed further in the context of a qualitative source-pathway-receptor risk assessment presented in Section 8.

For those determinands included in the analytical suite which do not have a corresponding UK screening criteria derived from the above sources, reference has been made to a hierarchy of international guidance in accordance with Environment Agency guidance.

8.2 Analytical Results

Six groundwater samples were obtained (BH01, BH03, WS02, WS03, WS04 and WS05) and the results were screened against relevant GACs for controlled waters:

Where encountered during drilling, groundwater was observed to comprise:

- Perched water confined between Made Ground and the upper horizon of the London Clay in BH01.
- Localised groundwater was encountered in a band of gravel (weathered claystone), which formed part of the London Clay from 5.1 to 5.9m bgl at BH03.
- Groundwater or potential water bearing strata were not encountered during drilling at any other locations. Accumulation of water in these wells is assumed to represent infiltration of perched water from Made Ground and associated seepage from softer upper horizons of London Clay.

Groundwater analytical certificates are presented in Appendix 3 and the screening tables are given in Appendix 4.

8.3 Results Below GAC

The following determinands were below the relevant GAC in all six groundwater samples:

- heavy metals (arsenic, beryllium, cadmium, chromium, copper, copper, iron, lead, mercury, vanadium and zinc);
- inorganic contaminants (ammoniacal nitrogen, sulphate and cyanide);
- total petroleum hydrocarbon fractions (TPH);
- volatile organic compounds (VOCs):
- BTEX compounds;
- Phenols (not recorded above the laboratory detection limit in any of the samples analysed);
- methyl tert-butyl ether (MTBE); and
- pH.

TPH, VOCs, BTEX, MTBE and phenol were not recorded at concentrations above the laboratory method detection limit in any of the six samples analysed.

8.4 Results Above GAC

Exceedances of Controlled Waters GAC were recorded in all six groundwater samples, albeit these were limited to metals and inorganic contaminants as summarised in Table 8.1 below:

Table 8.1 Summary of Results Above GAC - Groundwater Analytical Results (Water Environment)

Determinand	Conc. Range (µg/l)	Location of Max. Conc.	Ramboll Controlled Waters GAC (µg/l)	No. and Location of Exceedances
Metals				
Boron	150 – 910	BH01	750 (B)	**1 (BH01)**
Nickel	17 - 54	BH01	15 (A)	**6 (BH01, BH03, WS02, WS03, WS04, WS05)**
Selenium	44 - 210	BH03	7.5 (B)	**2 (BH01, BH03)**
Other Inorganic Compounds				
Ammoniacal nitrogen as N	660 – 8,500	WS02	290 (A)	**6 (BH01, BH03, WS02, WS03, WS04, WS05)**

Notes:

LOD – Limit of Detection

N/A – Not applicable

A – WFD Threshold Values (TVs) for 'Good' Status. General Quality of Groundwater Body.

B – WFD Threshold Values (TVs) for 'Good' Status. Drinking Water Protection Area.

C – Scotland Resource Protection Values (Non-Hazardous Substances)

D – Scotland Resource Protection Value (Significant Pollution of Contaminated Land)

E – England and Wales Minimum Reporting Values for Hazardous Substances

8.5 Discussion of Results

Metals and Other Inorganic Contaminants

Boron exceeded the assessment criteria at BH01. Nickel exceeded the assessment criteria at six locations (BH01, BH03, WS02, WS03, WS04 and WS05), with a maximum concentration of 54 µg/l recorded at BH01. Exceedances of the GAC for selenium were recorded at BH03 (210 µg/l) and BH01 (44 µg/l).

Other exceedances of inorganic contaminants included ammoniacal nitrogen which exceeded the GAC of 290 µg/l in all six groundwater samples at concentrations of 1,400 µg/l (BH01), 1,800 µg/l (BH03), 8,500 µg/l (WS02), 660 µg/l WS03, 2,900 µg/l WS04 and 5,900 µg/l (WS05).

The concentrations of inorganic contaminants detected are not considered significant in the context of the site's setting and the conservative assessment criteria for drinking water. In the absence of an obvious on-site source the concentrations detected are considered to be reflective of local background groundwater quality.

9. BUILT ENVIRONMENT

9.1 Ground Gas Assessment Approach

Ground gases can be produced as a result of the decomposition of organic materials and may also originate from natural sources, such as coal seams and organic-rich soils. The principal components of ground gas are methane and carbon dioxide, although other gases may be present in trace concentrations. Ground gas can present a hazard to site occupants and property as result of flammable / explosive hazards, physiological effects, odour and effects on vegetation.

The ground gas assessment included in this report is provided for indicative purposes only and is not intended for use as a detailed ground gas risk assessment.

Ramboll has applied a semi-quantitative method in line with current good practice guidance on risk assessment to assess ground gas risks. Full details of Ramboll's assessment methodology are presented in Appendix 5.

As discussed in Section 3 of this report, four rounds of ground gas monitoring were previously undertaken as part of an assessment prepared by JOMAS in 2020 in support of the outline planning application for the site over a period of approximately one month. Three additional confirmatory rounds of ground gas monitoring were undertaken by Ramboll utilising newly installed wells to improve coverage and confirm the previously established ground gas classification of CS1: Very Low Risk, bringing the total number of monitoring rounds undertaken to 7 over a combined period of 7 weeks. Ramboll's monitoring visits were undertaken over a period of 3 weeks to provide representative results of a range of pressure conditions.

Consideration was given to the conceptual site model and the ground gas potential of the site when determining the monitoring scope and frequency. The site is considered to have a low ground gas generating potential on the basis that:

- Potential sources of ground gas present at the site are limited to the presence of Made Ground. The geology at the site was found to comprise Made Ground comprising granular (crushed brick, concrete and stone) and cohesive (re-worked clay) fill materials underlain by London Clay. These are all materials considered to have a low ground gas generating potential.
- Other potential ground gas sources such as on or off-site peat deposits, landfill sites or methane within groundwater were not identified.

9.2 Ground Gas Monitoring Results

In total eight wells were monitored, with five targeting the Made Ground and three targeting the London Clay. The ground gas data from the latter three deeper wells has been included in this report for completeness but is considered to be less representative of the ground gas regime.

A summary of the ground gas concentrations recorded is provided in Table 9.1 below. The ground gas monitoring results are provided in full in Appendix 5.

Table 9.1: Summary of Ground Gas Monitoring Results

Monitoring Well	Response Zone	Date	Steady State Flow Rate (l/hr)	Peak Methane (% v/v)	Methane GSV (l/hr)	Peak Carbon Dioxide (%)	Carbon Dioxide GSV (l/hr)
BH01	London Clay	04/05/2022	<0.1	<0.1	0.0001	5.9	0.0059
		11/05/2022	<0.1	<0.1	0.0001	6.2	0.0062
		18/05/2022	<0.1	<0.1	0.0001	6.4	0.0064
BH02	London Clay	04/05/2022	<0.1	<0.1	0.0001	0.6	0.0006
		11/05/2022	<0.1	<0.1	0.0001	0.8	0.0008
		18/05/2022	<0.1	<0.1	0.0001	0.8	0.0008
BH03	London Clay	04/05/2022	<0.1	<0.1	0.0001	0.6	0.0006
		11/05/2022	<0.1	<0.1	0.0001	1.6	0.0016
		18/05/2022	<0.1	<0.1	0.0001	2.2	0.0022
WS01	Made Ground	04/05/2022	<0.1	<0.1	0.0001	0.9	0.0009
		11/05/2022	<0.1	<0.1	0.0001	0.9	0.0009
		18/05/2022	<0.1	<0.1	0.0001	0.9	0.0009
WS02	Made Ground	04/05/2022	<0.1	<0.1	0.0001	0.5	0.0005
		11/05/2022	<0.1	<0.1	0.0001	0.6	0.0006
		18/05/2022	<0.1	<0.1	0.0001	0.7	0.0007
WS03	Made Ground	04/05/2022	<0.1	<0.1	0.0001	<0.1	0.0001
		11/05/2022	<0.1	<0.1	0.0001	<0.1	0.0001
		18/05/2022	<0.1	<0.1	0.0001	<0.1	0.0001
WS04	Made Ground	04/05/2022	<0.1	<0.1	0.0001	0.7	0.0007
		11/05/2022	<0.1	<0.1	0.0001	1.2	0.0012
		18/05/2022	<0.1	<0.1	0.0001	1.5	0.0015
WS05	Made Ground	04/05/2022	<0.1	<0.1	0.0001	<0.1	0.0001
		11/05/2022	<0.1	<0.1	0.0001	0.1	0.0001
		18/05/2022	<0.1	<0.1	0.0001	0.1	0.0001

9.2.1 Atmospheric Pressure

The three monitoring rounds were undertaken under a range of low and high atmospheric pressure conditions between 1004 and 1019 mb. The highest atmospheric pressure was recorded during monitoring round 3 and the lowest pressure was recorded during monitoring round 2.

9.2.2 Flow Rates

Steady state gas flow rates were not recorded above the instrument detection limit of <0.1 l/h at any well location. The flow rates recorded do not indicate that large volumes of ground gases are

present at the site. Peak flow rates are presented in Appendix 5 (these are not relevant to the calculation of the GSVs).

9.2.3 Methane and Carbon Dioxide

Methane was not recorded above the lower instrument detection limit (<0.1%) during any of the three monitoring rounds.

Carbon dioxide concentrations ranged between the instrument detection limit (<0.1%) and 6.4% by volume (v/v). The highest concentrations were recorded at BH01, with 6.4% recorded during the third monitoring round (6.2% recorded during the second, and 5.9% on the first). Carbon dioxide concentrations exceeding 5% were therefore recorded on three occasions but only at one location. In addition, BH01 screens London Clay at depth (3.0m to 8.0m) and therefore this data is considered to be less representative of ground gas conditions across the site. As such, it is not considered likely for there to be a need to consider measures to prevent gas ingress to the proposed development structures.

9.2.4 Oxygen

Oxygen concentrations ranged between 12.9% by volume in BH03 (east of the site) and 20.2% in WS02 (north-west of the site), recorded during the third and first monitoring rounds respectively. Oxygen levels were recorded below 18% by volume in a total of six wells targeting both the Made Ground (WS03, WS04 and WS05) and London Clay (BH01, BH02 and BH03), indicating depleted oxygen concentrations beneath some areas. Oxygen levels below 13% (12.9%) were recorded at one location (BH03) on one occasion only.

9.2.5 Volatile Organic Compounds (VOCs)

During the ground gas monitoring a photo-ionisation detector (PID) was used to screen for the potential presence of VOCs within the monitoring wells. VOC concentrations were recorded above the instrument detection limit of 0.1ppm/v at a number of locations, with the highest reading recorded as 2.2ppm at BH03 during the third monitoring round. The highest VOC concentrations recorded during the second and third monitoring rounds were 0.9ppm and 1.4ppm, both recorded in monitoring well BH03 also.

9.3 **Classification of Ground Gases**

Details of Ramboll's assessment methodology is presented in Appendix 5 and a discussion of the results is provided below.

The carbon dioxide GSV ranged between 0.0001 l/h and 0.0064 l/h (BH01). All GSVs correspond to 'Characteristic Situation 1' (CS1, very low hazard) in BS8485 which is applicable for industrial / commercial and high-rise residential development; or as 'Green' (negligible gas regime) using the NHBC Traffic Light system, which is relevant to low rise housing.

The calculated methane GSV did not exceed 0.0001 l/h. All GSVs correspond to 'Characteristic Situation 1' (CS1, very low hazard) in BS8485 which is applicable for industrial/commercial and high-rise residential development; or as 'Green' (negligible gas regime) using the NHBC Traffic Light system, which is relevant to low rise housing.

BS8485 and the NHBC Traffic Light system both indicate that where carbon dioxide typically is greater than 5%, consideration should be given to increasing the classification from CS1 to CS2, or from Green to Amber 1, where gas protection measures would be required. Peak carbon dioxide concentrations marginally above 5% were detected at one location (BH01) at concentrations of 6.4%, 6.2% and 5.9%, albeit this well is noted to screen London Clay at depth and the ground conditions encountered do not suggest the presence of material with gas

generating potential. Borehole flow rates were not detected above the instrument detection limit of 0.1 l/hr indicating that significant volumes of ground gas are not being generated and the resulting GSV (0.0064 l/hr) is well below that of a CS2 site (0.07 l/hr). Furthermore, no elevated levels of carbon dioxide were detected at a shallow depth.

Methane concentrations were not detected above the instrument detection limit of <0.1% in any of the boreholes during the gas monitoring rounds undertaken to date.

In summary, based on the monitoring data the site is considered to be CS1 (very low hazard)/ 'Green' (negligible gas regime). No gas protection is therefore considered necessary and this is consistent with past monitoring and assessment (see Section 3 for past investigations).—The requirement (or otherwise) and design of gas protection measures will need to be agreed in consultation with the Local Authority Building Control prior to construction and implemented in line with guidance provided in BS8485 or by the NHBC (depending on the proposed development) which include consideration for the building's construction and use.

9.4 Water Supply Pipes

Buried water supply pipes can be at risk from permeation and accelerated deterioration from certain contaminants. A detailed assessment of existing and future pipe materials is outside of the scope of this investigation; however, architects and designers should liaise with the local water supply company and are directed to the following document for guidance:

- Water UK, Contaminated Land Assessment Guidance, 2014
- Guidance for the Selection of Water Supply Pipes to be used in Brownfield sites; UK Water Industry Research (UK WIR), 2010 (Ref. 10/WM/03/21)

9.5 Building Materials

There are a number of contaminants that may attack some building materials under certain conditions if present. The focus of this investigation is to assess risks to human health and environmental receptors and no assessment has been made of impact to building materials.

10. REVISED CONCEPTUAL SITE MODEL

Using information obtained during this site investigation, the preliminary Conceptual Site Model presented in Section 4 has been refined and is described in Table 10.1 below.

Table 10.1: Revised Conceptual Site Model

Sources of Contamination			
A significant source of contamination was not detected in soil or groundwater. **Soils:** No contaminant concentrations exceeded the GAC in any of the sampling locations. Asbestos was not detected within the Made Ground. Note that some contaminants are present below the GAC and should be considered by construction workers and waste classification. **Groundwater:** No contaminant concentrations exceeded the volatilisation assessment criteria for human health. Elevated concentrations of some metals (boron, nickel and selenium) and other inorganics (ammoniacal nitrogen) in groundwater exceed the GAC for controlled waters. Concentrations of PAHs, VOCs and TPH fractions were below the laboratory limit of detection at all locations.			
Geology: The investigation encountered a layer of Made Ground encountered beneath hardstanding or topsoil across the site and present to a maximum depth of 2.15m. Natural deposits of brown to grey mottled clay underlie the Made Ground. This is interpreted as London Clay (likely to be weathered in the upper horizon). The thickness of London Clay was not proven, but published BGS mapping suggests a thickness of around 85m in the area of the site.			
Hydrogeology: The investigation did not encounter continuous perched or shallow groundwater bodies at the site. Where encountered, groundwater was generally observed to comprise perched water confined between Made Ground and the upper horizon of the London Clay (an unproductive strata). Localised groundwater associated with a higher permeability layer of claystone within the London Clay was encountered at a depth of approximately 5-6m bgl at one borehole location only. The thickness of the London Clay (anticipated to be around 85m) is considered to provide protection from site derived contaminants to the Chalk Principal Aquifer present underlying the clay at depth.			
Hydrology: The site is located in an area of low sensitivity with regards to surface water resources. The nearest surface water receptor is the Grand Union Canal located approximately 38m north-east of the site, although this is noted to be concrete lined. There are no other named surface watercourses within 1km of the site.			
Potential Contaminant Linkages The following potential pollutant linkages have been identified at the site and are considered further in the qualitative risk assessment:			**Potential Contaminant Linkage**
Human Health (Future Commercial Users and Construction Workers)	On-site	Dermal contact & ingestion	PCL1
		Inhalation – dust, asbestos fibres and volatilisation	PCL2
Water Environment	On-site	Leaching of contaminants from the unsaturated zone to groundwater	PCL3
	Off-site	Vertical migration of contaminants in groundwater to the deeper aquifers.	PCL4
	Off-site	Migration of contaminants off-site within groundwater, onto third party land and towards off-site surface water features	PCL5
Built Environment	On-site	Migration of ground gases into buildings and structures	PCL6

10.1 Qualitative Risk Assessment

The principal sources of contamination, receptors and potential pollutant linkages have been assessed using a qualitative source-pathway-receptor approach and are summarised in Table 10.2 below.

Table 8.2: Qualitative Risk Assessment: Commercial Site Use

Potential Contaminant Linkage	Contaminant	Pathways	Receptors	Discussion	Risk
PCL1	**Contaminants present but below GAC** Asbestos, inorganics, metals, PAHs, TPH and VOCs in Made Ground.	Dermal Contact, Ingestion	Future site Users	**Future Commercial Users:** Concentrations of contaminants were not recorded above commercial use assessment criteria. Asbestos was not identified in Made Ground by Ramboll, albeit it is noted that previous investigation undertaken by JOMAS in 2020 reported loose asbestos fibres in shallow Made Ground at two locations (concentrations were reported to be <0.1%). The proposed development plan comprises a commercial data centre (i.e. building cover with areas of external hardstanding); this will cap the underlying contaminants and as such there is not considered to be a pathway between the contaminant and future site users. Soils for landscaped areas should be demonstrated to be suitable for use and not to provide a risk to future site users; soils should also comply with British Standard for Topsoil (BS3882:2015). **Construction Workers** The use of appropriate risk assessment and working procedures, such as basic personal protective equipment and good hygiene practices should be maintained. As would be expected on brownfield development sites. As is standard, an asbestos management plan should be prepared for known and potentially unexpected asbestos in soil.	**Negligible**, based on the presence of hardstanding across the site, as part of the proposed development. **Low**, assuming the use of appropriate control measures during construction.
PCL2		Inhalation - volatilisation or dust and asbestos fibres			
PCL3	Metals and other inorganics, PAHs, TPH and VOCs in Made Ground.	Leaching of contaminants from the unsaturated zone to groundwater.	Perched water	Elevated concentrations of contaminants were not identified in soils that may be a potential contaminative risk to controlled waters (e.g. mobile contamination or saturated soils). Concentrations of contaminants detected in samples of perched water were not significantly elevated. The site is not considered to be located within an area of sensitive groundwater and the investigation did not identify a continuous groundwater body at the site.	**Negligible**
PCL4	Metals, inorganics, TPH, PAH and VOCs identified in groundwater.	Vertical migration of contaminants in groundwater to the deeper aquifers.	Groundwater in deeper aquifers	The site is located in a low sensitivity setting in terms of groundwater resources. Perched groundwater was encountered at some locations during the investigation and was not found to be continuous across the site. A continuous groundwater body was not identified. Whilst exceedances of the GAC were recorded for some metals and other inorganic compounds, the concentrations detected are reflective of background water quality in an area with an industrial history and are not considered to pose a significant risk to controlled waters.	**Negligible**

Table 8.2: Qualitative Risk Assessment: Commercial Site Use

Potential Contaminant Linkage	Contaminant	Pathways	Receptors	Discussion	Risk
				Although BGS records indicate that a chalk aquifer is present at significant depth beneath the site, this is isolated from impact from current or historical activities at the site by a significant thickness of low permeability London Clay. The risk to the deeper chalk aquifer from the concentrations of contaminants identified in shallow/perched groundwater is considered to be negligible.	
PCL5	Metals, inorganics, TPH, PAH and VOCs identified in groundwater.	Migration of contaminants off-site within groundwater, onto third party land and towards off-site surface water features.	Off-site third party land and its users. Off-site surface water features.	Given the site's historical setting and the fact that a continuous shallow groundwater body has not been identified at the site, the risk to adjacent off-site land from migration within perched shallow groundwater is considered to be negligible. The nearest surface water receptor (the Grand Union Canal), located approximately 38m north-east of the site, is noted to be concrete lined. This reduces the risk of potential migration of contaminants into the canal.	**Negligible**
PCL6	Ground gases	Lateral and vertical migration	Future site Users and Built Environment	Ground gas monitoring and assessment has identified the site to have a Gas Screening Value of 0.0064 l/h: Characteristic Situation (CS) 1: Very Low Risk. Based on the concentrations of methane and carbon dioxide detected it is considered that the Characteristic Situation 1 classification is appropriate for the site and therefore, gas protection measures are not deemed necessary for the proposed development, albeit further confirmatory monitoring is recommended.	**Very Low**

11. PRELIMINARY GEOTECHNICAL ASSESSMENT

The ground conditions at the site comprise Made Ground overlying London Clay. The typical ground profile and material descriptions are indicated in Table 6.1. Engineering considerations associated with these materials are described in the following sections. The primary data source is the GEL ground investigation, although data from the JOMAS 2020 ground investigation has also been used where appropriate.

11.1 Made Ground

The Made Ground is of variable composition with depth and spatially. Hardstanding is present across much of the site, underlain by 'hardcore' type fill (crushed brick, concrete and stone), underlain by cohesive fill. The total depth of Made Ground is typically in the range 0.5-2.0m below ground level (mbgl).

11.1.1 Plate load tests

To consider the suitability of the made ground for supporting loads from ground-bearing floor slabs and from roads and paved areas, plate load tests were carried out. The tests involve applying load to a steel plate and measuring the load/deflection behaviour under incremental loading. The tests were carried out in shallow trial pits, to enable removal of the hardstanding and underlying hardcore/sub-base material. The results are summarised in Table 11.1. The full results including settlement/time and settlement/stress plots are included in the GEL factual report.

Table 11.1 Summary of plate load test results

Test location	Material tested	Maximum applied stress	Maximum settlement	Modulus of subgrade reaction, k762	California Bearing Ratio
PL1	Gravelly clay at 0.7m depth	84kPa	4.27mm	17	1
PL2	Gravelly clay at 0.1m depth	84kPa	2.92mm	17 MN/m^2	1 %
PL3	Gravelly clay at 0.1m depth	84kPa	1.62mm	31 MN/m^2	4 %
PL4	Gravelly clay at 0.5m depth	84kPa	8.31mm	12 MN/m^2	1 %
PL5	Gravelly clay at 0.5m depth	84kPa	10.55mm	13 MN/m^2	1 %

11.2 London Clay

London Clay is present beneath the Made Ground. The upper layer of London Clay has been weathered to a 'firm' or 'soft to firm' condition; this is interpreted as being due to natural weathering processes including the presence of perched groundwater/meteoric water above the relatively impermeable stiffer clay beneath. The weathered layer is present to a varying depth; for design purposes this is typically 2.0 metres bgl, and locally up to 3.5 metres bgl. Beneath the weathered layer, the London Clay increases in stiffness and strength throughout its depth profile, typically from 'firm to stiff' to 'very stiff'. At deeper level, bands described as 'Claystone' are present; indicating that the London Clay is sufficiently stiff that it behaves as a weak rock. The London Clay stratum was proven to a depth of 35.5 metres.

11.2.1 Classification

The London Clay was described in the borehole logs as 'CLAY', and locally 'slightly sandy CLAY'. This indicates that the majority of the material comprised of clay particle sizes, with some layers containing subordinate coarser sand particles. The plasticity of the clay was investigated by conducting Plasticity Index tests, and plotting the results on an Atterberg chart. Data plots are included in Appendix 6. The Atterberg chart is reproduced from the GEL factual report as Figure 11.1. The results indicate that the clay is of high plasticity, which is typical for London Clay. The natural moisture content ranged from 15 - 36%; typically this was above the plastic limit of the material.

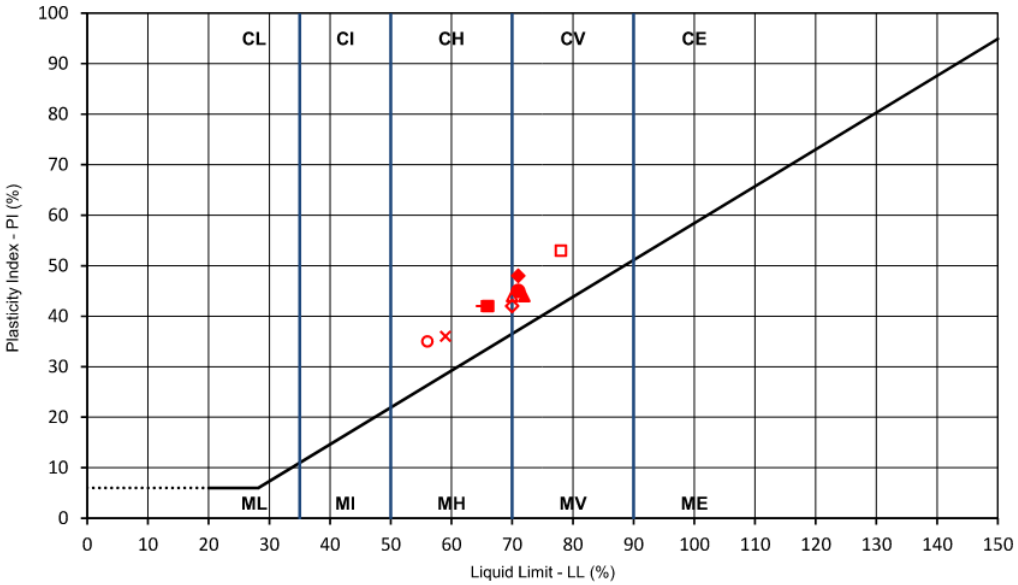


Figure 11.1 Atterberg chart indicating plasticity of London Clay *(CH and CV respectively refer to Clay of High and Very High plasticity)*

A summary of the classification testing data is shown in Table 11.2.

Table 11.2 Summary of classification testing results for London Clay

Parameter	Unit	No. of tests	Range	Mean	Median	Standard deviation
Moisture content	%	51	15 to 36	26	27	5.3
Liquid Limit	%	9	56 to 78	68	70	6.9
Plastic Limit	%	9	21 to 28	25	25	2.4
Plasticity Index	%	9	35 to 53	43	44	5.5
Bulk density	Mg/m3	32	1.89 to 2.05	1.98	2.00	0.057
Dry density	Mg/m3	32	1.39 to 1.68	1.55	1.58	0.087

11.2.2 Strength

Laboratory triaxial strength tests were conducted on samples representative of the full depth range of London Clay encountered, and spatially across the site. SPTs were conducted at regular intervals throughout the depth range of the boreholes. Triaxial tests were conducted as 'unconsolidated, undrained', to provide appropriate strength parameters for pile design.

Based on pile design practice in accordance with the London District Surveyors Association (LDSA) publication 'Guidance Notes for the Design of Straight Shafted Bored Piles in London Clay', undrained shear strength (Cu) data for the London Clay is required throughout and beneath the depth profile of proposed foundation piles. Triaxial strength tests and SPTs from both the GEL GI and the JOMAS GI were combined for this purpose, to provide increased data population and coverage across the site. Triaxial tests directly report the design parameter Cu, whereas for SPTs a correlation factor 'F1' is used. The F1 factor relates to the plasticity index of the material. Through consideration of the plasticity index results, and through plotting the SPT and triaxial results from both investigations together, an F1 correlation factor of 4.5 has been derived. The design Cu profile is indicated in Figure 11.2.

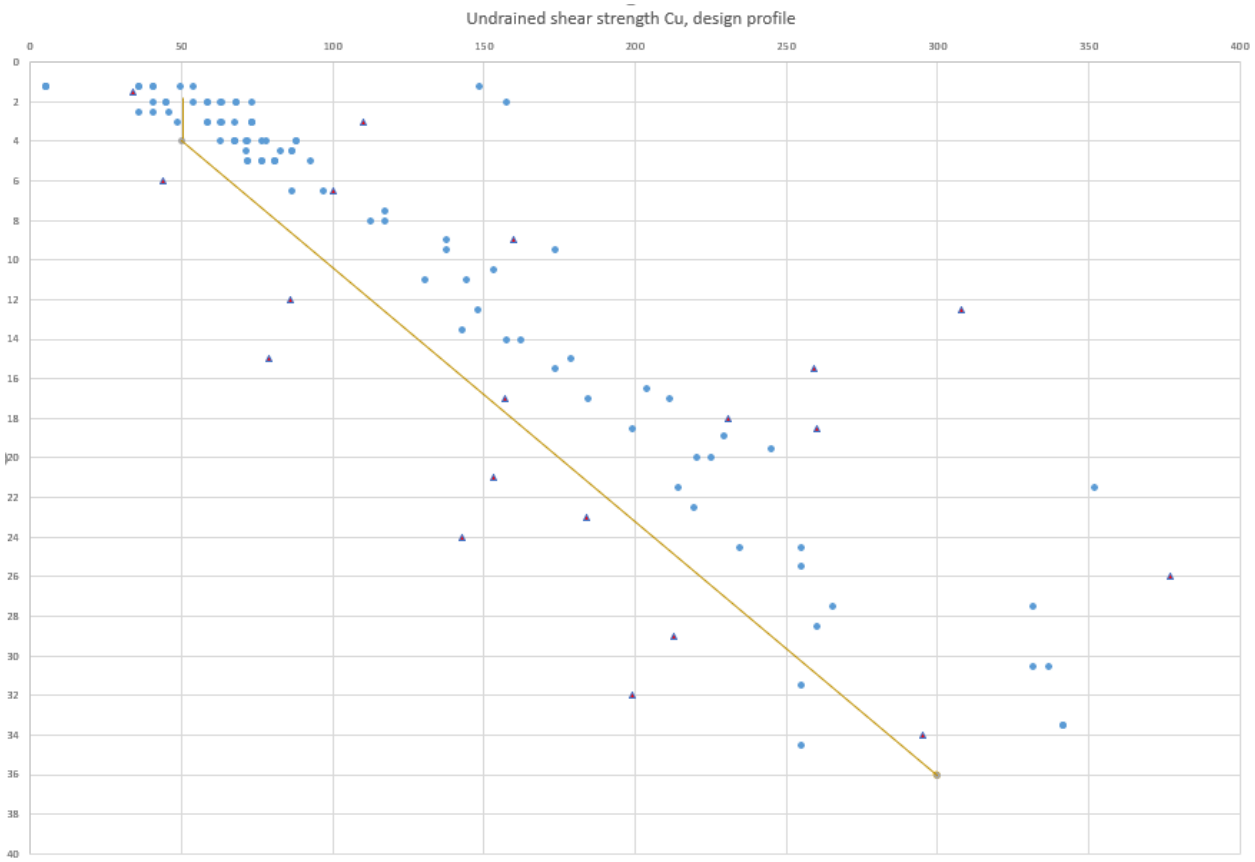


Figure 11.2 Design Cu profile for London Clay used for preliminary pile design.
Legend: triangle = Cu from triaxial (kPa), circle = SPT N value with F1 factor of 4.5 applied to give equivalent Cu (kPa). Vertical axis = depth in metres.

A characteristic value for constant volume effective angle of shearing resistance φ'cv has been derived using the following relationship from BS 8004:2015, using the results of plasticity index testing:

φ'cv = 42 - 12.5 log P

11.2.3 Stiffness and compressibility

In order to derive the undrained Young's Modulus, a relationship of E_u = 400 x Cu (with E_u given in kPa) is deemed suitable for the London Clay, based on comparable local experience and published guidance. The drained Young's Modulus may be obtained by the relationship E' = 0.8E_u.

One-dimensional consolidation (Oedometer) tests were conducted on samples within the likely depth of influence of shallow foundations. The purpose of the tests is to assess the behaviour of the clay under loading, and to derive the parameters mv (coefficient of volume compressibility) and Cv (coefficient of consolidation). These parameters are typically used in shallow foundation design to assess the magnitude and duration of settlement, respectively. Reference should be made to the GEL factual report, and the foundation designer should select design values of mv and Cv which are appropriate to the in-situ confining pressure. Established practice shows that settlements based on oedometer-derived mv values are typically over-estimates; in the London Clay the use of a 'geological factor' of 0.5-0.7 is recommended to compensate for this. The mv and Cv values resulting from the Oedometer tests are summarised in Table 11.3. The tests were conducted on samples from shallow depths within the London Clay, however it can be seen that compressibility (represented by mv) reduces with depth, i.e. inversely proportional to stiffness.

Table 11.3 Summary of Oedometer test results

Pressure Stage (approximate)		50kPa		100kPa		200kPa		400 kPa		800 kPa		Unloading
Location	**Depth (m bgl)**	**mv**	**Cv**	**mv**	**Cv**	**mv**	**Cv**	**mv**	**Cv**	**mv**	**Cv**	**mv**
BH02	3.50	0.29	1.60	0.36	1.40	0.24	0.82	0.19	0.61			0.10
BH03	3.60	0.24	2.10	0.30	3.30	0.24	2.70	0.71	0.14			0.10
BH02	5.55	0.26	0.63	0.24	0.50	0.20	0.51	0.14	0.65			0.12
BH01	5.85	0.2	1.0	0.26	0.60	0.19	0.76	0.15	0.48			0.10
BH02	8.00			0.04	0.82	0.12	0.29	0.11	0.28	0.07	0.25	0.06
Mean average		**0.25**	**1.33**	**0.24**	**1.32**	**0.20**	**1.02**	**0.26**	**0.43**	**0.07**	**0.25**	**0.10**

Units: mv = MN/m², Cv = m²/yr

11.2.4 Characteristic Parameters

The recommended characteristic parameters for the London Clay Formation are summarised in Table 11.4. 'z' represents the depth in metres below ground level. These parameters are provided for guidance, and the designer should establish appropriate parameters particular to the design.

Table 11.4 Summary of Characteristic Parameters for London Clay Formation

Soil Parameter		Unit	Value	Justification
Bulk density		**Mg/m³**	**20**	**Laboratory testing**
Undrained Shear Strength (c_u)	0 – 4.0m bgl	kPa	50 kPa	In-situ testing, laboratory testing and published correlations
	>4.0m bgl		20 + 7.8z kPa	
Effective Angle of Shearing Resistance (φ'_{cv})		Degrees	21	Laboratory testing and published correlations
Undrained Young's Modulus (E_u)	0 – 4.0m bgl	MPa	20	In-situ testing, laboratory testing and published correlations
	>4.0m bgl		8 + 3.1z	
Drained Young's Modulus (E')	0 – 4.0m bgl	MPa	16	In-situ testing, laboratory testing and published correlations
	>4.0m bgl		6.4 + 32.5z	
Undrained Poisson's Ratio (v)		-	0.5	Published values (Tomlinson, 2001)
Drained Poisson's Ratio (v')		-	0.2	Published values (Tomlinson, 2001)

11.3 Groundwater

Groundwater strikes during drilling are shown in Section 4.2. Groundwater monitoring results are summarised in Table 11.5 (taken from the monitoring data included in Appendix 5).

Table 11.5 Summary of Groundwater Monitoring Results

Borehole	BH01		BH02		BH03		WS01		WS02	
Instrument Diameter (mm)	50		50		50		50		50	
Response Zone (m)	3.0-8.0		20.0-35.0		5.0-20.0		0.4-1.0		0.4-1.0	
Depth to Base (m)	7.995		35		19.485		1.065		0.95	
Level (mAOD)	32.75		33		33.65		32.75		32.85	
Date	**Depth (m)**	**Level (m AOD)**	**Depth (m)**	**Level (m AOD)**	**Depth (m)**	**Level (m AOD)**	**Depth (m)**	**Level (m AOD)**	**Depth (m)**	**Level (m AOD)**
04/05/2022	7.255	25.495	Dry	Dry	18.395	15.255	Dry	Dry	0.565	32.285
11/05/2022	7.295	25.455	Dry	Dry	16.405	17.245	Dry	Dry	0.6	32.250
18/05/2022	7.12	25.630	Dry	Dry	14.485	19.165	Dry	Dry	0.63	32.220

Borehole	WS03		WS04		WS05		BH2 (JOMAS)		WS2 (JOMAS)	
Instrument Diameter (mm)	50		50		50		50		50	
Response Zone (m)	0.5-1.0		0.5-1.0		0.5-1.0		2.0-5.0		1.0-5.0	
Depth to Base (m)	1.08		1.045		2.01		5.335		4.77	
Level (mAOD)	33.4		33.25		33.25		NA		NA	
Date	**Depth (m)**	**Level (m AOD)**	**Depth (m)**	**Level (m AOD)**	**Depth (m)**	**Level (m AOD)**	**Depth (m)**	**Level (m AOD)**	**Depth (m)**	**Level (m AOD)**
04/05/2022	0.805	32.595	0.805	32.445	0.960	32.290	0.965	NA	1.400	NA
11/05/2022	0.805	32.595	0.815	32.435	0.935	32.315	1.080	NA	0.925	NA
18/05/2022	0.79	32.610	1.81	31.440	0.995	32.255	1.034	NA	0.930	NA

The results do not indicate the presence of a continuous phreatic surface. This is evidenced by the dry nature of BH02, which contained a deep response zone of 20 to 35 metres bgl; compared to the presence of groundwater in BH03 with a shallower response zone of 5 to 20 metres bgl. Perched bodies of groundwater within the made ground and weathered London Clay are likely to be encountered during construction excavations, and flows may be significant and persistent where the water is recharged from off-site sources, particularly during or following periods of high rainfall. Groundwater is likely to be encountered in discrete horizons within the London Clay throughout its depth range. Long-term piezometric groundwater levels have not been assessed.

11.4 Aggressive Ground Conditions for Concrete

Aggressive Ground Conditions for Concrete (ACEC) testing was carried out on made ground and London Clay, in accordance with BRE SD1, 'Concrete in Aggressive Ground'. The results indicate that the ground conditions are pyritic, i.e. pyrite compounds would probably oxidise when disturbed or exposed, releasing sulphates and increasing the risk of chemical attack on buried concrete. Sulphate-resistant concrete is therefore required; the assessment indicates that the Design Sulphate Class is DS-4, and the ACEC Class is AC-4. Where concrete doesn't come into contact with exposed disturbed ground, for example in the case of piling, the classification may be reduced to AC-2. This should be assessed as part of the foundation and pile design, and specialist advice sought as necessary.

11.5 Electrical resistivity

Soil resistivity testing was carried out during the ground investigation works. The work was carried out by subcontractor SUMO Geophysics. Two expanding Werner arrays were completed in the accessible area between the buildings in the central part of the site. Buildings and underground services prevented survey access to much of the site. The results are provided and discussed in the SUMO report within the GEL factual report in Appendix 2. The results are understood to be required for the purposes of earthing design.

11.6 Foundations

11.6.1 Floor slabs

The plate load tests were carried out to assess the load-carrying capacity and stiffness of the ground at shallow depth, under low loads, appropriate to floor slab and road pavement foundation design. The plate diameter was 452mm, and therefore the zone of influence of the test does not represent the much larger zone of influence of a foundation floor slab. The settlements obtained for the nominal loadings associated with a typical floor slab are low (for example, less than 1mm for all tests under a load of 19kN/m^2). However, the soft nature of the material as described in the borehole logs, and the typically low CBR values obtained, indicate that in its current condition the cohesive made ground would not be reliable for supporting loads from ground bearing floor slabs. Some form of improvement is likely to be required, and this could take the form of:

- Visual identification of unsuitable material, and replacement with acceptable fill;
- Proof rolling and visual inspection, supplemented by in-situ tests on the prepared formation (such as Lightweight Deflectometer (LWD) or plate load tests);
- Potential stabilisation (for example in-situ lime improvement) to provide increased stiffness and bearing resistance.

Shrink-swell effects associated with volume change due to moisture content or unloading can occur in high plasticity clays, such as the London Clay underlying this site. The site is currently treeless and doesn't appear to within the root zone of any trees. Volume change associated with tree roots is therefore unlikely to be an issue unless any trees are planted as part of the landscaping works. Tree species, root zone of influence and mitigation measures should be considered in liaison with the landscape designer, in that eventuality.

Basements and significant excavations are not proposed, therefore heave due to reduction in confining pressure is unlikely to occur. For detailed design purposes, swelling pressures were obtained as part of the ground investigation; these are recorded in the factual report. The values are within the range of 17 to 28 kPa at depths of 3.5 to 5.5m bgl, increasing to 51kPa on one sample at 8.0m bgl.

11.6.2 Pavement foundations

For road foundation construction, a minimum CBR value of 2.5% is typically required. This could be achieved in the granular made ground, but to ensure consistent and reliable pavement foundations, excavation and recompaction to an appropriate specification is likely to be required. CBR values of 5% or greater may be achieved in appropriately recompacted granular material. The cohesive made ground is unlikely to be suitable as a pavement foundation.

11.6.3 Earthworks

Measures and requirements for preparation of formations should be included in an earthworks specification for the project.

Because of the level nature of the site and the absence of proposals for earthworks cut/fill or significant excavations, testing for earthworks classification and acceptability hasn't been carried out. Should the design evolve such that engineering re-use of site-won material is proposed, testing would be required, and the results incorporated into the earthworks specification.

11.6.4 Structural foundations

The upper part of the London Clay is soft and highly weathered and as such unsuitable for supporting structural column loads. The depth at which the London Clay becomes less weathered and firm to stiff in nature at at depth of approximately 2.0 metres, locally as deep as 3.5 metres. Depth to suitable founding material would vary across the proposed structure locations. Allowable bearing pressures in the region of 150-200kN/m^2 are likely to be achievable; this would need to be assessed in detail, based on the proposed foundation dimensions and settlement tolerances. However, an excavation depth of up to 3.5 metres is unlikely to be considered appropriate for excavations for conventional foundations (e.g. pad and strip footings).

The London Clay becomes stronger and stiffer with depth. The depth at which structural loads associated with the datacentre could be appropriately supported would be in excess of a practical excavation depth for conventional foundations. Therefore, piled foundations are likely to represent the optimal solution for supporting the structural loads. Typically, Continuous Flight Auger (CFA) piles are used in London Clay to support structures similar to those proposed. CFA piles provide benefits compared to conventional bored piles, in terms of installation speed and practicality.

The depth of investigation has been taken to 35m bgl, as appropriate in terms of good practice and code compliance, for piled foundations of up to 30m long. CFA piling rigs are capable of installing piles at depths of 30m or greater and this solution would probably represent the most economical type of piling. The London Clay increases in strength with depth, although LDSA (London District Surveyors Association) and other guidance indicates limits in average soil strength through the length of the pile, beyond which greater capacity isn't achievable. Piles of greater length than 30m are therefore unlikely to be necessary, and piles may ultimately be designed as significantly less than 30m in length.

Appropriate Eurocode material, action, and resistance factors have been used to calculate indicative pile capacities for a range of lengths and diameters, as shown in Table 11.6. Set B represents Eurocode Design Approach 1 (DA-1) Combination 1 pile capacities, and Set C represents DA-1 Combination 2 pile capacities. The design Cu profile described in Section 11.2.2 has been used, with an 'alpha' factor of 0.5 on shaft friction, as recommended by the LDSA. It

should be noted that these capacities are for indicative purposes only, and detailed design should be carried out by the pile designer.

Table 11.6 Indicative Pile Capacities

Diameter	1.05	m	0.9	m	0.6	m
Length	**Set B kN**	**Set C kN**	**Set B kN**	**Set C kN**	**Set B kN**	**Set C kN**
15m	2079	1039	1689	845	1002	501
20m	3211	1605	2633	1316	1596	798
25m	4572	2286	3773	1887	2321	1160
30m	6164	3082	5111	2555	3177	1589

12. PRELIMINARY GEOTECHNICAL RISK REGISTER

Table 12.1: Preliminary Geotechnical Risk Register

Subject	Hazard	Risk	Information to be communicated to Client / Contractor
Made Ground	Inherent variability of the stratum, i.e. thickness, composition and engineering properties. Risk of buried obstructions.	Unsuitable founding layer. Cost and programme implication associated with encountering and removing buried obstructions.	Made Ground is not suitable for supporting structural column loads. Made Ground may be considered as a founding stratum for ground bearing floor slabs, subject to detailed assessment. Depth and properties of Made Ground have been investigated at each exploratory hole location, however due to its variable nature, composition and properties may differ elsewhere on site.
London Clay Formation	The stratum was observed to be highly weathered near the surface and to a maximum depth of 3.5 metres. High plasticity clay material.	Potential for encountering material of low shear strength in the upper zone of the stratum. Potential for heave within the stratum due to excavation.	Structural foundations should not be founded on the shallow weathered material. If design development results in significant excavations, heave potential should be assessed.
Groundwater	Shallow perched water was encountered during groundwater monitoring of boreholes during Spring 2022. Groundwater monitoring has not taken place during the wetter, winter months. The Grand Union Canal is 38 metres north-east of the site.	Perched water bodies may extend beyond the confines of the site. Risk of persistent flows being encountered in foundation excavations, especially if recharge is fed by the canal. Groundwater levels could be higher during the winter months.	Groundwater control measures may be required during foundation excavations. Design development of the proposed geotechnical substructure should accommodate the groundwater conditions, whilst accounting for potential seasonal fluctuations.

Table 12.1: Preliminary Geotechnical Risk Register

Subject	Hazard	Risk	Information to be communicated to Client / Contractor
Aggressivity to Concrete	Potential for concrete aggressivity within the ground and groundwater.	Impact on structural design of concrete in contact with the ground.	A concrete aggressivity assessment has resulted in Design Sulphate classes and Aggressive Chemical Environment for Concrete (ACEC) Classes of DS-4 AC-4 for concrete placed within the London Clay Formation. There is potential to reduce this to DS-2, AC-2 for piles, in discussion with a specialist piling contractor.
Pavement Design	Potential for encountering shallow groundwater and localised soft spots within the Made Ground.	Ground conditions may result in inadequate subgrade strength for pavement construction. Cost/programme implications if a more onerous pavement foundation is required.	The pavement design should consider the CBR and groundwater monitoring data. Subgrade formations shall be proof rolled and inspected, and soft spots removed. Pavement surface should be graded to allow surface water run-off.
Buried Obstructions & Utilities	Buried services are present within the site	Potential for clash between obstructions/utilities and proposed geotechnical substructure (i.e. foundations) Programme and cost implication of encountering and removing any unforeseen obstructions.	Structural foundations should penetrate into the London Clay Formation, bypassing any potential obstructions. This may require the breaking out and removal of obstructions at foundation locations. Any other obstructions across the site that are removed should be backfilled with suitably placed and compacted engineering fill. Design development and any eventual contractor should assess the existing and proposed utilities across the site and their impact upon the proposed structure, including the GPR survey undertaken. Suitable service clearance techniques (in accordance with HSG47) should be employed prior to breaking ground.
Electrical distribution network infrastructure	A substation is present bordering the east of the site. A cable tunnel passes beneath the eastern part of the site.	Potential for restrictions on proximity of heavy plant, or limits on vibration, in the vicinity of the substation. Potential for restrictions on foundation loading above or in close proximity to the cable tunnel.	Consultations with the asset owner (understood to be National Grid) should be undertaken, as part of developing the design n construction methodology.

13. RE-USE OF MATERIAL

13.1 Re-use Of Materials on Site

Where the re-use of soils at the site takes place this would need to be documented within a Materials Management Plan, following the CL:AIRE guidance "Definition of Waste: Development Industry Code of Practice". There is a four-point test for the re-use of material:

- Protection of human health and the environment - suitable risk assessments must be in place to demonstrate that the re-use of materials is acceptable.
- Suitability of use without further treatment - should the contaminated soils need treating then they may still be re-used if that treatment is carried out under appropriate authorisation.
- Certainty of use - there should be a justifiable reason for re-use rather than just avoiding waste disposal.
- Quantity of Materials - only the quantities required for the specific use should be used. Use of excessive material may be seen as waste disposal rather than justified re-use.

Assuming that these four points can be satisfied by providing suitable risk assessments and within the design of the development, it should be possible to reuse materials on site (if required). Ramboll considers this should be achievable for most of the soil that is present on-site.

From a geotechnical perspective, the predominantly coarse-grained Made Ground is likely to be re-useable as a Class 1 fill material, in accordance with the Highways England Specification for Highway Works, and subject to potential removal or breaking of coarser particles such as concrete, bricks and surfacing. Any re-use shall be subject to a project-specific earthworks specification.

13.2 Waste

Waste classification and material disposal should be considered ahead of any groundworks to provide an efficient and sustainable method of managing waste soil. The contractor should use the results of this report to inform waste classification.

14. CONCLUSIONS AND RECOMMENDATIONS

14.1 Conclusions – Contamination

Ramboll's investigation has not identified significant contamination in relation to the proposed data centre development.

Soil

All soil analytical results were below respective screening criteria (GACs) in respect of metals, inorganics, TPH, BTEX, PAHs and VOCs. The concentrations detected are not considered to pose a risk to a future commercial development and furthermore, the design of the proposed development is considered sufficient to mitigate exposure pathways (i.e. the soil will be capped with buildings and hardstanding mitigating the risk of exposure).

Asbestos was not identified in soil at any of the ten samples obtained by Ramboll; however, it is noted that previous investigation undertaken at the site in 2020 recorded loose asbestos fibres in Made Ground at two locations. Whilst significant risk to future site users have not been identified, consideration to the potential presence of asbestos and other typical brownfield contaminants during the construction phase is required and will necessitate information being held on the site safety file or future maintenance events as outlined further in the recommendations below.

Groundwater

A significant risk of pollution to Controlled Waters was not identified - a continuous groundwater body was not encountered at the site. Whilst some elevated contaminant concentrations were identified in discontinuous perched water, the concentrations are not considered significant due to the low sensitivity hydrogeological and hydrological setting. The concentrations of contaminants detected are considered to be reflective of background water quality in an area with an industrial legacy. Remediation is not considered necessary.

Ground Gas

Gas monitoring was undertaken on three occasions and did not identify significantly elevated concentrations of methane, carbon dioxide or elevated gas flows. Assessment of ground gases has identified the site to have a Gas Screening Value of 0.0064 l/hr: Characteristic Situation (CS) 1: Very Low Risk. Therefore, gas protection measures are not deemed necessary for the proposed development based on the current gas results. Ramboll's gas monitoring is consistent with a third party assessment (this included a further four rounds of monitoring).

Conclusion

Overall, based on this investigation Ramboll has not identified a significant risk of harm to human health or pollution of controlled waters (i.e. the main tests to determine whether land is contaminated). Therefore, Ramboll does not consider that the site would be determined as contaminated land by the local authority in terms of Part 2A of the Environmental Protection Act 1990 if the local authority was consulted over the results.

It cannot be discounted that 'hot spots' of contamination may be present between sampling points and that 'unexpected finds' may be encountered during earthworks, which could require management during redevelopment (this is the case for any brownfield land).

Ramboll considers that a watching brief for unexpected contamination will need to be upheld during the development phase in areas not accessible during this phase of investigation (e.g. within the area of existing building footprints). Development considerations are discussed further in the next section.

This report and risk assessment is not an appraisal of risks to ground development workers, and the site should be treated as a brownfield site.

14.2 Recommendations – Contamination

The proposed development will need to consider typical precautions of redeveloping a brownfield site, including among other things appropriate health and safety management for construction workers, waste soil classification, and method statements for unexpected contamination:

1. The Local Authority may require an intrusive environmental investigation as a condition of planning. This report should be submitted to the Local Authority in that regard and agreement reached on the scope of further actions (as outlined below).
2. It is possible that as-yet unidentified sources of contamination may be present at the site. A watching brief should be maintained for environmental purposes during the development works to record ground conditions in areas of the site that were not accessible during the current phase of investigation (for example within the footprints of existing buildings). This could take the form of a watching brief (and soil sampling if required) to be executed by a suitably qualified environmental consultant during the demolition and site clearance phase of the development works.
3. It cannot be discounted that 'unexpected finds' or 'hotspots' of contamination requiring management may be encountered during development. An 'unexpected contamination procedure' should be implemented to allow groundworkers to act appropriately upon encountering or suspecting the presence of previously unidentified ground contamination.
4. Appropriate health and safety management precautions should be followed prior to and during the construction phase. This report and the generic assessment criteria (GAC) consider long term and chronic risk to humans based on defined exposure scenarios set out in CLR11. In some cases, contaminants may also pose acute hazards to workers at a site and a worker's short exposure is not considered when deriving the GAC. Asbestos in soil is not considered by CLR11 and will need to be considered for the redevelopment works. The data generated by the investigation should therefore be considered in the appropriate pre-works health and safety assessment, together with the appropriate shorter exposure times for construction workers and more direct contact with the ground. It is anticipated that these short-term risks can be appropriately addressed through the use of appropriate, health and safety plans, safe working procedures and the use of personal protective equipment (PPE), in line with relevant legislation and guidance. Groundworks undertaken by the contractor should be given to CAR 2012 (or CAR-SOIL guidance) when undertaking works at the site
5. Material management plans should be prepared if, for example, excess material is to be retained or re-used on-site. Further testing may also be required to confirm the suitability of any material imported or re-used.
6. It is recommended that waste classification and material disposal is considered ahead of any groundworks to provide an efficient and sustainable method of managing waste soil.
7. If landscaping is planned a separate assessment should be undertaken to confirm that soil in landscaped areas is suitable for use. Soils for landscaped areas should be demonstrated to be suitable for use and not to provide a risk to future site users; soils should also comply with British Standard for Topsoil (BS3882:2015).
8. Future water supply pipes should be selected based on appropriate material selection criteria given the brownfield nature of the site.

14.3 Conclusions – Geotechnical

The development proposals comprise medium rise structures which will impart substantial foundation loads. The ground comprises made ground overlying London Clay. The Made Ground includes hardstanding, granular fill, and soft cohesive (clay) material.

The Made Ground will be unsuitable for supporting structural column loads, but it may be suitable for supporting loads from ground bearing floor slabs, subject to treatment or removal of soft material and detailed assessment of the ground stiffness.

The London Clay comprises an upper layer of weathered material to a maximum depth of 3.5m bgl. This depth is likely to be too deep for the practical excavation of conventional foundations, and the load carrying capacity of the ground may not be sufficient for the proposed structure, within acceptable settlement tolerances. Therefore, piled foundations are likely to be the most appropriate solution. A range of pile lengths and diameters have been considered in formulating indicative pile capacities.

Granular made ground is likely to be suitable for re-use as a road pavement foundation; however, cohesive made ground is likely to have insufficient stiffness in its in-situ condition for this use.

A summary of the geotechnical risks posed to the proposed development, relating to the ground and groundwater conditions encountered on site, is presented in the Geotechnical Risk Register in Section 12. Key risks include the potential for encountering buried obstructions, geochemical aggressivity of the ground and the potential for perched groundwater.

The geotechnical advice in this report is intended for preliminary assessment purposes only. The geotechnical designer for the scheme should consider the information and develop the design in liaison with the structural and civils designers, and detailed foundation solutions should be developed accordingly.

14.4 Recommendations – Geotechnical

The following recommendations are made for geotechnical design and aim to mitigate the identified risks associated with the ground and groundwater conditions:

1. The London Clay Formation is recommended as the founding layer for foundations supporting structural column loads for the proposed development.
2. A Geotechnical Design Report (GDR) should be produced for the project, compliant with requirements set out in Eurocode 7. The report shall include full details on the interpretation of design data and justification for foundation and earthworks design.
3. A performance piling specification should be developed, to specify the design requirements for a specialist piled foundation designer.
4. An earthworks specification should be developed to specify the requirements for material re-use and excavations within the site.
5. Ramboll has not undertaken any interpretation of the results of the thermal and electrical resistivity testing undertaken as part of this report. Design development of the utilities and services associated with the development should consider the test data

APPENDIX 1
FIGURES

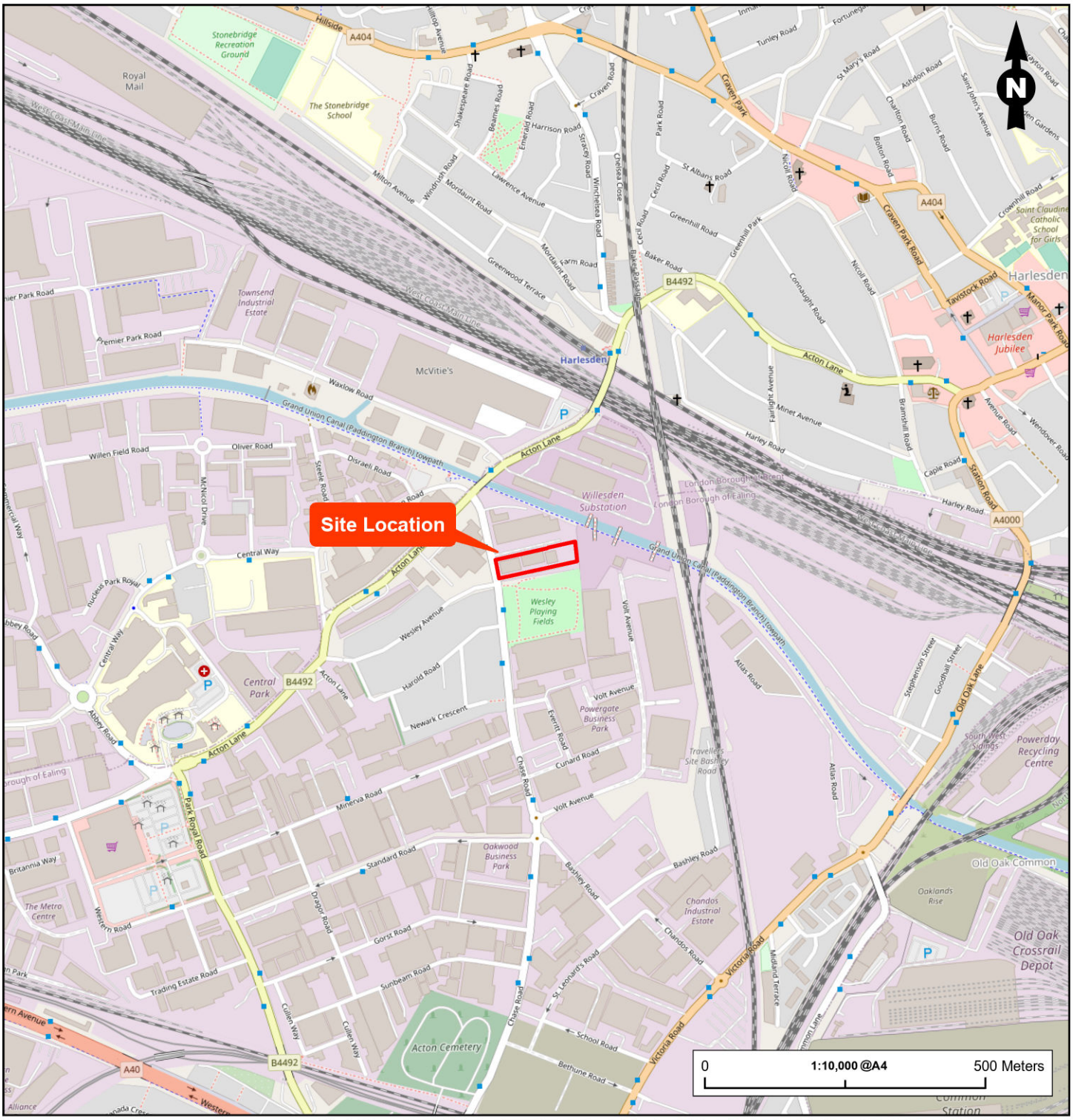
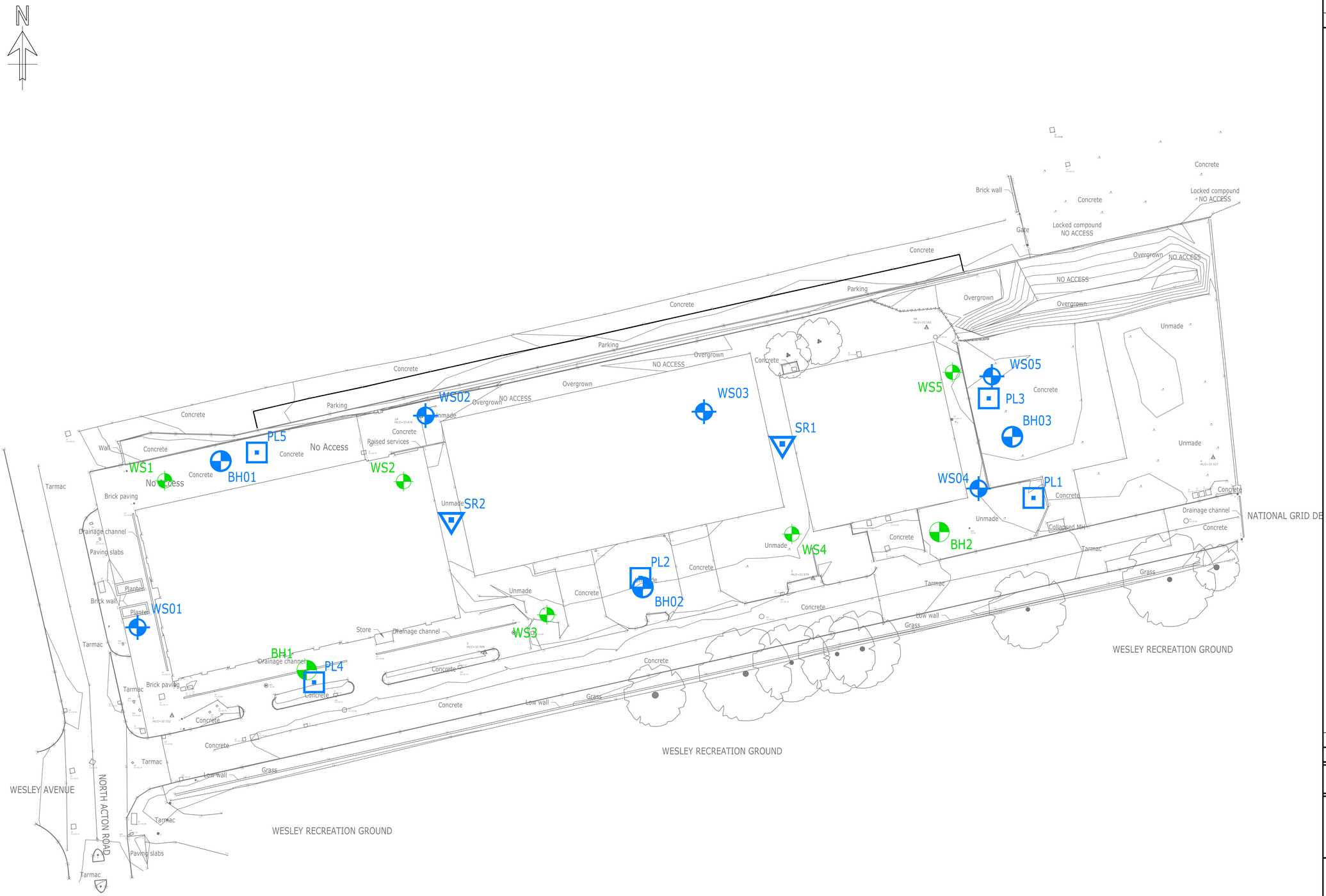


Figure Title: Figure 1: Site Location	Project Name: 37-39, North Acton Road, London, NW10 6PF	Date: October 2021		RAMBOLL
		Scale: As shown		
Project Number: 1620013218	Client: Northtree Investment Management	Issue: 1	Prepared By: BVK	



Notes

1. DO NOT SCALE FROM THIS DRAWING.
2. ALL DIMENSIONS ARE MILLIMETRES U.N.O.
3. ALL LEVELS ARE IN METRES ABOVE ORDNANCE DATUM U.N.O.
4. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.

PLAN LEGEND

JOMAS ASSOCIATES LTD GROUND INVESTIGATION (AUGUST 2020)

- WINDOWLESS SAMPLE
- EXPLORATORY BOREHOLE

GEOTECHNICAL ENGINEERING LTD GROUND INVESTIGATION (APRIL 2022)

- WINDOWLESS SAMPLE
- EXPLORATORY BOREHOLE
- PLATE LOAD TEST
- INSITU RESISTIVITY TEST

Rev	Description	Date	By	Chk	App
I01	PRELIMINARY INFORMATION	21/06 2022	DH	IB	-

INFORMATION

LRH21
NORTH ACTON ROAD

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FIGURE 2:
EXPLORATORY HOLE LOCATION PLAN
TOPOGRAPHICAL SURVEY

Project No:	Scale (@A1):	Drawn:	Date:
RUK2021N00705	1:250	DH	JUNE 22

Drawing No: RAM-XX-00-DR-G-00001 Rev: I01

22/06/2022 11:23:43

Notes

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Rev	Description	Date	By / Chk	App
I01	PRELIMINARY INFORMATION	21/06 2022	DH / IB	-

INFORMATION

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NORTH ACTON ROAD

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FIGURE 3:
EXPLORATORY HOLE LOCATION PLAN
PROPOSED DEVELOPMENT

Project No:	Scale (@A1):	Drawn:	Date:
RUK2021N00705	1:250	DH	JUNE 22

Drawing No:	Rev:
RAM-XX-00-DR-G-00002	I01

22/06/2022 11:22:47

APPENDIX 2
GEL FACTUAL REPORT AND BOREHOLE LOGS

VANTAGE LHR21, NORTH ACTON ROAD, LONDON

FACTUAL GROUND INVESTIGATION REPORT

Prepared for RAMBOLL UK LTD

Report Ref: 37013

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VANTAGE LHR21, NORTH ACTON ROAD, LONDON

FACTUAL GROUND INVESTIGATION REPORT

Prepared for RAMBOLL UK LTD

Report Ref: 37013

PROJECT: Construction of a new five storey commercial property

VOLUME - VERSION	STATUS	ORIGINATOR	CHECKER	APPROVED	DATE
1 of 1 – A	DRAFT	AT	CT	-	15/06/2022
1 of 1 – B	FINAL	AT	CT	CT	04/07/2022

ORIGINATOR	APPROVER
	
A TATNELL Senior Engineering Geologist	C THOMAS Geotechnical Consultant

The report is not to be used for contractual or engineering purposes unless this sheet is signed and the report designated “Final”.
The report has been prepared for the sole use and reliance by Ramboll UK LTD. GEL accepts no liability as a result of the use or reliance of this report by any other parties.

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FIGURES **Nos.**

APPENDICES

1. INTRODUCTION

It is proposed to demolish the existing light industrial structures and construct a new 5-storey commercial property for use as a datacentre at 37-39 North Acton Road, London. Geotechnical Engineering Limited (GEL) was instructed by Ramboll UK Limited (the Client) to carry out an investigation to determine the ground conditions.

The scope of works and terms and conditions of appointment were specified by the Client and GEL correspondence reference T33063 dated 15th February 2022. The investigation was carried out under direction and supervision of the Client.

This report describes the investigation and presents the findings.

2. SITE LOCATION AND GEOLOGY

The site is situated at 37-39 North Acton Road, London and is located north of Wesley Recreation Ground, east of North Acton Road, south of the Royal London Industrial Estate and west of Powergate Business Park. The centre of the site can be located by its National Grid co-ordinates TQ 208 830.

British Geological Survey (BGS) England and Wales (Sheet No. 256, 1:50,000, 2006) and the BGS online geology (1:50,000) indicate the site is underlain by the solid geology of the London Clay Formation, no superficial deposits are record beneath the site. Made Ground associated with construction of the existing light industrial structures was anticipated.

3. GROUND INVESTIGATION

3.1 Fieldwork

The fieldwork was carried out in general accordance with BS5930:2015+A1:2020 during the period 19th April to 27th April 2022 and comprised three cable percussion boreholes, five dynamic sample boreholes, fifteen in-situ thermal resistivity tests, five plate load tests and two electrical resistivity tests.

The exploratory hole locations were selected by the Client and set out by this Company and are shown on Figure 1. The ground level and co-ordinates at each exploratory hole were established by this Company using GPS techniques.

Cable Percussion boreholes

The boreholes, referenced BH01 to BH03 (Appendix A), were formed using a light cable tool (shell and auger) rig utilising either 200mm and 150mm tools and casing. Initially, rotary core (300mm) drilling techniques utilising a water flush was used to penetrate surface hardstanding at boreholes BH01 and BH03. An inspection pit was then hand excavated at each borehole location to 1.20m to check for buried services. The boreholes were advanced using a clay cutter and bailer.

Disturbed samples of the arisings were taken and retained in plastic bags and airtight containers. Undisturbed samples of 100mm nominal diameter were taken in suitable cohesive soils using a thin walled, open drive sampler (UT100). The UT samples were wax sealed and capped on site to prevent moisture loss.

Standard penetration tests (SPT) were carried out in general accordance with BS EN ISO 22476-3:2005+A1:2011. A split barrel was used and the samples retained in airtight jars. The SPT N value was taken as the number of blows to penetrate the 300mm test drive following a 150mm

seating drive. Where low penetration was recorded the seating drive was terminated at 25 blows and the test drive completed after a further 50 blows. Detailed SPT results, together with the energy ratio (E_r), are presented in Appendix A and summarised as uncorrected N values on the borehole logs.

Boreholes were monitored for groundwater ingress as boring proceeded. Upon encountering water in BH01 and BH03, boring was temporarily stopped to allow the level to stabilise. Water levels were also recorded at the start and finish of each day's work and on completion of the borehole and are presented on the relevant log.

On completion, gas/water monitoring standpipes were installed in BH01 to BH03. Each installation consisted of a 50mm ID HDPE slotted tube set in a filter response zone of non-calcareous pea gravel. The installation was sealed above (and below in boreholes BH01 and BH03) with a bentonite plug and accessed via a valve assembly. The installations were protected at the surface by a lockable stopcock cover set in concrete. Installation details are given on the relevant borehole log.

Dynamic sample boreholes

The boreholes, referenced WS01 to WS05 (Appendix A), were formed using a Terrier 2000 rig. Initially, rotary core (300mm) drilling techniques utilising a water flush was used to penetrate surface hardstanding at boreholes WS01, WS03, WS04 and WS05. An inspection pit was then hand excavated at each borehole location 1.20m to check for buried services. Disturbed samples were taken and retained in a combination of plastic tubs and bags.

Thermal resistivity values (Appendix A) were determined within the inspection pits of boreholes WS01 to WS05 at depths of 0.30m, 0.70m and 1.00m in accordance with IEEE Std 442 (2003). Testing was carried out in-situ using a TEMPOS Thermal Properties Analyser and TR-3 probe. Disturbed samples of the tested material were taken and retained in plastic tubs and the moisture content determined in accordance with BS EN ISO 17892-1:2014.

Dynamic sampling techniques were then employed to produce a continuous disturbed sample of 97mm diameter reducing to 83mm (except borehole WS05) and 70mm (borehole WS04 only) as the borehole was advanced. The samples were recovered in semi-rigid plastic liner which were extracted horizontally from the sampler, labelled and each end sealed to retain moisture.

Standard penetration tests (SPT) were carried out in general accordance with BS EN ISO 22476-3:2005+A1:2011. A split barrel was used and the samples retained in airtight jars. The SPT N value was taken as the number of blows to penetrate the 300mm test drive following a 150mm seating drive. Detailed SPT results, together with the energy ratio (Er), are presented in Appendix A and summarised as uncorrected N values on the borehole logs.

Groundwater was not encountered during the drilling of the dynamic sampler boreholes.

On completion, gas/water monitoring standpipes were installed in WS01 to WS05. Each installation consisted of a 50mm ID HDPE slotted tube set in a filter response zone of non-calcareous pea gravel. The installation was sealed above and below with a bentonite plug and accessed via a valve. The installations were protected at the surface by a lockable stopcock cover set in concrete. Installation details are given on the relevant borehole log.

Plate Load Tests

Plate loading tests, referenced PL1 to PL5 were carried out beneath surface hardstanding to determine equivalent California Bearing Ratio (CBR) values. The tests were carried out in general accordance with BS1377:1990: Part 9:4.1 and the equivalent CBR value determined in accordance with HA Interim Advice Note 73/06 (2009). A 452mm diameter plate was used with load transmitted to the plate by jacking against the underside of a 14-tonne excavator. Sequential loads were applied to produce a penetration range of 0 to 2mm at approximately 0.25 to 0.50mm intervals. The load determined from a plate penetration of 1.25mm enabled

the calculation of the equivalent CBR value. The testing was undertaken by Hixtra Limited and the results are presented in Appendix A.

Resistivity

In situ resistivity tests, referenced SR1 and SR2 (Appendix A), were carried out in accordance with BS EN 50522 (2012) by SUMO Geophysics Limited using a Megger DET 2/2 Digital Earth Tester. Only Type A Wenner arrays (one of two array options specified by the Client) could be carried out at each test location in north-northwest/south-southeast orientation due to the limited space available.

Testing was carried out using an array of four equally spaced probes, with probe spacing's of 0.3m, 0.5m. 0.7m, 1m, 1.5m, 2m, 3m, 4m, 5m, 7m, 9m (location SR2) and 10m (location SR1), with probe spacing being equal to the effective testing depth. Results are presented as average apparent soil resistivity values in Ωm, except where values deviate by greater than 15% from the average.

Sample Delivery

On completion of fieldwork all samples were brought to this Company's laboratory for testing and storage.

3.2 Logging

The logging of soils was carried out by an Engineering Geologist in general accordance with BS5930:2015+A1:2020. A key to the exploratory hole logs is presented in Appendix A.

Detailed descriptions of the samples are given in the borehole logs, Appendix A, along with details of sampling, in situ testing, groundwater ingress, installations and relevant comments on drilling techniques.

3.3 Laboratory Testing

A schedule of laboratory tests was prepared by the Consultant, the results are presented in Appendix B.

The natural water content was determined on ten selected samples in accordance with BS EN ISO 17892-1:2014.

Liquid limit, plastic limit and plasticity index tests were carried out on ten selected samples in accordance with BS EN ISO 17892-12:2018:5.3 & 5.5. An Atterberg line plot has also been presented.

The swelling pressure test was carried out in the oedometer on five 63.5mm diameter by 19mm thick specimens prepared from UT100 samples in accordance with BS 1377-5:4.3.

The one-dimensional consolidation properties were determined in the oedometer in accordance with BS EN ISO 17892-5:2017. The tests were carried out on five 63.5mm diameter by 19mm thick specimens prepared from UT100 samples. The results are presented in tabular form and also as graphs of void ratio versus log (effective pressure).

Unconsolidated undrained triaxial compression tests were carried out under a single cell pressure in accordance with BS EN ISO 17892-8:2018 on twenty-eight specimens prepared from full diameter UT100 samples. A cell pressure specified by the Consultant was used. Fully saturated, $\Phi_u = 0$, conditions were assumed and the undrained cohesion, c_u was taken as half the deviator stress at failure.

The BRE SD1 (2005) suite of tests was carried out on thirteen samples by Chemtest Limited using in-house methods.

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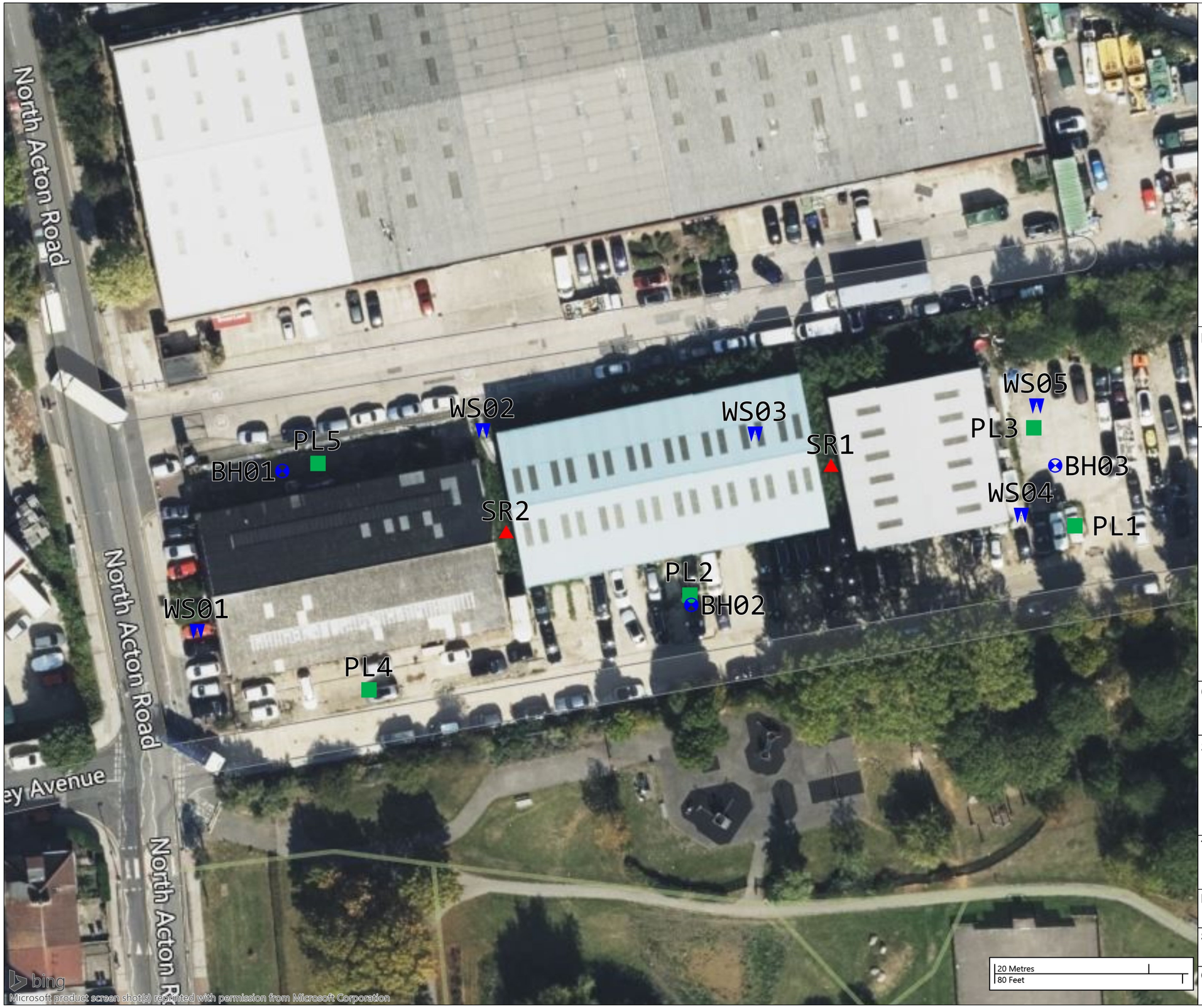

Key.

- Locations By Type - CP
- Locations By Type - WS
- In-situ Resistivity - SR
- Plate Load Test - PL

North

Notes:

Microsoft product screen shot(s) reprinted with permission from Microsoft Corporation

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Client: RAMBOLL UK LTD

Site: VANTAGE LHR21, NORTH ACTON ROAD, LONDON

Title: EXPLORATORY HOLE LOCATION PLAN

Drawn By:	CN	Checked By:	EC	Paper Size:	A3
Scale:	1:500	Date:	June 2022		
Contract:	37013	Figure:	1		

APPENDIX A

FIELDWORK DATA

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KEY TO EXPLORATORY HOLE LOGS

Sample type

D	Small disturbed	U	Undisturbed	L	Dynamic	ES	Environmental - soil
B	Bulk disturbed	UT	Undisturbed thin wall	C	Core	EW	Environmental - water
LB	Large bulk disturbed	P	Piston	W	Water		

CS Core subsample (prepared)
LS Dynamic subsample (prepared)

Test type

S SPT - Split spoon sampler followed by uncorrected SPT 'N' Value
C SPT - Solid cone followed by uncorrected SPT 'N' Value
(*250 - Where full test drive not completed, linearly extrapolated 'N' value reported, ** - Denotes no effective penetration). Arrow length reflects test depth range.
H Hand vane - direct reading in kPa - not corrected for BS1377 (1990). Re* denotes refusal. Where the limit of the equipment is reached during a test, the reported value is the minimum recorded shear strength of the material.
M Mackintosh probe - number of blows to achieve 100mm penetration
Mx Mexe cone - average reading of equivalent CBR value in %
PP Pocket penetrometer - calculated reading in kPa
Vo Headspace vapour reading, uncorrected peak values in ppm, using a PID (calibrated with isobutylene, using a 10.6eV bulb)
TR In situ thermal resistivity by needle probe in mK/W

Sample/core range/I_f

Dynamic sample

Undisturbed sample - open drive including thin wall. Symbol length reflects recovery

$\overline{x}$ x = Total Core Recovery (TCR) as percentage of core run

y y = Solid Core Recovery (SCR) as percentage of core run. Assessment of core is based on full diameter

$\underline{z}$ z = Rock Quality Designation (RQD). The amount of solid core greater then 100mm expressed as percentage of core run

Where SPT has been carried out at the beginning of core run, disturbed section of core excluded from SCR and RQD assessment

I_f - fracture spacing - the modal fracture spacing (mm) over the indicated length of core. Where spacing varies significantly, the minimum, mode and maximum values are also given. NI = non-intact core NA = not applicable NR = no recovery

Instrumentation

Porous tip
Perforated standpipe
Inclinometer
Extensometer

Backfill

Granular response zone
Bentonite seal
Cement/ bentonite grout
Soil backfill
Concrete

Cover

instru -ment Raised cover
instru -ment Stopcock cover

Stratum boundaries

Estimated boundary
Grading boundary

Logging

The logging of soils and rocks has been carried out in general accordance with BS 5930:2015+A1:2020

Chalk is logged in general accordance with Lord et al (2002) CIRIA C574. Where possible, dynamic samples in chalk have been logged in accordance with CIRIA C574; descriptions and gradings (if presented) should be treated with caution given the potential for sample disturbance.

For rocks the term fracture has been used to identify a mechanical break within the core. Where possible incipient and drilling induced fractures have been excluded from the assessment of fracture state. Where doubt exists, a note has been made in the descriptions. All fractures are considered to be continuous unless otherwise reported.

Made Ground is readily identified when, within the natural make up, man made constituents are evident. Where Made Ground appears to be reworked natural material the differentiation between in situ natural deposits and Made Ground is much more difficult to ascertain. The interpretation of Made Ground within the logs should therefore be treated with caution.

The descriptors "topsoil" and "tarmacadam" are used as generic terms and do not imply conformation to any particular standard or composition.

Rootlets are defined as being less than 2mm in diameter, roots are defined as in excess of 2mm diameter.

General comments

The process of drilling and sampling will inevitably lead to sample disturbance, mixing or loss of material in some soil and rocks.

Indicated water levels are those recorded during the process of drilling or excavating exploratory holes and may not represent standing water levels.

All depths are measured along the axis of the borehole and are related to ground level at the point of entry. All inclinations are measured normal to the axis of the core.

Where provided, the stratigraphical names/geological rock units are for guidance only and may not be wholly accurate.

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BOREHOLE LOG

BH01

CLIENT RAMBOLL UK LTD

SITE VANTAGE LHR21, NORTH ACTON ROAD, LONDON

Sheet 1 of 5

Start Date 19 April 2022 Easting 520788 Scale 1:50

End Date 21 April 2022 Northing 183001 Ground Level 32.75mOD Depth 35.50 m

sample no & type	sample depth (m) from	to	casing depth (m)	samp. range	chiselling details	water strike/ added (m)	instru -ment	test type & value	description	depth (m)	reduced level (m)	legend
C	0.00	0.25							Light greyish brown CONCRETE with 5mm diam steel reinforcement bars (150mm grid). (MADE GROUND)	0.25	32.50	
1B	0.35	0.50										
2D	0.35	0.50							Black silty gravelly (ashy) fine to coarse SAND with a faint organic odour. Gravel is angular to rounded fine slag and clinker. (MADE GROUND)	0.55	32.20	
3B	0.90	1.10										
4D	0.90	1.10				1.10			Soft greenish grey locally speckled black slightly sandy silty CLAY with a faint organic odour and frequent fragments (up to 5mm) of decomposed plant material.	1.30	31.45	
5UT	1.20	1.65	1.20									
6D	1.70								Soft fissured brown locally slightly gravelly CLAY with frequent selenite crystals (up to 2mm). Fissures are randomly orientated extremely closely spaced with bluish grey gleying. Gravel is angular fine claystone.			
7B	1.90											
8D	2.50	2.95	2.50					S 7		2.50	30.25	
9B	2.50	2.80							Soft fissured grey CLAY with frequent pockets (up to 150mm diam) of orangish brown clay and frequent selenite crystals (up to 4mm). Fissures are randomly orientated extremely closely spaced undulating smooth with bluish grey gleying frequently infilled with brown relict rootlets.			
10D	3.00											
11UT	3.50	3.95	3.50							3.50	29.25	
12D	4.00								Firm fissured brown slightly sandy CLAY with frequent selenite crystals (up to 10mm). Fissures are randomly orientated very closely spaced undulating smooth with bluish grey gleying frequently infilled with brown relict rootlets.			
13D	4.50	4.95	4.00					S 14		4.50	28.25	
14B	4.50	4.80							Firm fissured brown CLAY with rare selenite crystals (up to 25mm). Fissures are randomly orientated very closely spaced planar smooth with rare bluish grey gleying.			
15D	5.00											
16UT	5.50	5.95	4.50									
17D	6.00									6.00	26.75	
18D	6.50	6.95	4.50					S 17	Stiff fissured brown CLAY with rare selenite crystals (up to 20mm). Fissures are subvertical extremely closely spaced undulating smooth with frequent brownish orange gleying.			
19B	6.50	6.80								6.70	26.05	
									Stiff thinly laminated dark grey silty CLAY with rare selenite crystals (up to 2mm).			
20D	7.50											
21UT	8.00	8.45	4.50									

Continued Next Page

HOLE CONSTRUCTION

TOP (m)	BASE (m)	TYPE	PLANT USED
0.00	0.25	Rotary Core	Bolt down coring unit
0.25	1.20	Inspection Pit	Hand tools
1.20	35.50	Cable Percussion	Dando 3000

WATER STRIKE Groundwater not encountered

DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS
1.10	Nil	1.10	20	Seepage

CASING DEPTH

DIAM (mm)	BASE (m)
200	4.50
150	9.50

HOLE DIAMETER

DIAM (mm)	BASE (m)
300	0.25
200	8.00
150	35.50

BACKFILL

TOP (m)	BASE (m)	MATERIAL
0.00	0.50	Concrete
0.50	3.00	Bentonite
3.00	8.00	Gravel
8.00	35.50	Bentonite

INSTRUMENTATION

DEPTH (m)	TYPE
8.00	Standpipe (50mm)

HOLE PROGRESS

DATE TIME	DEPTH (m)	CASING (m)	WATER (m)
19-04-2022 09:20	0.00	Nil	
19-04-2022 16:00	8.00	4.50	Dry
20-04-2022 09:00	8.00	4.50	Dry
20-04-2022 15:30	27.00	9.50	Dry
21-04-2022 08:30	27.00	9.50	Dry

REMARKS

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Geotechnical Engineering Limited

BOREHOLE LOG

BH01

CLIENT RAMBOLL UK LTD

SITE VANTAGE LHR21, NORTH ACTON ROAD, LONDON

Sheet 2 of 5

Start Date 19 April 2022 Easting 520788 Scale 1:50

End Date 21 April 2022 Northing 183001 Ground Level 32.75mOD Depth 35.50 m

sample no & type	sample depth (m) from	to	casing depth (m)	samp. range	chiselling details	water strike/ added (m)	instru -ment	test type & value	description	depth (m)	reduced level (m)	legend
22D	8.50									8.50	24.25	
									Stiff thinly laminated dark grey slightly sandy CLAY with frequent randomly orientated burrows (up to 20mm) infilled with grey silt and rare selenite crystals (up to 2mm).			
23D	9.00											
24D	9.50	9.95	9.00					S 27				
25B	9.50	9.80										
26D	10.50											
27UT	11.00	11.45	9.50									
28D	11.50											
29D	12.00											
30D	12.30								12.20 - 12.50m: Extremely weak grey claystone with frequent veins of white calcite (up to 25mm) recovered non-intact.	12.50	20.25	
31D	12.50	12.95	9.50					S 34				
32B	12.50	12.80										
									Very stiff indistinctly fissured thinly laminated dark grey locally slightly sandy CLAY with frequent selenite crystals (up to 2mm diam) and rare subangular pyrite nodules (up to 40mm).			
33D	13.00								13.30 - 13.50m: Extremely weak grey claystone recovered non-intact.			
34UT	14.00	14.45	9.50									
35D	14.50											
36D	15.00											
37D	15.50	15.95	9.50					S 35				
38B	15.50	15.80										

Continued Next Page

HOLE CONSTRUCTION
TOP (m) BASE (m) TYPE PLANT USED

WATER STRIKE Groundwater not encountered
DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH
DIAM (mm) BASE (m)

HOLE DIAMETER
DIAM (mm) BASE (m)

BACKFILL
TOP (m) BASE (m) MATERIAL

INSTRUMENTATION
DEPTH (m) TYPE

HOLE PROGRESS

DATE TIME	DEPTH (m)	CASING (m)	WATER (m)
21-04-2022 13:00	35.50	9.50	Dry

REMARKS

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BOREHOLE LOG

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Sheet 3 of 5

Start Date 19 April 2022 Easting 520788 Scale 1:50

End Date 21 April 2022 Northing 183001 Ground Level 32.75mOD Depth 35.50 m

sample no & type	sample depth (m) from	to	casing depth (m)	samp. range	chiselling details	water strike/ added (m)	instru -ment	test type & value	description	depth (m)	reduced level (m)	legend
39D	16.50											
40UT	17.00	17.45	9.50									
41D	17.50									17.50	15.25	
									Very stiff thinly laminated dark brownish grey locally slightly sandy CLAY with abundant selenite crystals (up to 2mm) and frequent randomly orientated burrows (up to 20mm) infilled with grey silt.			
42D	18.00											
43D	18.50	18.95	9.50					S 45				
44B	18.50	18.80										
45D	19.00											
46UT	19.50	19.95	9.50									
47D	20.00											
48D	20.50											
49D	21.50	21.87	9.50					S *69				
50B	21.50	22.00										
									21.80 - 22.30m: Extremely weak grey claystone recovered non-intact.			
51D	22.50											
52UT	23.00	23.45	9.50									
									23.00 - 23.45m: Triaxial suggests stiff.			
53D	23.50											
54D	24.00											

Continued Next Page

HOLE CONSTRUCTION
TOP (m) BASE (m) TYPE PLANT USED

WATER STRIKE Groundwater not encountered
DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH
DIAM (mm) BASE (m)

HOLE DIAMETER
DIAM (mm) BASE (m)

BACKFILL
TOP (m) BASE (m) MATERIAL

INSTRUMENTATION
DEPTH (m) TYPE

HOLE PROGRESS
DATE TIME DEPTH (m) CASING (m) WATER (m)

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BOREHOLE LOG

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SITE VANTAGE LHR21, NORTH ACTON ROAD, LONDON

Sheet 4 of 5

Start Date 19 April 2022 Easting 520788 Scale 1:50

End Date 21 April 2022 Northing 183001 Ground Level 32.75mOD Depth 35.50 m

sample no & type	sample depth (m) from	to	casing depth (m)	samp. range	chiselling details	water strike/ added (m)	instru -ment	test type & value	description	depth (m)	reduced level (m)	legend
55D	24.50	24.95	9.50					S 50				
56B	24.50	24.80										
57D	25.50											
58UT	26.00	26.45	9.50									
59D	26.50											
60D	27.00											
61D	27.50	27.88	9.50					S *65				
62B	27.50	27.80										
63D	28.50											
64UT	29.00	29.45	9.50									
65D	29.50											
66D	30.00											
67D	30.50	30.88	9.50					S *66				
68B	30.50	30.80										
69D	31.00											
70UT	32.00	32.45	9.50	-								

Continued Next Page

HOLE CONSTRUCTION
TOP (m) BASE (m) TYPE PLANT USED

WATER STRIKE Groundwater not encountered
DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH
DIAM (mm) BASE (m)

HOLE DIAMETER
DIAM (mm) BASE (m)

BACKFILL
TOP (m) BASE (m) MATERIAL

INSTRUMENTATION
DEPTH (m) TYPE

HOLE PROGRESS
DATE TIME DEPTH (m) CASING (m) WATER (m)

REMARKS

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BOREHOLE LOG

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SITE VANTAGE LHR21, NORTH ACTON ROAD, LONDON

Sheet 5 of 5

Start Date 19 April 2022 Easting 520788 Scale 1:50

End Date 21 April 2022 Northing 183001 Ground Level 32.75mOD Depth 35.50 m

sample no & type	sample depth (m) from	to	casing depth (m)	samp. range	chiselling details	water strike/ added (m)	instru -ment	test type & value	description	depth (m)	reduced level (m)	legend
										32.20	0.55	
71D	32.50								Very stiff indistinctly fissured dark brownish grey CLAY with abundant selenite crystals (up to 2mm), frequent burrows (up to 30mm) infilled with grey silt and rare shell fragments (up to 20mm diam).			
72D	33.00											
73D	33.50	33.87	9.50					S *67				
74B	33.50	33.80										
75D	34.50											
76UT	35.00	35.45	9.50									
77D	35.50									35.50	-2.75	
									Borehole Completed at 35.50m			

HOLE CONSTRUCTION
TOP (m) BASE (m) TYPE PLANT USED

WATER STRIKE Groundwater not encountered
DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH
DIAM (mm) BASE (m)

HOLE DIAMETER
DIAM (mm) BASE (m)

BACKFILL
TOP (m) BASE (m) MATERIAL

INSTRUMENTATION
DEPTH (m) TYPE

HOLE PROGRESS
DATE TIME DEPTH (m) CASING (m) WATER (m)

REMARKS

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BOREHOLE LOG

BH02

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SITE VANTAGE LHR21, NORTH ACTON ROAD, LONDON

Sheet 1 of 5

Start Date 21 April 2022 Easting 520842 Scale 1:50

End Date 26 April 2022 Northing 182985 Ground Level 33.00mOD Depth 35.00 m

sample no & type	sample depth (m) from	to	casing depth (m)	samp. range	chiselling details	water strike/ added (m)	instru -ment	test type & value	description	depth (m)	reduced level (m)	legend
1B	0.20	0.40							Soft brown slightly sandy slightly gravelly silty CLAY with rare fragments of wood (up to 70mm), plastic (up to 50mm) and glass (up to 55mm). Gravel is angular to rounded fine to coarse flint, brick, ceramic and concrete. (MADE GROUND)			
2D	0.20	0.40								0.60	32.40	
3B	0.80	1.00							Stiff friable dark brown slightly sandy slightly gravelly silty CLAY. Gravel is angular fine to coarse brick, ceramic and concrete. (MADE GROUND)			
4D	0.80	1.00								1.10	31.90	
5D	1.50		1.50						Soft becoming firm brown mottled orangish brown and bluish grey locally slightly gravelly CLAY with frequent brown relict rootlets. Gravel is subrounded and rounded fine to coarse flint and quartzite.			
6UT	1.50	1.95								1.95	31.05	
7D	1.90								Firm thinly laminated brown mottled bluish grey CLAY with rare pockets (up to 30mm) of brownish orange silt.			
8D	2.00									2.50	30.50	
10B	2.50	2.80	2.50					S 9	Firm indistinctly fissured brown CLAY with frequent pockets (up to 20mm) of brownish orange silt and frequent selenite crystals (up to 2mm). Fissures are gleyed bluish grey.			
9D	2.50	2.95										
11D	3.00											
12UT	3.50	3.95	2.50									
13D	4.00											
14D	4.50		2.50					S 17	Stiff fissured brown locally orangish brown CLAY with frequent selenite crystals (up to 5mm). Fissures are randomly orientated extremely closely spaced intersecting planar smooth with bluish grey gleying.	4.50	28.50	
15D	4.50	4.95										
16B	4.50	4.80										
17D	5.50		2.50						Firm becoming stiff fissured thinly laminated brown mottled orange CLAY with frequent selenite crystals (up to 3mm). Fissures are subhorizontal and subvertical very closely spaced intersecting planar smooth faintly gleyed bluish grey and brownish orange.	5.50	27.50	
18UT	5.50	5.95										
19D	6.00											
20D	6.50		2.50					S 19	Stiff fissured thinly laminated dark grey slightly sandy CLAY with rare burrows (up to 20mm) infilled with grey silt. Fissures are randomly orientated extremely closely spaced undulating smooth with orange gleying.	6.80	26.20	
21D	6.50	6.95										
22B	6.50	6.80										
23D	7.00											
									Stiff fissured thinly laminated fissured dark grey locally slightly sandy CLAY with rare selenite crystals (up to 25mm). Fissures are randomly orientated very closely spaced intersecting planar smooth.	7.50	25.50	
24UT	8.00	8.45	2.50									

Continued Next Page

HOLE CONSTRUCTION

TOP (m)	BASE (m)	TYPE	PLANT USED
0.00	1.20	Inspection Pit	Hand tools
1.20	35.00	Cable Percussion	Dando 3000

WATER STRIKE Groundwater not encountered

DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS

CASING DEPTH

DIAM (mm)	BASE (m)
150	2.50

HOLE DIAMETER

DIAM (mm)	BASE (m)
150	35.00

BACKFILL

TOP (m)	BASE (m)	MATERIAL
0.00	0.50	Concrete
0.50	20.00	Bentonite
20.00	35.00	Gravel

INSTRUMENTATION

DEPTH (m)	TYPE
35.00	Standpipe (50mm)

HOLE PROGRESS

DATE TIME	DEPTH (m)	CASING (m)	WATER (m)
21-04-2022 14:45	0.00	Nil	
21-04-2022 15:30	1.20	Nil	Dry
22-04-2022 08:30	1.20	Nil	Dry
22-04-2022 14:00	19.00	2.50	Dry
25-04-2022 08:50	19.00	2.50	Dry

REMARKS

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BOREHOLE LOG

BH02

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SITE VANTAGE LHR21, NORTH ACTON ROAD, LONDON

Sheet 2 of 5

Start Date 21 April 2022 Easting 520842 Scale 1:50

End Date 26 April 2022 Northing 182985 Ground Level 33.00mOD Depth 35.00 m

sample no & type	sample depth (m) from	to	casing depth (m)	samp. range	chiselling details	water strike/ added (m)	instru -ment	test type & value	description	depth (m)	reduced level (m)	legend
25D	8.50											
26D	9.00											
27D 28B	9.50 - 9.95 9.50 - 9.80		2.50					S 27				
29D	10.50											
30UT	11.00 - 11.45		2.50									
31D	11.50											
32D	12.00											
33D 34B	12.50 - 12.95 12.50 - 12.80		2.50					S 29	Stiff becoming very stiff fissured thinly laminated dark grey locally slightly sandy CLAY with frequent burrows (up to 20mm) infilled with grey silt and abundant selenite crystals (up to 2mm). Fissures are randomly orientated very closely spaced planar smooth.	12.50	20.50	
35D	13.50											
36UT	14.00 - 14.45		2.50									
37D	14.50											
38D	15.00											
39D 40B	15.50 - 15.95 15.50 - 15.80		2.50					S 34				

Continued Next Page

HOLE CONSTRUCTION
TOP (m) BASE (m) TYPE PLANT USED

WATER STRIKE Groundwater not encountered
DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH
DIAM (mm) BASE (m)

HOLE DIAMETER
DIAM (mm) BASE (m)

BACKFILL
TOP (m) BASE (m) MATERIAL

INSTRUMENTATION
DEPTH (m) TYPE

HOLE PROGRESS

DATE TIME	DEPTH (m)	CASING (m)	WATER (m)
25-04-2022 16:00	35.00	2.50	Dry
26-04-2022 08:30	35.00	2.50	Dry

REMARKS

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Geotechnical Engineering Limited

BOREHOLE LOG

BH02

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SITE VANTAGE LHR21, NORTH ACTON ROAD, LONDON

Sheet 3 of 5

Start Date 21 April 2022 Easting 520842 Scale 1:50

End Date 26 April 2022 Northing 182985 Ground Level 33.00mOD Depth 35.00 m

sample no & type	sample depth (m) from	to	casing depth (m)	samp. range	chiselling details	water strike/ added (m)	instru -ment	test type & value	description	depth (m)	reduced level (m)	legend
41D	16.50											
42UT	17.00	17.45	2.50									
43D	17.50											
44D	18.50		2.50					S 39				
45D	18.50	18.95										
46B	18.50	18.80										
47D	19.50											
48UT	20.00	20.45	2.50									
49D	20.50											
50D	21.00											
51D	21.50	21.95	2.50					S 42				
52B	21.50	21.80										
53D	22.50											
54UT	23.00	23.45	2.50									
55D	23.50											
56D	24.00								Continued Next Page	24.00	9.00	

HOLE CONSTRUCTION
TOP (m) BASE (m) TYPE PLANT USED

WATER STRIKE Groundwater not encountered
DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH
DIAM (mm) BASE (m)

HOLE DIAMETER
DIAM (mm) BASE (m)

BACKFILL
TOP (m) BASE (m) MATERIAL

INSTRUMENTATION
DEPTH (m) TYPE

HOLE PROGRESS
DATE TIME DEPTH (m) CASING (m) WATER (m)

REMARKS

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BOREHOLE LOG

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CLIENT RAMBOLL UK LTD

SITE VANTAGE LHR21, NORTH ACTON ROAD, LONDON

Sheet 4 of 5

Start Date 21 April 2022 Easting 520842 Scale 1:50

End Date 26 April 2022 Northing 182985 Ground Level 33.00mOD Depth 35.00 m

sample no & type	sample depth (m) from	to	casing depth (m)	samp. range	chiselling details	water strike/ added (m)	instru -ment	test type & value	description	depth (m)	reduced level (m)	legend
57D	24.50	24.95	2.50					S 46	Very stiff fissured thinly laminated dark brownish grey CLAY with frequent burrows (up to 10mm) infilled with grey silt rarely selenite. Fissures are randomly orientated intersecting planar smooth.			
58B	24.50	24.80										
59D	25.50											
60UT	26.00	26.45	2.50									
61D	26.50											
62D	27.00											
63D	27.50	27.94	2.50					S *52		27.50	5.50	
64B	27.50	27.80							Very stiff fissured thinly laminated dark brownish grey CLAY with abundant burrows (up to 20mm) infilled with grey silt, abundant selenite crystals (up to 2mm) and rare pockets (up to 25mm) of black fine sand. Fissures are randomly orientated very closely spaced planar smooth			
65D	28.50											
66UT	29.00	29.45	2.50									
67D	29.50											
68D	30.00											
69D	30.50	30.88	2.50					S *65				
70B	30.50	30.80								30.70	2.30	
71D	31.00								Extremely weak grey CLAYSTONE recovered non-intact as slightly sandy slightly gravelly clay. Gravel is angular fine claystone.			
									Very stiff fissured thinly laminated dark brownish grey CLAY with rare selenite crystals (up to 2mm). Fissures are randomly orientated closely spaced undulating smooth locally gleyed black.	31.60	1.40	
72UT	32.00	32.45	2.50									

Continued Next Page

HOLE CONSTRUCTION
TOP (m) BASE (m) TYPE PLANT USED

WATER STRIKE Groundwater not encountered
DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH
DIAM (mm) BASE (m)

HOLE DIAMETER
DIAM (mm) BASE (m)

BACKFILL
TOP (m) BASE (m) MATERIAL

INSTRUMENTATION
DEPTH (m) TYPE

HOLE PROGRESS
DATE TIME DEPTH (m) CASING (m) WATER (m)

REMARKS

AGS

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BOREHOLE LOG

BH02

CLIENT RAMBOLL UK LTD

SITE VANTAGE LHR21, NORTH ACTON ROAD, LONDON

Sheet 5 of 5

Start Date 21 April 2022 Easting 520842 Scale 1:50

End Date 26 April 2022 Northing 182985 Ground Level 33.00mOD Depth 35.00 m

sample no & type	sample depth (m) from	to	casing depth (m)	samp. range	chiselling details	water strike/ added (m)	instru -ment	test type & value	description	depth (m)	reduced level (m)	legend
73D	32.50											
74D	33.00											
75D	33.50	33.88	2.50					S *67				
76B	33.50	33.80										
77D	34.50		2.50									
78UT	34.50	34.95										
79D	35.00								Borehole Completed at 35.00m	35.00	-2.00	

HOLE CONSTRUCTION
TOP (m) BASE (m) TYPE PLANT USED

WATER STRIKE Groundwater not encountered
DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH
DIAM (mm) BASE (m)

HOLE DIAMETER
DIAM (mm) BASE (m)

BACKFILL
TOP (m) BASE (m) MATERIAL

INSTRUMENTATION
DEPTH (m) TYPE

HOLE PROGRESS
DATE TIME DEPTH (m) CASING (m) WATER (m)

REMARKS

AGS

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BOREHOLE LOG

BH03

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SITE VANTAGE LHR21, NORTH ACTON ROAD, LONDON

Sheet 1 of 5

Start Date 19 April 2022 Easting 520889 Scale 1:50

End Date 27 April 2022 Northing 183004 Ground Level 33.65mOD Depth 35.00 m

sample no & type	sample depth (m) from	to	casing depth (m)	samp. range	chiselling details	water strike/ added (m)	instru -ment	test type & value	description	depth (m)	reduced level (m)	legend
C	0.00	0.20							Grey CONCRETE. (MADE GROUND)	0.05	33.60	
1B	0.30	0.50							0.05m: Blue plastic membrane.	0.20	33.45	
2D	0.30	0.50							Grey CONCRETE with 5mm diam steel reinforcement bars (200mm grid). (MADE GROUND)	0.50	33.15	
3B	0.80	1.00										
4D	0.80	1.00							Brownish orange silty gravelly medium and coarse SAND. Gravel is subrounded and rounded fine and medium flint. (MADE GROUND)	0.85	32.80	
5B	1.20	1.50										
6UT	1.50	1.95	1.50						Dark grey and black silty SAND and GRAVEL. Sand is fine to coarse. Gravel is angular coarse brick and concrete. (MADE GROUND)	1.70	31.95	
7D	1.80											
8D	2.00								Soft dark greenish grey slightly sandy slightly gravelly CLAY with frequent pockets (up to 3mm) of black organic material with a faint organic odour. Gravel is angular fine claystone. (MADE GROUND)			
10B	2.50	2.80	2.50					S 8	Firm light brown and bluish grey mottled brown CLAY with frequent black discolouration (up to 3mm).	2.50	31.15	
9D	2.50	2.95							Soft to firm light brown and bluish grey mottled CLAY with abundant pockets (up to 15mm) of selenite crystals (up to 2mm).			
11D	3.50		3.00							3.50	30.15	
12UT	3.50	3.95							Stiff fissured light brown slightly sandy CLAY with rare pockets (up to 5mm) of orange silt. Fissures are extremely closely and very closely spaced randomly orientated intersecting planar smooth gleyed bluish grey rarely infilled with selenite crystals (up to 2mm) or dark brown relict rootlets.			
13D	4.00											
14D	4.50		4.00					S 14		4.50	29.15	
15D	4.50	4.95							Firm to stiff brown locally mottled orange and bluish grey CLAY with rare selenite crystals (up to 4mm).			
16B	4.50	4.80										
17D	5.00					5.10				5.10	28.55	
18D	5.50								Extremely weak grey CLAYSTONE with rare veins (up to 20mm) of calcite recovered non-intact as clayey angular fine to coarse GRAVEL.			
19D	6.00		6.00							5.90	27.75	
20UT	6.00	6.45							Firm fissured dark grey CLAY with rare selenite crystals (up to 45mm diam). Fissures are randomly orientated very closely spaced planar smooth gleyed orange.			
21D	6.50								Stiff thinly laminated dark grey locally speckled black CLAY with rare pockets (up to 5mm) of black sandy clay and grey silt.	6.50	27.15	
22D	7.00											
23D	7.50	7.95	6.00					S 23				
24B	7.50	7.80										

Continued Next Page

HOLE CONSTRUCTION

TOP (m)	BASE (m)	TYPE	PLANT USED
0.00	0.20	Rotary Core	Bolt down coring unit
0.20	1.20	Inspection Pit	Hand tools
1.20	35.00	Cable Percussion	Dando 3000

WATER STRIKE

DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS
5.10	4.00	5.00	20	

CASING DEPTH

DIAM (mm)	BASE (m)
150	6.00

HOLE DIAMETER

DIAM (mm)	BASE (m)
300	0.20
150	35.00

BACKFILL

TOP (m)	BASE (m)	MATERIAL
0.00	0.50	Concrete
0.50	5.00	Bentonite
5.00	20.00	Gravel
20.00	35.00	Bentonite

INSTRUMENTATION

DEPTH (m)	TYPE
20.00	Standpipe (50mm)

HOLE PROGRESS

DATE TIME	DEPTH (m)	CASING (m)	WATER (m)
19-04-2022 13:25	0.00	Nil	
19-04-2022 14:15	0.27	Nil	Dry
26-04-2022 09:30	0.27	Nil	Dry
26-04-2022 16:00	16.50	6.00	Dry
27-04-2022 08:00	16.50	6.00	Dry

REMARKS

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BOREHOLE LOG

BH03

CLIENT RAMBOLL UK LTD

SITE VANTAGE LHR21, NORTH ACTON ROAD, LONDON

Sheet 2 of 5

Start Date 19 April 2022 Easting 520889 Scale 1:50

End Date 27 April 2022 Northing 183004 Ground Level 33.65mOD Depth 35.00 m

sample no & type	sample depth (m) from	to	casing depth (m)	samp. range	chiselling details	water strike/ added (m)	instru -ment	test type & value	description	depth (m)	reduced level (m)	legend
25D	8.50											
26UT	9.00	9.45	6.00							9.00	24.65	
27D	9.50								Stiff to very stiff indistinctly fissured thinly laminated dark grey CLAY with abundant selenite crystals (up to 2mm), rare shell fragments (up to 2mm) and rare pyrite nodules (up to 40mm).			
28D	10.00											
29D	10.50	10.95	6.00					S 30				
30B	10.50	10.80										
31D	11.50											
32UT	12.00	12.45	6.00									
33D	12.50									12.50	21.15	
34D	13.00								Stiff becoming very stiff indistinctly fissured dark brownish grey locally slightly sandy CLAY with frequent infilled burrows (up to 10mm) with grey silt and frequent selenite crystals (up to 2mm).			
35D	13.50	13.95	6.00					S 28				
36B	13.50	13.80										
37D	14.50											
38UT	15.00	15.45	6.00									
39D	15.50											

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HOLE CONSTRUCTION
TOP (m) BASE (m) TYPE PLANT USED

WATER STRIKE
DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH
DIAM (mm) BASE (m)

HOLE DIAMETER
DIAM (mm) BASE (m)

BACKFILL
TOP (m) BASE (m) MATERIAL

INSTRUMENTATION
DEPTH (m) TYPE

HOLE PROGRESS

DATE TIME	DEPTH (m)	CASING (m)	WATER (m)
27-04-2022 15:00	35.00	6.00	Dry

REMARKS

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BOREHOLE LOG

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SITE VANTAGE LHR21, NORTH ACTON ROAD, LONDON

Sheet 3 of 5

Start Date 19 April 2022 Easting 520889 Scale 1:50

End Date 27 April 2022 Northing 183004 Ground Level 33.65mOD Depth 35.00 m

sample no & type	sample depth (m) from	to	casing depth (m)	samp. range	chiselling details	water strike/ added (m)	instru -ment	test type & value	description	depth (m)	reduced level (m)	legend
40D	16.50		6.00					S 40				
41D	16.50	16.95										
42B	16.50	16.80										
43D	17.50											
44UT	18.00	18.45	6.00									
45D	18.50											
46D	19.00											
47D	19.50	19.95	6.00					S 48				
48B	19.50	19.80										
49D	20.50											
50UT	21.00	21.45	6.00									
51D	21.50											
52D	22.50		6.00					S 43				
53D	22.50	22.95										
54B	22.50	22.80										
55D	23.50											
56UT	24.00	24.45	6.00									

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HOLE CONSTRUCTION
TOP (m) BASE (m) TYPE PLANT USED

WATER STRIKE
DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH
DIAM (mm) BASE (m)

HOLE DIAMETER
DIAM (mm) BASE (m)

BACKFILL
TOP (m) BASE (m) MATERIAL

INSTRUMENTATION
DEPTH (m) TYPE

HOLE PROGRESS
DATE TIME DEPTH (m) CASING (m) WATER (m)

REMARKS

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BOREHOLE LOG

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SITE VANTAGE LHR21, NORTH ACTON ROAD, LONDON

Sheet 4 of 5

Start Date 19 April 2022 Easting 520889 Scale 1:50

End Date 27 April 2022 Northing 183004 Ground Level 33.65mOD Depth 35.00 m

sample no & type	sample depth (m) from	to	casing depth (m)	samp. range	chiselling details	water strike/ added (m)	instru -ment	test type & value	description	depth (m)	reduced level (m)	legend
57D	24.50											
58D	25.50		6.00					S 50	25.40 - 25.50m: Abundant white shell fragments (up to 4mm).			
59D	25.50 - 25.95											
60B	25.50 - 25.80											
61D	26.50											
62UT	27.00 - 27.45		6.00									
63D	27.50											
64D	28.00											
65D	28.50 - 28.94		6.00					S *51				
66B	28.50 - 28.80											
67D	29.50											
68UT	30.00 - 30.45		6.00									
69D	30.10								Extremely weak grey calcareous CLAYSTONE recovered as non-intact as clayey angular fine to coarse GRAVEL.	30.10	3.55	
										30.80	2.85	
70D	31.00								Very stiff indistinctly fissured dark brownish grey CLAY with frequent infilled burrows (up to 10mm) with grey silt and frequent selenite crystals (up to 2mm).			
71D	31.50 - 31.95		6.00					S 50				
72B	31.50 - 31.80											

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HOLE CONSTRUCTION
TOP (m) BASE (m) TYPE PLANT USED

WATER STRIKE
DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH
DIAM (mm) BASE (m)

HOLE DIAMETER
DIAM (mm) BASE (m)

BACKFILL
TOP (m) BASE (m) MATERIAL

INSTRUMENTATION
DEPTH (m) TYPE

HOLE PROGRESS
DATE TIME DEPTH (m) CASING (m) WATER (m)

REMARKS

AGS

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BOREHOLE LOG

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SITE VANTAGE LHR21, NORTH ACTON ROAD, LONDON

Sheet 5 of 5

Start Date 19 April 2022 Easting 520889 Scale 1:50

End Date 27 April 2022 Northing 183004 Ground Level 33.65mOD Depth 35.00 m

sample no & type	sample depth (m) from	to	casing depth (m)	samp. range	chiselling details	water strike/ added (m)	instru -ment	test type & value	description	depth (m)	reduced level (m)	legend
73D	32.50											
74UT	33.00	33.45	6.00									
75D	33.50											
76D	34.50	34.95	6.00					S 50				
									Borehole Completed at 35.00m	35.00	-1.35	

HOLE CONSTRUCTION
TOP (m) BASE (m) TYPE PLANT USED

WATER STRIKE
DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH
DIAM (mm) BASE (m)

HOLE DIAMETER
DIAM (mm) BASE (m)

BACKFILL
TOP (m) BASE (m) MATERIAL

INSTRUMENTATION
DEPTH (m) TYPE

HOLE PROGRESS
DATE TIME DEPTH (m) CASING (m) WATER (m)

REMARKS

AGS

CONTRACT	CHECKED
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Geotechnical Engineering Limited

BOREHOLE LOG

WS01

CLIENT RAMBOLL UK LTD

SITE VANTAGE LHR21, NORTH ACTON ROAD, LONDON

Sheet 1 of 2

Start Date 26 April 2022 Easting 520777 Scale 1:50

End Date 26 April 2022 Northing 182980 Ground Level 32.75mOD Depth 4.45 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
C	0.00 - 0.20		100					BRICK pavement. (MADE GROUND)	0.05	32.70	
								Light grey reinforced CONCRETE. (MADE GROUND)	0.20	32.55	
001D	0.30 - 0.40						TR 3.489	Dark grey slightly gravelly clayey fine to coarse SAND with a low angular concrete cobble content and frequent pockets (up to 40mm) of dark grey sandy clay. Gravel is angular to subrounded fine to coarse brick, concrete and charcoal. Faint hydrocarbon odour. (MADE GROUND)	0.60	32.15	
1D	0.30 - 0.40										
2B	0.30 - 0.50										
002D	0.70 - 0.80						TR 1.779				
3D	0.70 - 0.80										
4B	0.70 - 0.90						TR 3.262				
003D	1.00 - 1.10										
5D	1.00 - 1.10	Nil					S <1	Very soft dark greenish grey slightly sandy slightly gravelly silty CLAY with rare rootlets. Gravel is angular to subrounded fine and medium concrete, brick, mudstone and flint. (MADE GROUND)			
6B	1.00 - 1.20	1.20									
7D	1.20 - 1.65										
8L	1.20 - 2.00										
9D	1.70 - 1.80										
								1.60m: Becoming brown mottled grey and orangish brown.	1.90	30.85	
10D	2.00 - 2.60	2.00					S 13	Firm indistinctly fissured brown mottled light bluish grey CLAY with frequent rootlets with light bluish grey gleying, clusters (up to 25mm) of selenite crystals (up to 2mm) and rare pockets (up to 20mm) of orangish brown sandy clay.			
11L	2.00 - 3.00										
12D	2.70 - 2.80										
13D	3.00 - 3.45	2.00					S 15	Stiff fissured brown CLAY with frequent rootlet tracks with light bluish grey gleying and rare selenite crystals (up to 5mm). Fissures are subhorizontal and 70° to subvertical extremely closely and very closely spaced and intersecting planar rough with light bluish grey gleying.	2.90	29.85	
14L	3.00 - 4.00										
15D	3.70 - 3.80										
16D	4.00 - 4.45	2.00					S 18				
								Borehole Completed at 4.45m	4.45	28.30	

Continued Next Page

HOLE CONSTRUCTION

TOP (m)	BASE (m)	TYPE	PLANT USED
0.00	0.20	Rotary Core	Bolt down coring unit
0.20	1.20	Inspection Pit	Hand tools
1.20	4.45	Windowless Sample	Terrier 2000

WATER STRIKE Groundwater not encountered

DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS

CASING DEPTH

DIAM (mm)	BASE (m)
128	2.00

BARREL DIAMETER

DIAM (mm)	BASE (m)
300	0.20
113	3.00
98	4.00

BACKFILL

TOP (m)	BASE (m)	MATERIAL
0.00	0.10	Concrete
0.10	0.20	Gravel
0.20	0.40	Bentonite
0.40	1.00	Gravel

INSTRUMENTATION

DEPTH (m)	TYPE
1.00	Standpipe (50mm)

HOLE PROGRESS

DATE TIME	DEPTH (m)	CASING (m)	WATER (m)
26-04-2022 10:15	0.00	Nil	
26-04-2022 13:10	4.45	2.00	Dry

REMARKS

In-situ resistivity testing undertaken at 0.30m, 0.70m and 1.00m (results presented separately).

CONTRACT	CHECKED
37013	CT

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BOREHOLE LOG

WS01

CLIENT RAMBOLL UK LTD

SITE VANTAGE LHR21, NORTH ACTON ROAD, LONDON

Sheet 2 of 2

Start Date 26 April 2022 Easting 520777 Scale 1:50

End Date 26 April 2022 Northing 182980 Ground Level 32.75mOD Depth 4.45 m

sample no & type	sample depth (m) from	to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend

HOLE CONSTRUCTION

TOP (m)	BASE (m)	TYPE	PLANT USED

WATER STRIKE Groundwater not encountered

DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS

CASING DEPTH

DIAM (mm)	BASE (m)

BARREL DIAMETER

DIAM (mm)	BASE (m)

BACKFILL

TOP (m)	BASE (m)	MATERIAL
1.00	4.45	Bentonite

INSTRUMENTATION

DEPTH (m)	TYPE

HOLE PROGRESS

DATE TIME	DEPTH (m)	CASING (m)	WATER (m)

REMARKS

AGS

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BOREHOLE LOG

WS02

CLIENT RAMBOLL UK LTD

SITE VANTAGE LHR21, NORTH ACTON ROAD, LONDON

Sheet 1 of 1

Start Date 26 April 2022 Easting 520814 Scale 1:50

End Date 26 April 2022 Northing 183007 Ground Level 32.85mOD Depth 4.51 m

sample no & type	sample depth (m) from	to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
001D	0.30	0.40						TR 6.431	Grass over very soft dark brown slightly sandy slightly gravelly silty CLAY with frequent rootlets. Gravel is angular to subrounded fine to coarse brick, concrete, flint, mudstone and sandstone. (MADE GROUND)			
1D	0.30	0.40										
2B	0.30	0.50										
002D	0.70	0.80						TR 1.457	Very soft dark bluish grey slightly gravelly silty CLAY with strong hydrocarbon odour. Gravel is angular to subrounded fine brick, charcoal, concrete and mudstone. (MADE GROUND)	0.60	32.25	
3D	0.70	0.80										
4B	0.70	0.90										
003D	1.00	1.10						TR 1.279		1.00	31.85	
5D	1.00	1.10	Nil					S <1	Very soft dark greenish grey slightly gravelly silty CLAY with faint hydrocarbon odour. Gravel is angular to subrounded fine brick, charcoal, concrete and mudstone. (MADE GROUND)			
6B	1.00	1.20	1.20									
7D	1.20	1.75										
8L	1.20	2.00										
9D	1.80	1.90								1.70	31.15	
10D	2.00	2.45	2.00					S 13	Firm indistinctly fissured brown mottled light bluish grey CLAY with frequent clusters (up to 20mm) of selenite crystals (up to 5mm) and rootlets and rare pockets (up to 25mm) of orangish brown sandy clay.			
11L	2.00	3.00										
12D	2.80	2.90							2.80 - 3.00m: Abundant rootlets and light bluish grey rootlet tracks.			
13D	3.00	3.57	2.00					S 15				
14L	3.00	4.00										
										3.30	29.55	
15D	3.80	3.90							Stiff fissured brown CLAY with frequent rootlet tracks, frequent light bluish grey gleying and rare selenite crystals (up to 5mm). Fissures are subhorizontal and 70° to subvertical extremely closely and very closely spaced and intersecting planar rough with light bluish grey gleying.			
16D	4.00	4.51	2.00					S 18				
									Borehole Completed at 4.51m	4.51	28.34	

HOLE CONSTRUCTION

TOP (m)	BASE (m)	TYPE	PLANT USED
0.00	1.20	Inspection Pit	Hand tools
1.20	4.51	Windowless Sample	Terrier 2000

WATER STRIKE Groundwater not encountered

DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS

CASING DEPTH

DIAM (mm)	BASE (m)
128	2.00

BARREL DIAMETER

DIAM (mm)	BASE (m)
113	3.00
98	4.00

BACKFILL

TOP (m)	BASE (m)	MATERIAL
0.00	0.30	Concrete
0.30	0.40	Bentonite
0.40	1.00	Gravel
1.00	4.51	Bentonite

INSTRUMENTATION

DEPTH (m)	TYPE
1.00	Standpipe (50mm)

HOLE PROGRESS

DATE TIME	DEPTH (m)	CASING (m)	WATER (m)
26-04-2022 13:25	0.00	Nil	
26-04-2022 16:05	4.51	2.00	Dry

REMARKS

In-situ resistivity testing undertaken at 0.30m, 0.70m and 1.00m (results presented separately).

CONTRACT	CHECKED
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Geotechnical Engineering Limited

BOREHOLE LOG

WS03

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SITE VANTAGE LHR21, NORTH ACTON ROAD, LONDON

Sheet 1 of 1

Start Date 25 April 2022 Easting 520850 Scale 1:50

End Date 25 April 2022 Northing 183008 Ground Level 33.40mOD Depth 5.45 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
C	0.00 - 0.30		100					Light grey reinforced CONCRETE. (MADE GROUND)			
001D	0.30 - 0.40						TR 1.592	0.30m: Blue plastic membrane (1mm thick).	0.30	33.10	
1D	0.30 - 0.40							Brown silty gravelly fine to coarse SAND with rare fragments (up to 5mm) of glass and plastic. Gravel is angular to subrounded fine to coarse concrete, brick, flint, sandstone and mudstone. (MADE GROUND)			
2B	0.30 - 0.50								0.60	32.80	
002D	0.70 - 0.80						TR 0.849				
3D	0.70 - 0.80										
4B	0.70 - 0.90						TR 1.106		1.00	32.40	
003D	1.00 - 1.10							0.55m: Grey geomembrane (2mm thick).			
5D	1.00 - 1.10	Nil					S <1		1.20	32.20	
6B	1.00 - 1.20	1.20						Very soft dark grey slightly gravelly sandy CLAY with low angular concrete cobble content and faint organic odour. Gravel is angular to subrounded fine and medium concrete, brick and flint. (MADE GROUND)			
7D	1.20 - 1.70										
8L	1.20 - 2.00										
9D	1.70 - 1.80										
10D	1.90 - 2.00								1.90	31.50	
11D	2.00 - 2.60	2.00					S 14	Very soft dark grey slightly gravelly silty CLAY with faint organic odour. Gravel is angular to subrounded fine to coarse brick, concrete, mudstone and sandstone. (MADE GROUND)			
12L	2.00 - 3.00								2.15	31.25	
13D	2.60 - 2.70							Very soft dark greenish grey mottled orangish brown CLAY with rare rootlets. (MADE GROUND)			
14D	3.00 - 3.45	3.00					S 10	Firm orangish brown mottled dark grey slightly gravelly silty CLAY with faint organic odour. Gravel is angular to subrounded fine and medium brick, concrete and mudstone. (MADE GROUND)			
15L	3.00 - 4.00								3.50	29.90	
16D	3.90 - 4.00							Firm becoming stiff indistinctly fissured orangish brown mottled light bluish grey CLAY with frequent clusters (up to 20mm) of selenite crystals (up to 2mm).			
17D	4.00 - 4.45	3.00					S 16				
18L	4.00 - 5.00							Stiff fissured brown mottled light bluish grey CLAY with frequent selenite crystals (up to 5mm) and rare brown rootlets. Fissures are subhorizontal and 70° to subvertical extremely closely and very closely spaced and intersecting planar rough with light bluish grey gleying.			
19D	4.90 - 5.00							4.10m: Fissures becoming very closely and closely spaced.			
20D	5.00 - 5.45	3.00					S 19	4.70 - 5.45m: Locally mottled orangish brown.			
								Borehole Completed at 5.45m	5.45	27.95	

HOLE CONSTRUCTION

TOP (m)	BASE (m)	TYPE	PLANT USED
0.00	0.30	Rotary Core	Bolt down coring unit
0.30	1.20	Inspection Pit	Hand tools
1.20	5.45	Windowless Sample	Terrier 2000

WATER STRIKE Groundwater not encountered

DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS

CASING DEPTH

DIAM (mm)	BASE (m)
128	3.00

BARREL DIAMETER

DIAM (mm)	BASE (m)
300	0.30
113	4.00
98	5.00

BACKFILL

TOP (m)	BASE (m)	MATERIAL
0.00	0.40	Concrete
0.40	0.50	Bentonite
0.50	1.00	Gravel
1.00	5.45	Bentonite

INSTRUMENTATION

DEPTH (m)	TYPE
1.00	Standpipe (50mm)

HOLE PROGRESS

DATE TIME	DEPTH (m)	CASING (m)	WATER (m)
25-04-2022 09:15	0.00	Nil	
25-04-2022 12:55	5.45	3.00	Dry

REMARKS

In-situ resistivity testing undertaken at 0.30m, 0.70m and 1.00m (results presented separately).

CONTRACT	CHECKED
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Geotechnical Engineering Limited

BOREHOLE LOG

WS04

CLIENT RAMBOLL UK LTD

SITE VANTAGE LHR21, NORTH ACTON ROAD, LONDON

Sheet 1 of 2

Start Date 26 April 2022 Easting 520885 Scale 1:50

End Date 26 April 2022 Northing 182998 Ground Level 33.25mOD Depth 4.45 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
C	0.00 - 0.20		100					Light grey reinforced CONCRETE. (MADE GROUND)			
001D	0.30 - 0.40						TR 1.499	0.20m: Steel reinforcement bar (10mm diam).	0.20	33.05	
1D	0.30 - 0.40							Dark grey slightly gravelly clayey fine to coarse SAND with a faint organic odour and frequent pockets (up to 20mm) of dark grey sandy clay. Gravel is angular to subrounded fine to coarse charcoal, brick and flint. (MADE GROUND)			
2B	0.30 - 0.50								0.50	32.75	
002D	0.70 - 0.80						TR 1.590				
3D	0.70 - 0.80										
4B	0.70 - 0.90						TR 1.533				
003D	1.00 - 1.10							Very soft dark greenish grey slightly sandy slightly gravelly silty CLAY with a faint organic odour. Gravel is angular to subrounded fine and medium concrete, charcoal, brick and mudstone. (MADE GROUND)			
5D	1.00 - 1.10	Nil					S <1		1.25	32.00	
6B	1.00 - 1.20	1.20						0.95m: Becomes light greenish grey.			
7D	1.20 - 1.65							Very soft light greenish grey slightly gravelly silty CLAY. Gravel is angular to subrounded fine concrete, brick and mudstone. (MADE GROUND)	1.75	31.50	
8L	1.20 - 2.00										
9D	1.65 - 1.75										
10D	2.00 - 2.70	2.00					S 11				
11L	2.00 - 3.00							Firm indistinctly fissured brown mottled light bluish grey CLAY with frequent rootlets traces with light bluish grey gleying, clusters (up to 30mm) of selenite crystals (up to 5mm) and rare pockets (up to 30mm) of orangish brown sandy clay.			
12D	2.70 - 2.80								2.90	30.35	
13D	3.00 - 3.45	2.00					S 15	Stiff fissured brown CLAY with frequent rootlet traces with light bluish grey gleying and rare selenite crystals (up to 4mm). Fissures are subhorizontal and 70° to subvertical extremely closely and very closely spaced and intersecting planar rough with light bluish grey gleying.			
14L	3.00 - 4.00										
15D	3.70 - 3.80										
16D	4.00 - 4.45	2.00					S 17				
								Borehole Completed at 4.45m	4.45	28.80	
								Continued Next Page			

HOLE CONSTRUCTION

TOP (m)	BASE (m)	TYPE	PLANT USED
0.00	0.20	Rotary Core	Bolt down coring unit
0.20	1.20	Inspection Pit	Hand tools
1.20	4.45	Windowless Sample	Terrier 2000

WATER STRIKE Groundwater not encountered

DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS

CASING DEPTH

DIAM (mm)	BASE (m)
128	2.00

BARREL DIAMETER

DIAM (mm)	BASE (m)
300	0.20
113	2.00
98	3.00
84	4.00

BACKFILL

TOP (m)	BASE (m)	MATERIAL
0.00	0.30	Concrete
0.30	0.40	Gravel
0.40	0.50	Bentonite
0.50	1.00	Gravel

INSTRUMENTATION

DEPTH (m)	TYPE
1.00	Standpipe (50mm)

HOLE PROGRESS

DATE TIME	DEPTH (m)	CASING (m)	WATER (m)
26-04-2022 08:00	0.00	Nil	
26-04-2022 10:00	4.45	2.00	Dry

REMARKS

In-situ resistivity testing undertaken at 0.30m, 0.70m and 1.00m (results presented separately).

AGS

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Geotechnical Engineering Limited

BOREHOLE LOG

WS04

CLIENT RAMBOLL UK LTD

SITE VANTAGE LHR21, NORTH ACTON ROAD, LONDON

Sheet 2 of 2

Start Date 26 April 2022 Easting 520885 Scale 1:50

End Date 26 April 2022 Northing 182998 Ground Level 33.25mOD Depth 4.45 m

sample no & type	sample depth (m) from	to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend

HOLE CONSTRUCTION

TOP (m)	BASE (m)	TYPE	PLANT USED

WATER STRIKE Groundwater not encountered

DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS

CASING DEPTH

DIAM (mm)	BASE (m)

BARREL DIAMETER

DIAM (mm)	BASE (m)

BACKFILL

TOP (m)	BASE (m)	MATERIAL
1.00	4.45	Bentonite

INSTRUMENTATION

DEPTH (m)	TYPE

HOLE PROGRESS

DATE TIME	DEPTH (m)	CASING (m)	WATER (m)

REMARKS

AGS

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Geotechnical Engineering Limited

BOREHOLE LOG

WS05

CLIENT RAMBOLL UK LTD

SITE VANTAGE LHR21, NORTH ACTON ROAD, LONDON

Sheet 1 of 1

Start Date 25 April 2022 Easting 520886 Scale 1:50

End Date 25 April 2022 Northing 183012 Ground Level 33.65mOD Depth 4.45 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
C	0.00 - 0.20		100					Light grey reinforced CONCRETE. (MADE GROUND)			
001D	0.30 - 0.40						TR 6.135	0.20m: 2mm thick geomembrane.	0.20	33.45	
1D	0.30 - 0.40							Brown silty gravelly fine to coarse SAND with a low angular concrete cobble content. Gravel is angular to subrounded fine to coarse concrete, brick, flint and charcoal. (MADE GROUND)			
2B	0.30 - 0.50								0.60	33.05	
002D	0.70 - 0.80						TR 1.612				
3D	0.70 - 0.80								0.90	32.75	
4B	0.70 - 0.90						TR 2.657				
003D	1.00 - 1.10							Black clayey gravelly fine to coarse SAND with a faint hydrocarbon odour and rare fragments of wood (up to 25mm), clinker (up to 10mm) and metal wires (up to 20mm). Gravel is angular to subrounded fine and medium concrete, brick and charcoal. (MADE GROUND)			
5D	1.00 - 1.10	Nil					S <1		1.40	32.25	
6B	1.00 - 1.20	1.20									
7D	1.20 - 1.76										
8L	1.20 - 2.00										
9D	1.80 - 1.90										
10D	2.00 - 2.75	2.00					S 15	Very soft dark grey slightly sandy slightly gravelly silty CLAY with faint organic odour. Gravel is angular to subrounded fine and medium brick, flint and concrete. (MADE GROUND)	2.00	31.65	
11L	2.00 - 3.00										
12D	2.50 - 2.60							Soft becoming firm dark greenish grey slightly gravelly silty CLAY with rare brown rootlets. Gravel is angular fine brick and concrete. (MADE GROUND)			
13D	3.00 - 3.67	2.00					S 13	Firm to stiff becoming firm indistinctly fissured brown mottled light bluish grey CLAY with frequent clusters (up to 30mm) of selenite crystals (up to 5mm) and rootlet tracks with light bluish grey gleying.			
14L	3.00 - 4.00								3.60	30.05	
15D	3.80 - 3.90							Firm fissured brown CLAY with frequent selenite crystals (up to 10mm). Fissures are subhorizontal and 70° to subvertical extremely closely and very closely spaced and intersecting planar rough with light bluish grey gleying.			
16D	4.00 - 4.45	2.00					S 13				
								Borehole Completed at 4.45m	4.45	29.20	

HOLE CONSTRUCTION

TOP (m)	BASE (m)	TYPE	PLANT USED
0.00	0.20	Rotary Core	Bolt down coring unit
0.20	1.20	Inspection Pit	Hand tools
1.20	4.45	Windowless Sample	Terrier 2000

WATER STRIKE Groundwater not encountered

DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS

CASING DEPTH

DIAM (mm)	BASE (m)
128	2.00

BARREL DIAMETER

DIAM (mm)	BASE (m)
300	0.20
113	4.00

BACKFILL

TOP (m)	BASE (m)	MATERIAL
0.00	0.30	Concrete
0.30	0.40	Bentonite
0.40	2.00	Gravel
2.00	4.45	Bentonite

INSTRUMENTATION

DEPTH (m)	TYPE
2.00	Standpipe (50mm)

HOLE PROGRESS

DATE TIME	DEPTH (m)	CASING (m)	WATER (m)
25-04-2022 13:10	0.00	Nil	
25-04-2022 16:30	4.45	2.00	Dry

REMARKS

In-situ resistivity testing undertaken at 0.30m, 0.70m and 1.00m (results presented separately).

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STANDARD PENETRATION TEST

CLIENT RAMBOLL UK LTD

SITE VANTAGE LHR21, NORTH ACTON ROAD, LONDON

borehole no.	borehole depth (m)	s.w.p (mm)	bottom depth (m)	casing depth (m)	water level (m)	seating drive blows	seating drive pen (mm)	test drive blows	test drive pen (mm)	test type	N	energy ratio (%)
BH01	2.50		2.95	2.50	Dry	1 1	75 75	1 2 2 2	75 75 75 75	S	7	68
BH01	4.50		4.95	4.00	Dry	1 2	75 75	3 3 4 4	75 75 75 75	S	14	68
BH01	6.50		6.95	4.50	Dry	1 2	75 75	3 3 6 5	75 75 75 75	S	17	68
BH01	9.50		9.95	9.00	Dry	1 4	75 75	5 6 8 8	75 75 75 75	S	27	68
BH01	12.50		12.95	9.50	Dry	3 5	75 75	7 8 9 10	75 75 75 75	S	34	68
BH01	15.50		15.95	9.50	Dry	5 5	75 75	7 8 9 11	75 75 75 75	S	35	68
BH01	18.50		18.95	9.50	Dry	4 6	75 75	9 11 12 13	75 75 75 75	S	45	68
BH01	21.50		21.87	9.50	Dry	6 10	75 75	22 15 13	75 75 68	S	69	68
BH01	24.50		24.95	9.50	Dry	6 8	75 75	10 11 14 15	75 75 75 75	S	50	68
BH01	27.50		27.88	9.50	Dry	7 9	75 75	14 17 16 3	75 75 75 7	S	65	68
BH01	30.50		30.88	9.50	Dry	7 11	75 75	13 13 23 1	75 75 75 1	S	66	68
BH01	33.50		33.87	9.50	Dry	8 14	75 75	16 19 15	75 75 73	S	67	68
BH02	2.50		2.95	2.50	Dry	1 2	75 75	2 2 2 3	75 75 75 75	S	9	68
BH02	4.50		4.95	2.50	Dry	2 4	75 75	3 4 5 5	75 75 75 75	S	17	68
BH02	6.50		6.95	2.50	Dry	2 2	75 75	4 4 6 5	75 75 75 75	S	19	68
BH02	9.50		9.95	2.50	Dry	4 4	75 75	5 7 7 8	75 75 75 75	S	27	68
BH02	12.50		12.95	2.50	Dry	4 4	75 75	5 6 10 8	75 75 75 75	S	29	68
BH02	15.50		15.95	2.50	Dry	4 6	75 75	6 9 9 10	75 75 75 75	S	34	68
BH02	18.50		18.95	2.50	Dry	4 6	75 75	9 9 9 12	75 75 75 75	S	39	68
BH02	21.50		21.95	2.50	Dry	5 8	75 75	9 10 12 11	75 75 75 75	S	42	68
BH02	24.50		24.95	2.50	Dry	6 9	75 75	9 11 12 14	75 75 75 75	S	46	68
BH02	27.50		27.94	2.50	Dry	7 9	75 75	12 14 14 10	75 75 75 66	S	52	68
BH02	30.50		30.88	2.50	Dry	7 9	75 75	12 15 15 8	75 75 75 5	S	65	68
BH02	33.50		33.88	2.50	Dry	6 10	75 75	16 17 17	75 75 75	S	67	68
BH03	2.50		2.95	2.50	Dry	1 2	75 75	2 2 2 2	75 75 75 75	S	8	68

notes:
1. Test carried out in general accordance with BS EN ISO 22476-3:2005 + A1:2011
2. s.w.p = self weight penetration.
3. N values have not been subjected to any correction.
4. Test carried out using split spoon S, solid cone C.
5. Where full test drive not completed, linearly extrapolated N value reported.
6. ** Denotes no effective penetration.

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STANDARD PENETRATION TEST

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SITE VANTAGE LHR21, NORTH ACTON ROAD, LONDON

borehole no.	borehole depth (m)	s.w.p (mm)	bottom depth (m)	casing depth (m)	water level (m)	seating drive blows	seating drive pen (mm)	test drive blows	test drive pen (mm)	test type	N	energy ratio (%)
BH03	4.50		4.95	4.00	Dry	1 2	75 75	2 4 3 5	75 75 75 75	S	14	68
BH03	7.50		7.95	6.00	Dry	4 5	75 75	4 6 6 7	75 75 75 75	S	23	68
BH03	10.50		10.95	6.00	Dry	3 6	75 75	6 7 8 9	75 75 75 75	S	30	68
BH03	13.50		13.95	6.00	Dry	3 5	75 75	6 6 8 8	75 75 75 75	S	28	68
BH03	16.50		16.95	6.00	Dry	5 7	75 75	8 9 12 11	75 75 75 75	S	40	68
BH03	19.50		19.95	6.00	Dry	6 8	75 75	10 11 14 13	75 75 75 75	S	48	68
BH03	22.50		22.95	6.00	Dry	5 8	75 75	8 10 12 13	75 75 75 75	S	43	68
BH03	25.50		25.95	6.00	Dry	5 9	75 75	10 13 14 13	75 75 75 75	S	50	68
BH03	28.50		28.94	6.00	Dry	6 10	75 75	10 9 12 19	75 75 75 67	S	51	68
BH03	31.50		31.95	6.00	Dry	6 7	75 75	11 12 13 14	75 75 75 75	S	50	68
BH03	34.50		34.95	6.00	Dry	5 9	75 75	12 11 12 15	75 75 75 75	S	50	68
WS01	1.20	450	1.65	Nil	Dry					S	<1	65
WS01	2.00	150	2.60	2.00	Dry	1 3	75 75	2 3 4 4	75 75 75 75	S	13	65
WS01	3.00		3.45	2.00	Dry	2 1	75 75	3 3 4 5	75 75 75 75	S	15	65
WS01	4.00		4.45	2.00	Dry	2 2	75 75	3 4 5 6	75 75 75 75	S	18	65
WS02	1.20	550	1.75	Nil	Dry					S	<1	65
WS02	2.00		2.45	2.00	Dry	1 3	75 75	3 3 3 4	75 75 75 75	S	13	65
WS02	3.00	120	3.57	2.00	Dry	2 2	75 75	4 3 3 5	75 75 75 75	S	15	65
WS02	4.00	60	4.51	2.00	Dry	2 2	75 75	4 4 5 5	75 75 75 75	S	18	65
WS03	1.20	500	1.70	Nil	Dry					S	<1	65
WS03	2.00	150	2.60	2.00	Dry	2 2	75 75	2 3 4 5	75 75 75 75	S	14	65
WS03	3.00		3.45	3.00	Dry	1 2	75 75	1 2 3 4	75 75 75 75	S	10	65
WS03	4.00		4.45	3.00	Dry	1 3	75 75	3 3 4 6	75 75 75 75	S	16	65
WS03	5.00		5.45	3.00	Dry	2 3	75 75	4 4 5 6	75 75 75 75	S	19	65
WS04	1.20	450	1.65	Nil	Dry					S	<1	65

notes:
1. Test carried out in general accordance with BS EN ISO 22476-3:2005 + A1:2011
2. s.w.p = self weight penetration.
3. N values have not been subjected to any correction.
4. Test carried out using split spoon S, solid cone C.
5. Where full test drive not completed, linearly extrapolated N value reported.
6. ** Denotes no effective penetration.

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STANDARD PENETRATION TEST

CLIENT RAMBOLL UK LTD

SITE VANTAGE LHR21, NORTH ACTON ROAD, LONDON

borehole no.	borehole depth (m)	s.w.p (mm)	bottom depth (m)	casing depth (m)	water level (m)	seating drive blows	seating drive pen (mm)	test drive blows	test drive pen (mm)	test type	N	energy ratio (%)
WS04	2.00	250	2.70	2.00	Dry	2 2	75 75	2 2 3 4	75 75 75 75	S	11	65
WS04	3.00		3.45	2.00	Dry	1 3	75 75	3 3 4 5	75 75 75 75	S	15	65
WS04	4.00		4.45	2.00	Dry	2 3	75 75	3 4 5 5	75 75 75 75	S	17	65
WS05	1.20	560	1.76	Nil	Dry					S	<1	65
WS05	2.00	300	2.75	2.00	Dry	1 3	75 75	3 3 4 5	75 75 75 75	S	15	65
WS05	3.00	220	3.67	2.00	Dry	2 2	75 75	3 2 4 4	75 75 75 75	S	13	65
WS05	4.00		4.45	2.00	Dry	1 3	75 75	3 3 3 4	75 75 75 75	S	13	65

notes:
1. Test carried out in general accordance with BS EN ISO 22476-3:2005 + A1:2011
2. s.w.p = self weight penetration.
3. N values have not been subjected to any correction.
4. Test carried out using split spoon S, solid cone C.
5. Where full test drive not completed, linearly extrapolated N value reported.
6. ** Denotes no effective penetration.

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IN-SITU THERMAL RESISTIVITY

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SITE VANTAGE LHR21, NORTH ACTON ROAD, LONDON

Borehole /trial pit no.	Test depth (m)	Date	Method of needle insertion	Heating time (seconds)	Temp (°C)	Moisture content* (%)	Thermal conductivity (W/mK)	Thermal resistivity (mK/W)	Description
WS01	0.30	26/04/2022	Push	60	15.18	34.60	0.287	3.489	Dark grey slightly gravelly clayey fine to coarse SAND
WS01	0.70	26/04/2022	Push	60	14.57	36.50	0.562	1.779	Greenish grey slightly sandy slightly gravelly silty CLAY
WS01	1.00	26/04/2022	Push	60	13.96	37.70	0.307	3.262	Dark greenish grey slightly sandy slightly gravelly silty CLAY
WS02	0.30	26/04/2022	Push	60	12.75	28.50	0.156	6.431	Dark brown slightly sandy slightly gravelly silty CLAY
WS02	0.70	26/04/2022	Push	60	12.34	43.90	0.686	1.457	Dark bluish grey slightly gravelly silty CLAY
WS02	1.00	26/04/2022	Push	60	11.65	41.50	0.782	1.279	Dark greenish grey slightly gravelly silty CLAY
WS03	0.30	25/04/2022	Push	60	13.71	12.70	0.628	1.592	Brown silty gravelly fine to coarse SAND
WS03	0.70	25/04/2022	Push	60	13.15	36.10	1.178	0.849	Dark grey slightly gravelly sandy CLAY
WS03	1.00	25/04/2022	Push	60	13.41	43.30	0.905	1.106	Dark grey slightly gravelly silty CLAY
WS04	0.30	26/04/2022	Push	60	12.70	39.50	0.667	1.499	Dark grey slightly gravelly clayey fine to coarse SAND
WS04	0.70	26/04/2022	Push	60	12.76	38.70	0.629	1.590	Dark greenish grey slightly sandy slightly gravelly silty CLAY
WS04	1.00	26/04/2022	Push	60	12.50	41.30	0.652	1.533	Dark greenish grey slightly sandy slightly gravelly silty CLAY
WS05	0.30	25/04/2022	Push	60	15.82	6.90	0.163	6.135	Brown silty gravelly fine to coarse SAND
WS05	0.70	25/04/2022	Push	60	15.21	23.10	0.621	1.612	Black clayey gravelly fine to coarse SAND
WS05	1.00	25/04/2022	Push	60	13.80	48.10	0.376	2.657	Dark grey slightly sandy slightly gravelly silty CLAY

REMARKS

Equipment: Tempos Thermal Properties Analyser. Sensor - TR-3

Test carried out in general accordance with IEEE 442 (2003) Guide for Soil Thermal Resistivity Measurements

* - moisture content determined from samples taken and tested to BS EN ISO 17892-1:2014

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Milton Keynes
MK8 8DD

Certificate for the Determination of the Vertical Deformation and Strength Characteristics of Soil by the Incremental Plate Loading Test to BS 1377 Part 9: 1990

Report No: 7838-1
Report Date: 26/04/2022
Client: Geotechnical Engineering Ltd
Address: Centurion House, Olympus Park
Quedgeley
Gloucestershire
GL2 4NF
Site: 37-39 North Acton Road, London, NW10 6PF

Test Details

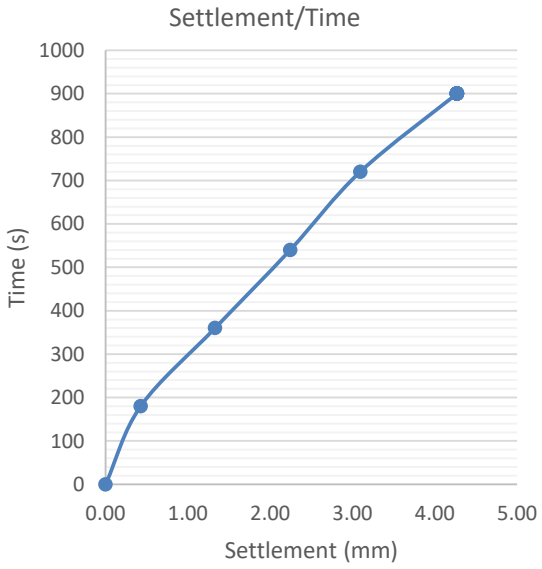
Test Location: PL1
Date of Test: 26/04/2022
Description: Gravelly Clay
Reaction Load: 14 Tonne Excavator
Material Class: Formation
Weather: Dry
Layer: 0.7m BGL
Plate Diameter (mm): 452
Condition: The results apply only to the location tested and the material was tested in an 'as found' condition

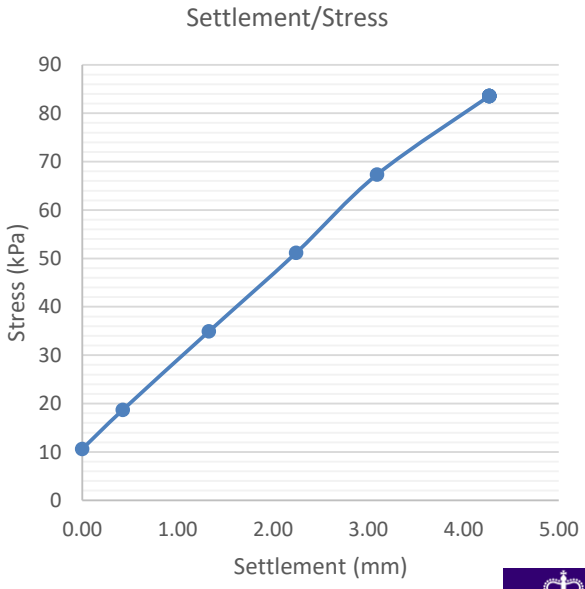
Test Results

Time, s	Settlement, mm	Plate Stress, kPa
0	0.00	11
180	0.43	19
360	1.33	35
540	2.24	51
720	3.09	67
900	4.27	84

Maximum Applied Stress (kPa):	84
Maximum Settlement (mm):	4.27
Equivalent CBR Value (%):	1
Modulus of Subgrade Reaction, k_{762} (MN/m^2/m):	17

Note: Supplemental test method, calculation of Equivalent CBR Value and Modulus of Subgrade Reaction: IAN 73/06 revision 1 (2009), HD 25/94 (withdrawn)





For and on behalf of Hixtra Ltd

Kevin Shorthouse
Authorised signatory

UKAS TESTING
8996

Hixtra Ltd
Unit 103, Caxton Court
Garamonde Drive
Milton Keynes
MK8 8DD

Certificate for the Determination of the Vertical Deformation and Strength Characteristics of Soil by the Incremental Plate Loading Test to BS 1377 Part 9: 1990

Report No: 7838-2
Report Date: 26/04/2022
Client: Geotechnical Engineering Ltd
Address: Centurion House, Olympus Park
Quedgeley
Gloucestershire
GL2 4NF
Site: 37-39 North Acton Road, London, NW10 6PF

Test Details

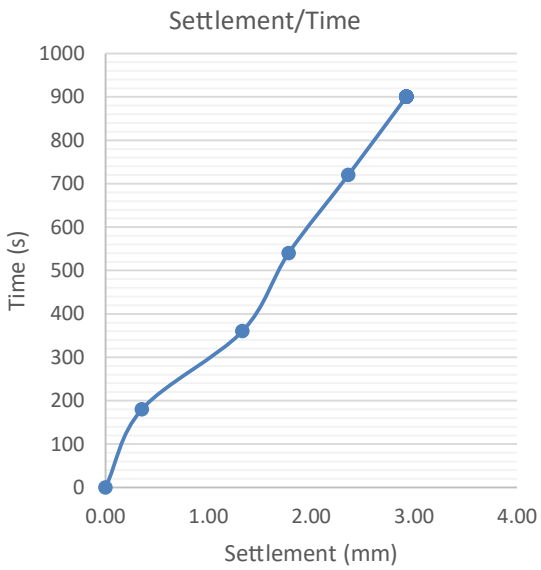
Test Location: PL2
Date of Test: 26/04/2022
Description: Gravelly Clay
Reaction Load: 14 Tonne Excavator
Material Class: Formation
Weather: Dry
Layer: 0.1m BGL
Plate Diameter (mm): 452
Condition: The results apply only to the location tested and the material was tested in an 'as found' condition

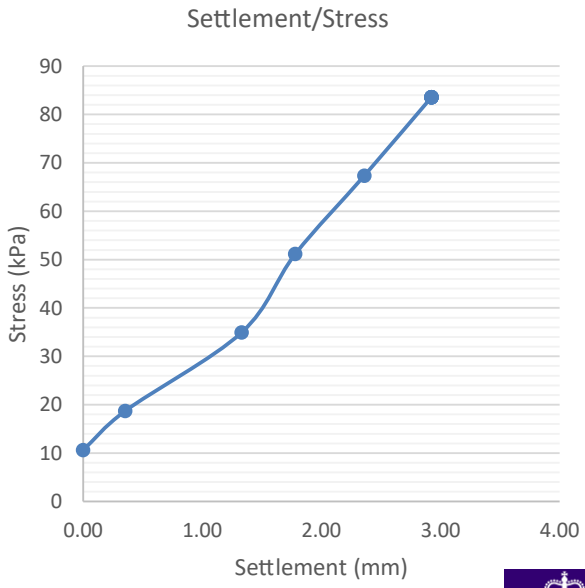
Test Results

Time, s	Settlement, mm	Plate Stress, kPa
0	0.00	11
180	0.35	19
360	1.33	35
540	1.78	51
720	2.36	67
900	2.92	84

Maximum Applied Stress (kPa):	84
Maximum Settlement (mm):	2.92
Equivalent CBR Value (%):	1
Modulus of Subgrade Reaction, k_{762} (MN/m²/m):	17

Note: Supplemental test method, calculation of Equivalent CBR Value and Modulus of Subgrade Reaction: IAN 73/06 revision 1 (2009), HD 25/94 (withdrawn)





For and on behalf of Hixtra Ltd

Kevin Shorthouse
Authorised signatory

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Garamonde Drive
Milton Keynes
MK8 8DD

Certificate for the Determination of the Vertical Deformation and Strength Characteristics of Soil by the Incremental Plate Loading Test to BS 1377 Part 9: 1990

Report No: 7838-3
Report Date: 26/04/2022
Client: Geotechnical Engineering Ltd
Address: Centurion House, Olympus Park
Quedgeley
Gloucestershire
GL2 4NF
Site: 37-39 North Acton Road, London, NW10 6PF

Test Details

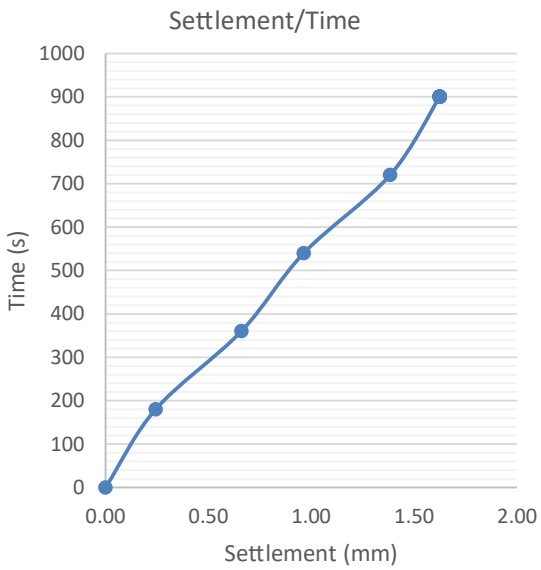
Test Location: PL3
Date of Test: 26/04/2022
Description: Gravelly Clay
Reaction Load: 14 Tonne Excavator
Material Class: Formation
Weather: Dry
Layer: 0.1m BGL
Plate Diameter (mm): 452
Condition: The results apply only to the location tested and the material was tested in an 'as found' condition

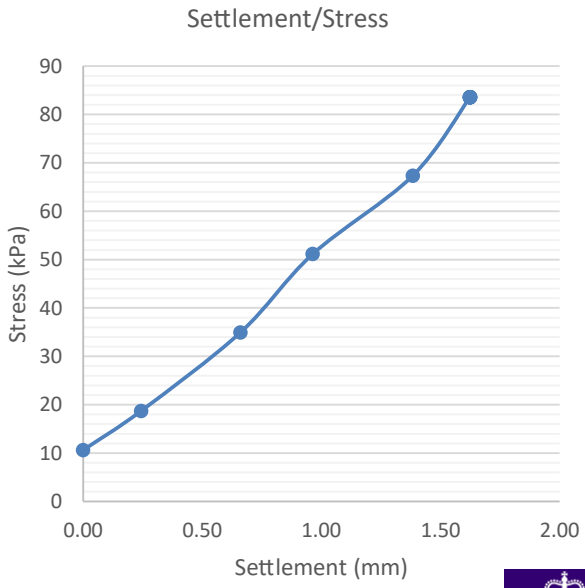
Test Results

Time, s	Settlement, mm	Plate Stress, kPa
0	0.00	11
180	0.24	19
360	0.66	35
540	0.96	51
720	1.38	67
900	1.62	84

Maximum Applied Stress (kPa):	84
Maximum Settlement (mm):	1.62
Equivalent CBR Value (%):	4
Modulus of Subgrade Reaction, k_{762} (MN/m²/m):	31

Note: Supplemental test method, calculation of Equivalent CBR Value and Modulus of Subgrade Reaction: IAN 73/06 revision 1 (2009), HD 25/94 (withdrawn)





For and on behalf of Hixtra Ltd

Kevin Shorthouse
Authorised signatory

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Hixtra Ltd
Unit 103, Caxton Court
Garamonde Drive
Milton Keynes
MK8 8DD

Certificate for the Determination of the Vertical Deformation and Strength Characteristics of Soil by the Incremental Plate Loading Test to BS 1377 Part 9: 1990

Report No: 7838-4
Report Date: 26/04/2022
Client: Geotechnical Engineering Ltd
Address: Centurion House, Olympus Park
Quedgeley
Gloucestershire
GL2 4NF
Site: 37-39 North Acton Road, London, NW10 6PF

Test Details

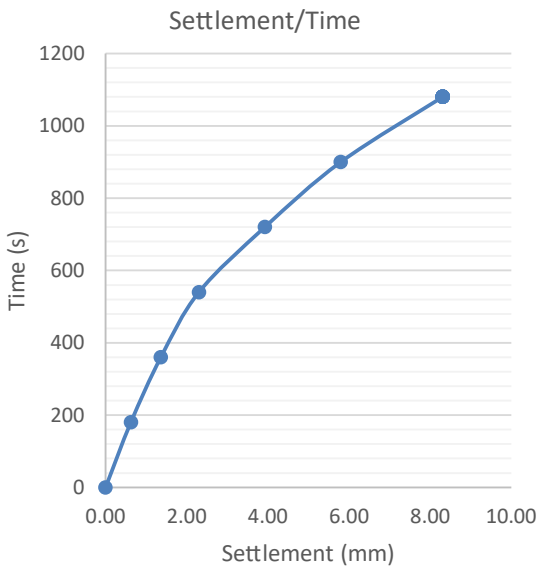
Test Location: PL4
Date of Test: 26/04/2022
Description: Gravelly Clay
Reaction Load: 14 Tonne Excavator
Material Class: Formation
Weather: Dry
Layer: 0.5m BGL
Plate Diameter (mm): 452
Condition: The results apply only to the location tested and the material was tested in an 'as found' condition

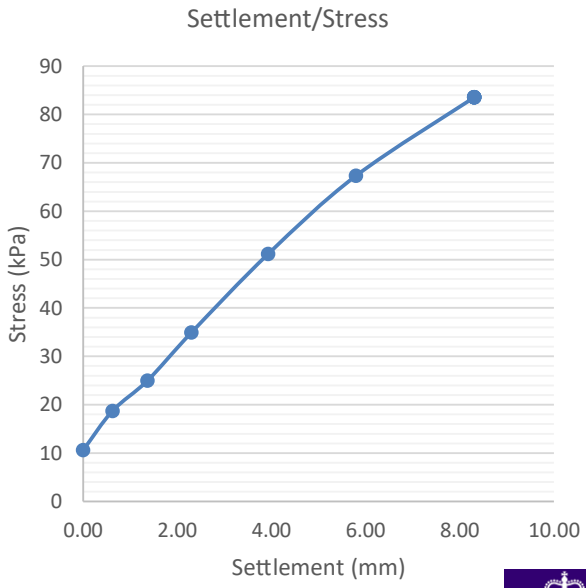
Test Results

Time, s	Settlement, mm	Plate Stress, kPa
0	0.00	11
180	0.62	19
360	1.36	25
540	2.30	35
720	3.93	51
900	5.80	67
1080	8.31	84

Maximum Applied Stress (kPa):	84
Maximum Settlement (mm):	8.31
Equivalent CBR Value (%):	1
Modulus of Subgrade Reaction, k_{762} (MN/m²/m):	12

Note: Supplemental test method, calculation of Equivalent CBR Value and Modulus of Subgrade Reaction: IAN 73/06 revision 1 (2009), HD 25/94 (withdrawn)





For and on behalf of Hixtra Ltd

Kevin Shorthouse
Authorised signatory

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Hixtra Ltd
Unit 103, Caxton Court
Garamonde Drive
Milton Keynes
MK8 8DD

Certificate for the Determination of the Vertical Deformation and Strength Characteristics of Soil by the Incremental Plate Loading Test to BS 1377 Part 9: 1990

Report No: 7838-5
Report Date: 26/04/2022
Client: Geotechnical Engineering Ltd
Address: Centurion House, Olympus Park
Quedgeley
Gloucestershire
GL2 4NF
Site: 37-39 North Acton Road, London, NW10 6PF

Test Details

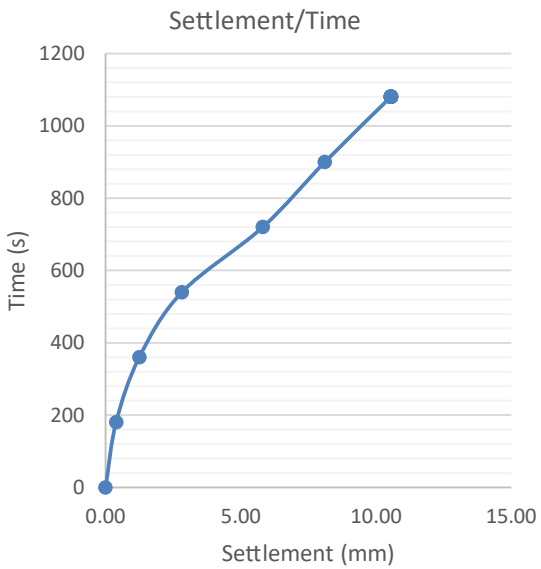
Test Location: PL5
Date of Test: 26/04/2022
Description: Gravelly Clay
Reaction Load: 14 Tonne Excavator
Material Class: Formation
Weather: Dry
Layer: 0.5m BGL
Plate Diameter (mm): 452
Condition: The results apply only to the location tested and the material was tested in an 'as found' condition

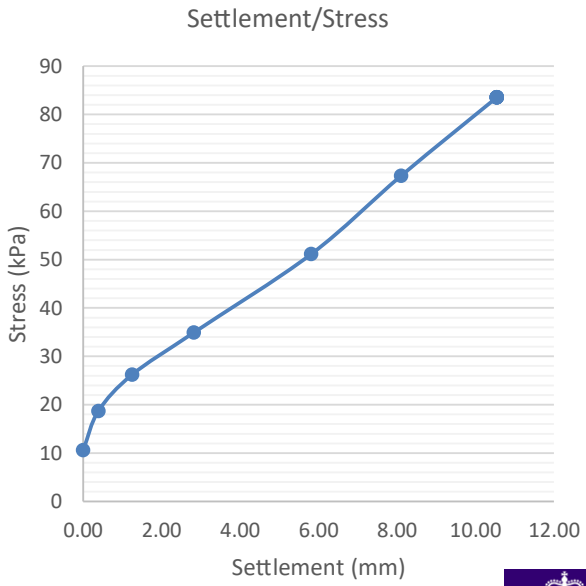
Test Results

Time, s	Settlement, mm	Plate Stress, kPa
0	0.00	11
180	0.39	19
360	1.25	26
540	2.82	35
720	5.81	51
900	8.11	67
1080	10.55	84

Maximum Applied Stress (kPa):	84
Maximum Settlement (mm):	10.55
Equivalent CBR Value (%):	1
Modulus of Subgrade Reaction, k_{762} (MN/m²/m):	13

Note: Supplemental test method, calculation of Equivalent CBR Value and Modulus of Subgrade Reaction: IAN 73/06 revision 1 (2009), HD 25/94 (withdrawn)





For and on behalf of Hixtra Ltd

Kevin Shorthouse
Authorised signatory

UKAS TESTING
8996

GEOPHYSICAL SURVEY REPORT

GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Vantage LHR 21, 37-39 North Acton Road, London

Client
Geotechnical Engineering Ltd

Survey Report
SUMO 07036

Date
May 2022

SUMO Geophysics Ltd
Vineyard House
Upper Hook Road
Upton upon Severn
Worcestershire
WR8 0SA
T: 01684 592266

geophysics@sumoservices.com
www.sumoservices.com

SUMO Geophysics Ltd

GEOPHYSICAL SURVEY REPORT

Project name:
Vantage LHR 21, 37-39 North Acton Road, London

SUMO Job reference:
SUMO 07036

Client:
Geotechnical Engineering Ltd

Survey date:
20 April 2022

Report date:
5th May 2022

Field operator:
Marek R Wajzer BSc PhD FGS

Report written by:
Marek R Wajzer BSc PhD FGS

CAD illustrations by:
Simon Haddrell BEng AMBCS PCIfA
Marek R Wajzer BSc PhD FGS

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Marek R Wajzer BSc PhD FGS

Checked by:
Simon Haddrell BEng AMBCS PCIfA

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LIST OF FIGURES

1 1 EXECUTIVE SUMMARY

A programme of soil resistivity testing was carried out at the Vantage LHR21 Site at 37-39 North Acton Road, London for the construction of a new data centre.

Two expanding Wenner arrays (SR1 – SR2) were completed for the testing. Due to very limited space available for doing the testing inside the site, both arrays could only be positioned along narrow, roughly grassed strips located between buildings in the central part of the site. The test locations are shown in Figure 2 and the soil resistivity data is presented in Tables 1 and 2. The results broadly correlate with a series of boreholes and window samples drilled on the site.

2 INTRODUCTION

2.1 Background

SUMO Geophysics were commissioned to undertake soil resistivity testing at the Vantage LHR21 Site in North Acton Road, London for a new data centre on the site. The soil resistivity data is required to produce a soil resistivity profile for assisting earthing design.

2.2 Site Details

Location	The site is located inside an industrial estate next to the Grand Union Canal at 37 - 39 North Acton Road, in the Acton district of London (Fig.1).
NGR / Postcode	TQ20828297 / NW10 6PF
Geology (BGS 2022)	Bedrock: Clay, silt and sand from the Palaeogene London Clay (48 – 56 Ma) Superficial: None recorded
Soils (CU 2022)	Soilscape 18: Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils
Survey Method	Soil resistivity testing

2.3 Aims and Objectives

The objective of the testing was to measure the soil resistivity at two locations specified by the Client for producing a soil resistivity profile.

3 SOIL RESISTIVITY METHOD

Soil resistivity is a geophysical method that measures variations in subsurface electrical properties, by applying small electrical currents across arrays of electrodes inserted into the ground.

Traditional resistivity surveys are carried out using four equally spaced electrodes, set out in a standard configuration Wenner Array as outlined in BS EN 50522. Readings are obtained by passing a low frequency electrical current across the two outer electrodes, with the potential difference measured across the inner two electrodes (Plate 1). The resistivity system automatically calculates the ground resistance by dividing the measured voltage by the current.

The Wenner model assumes measurements are made at a point on the surface, but this relationship can break down if the electrode is pushed too far into the ground. In optimum conditions the depth of the electrode should be less than 5% of the electrode spacing.

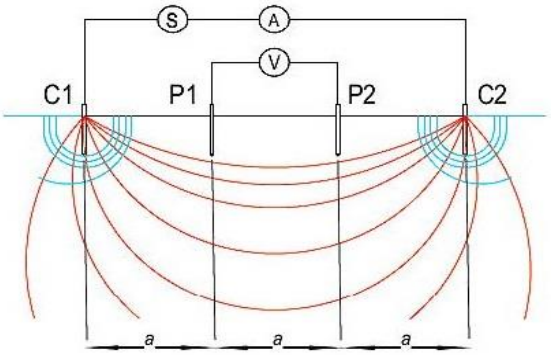


Plate 1 - Standard soil resistivity test with four-electrode Wenner array showing a schematic illustration of current flow lines

The resultant resistance readings are converted into apparent resistivity values (P_a) that represent the average ground resistivity between the electrodes. The geometric correction factor for converting the resistance readings into resistivity values depends on the configuration of electrodes used for the test measurement. The apparent resistivity for a Wenner configuration is given by the equation:

$$P_a = 2\Pi aR$$

P_a	=	Apparent resistivity in Ohm-metres
a	=	Electrode spacing in metres
R	=	Resistance in Ohms

Models of vertical variations in ground resistivity are obtained by using an expanding electrode array centred on the same reference point, known as an electrical sounding. The depth penetration increases directly in proportion to the spacing between the electrodes, provided the ground is reasonably homogenous. The apparent resistivity is measured at various electrode spacings, with the array centred on the same measurement point.

4 SITE TESTING PROCEDURE

The weather was sunny with occasional cloud at the time of the testing, with a maximum temperature of 18^{o}C.

The site was located inside an industrial estate, with a series of buildings occupying the northern side of the estate and a reinforced concrete road running along the southern side. Consequently, only very limited space was available for setting out test arrays inside the site. In accordance with the end client's instructions, the test positions were not be moved to more suitable locations outside the site.

An initial site inspection was agreed carried out with representatives from the Client and an engineer from Ramboll. It was agreed that the only suitable testing locations were two narrow, roughly grassed, north south-oriented strips found between buildings in the central part of the site; together with a narrow, vegetated verge running between the southern side of the road and the adjacent site boundary.

The positions were optimised with the assistance of utility detection personnel from Geotechnical Engineering, to try to avoid any nearby longitudinal services that could adversely affect the data. The utility scan identified suitable positions in the two strips between buildings. However, the narrow grass verge running down the western side of the road was found to contain six longitudinal, high voltage cables which prevented any meaningful testing from taking place in this area. The final selected test locations (SR1 and SR2) are shown in Figure 2.

A Megger DET 2/2 Digital Earth Tester was used for the testing operations with the calibration certificate attached in Appendix A. The system delivers a low frequency AC current to the electrodes. An operating frequency of 128 Hz was set to reduce interference from 50 Hz main electricity on a variable current setting. The testing was carried out in accordance with the specifications outlined in BS EN 50522, involving four equally spaced electrodes set out in a straight line expanding Wenner Array, centred on the test position.

Only Type A Wenner arrays (one of two array options specified by the end client) could be carried out in the limited space available, which had specified electrode spacings of 0.3, 0.5, 0.7 1.0, 1.5, 2, 3, 4, 5, 7, 10 and 15 metres. Both the SR1 and SR2 and SR2 arrays were aligned NNW/SSE to fit inside the limited available space. The maximum electrode spacing of SR1 was restricted by space to 10 metres. SR2 could only achieve a maximum specified electrode spacing of 7 metres, although one more reading was fitted in at 9 metres separation. Two representative resistance readings (R1 & R2) were recorded at each electrode spacing.

Plate 3 Soil Resistivity Testing in Progress at SR2

The cover page shows data acquisition in progress at location SR1 and Plate 2 shows the array set out at SR2. All of the repeat readings from each location differed by far less than 3% of the mean value, well within the accepted tolerance range.

5 SUMMARY OF RESULTS

5.1 Introduction

The results of the soil resistivity testing are presented in Tables 1 and 2, listing the array orientation, nominal testing depth and electrical resistance in ohms for each electrode spacing. The two resistance readings measured at each electrode spacing (R1 & R2) generally display good repeatability. The tables also present the average resistance and apparent resistivity (in ohm-metres) for each position.

It should be noted that the testing results are related to existing ground conditions at the time of site work. The results may not be valid if future remediation of the ground is carried out on the site. Ground resistivity can vary seasonally and may also be modified by the introduction of new fill material during any future construction operations.

5.3 Data Summary

The results from SR1 are presented in Table 1. After an initial moderately high reading of 112 ohm-metres at 0.3 metre electrode spacing, the resistivity values display a trend of progressively decreasing resistivity with depth continues down to 6 ohm-metres at 7 metres electrode separation, remaining at the same approximate value for the last possible reading at 10 metres electrode spacing.

The results from SR2 shown in Table 2 fall in a similar resistivity range and display a broadly similar pattern of decreasing resistivity with depth. The highest resistivity value of 118 ohm-metres was obtained at the narrowest electrode spacing of 0.3 metre, progressively decreasing to 5 Ohm-metres at 7 metres electrode spacing. The difficulties obtained in taking a final reading at the widest electrode separation of 9 metres suggests that less reliance should be placed on this reading.

6 BOREHOLE DATA CORRELATION

A total of three boreholes (BH01 – BH03) and five window samples (WS01 – WS05) were drilled by Geotechnical Engineering on the site. The borehole and window sample data revealed broadly consistent ground conditions of heterogeneous, layered made ground (0.55 – 2.15 metres) underlain by clay down to the terminations of the boreholes at 35 metres bgl. In terms of proximity, WS03 is nearest to location SR1 and WS02 is closest to SR2.

The resistivity values obtained for the first five readings at SR1 correlate to the made ground seen in WS03, which has a thickness of 2.15 metres. The three lowest layers of the made ground between 0.6 – 2.15 metres bgl have a clayey matrix, which is consistent with the lower resistivity values for the four readings between 0.7 metres – 2.0 metres electrode spacing.

Similarly at SR2 for the first four or five readings correlate to the made ground seen in WS032 which has a thickness of 1.70 metres. The two lowest layers of the made ground between 0.6 – 1.70 metres bgl again have a clayey matrix, which is consistent with the lower resistivity values for the four readings between 0.7 metres – 2.0 metres electrode spacing.

The very low resistivity values measured for electrode spacings wider than 2-metres at both test locations are consistent with the presence of clay below a maximum depth of 2. 15 metre recorded in all of the boreholes on the site.

7 CONCLUSIONS

Two expanding Wenner arrays were measured on the LHR 21 Site at 37-39 North Acton Road, London (SR1 and SR2). Due to very limited space available space inside the site, the arrays could only be positioned along narrow, roughly grassed strips between buildings in the central part of the site. The results are consistent with ground conditions of clay overlain by made ground and broadly correlate with borehole and window sample data from the site.

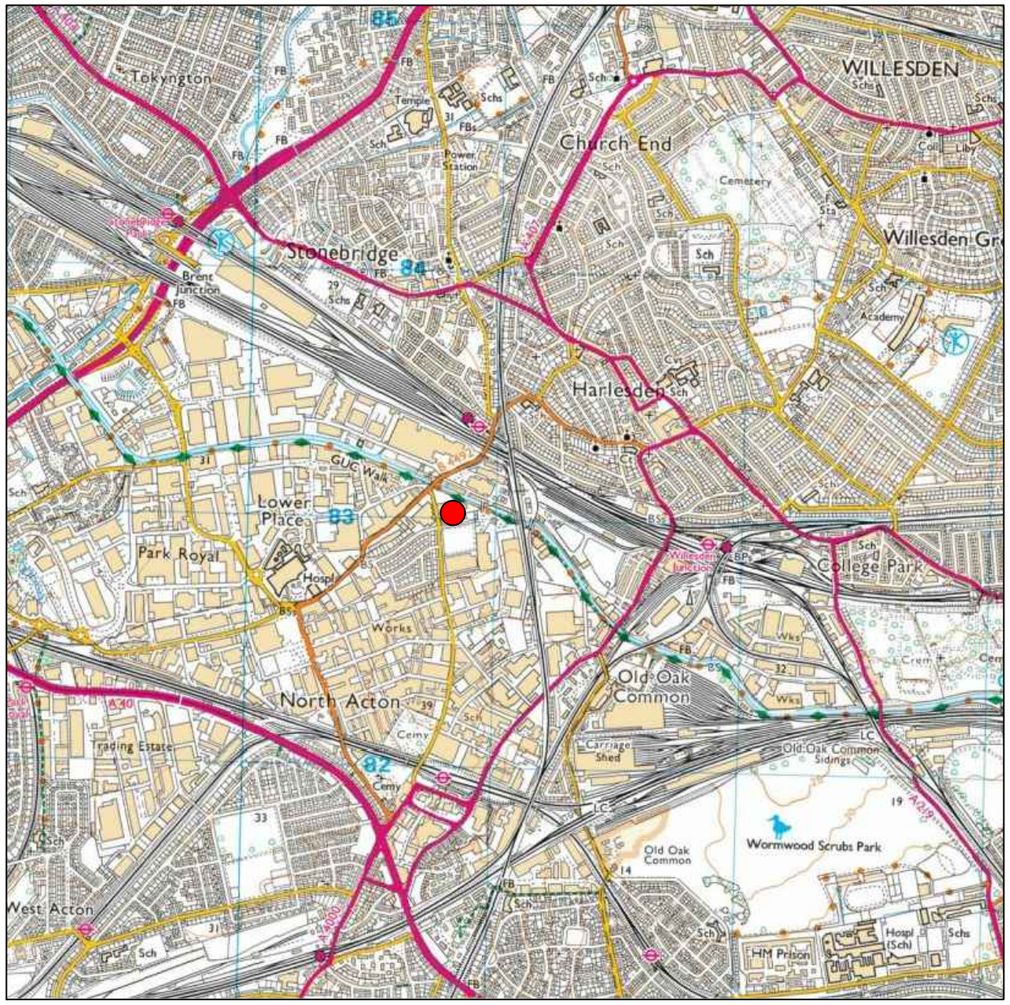
8 DATA TABLES

Table 1 Vantage LHR 21, 37-39 North Acton Road, London - Soil Resistivity Testing Results on 20/4/2022

Location	Orientation	Electrode Separation 'a' (metres)	Nominal Test Depth (metres)	R1 (Ohms)	R2 (Ohms)	Rav (Ohms)	Apparent Resistivity (Ohm-metres)	Comment
SR1	NNW/SSE	0.3	0.3	59.2	59.8	59.5	112.16	Array set out along narrow strip between buildings
SR1	NNW/SSE	0.5	0.5	31.9	32.0	32.0	100.37	
SR1	NNW/SSE	0.7	0.7	20.8	20.6	20.7	91.04	
SR1	NNW/SSE	1.0	1.0	6.95	6.97	6.96	43.73	
SR1	NNW/SSE	1.5	1.5	3.06	3.06	3.06	28.84	
SR1	NNW/SSE	2.0	2.0	1.44	1.44	1.44	18.10	
SR1	NNW/SSE	3.0	3.0	0.615	0.614	0.615	11.58	
SR1	NNW/SSE	4.0	4.0	0.338	0.336	0.337	8.47	
SR1	NNW/SSE	5.0	5.0	0.234	0.236	0.235	7.38	
SR1	NNW/SSE	7.0	7.0	0.146	0.147	0.147	6.44	
SR1	NNW/SSE	10.0	10.0	0.110	0.109	0.110	6.88	Array terminated by road at south end and fence at north end

Table 2 – Vantage LHR 21, 37-39 North Acton Road, London - Soil Resistivity Testing Results on 20/4/2022

Location	Orientation	Electrode Separation 'a' (metres)	Nominal Test Depth (metres)	R1 (Ohms)	R2 (Ohms)	Rav (Ohms)	Apparent Resistivity (Ohm-metres)	Comment
SR2	NNW/SSE	0.3	0.3	62.7	62.5	62.6	118.00	Array set out along narrow strip between buildings
SR2	NNW/SSE	0.5	0.5	24.1	24.2	24.2	75.87	
SR2	NNW/SSE	0.7	0.7	13.80	13.77	13.79	60.63	
SR2	NNW/SSE	1.0	1.0	6.11	6.12	6.12	38.42	
SR2	NNW/SSE	1.5	1.5	2.88	2.88	2.88	27.14	
SR2	NNW/SSE	2.0	2.0	1.49	1.49	1.49	18.71	
SR2	NNW/SSE	3.0	3.0	0.600	0.598	0.599	11.29	
SR2	NNW/SSE	4.0	4.0	0.338	0.336	0.337	8.47	
SR2	NNW/SSE	5.0	5.0	0.250	0.250	0.250	7.85	
SR2	NNW/SSE	7.0	7.0	0.123	0.126	0.125	5.48	
SR2	NNW/SSE	9.0	9.0	0.216	0.222	0.219	12.38	Noisy & difficult to stablise despite many repeat readings
								Array terminated by concrete drive at south end and fence at north end



N

Site Location

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

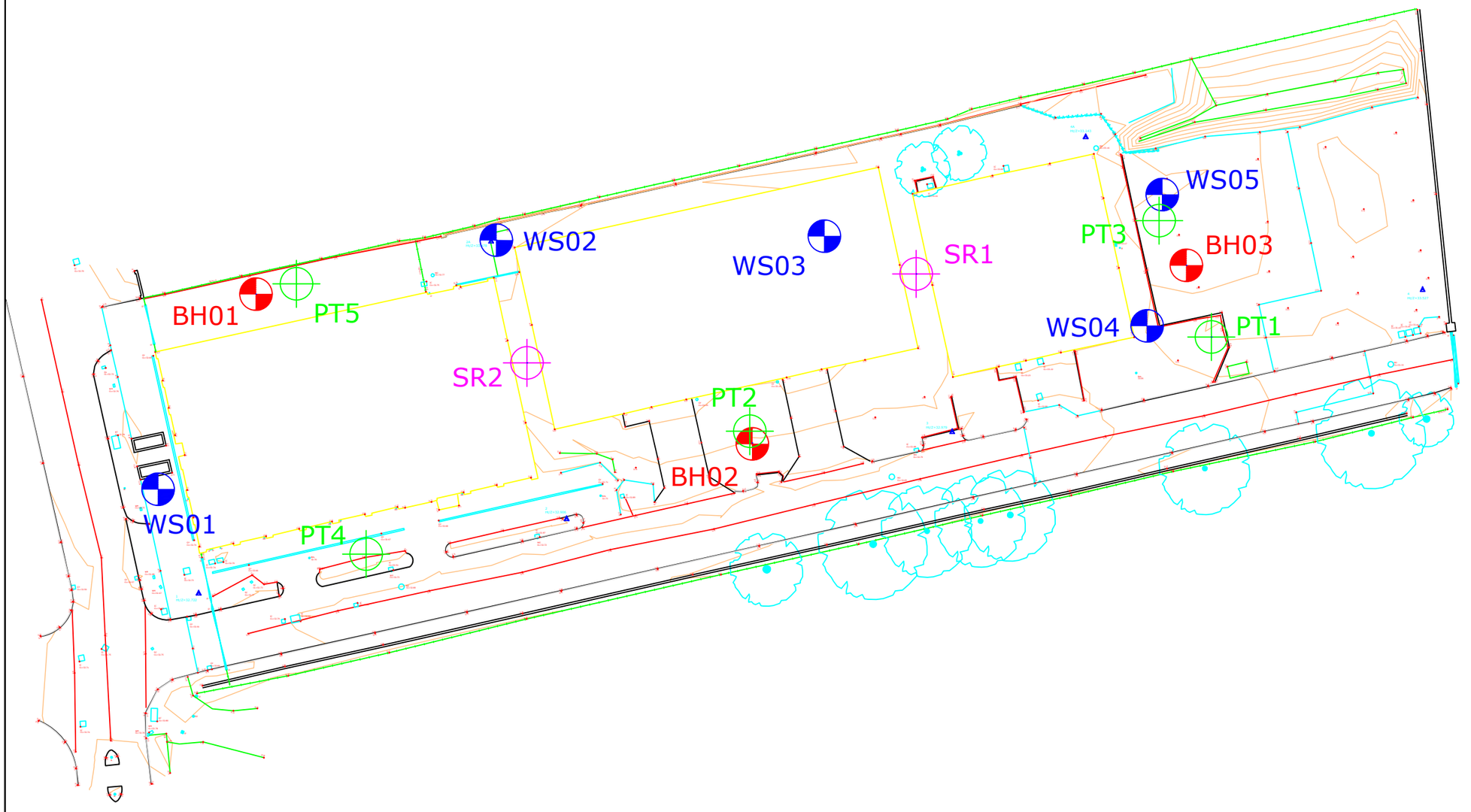
Title:
Site Location Diagram

Client:
Geotechnical Engineering Ltd

Project:
07036 - Vantage LHR 21
37-39 North Acton Road London

Scale:
0 metres 1000
1:25000 @ A3

Fig No:
01



N

Borehole Location

Window Sample Location

Plate Load Test Location

Soil Resistivity Test Location

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Soil Resistivity Testing Location Plan

Client:
Geotechnical Engineering Ltd

Project:
07036 - Vantage LHR 21
37-39 North Acton Road London

Scale:
0 metres 25
1:500 @ A3

Fig No:
02

CERTIFICATE OF CALIBRATION

QC 20/F

Certificate Number
H2114864

BS EN ISO 9001:2015 Cert. No. FS 09953

QUASAR Tronics LTD

Quasartronics Ltd.
Watt House, Dudley Innovation Centre
Kingswinford,
West Midlands
DY6 7YD
Tel: 01384 401132 Fax: 01384 400754
e-mail: mail@quasartronics.com

CUSTOMER : SUMO GEOPHYSICS LTD
VINEYARD HOUSE, UPPER HOOK ROAD
WORCESTERSHIRE
UPTON ON SEVERN
WR8 0SA

Order No. : TBA 301121
Customer Ref. : None
Engineer
Location

Calibration Information

Instrument Type	:	Megger DET2/2 AUTO EARTH TESTER	Serial Number	:	1005M459920
System ID	:	WED680	Job Number	:	D309049-1
Ambient Conditions					
Temperature	:	21°C ± 2°C	Calibration Date	:	30/11/2021
Relative Humidity	:	50% ± 20%	Cal Due Date	:	30/11/2022

Calibrated Under a Quality Management System Assessed By The BSI to BS EN ISO 9001:2015. The equipment used is traceable to National Standards (N.P.L.). ISO10012 : 2003 is used for guidance.
This instrument has been tested to the tolerances specified in the Procedure Number : 1270

CONDITION PRIOR TO CALIBRATION A :- No Adjustment Required

Overall result after calibration : PASS
Calibration status : COMPLETED

THE CALIBRATION STATUS WILL SHOW:
TERMINATED - if the procedure was prematurely terminated;
COMPLETED - if the procedure was completed without abnormal conditions

STANDARDS USED FOR CALIBRATION

Instrument Description	Asset Number	Certificate Number	Cal. Date	Cal. Period
TIME 1040 (Q298)	Q298	1710226	05/11/2021	52
Resistor Block (Q42)	Q42	H2105923	14/05/2021	52

Authorised Signatory : K Beardsmore K.Beardsmore

CERTIFIED THAT THE WHOLE CALIBRATION DETAILED HEREON HAVE BEEN INSPECTED AND TESTED IN ACCORDANCE WITH THE CONDITIONS AND REQUIREMENTS OF THE CONTRACT OR PURCHASE ORDER AND UNLESS OTHERWISE STATED CONFORM IN ALL RESPECTS TO THE SPECIFICATION(S) DRAWING(S) RELEVENT THERETO, AND THE MANUFACTURERS ORIGINAL STANDARDS WHERE AVAILABLE.

CERTIFICATE OF CALIBRATION

BS EN ISO 9001:2015 Cert. No. FS 09953

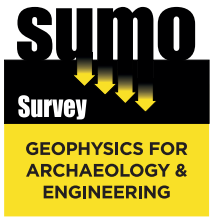
Calibration Date
30/11/2021

Certificate Number
H2114864

Test Title	Tolerance	Applied Value	Reading	Pass / Fail
EARTH RESISTANCE				
1 Ohm	7mR	1.000R	1.000R	PASS
10 Ohm	70mR	10.00R	10.00R	PASS
100 Ohm	700mR	100.0R	100.0R	PASS
500 Ohm	4.5R	0.500kR	0.500kR	PASS
1.0 KOhm	7R	1.000kR	1.000kR	PASS
5.0 Kohm	45R	5.00kR	4.99kR	PASS
10.0 Kohm	70R	10.00kR	9.99kR	PASS
15.0 Kohm	95R	15.00kR	14.99kR	PASS
19.0 Kohm	115R	19.00kR	19.01kR	PASS

Instrument was allowed to stabilise before calibration.

********** *END OF TEST DATA*



- Archaeological
- Geophysical
- Laser Scanning
- Measured Building
- Topographic
- Utility Mapping

SUMO Services Ltd, incorporated under the laws of England and Wales,
Company Registration No.4275993.
Registered Office Unit 8 Hayward Business Centre, New Lane, Havant, Hampshire, PO9 2NL

APPENDIX B

LABORATORY TESTING

2718

GEOTECHNICAL ENGINEERING LIMITED

Version No.	1
For the attention of Hamzah Afzul / Andrew Tatnell	Page No. 1 of 17
Date of Issue	13/06/2022

TEST REPORT

PROJECT/SITE	VANTAGE LHR21, NORTH ACTON ROAD, LONDON	Samples received	29/04/2022
GEL REPORT NUMBER	37013	Schedule received	10/05/2022
Your ref/PO:		Testing commenced	24/05/2022
Test report refers to	Schedule 1	Status	Final

SUMMARY OF RESULTS ATTACHED

TEST METHOD & DESCRIPTION	QUANTITY	ACCREDITED TEST
BS EN ISO 17892-1: 2014:5, Water Content	10	YES
BS EN ISO 17982-12:2018+A1:2020, Liquid & Plastic Limits	10	YES
BS1377: Part 5: 1990:4, Swelling Determination	5	NO
BS EN ISO 17892-5: 2017, Oedometer	5	YES
BS EN ISO 17892-8:2018, Undrained Triaxial Compression	28	YES
BRE SD1 Suite (Subcontracted)	13	YES/NO

General Remarks

This report may not be partially reproduced without written permission from this laboratory.

The results reported relate to samples received in the laboratory and the items tested.

Report Specific Remarks

Approved Signatories:

W Jones (Laboratory Manager) **T Best (Deputy Laboratory Manager)**

E Crimp (Senior Geotechnical Engineer) J Hanson (Director) N Parry (Director)

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Sort code: 30-93-48 **Bank account**: 1713840

Geotechnical Engineering Limited

LIQUID AND PLASTIC LIMITS

BS EN ISO 17892-12:2018

CLIENT RAMBOLL UK LTD

SITE VANTAGE LHR21, NORTH ACTON ROAD, LONDON

borehole /trial pit no.	sample		specimen depth (m)	natural water content (%)	specimen preparation and test method	fraction >0.425 mm (%)	liquid limit (%)	plastic limit (%)	plasticity index (%)	description and remarks
	no./type	depth (m)								
BH01	12D	4.00	4.00	33.8	BXE	2	78	25	53	Brown and grey slightly sandy CLAY with rare selenite
BH01	35D	14.50	14.50	28.9	BXE	0	70	28	42	Brown slightly sandy CLAY
BH01	57D	25.50	25.50	26.7	BXE	0	70	26	44	Brown slightly sandy CLAY
BH02	29D	10.50	10.50	19	BXE	0	59	23	36	Brown slightly sandy CLAY
BH02	50D	21.00	21.00	25	BXE	1	65	23	42	Brown slightly sandy CLAY
BH02	71D	31.00	31.00	26.9	BXE	46	56	21	35	Brown slightly sandy slightly gravelly CLAY
BH03	5B	1.20	1.20	36.2	BXE	8	66	24	42	Brown and grey mottled black slightly gravelly slightly sandy CLAY
BH03	13D	4.00	4.00	30.9	BXE	0	71	23	48	Brown and grey slightly sandy CLAY
BH03	39D	15.50	15.50	29.8	BXE	1	72	28	44	Brown slightly sandy CLAY
BH03	57D	24.50	24.50	26.5	BXE	0	71	26	45	Brown slightly sandy CLAY

general remarks

natural water content determined in accordance with BS EN ISO 17892 - 1 : 2014 (unless specified)

NP denotes non plastic

# denotes sample tested is smaller than that which is recommended in accordance with BS EN ISO 17892 or BS1377

specimen preparation		test method	CONTRACT	CHECKED
A - as received	D - oven dried (60oC)	X - cone penetrometer (test 4.3)		
B - washed on 0.425mm sieve	E - oven dried (105oC)	Y - cone penetrometer (test 4.4)	**37013**	**TB**
C - air dried	F - not known	Z - casagrande apparatus (test 4.5)		

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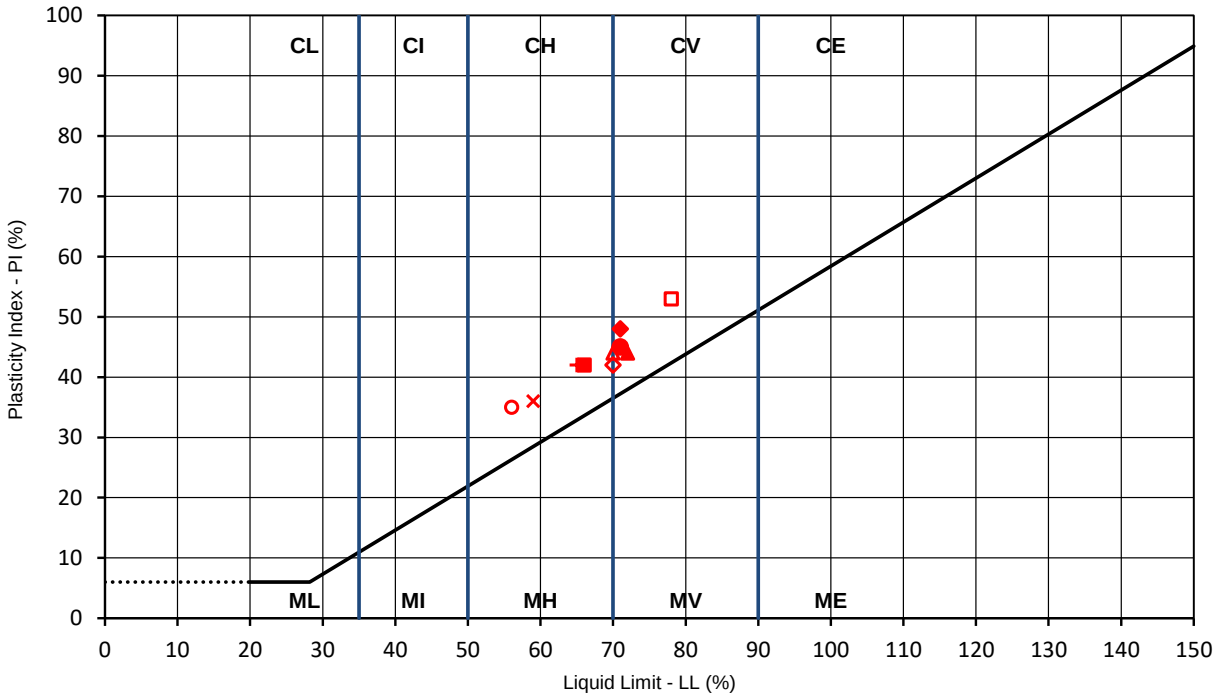
ATTERBERG LINE PLOT

CLIENT RAMBOLL UK LTD

SITE VANTAGE LHR21, NORTH ACTON ROAD, LONDON



	BH/TP No.	depth (m)	LL	PL	PI	remarks
□	BH01	4.00	78	25	53	
◇	BH01	14.50	70	28	42	
△	BH01	25.50	70	26	44	
×	BH02	10.50	59	23	36	
+	BH02	21.00	65	23	42	
○	BH02	31.00	56	21	35	
■	BH03	1.20	66	24	42	
◆	BH03	4.00	71	23	48	
▲	BH03	15.50	72	28	44	
●	BH03	24.50	71	26	45	

CONTRACT	CHECKED
37013	**TB**

Geotechnical Engineering Limited

MEASUREMENT OF SWELLING PRESSURE

BS.1377 : PART 5 : 1990 : 4.3

CLIENT RAMBOLL UK LTD

SITE VANTAGE LHR21, NORTH ACTON ROAD, LONDON

borehole /trial pit no.	sample		specimen depth	initial diameter	initial height	initial moisture content	density		particle density	initial voids ratio	initial degree of satura-tion	swelling pressure	description and remarks
	no./type	depth (m)	(m)	(mm)	(mm)	(%)	bulk (Mg/m3)	dry (Mg/m3)	(Mg/m3)		(%)	(kPa)	
BH01	16UT	5.50	5.85	63.28	18.75	36.4	1.90	1.39	#2.70	0.940	105	23	Brown CLAY with rare selenite
BH02	12UT	3.50	3.50	63.34	18.69	33.5	1.89	1.41	#2.70	0.910	99	28	Brown mottled grey CLAY with rare selenite
BH02	18UT	5.50	5.55	63.38	18.8	33.9	1.89	1.41	#2.70	0.911	100	17	Brown mottled orange CLAY with rare selenite
BH02	24UT	8.00	8.00	63.33	18.46	29.1	1.96	1.52	#2.70	0.781	101	51	Brown CLAY with rare selenite. Test duration 54.5 hours.
BH03	12UT	3.50	3.60	63.40	18.83	30	1.90	1.47	#2.70	0.843	96	28	Brown mottled grey and orange slightly sandy CLAY with rare selenite

general remarks

# denotes particle density has been assigned an assumed value

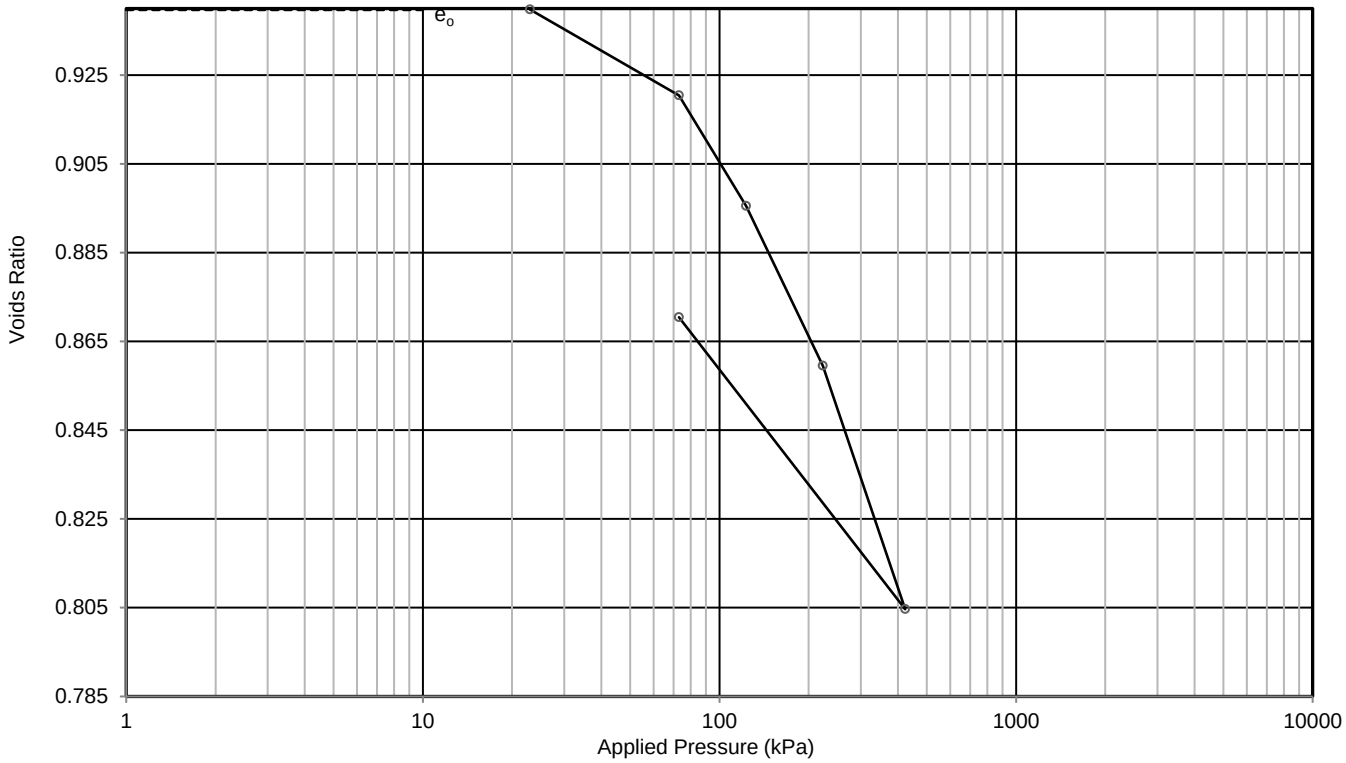
CONTRACT	CHECKED
37013	**TB**

Geotechnical Engineering Limited

DETERMINATION OF ONE-DIMENSIONAL CONSOLIDATION PROPERTIES

BS EN ISO 17892 - 5 : 2017 : 6

CLIENT	RAMBOLL UK LTD	BH/TP No.	BH01
SITE	VANTAGE LHR21, NORTH ACTON ROAD, LONDON	SAMPLE No./TYPE	16UT
DESCRIPTION	Brown CLAY with rare selenite	SAMPLE DEPTH (m)	5.50
		SPECIMEN DEPTH (m)	5.85



test and sample details			test results			
			pressure stage (kPa)	voids ratio	laboratory coefficients of compressibility mv (m2/MN)	consolidation Cv (m2/yr)
specimen diameter	mm	63.28				
specimen height	mm	18.75				
initial moisture content	%	36.4				
final moisture content	%	37.7				
initial bulk density	Mg/m3	1.90	23	0.940		
initial dry density	Mg/m3	1.39	73	0.920	0.2	1
initial voids ratio		0.940	123	0.895	0.26	0.6
initial degree of saturation	%	105	223	0.859	0.19	0.76
particle density	Mg/m3	#2.70	423	0.805	0.15	0.48
swelling pressure	kPa	23	73	0.870	0.1	
P'o to P'o +100 kPa		-				
laboratory temperature	oC	20 ± 2				
method of time fitting		root time				

remarks # denotes particle density has been assigned an assumed value

Load sequence added to swelling pressure.

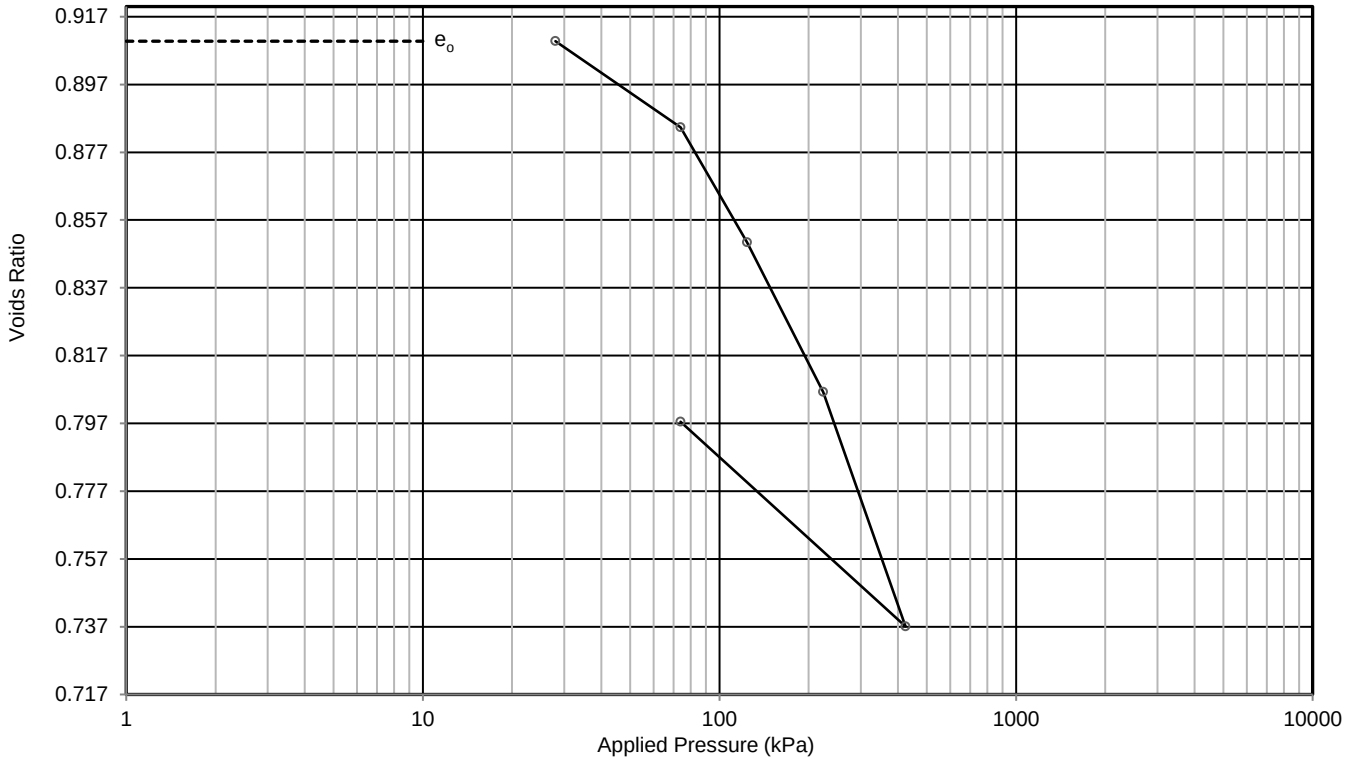
CONTRACT	CHECKED
37013	**TB**

Geotechnical Engineering Limited

DETERMINATION OF ONE-DIMENSIONAL CONSOLIDATION PROPERTIES

BS EN ISO 17892 - 5 : 2017 : 6

CLIENT	RAMBOLL UK LTD	BH/TP No.	BH02
SITE	VANTAGE LHR21, NORTH ACTON ROAD, LONDON	SAMPLE No./TYPE	12UT
DESCRIPTION	Brown mottled grey CLAY with rare selenite	SAMPLE DEPTH (m)	3.50
		SPECIMEN DEPTH (m)	3.50



test and sample details			test results			
			pressure stage (kPa)	voids ratio	laboratory coefficients of compressibility mv (m2/MN)	laboratory coefficients of consolidation Cv (m2/yr)
specimen diameter	mm	63.34				
specimen height	mm	18.69				
initial moisture content	%	33.5				
final moisture content	%	35.2				
initial bulk density	Mg/m3	1.89	28	0.910		
initial dry density	Mg/m3	1.41	74	0.884	0.29	1.6
initial voids ratio		0.910	124	0.850	0.36	1.4
initial degree of saturation	%	99	224	0.806	0.24	0.82
particle density	Mg/m3	#2.70	424	0.737	0.19	0.61
swelling pressure	kPa	28	74	0.797	0.099	
P'o to P'o +100 kPa		-				
laboratory temperature	oC	20 ± 2				
method of time fitting		root time				

remarks # denotes particle density has been assigned an assumed value

Peak swelling pressure 28kPa before dissipating to 24kPa. Load sequence added to swelling pressure.

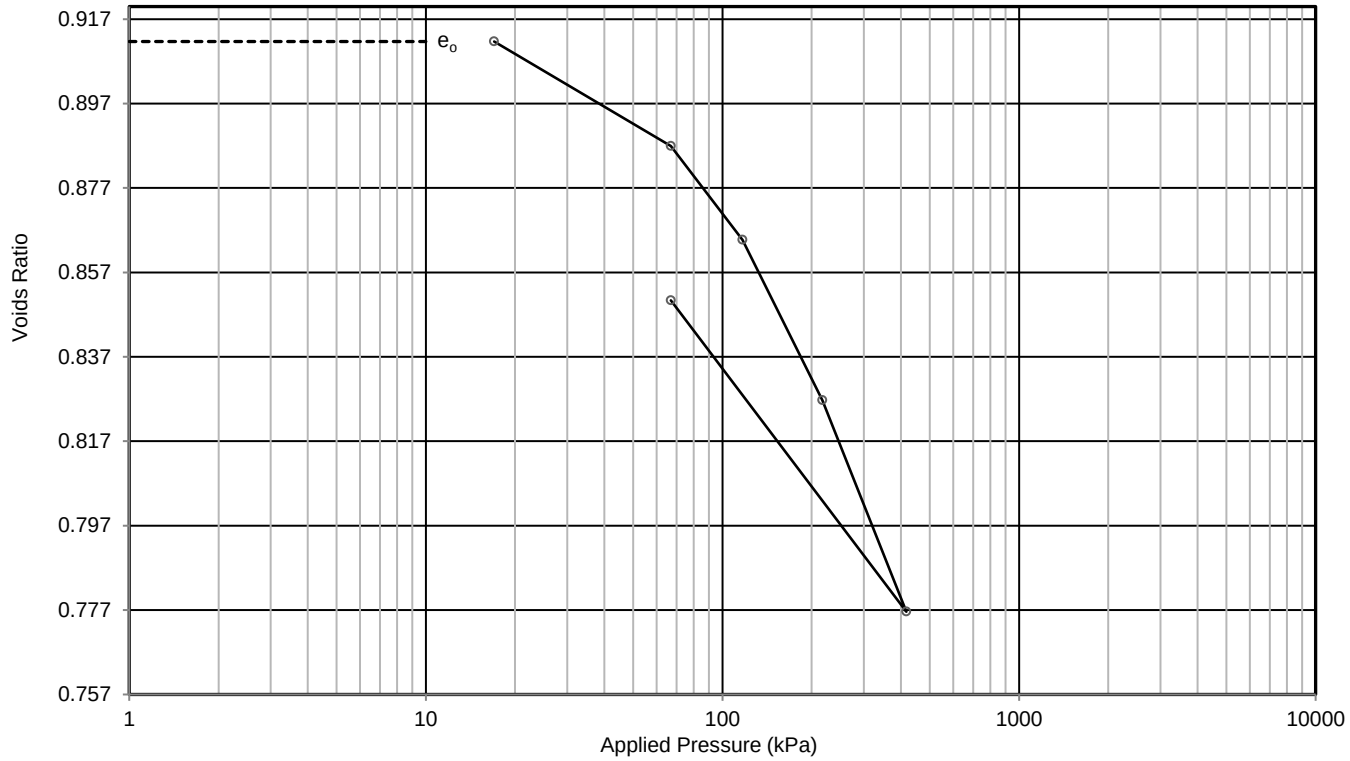
CONTRACT	CHECKED
37013	**TB**

Geotechnical Engineering Limited

DETERMINATION OF ONE-DIMENSIONAL CONSOLIDATION PROPERTIES

BS EN ISO 17892 - 5 : 2017 : 6

CLIENT	RAMBOLL UK LTD	BH/TP No.	BH02
SITE	VANTAGE LHR21, NORTH ACTON ROAD, LONDON	SAMPLE No./TYPE	18UT
DESCRIPTION	Brown mottled orange CLAY with rare selenite	SAMPLE DEPTH (m)	5.50
		SPECIMEN DEPTH (m)	5.55



test and sample details			test results			
			pressure stage (kPa)	voids ratio	laboratory coefficients of compressibility mv (m2/MN)	consolidation Cv (m2/yr)
specimen diameter	mm	63.38				
specimen height	mm	18.82				
initial moisture content	%	33.8				
final moisture content	%	35.0				
initial bulk density	Mg/m3	1.89	17	0.912		
initial dry density	Mg/m3	1.41	67	0.887	0.26	0.63
initial voids ratio		0.912	117	0.865	0.24	0.5
initial degree of saturation	%	100	217	0.827	0.2	0.51
particle density	Mg/m3	#2.70	417	0.777	0.14	0.65
swelling pressure	kPa	17	67	0.850	0.12	
P'o to P'o +100 kPa		-				
laboratory temperature	oC	20 ± 2				
method of time fitting		root time				

remarks # denotes particle density has been assigned an assumed value

Load sequence added to swelling pressure.

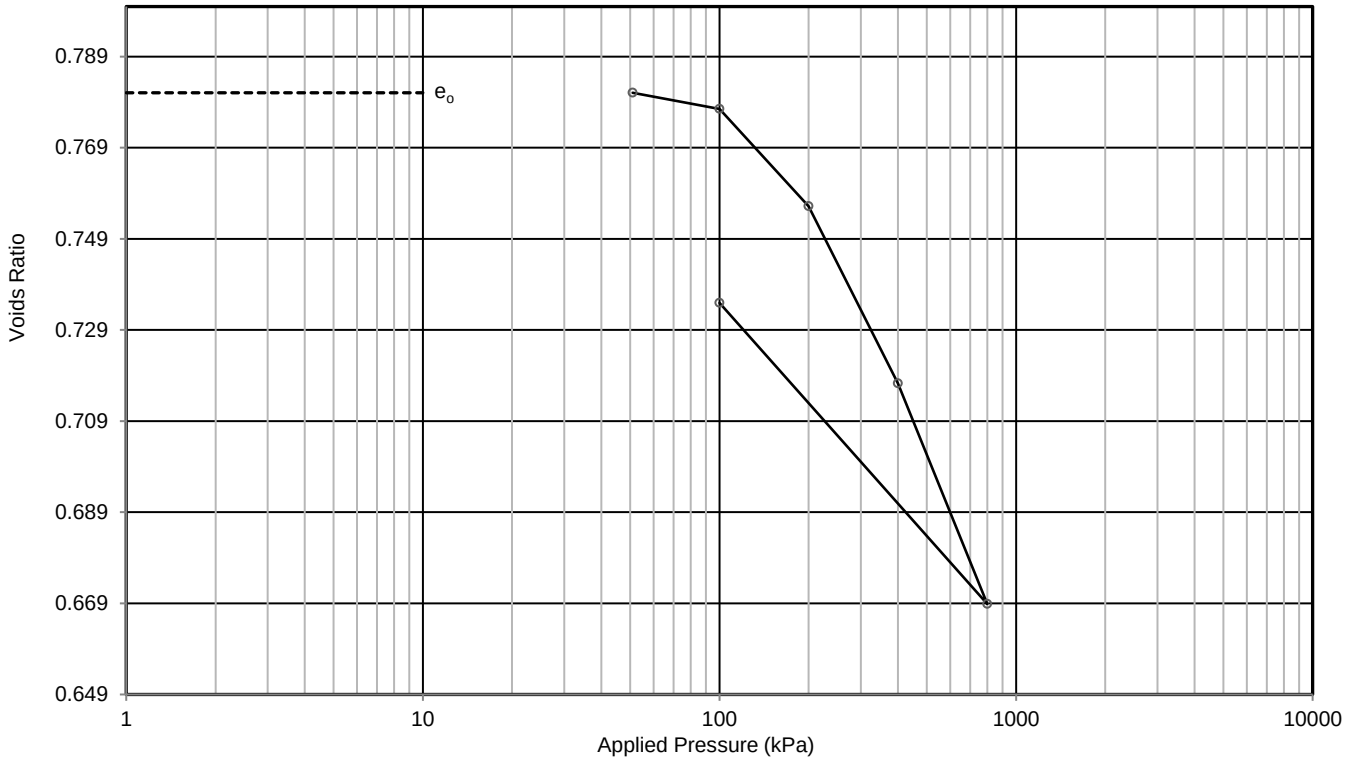
CONTRACT	CHECKED
37013	**TB**

Geotechnical Engineering Limited

DETERMINATION OF ONE-DIMENSIONAL CONSOLIDATION PROPERTIES

BS EN ISO 17892 - 5 : 2017 : 6

CLIENT	RAMBOLL UK LTD	BH/TP No.	BH02
SITE	VANTAGE LHR21, NORTH ACTON ROAD, LONDON	SAMPLE No./TYPE	24UT
DESCRIPTION	Brown CLAY with rare selenite	SAMPLE DEPTH (m)	8.00
		SPECIMEN DEPTH (m)	8.00



test and sample details			test results			
			pressure stage (kPa)	voids ratio	laboratory coefficients of compressibility mv (m2/MN)	consolidation Cv (m2/yr)
specimen diameter	mm	63.33				
specimen height	mm	18.46				
initial moisture content	%	29.1				
final moisture content	%	29.3				
initial bulk density	Mg/m3	1.96	51	0.781		
initial dry density	Mg/m3	1.52	100	0.778	0.041	0.82
initial voids ratio		0.781	200	0.756	0.12	0.29
initial degree of saturation	%	101	400	0.717	0.11	0.28
particle density	Mg/m3	#2.70	800	0.669	0.071	0.25
swelling pressure	kPa	51	100	0.735	0.057	
P'o to P'o +100 kPa		-				
laboratory temperature	oC	20 ± 2				
method of time fitting		root time				

remarks # denotes particle density has been assigned an assumed value

Load sequence amended due to swelling pressure exceeding the first scheduled load.

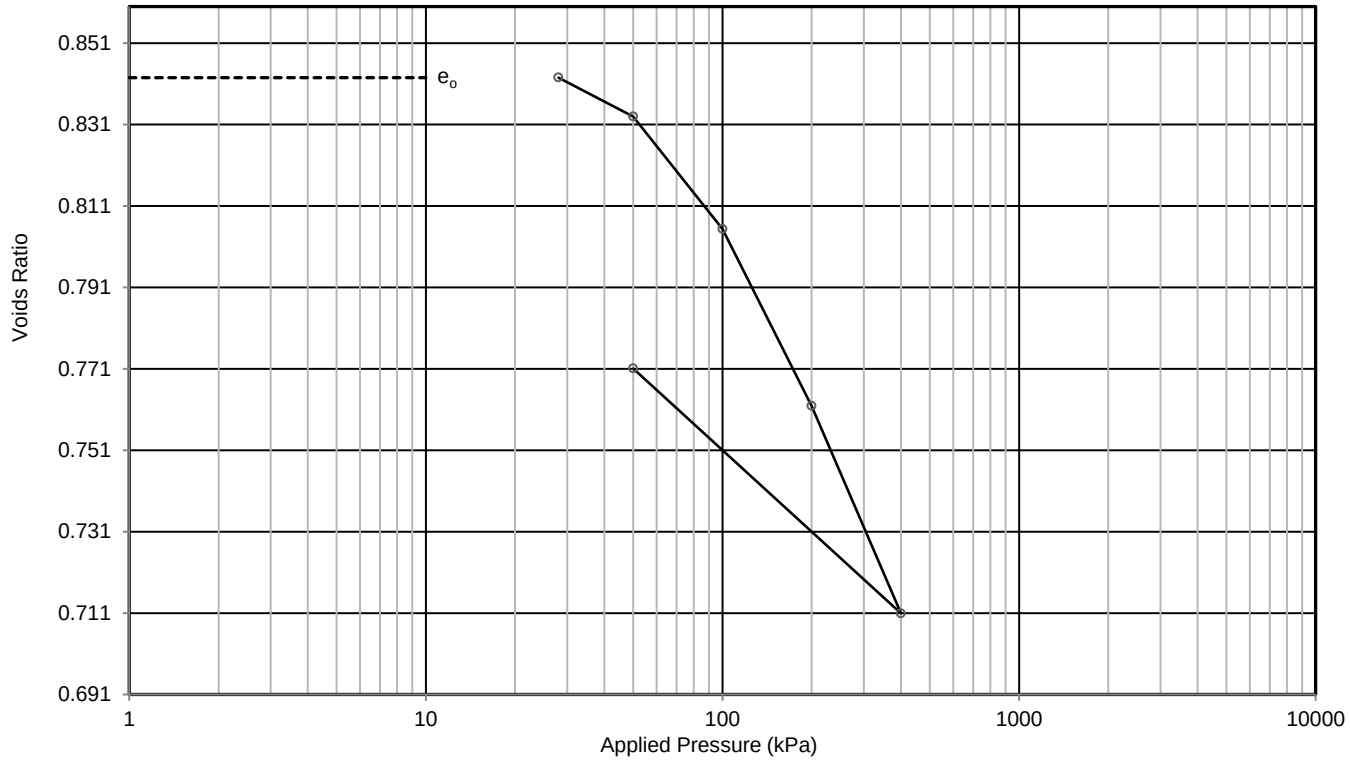
CONTRACT	CHECKED
37013	**TB**

Geotechnical Engineering Limited

DETERMINATION OF ONE-DIMENSIONAL CONSOLIDATION PROPERTIES

BS EN ISO 17892 - 5 : 2017 : 6

CLIENT	RAMBOLL UK LTD	BH/TP No.	BH03
SITE	VANTAGE LHR21, NORTH ACTON ROAD, LONDON	SAMPLE No./TYPE	12UT
DESCRIPTION	Brown mottled grey and orange slightly sandy CLAY with rare selenite	SAMPLE DEPTH (m)	3.50
		SPECIMEN DEPTH (m)	3.60



test and sample details			test results			
			pressure stage (kPa)	voids ratio	laboratory coefficients of compressibility mv (m2/MN)	consolidation Cv (m2/yr)
specimen diameter	mm	63.40				
specimen height	mm	18.83				
initial moisture content	%	30.0				
final moisture content	%	30.4				
initial bulk density	Mg/m3	1.90	28	0.843		
initial dry density	Mg/m3	1.47	50	0.833	0.24	2.1
initial voids ratio		0.843	100	0.805	0.3	3.3
initial degree of saturation	%	96	200	0.762	0.24	2.7
particle density	Mg/m3	#2.70	400	0.711	0.14	1.3
swelling pressure	kPa	28	50	0.771	0.1	
P'o to P'o +100 kPa		-				
laboratory temperature	oC	20 ± 2				
method of time fitting		root time				

remarks	CONTRACT	CHECKED
# denotes particle density has been assigned an assumed value	**37013**	**TB**

Geotechnical Engineering Limited

UNDRAINED TRIAXIAL COMPRESSION

BS EN ISO 17892-8: 2018

CLIENT RAMBOLL UK LTD

SITE VANTAGE LHR21, NORTH ACTON ROAD, LONDON

borehole /trial pit no.	sample		specimen depth	code	water content		dimensions		density		cell pressure	rate of strain	deviator stress	failure strain	failure mode	shear strength*	description and remarks
	no./type	depth (m)	(m)		initial (%)	final (%)	length (mm)	diameter (mm)	bulk (Mg/m3)	dry (Mg/m3)	(kPa)	(%/min)	(kPa)	(%)		(kPa)	
BH01	5UT	1.20	1.37	UU100	33.8	34.8	206	103	1.89	1.41	25	2.0	35	15.1	I	17	Orangish brown mottled brown slightly gravelly CLAY
BH01	16UT	5.50	5.64	UU100	34.3	33.9	205	103	1.89	1.41	125	2.0	129	3.4	S	64	Brown CLAY with rare selenite
BH01	27UT	11.00	11.22	UU100	20.0	26.9	185	103	2.02	1.68	225	2.0	181	4.9	S	91	Dark greyish brown slightly sandy CLAY
BH01	40UT	17.00	17.13	UU100	26.0	25.9	205	104	2.04	1.62	350	2.0	382	4.4	S	191	Dark brown CLAY
BH01	52UT	23.00	23.00	UU100	28.1	28.7	205	103	1.98	1.55	475	2.0	171	2.9	S	86	Brown CLAY
BH01	64UT	29.00	29.20	UU100	23.3	24.1	207	103	2.03	1.65	600	1.0	473	3.9	S	237	Brown CLAY
BH01	76UT	35.00	35.00	UU100	27.5	23.2	205	104	2.05	1.61	700	1.0	578	4.4	S	289	Greyish brown CLAY
BH02	6UT	1.50	1.56	UU100	29.5	30.4	205	103	1.95	1.50	50	2.0	85	5.4	I	42	Brown mottled grey CLAY with rare rootlets
BH02	12UT	3.50	3.56	UU100	31.1	32.6	205	103	1.92	1.47	75	2.0	98	5.4	S	49	Brown mottled grey CLAY with rare selenite
BH02	18UT	5.50	5.70	UU100	32.8	33.9	205	104	1.90	1.43	125	2.0	137	3.9	S	69	Brown mottled orange CLAY with rare selenite
BH02	24UT	8.00	8.05	UU100	28.1	28.4	186	103	2.02	1.58	175	2.0	226	12.4	S	113	Brown CLAY with rare selenite
BH02	30UT	11.00	11.00	UU100	24.6	27.3	206	103	2.03	1.63	225	1.0	226	6.8	S	113	Greyish brown CLAY with rare shell fragements
BH02	36UT	14.00	14.00	UU100	27.7	26.2	205	103	1.99	1.56	275	1.5	426	3.9	S	213	Brown CLAY

general remarks:

* shear strength taken as half deviator stress at failure for each stage
membrane correction applied
sample taken vertically (unless otherwise specified)
strain rate 2%/min (unless otherwise specified)

code:

UU - unconsolidated undrained
M - multi stage
S - set of three
R - remoulded

failure mode:

B - barrel (plastic failure)
S - shear (brittle failure)
I - intermediate
O - other (see remarks)

membrane type/thickness:

latex membrane used (unless otherwise specified)
38 - 0.2mm
70 - 0.4mm
100 - 0.4mm

CONTRACT	CHECKED
37013	**EC**

Geotechnical Engineering Limited

UNDRAINED TRIAXIAL COMPRESSION

BS EN ISO 17892-8: 2018

CLIENT RAMBOLL UK LTD

SITE VANTAGE LHR21, NORTH ACTON ROAD, LONDON

borehole /trial pit no.	sample		specimen depth	code	water content		dimensions		density		cell pressure	rate of strain	deviator stress	failure strain	failure mode	shear strength*	description and remarks
	no./type	depth (m)	(m)		initial (%)	final (%)	length (mm)	diameter (mm)	bulk (Mg/m3)	dry (Mg/m3)	(kPa)	(%/min)	(kPa)	(%)		(kPa)	
BH02	42UT	17.00	17.00	UU100	27.7	29.6	187	104	1.97	1.54	350	1.0	314	3.7	S	157	Greyish brown CLAY with rare shell fragments
BH02	48UT	20.00	20.25	UU70	26.7	24.7	142	67	2.04	1.61	400	2.0	815	3.9	S	408	Greyish brown CLAY . Lathed to 70mm.
BH02	54UT	23.00	23.22	UU100	25.9	26.6	205	103	2.01	1.60	475	2.0	368	4.9	S	184	Dark brown CLAY
BH02	60UT	26.00	26.20	UU100	25.7	25.5	205	104	2.03	1.61	525	2.0	755	3.2	S	377	Dark brown CLAY
BH02	66UT	29.00	29.03	UU100	25.1	25.1	205	104	2.03	1.63	600	1.5	426	3.4	S	213	Greyish brown CLAY
BH02	72UT	32.00	32.00	UU100	27.3	26.2	205	103	2.04	1.60	650	2.0	398	7.8	S	199	Dark brown CLAY
BH02	78UT	34.50	34.71	UU100	22.9	24.0	192	104	2.04	1.66	700	1.0	590	2.9	S	295	Greyish brown CLAY
BH03	6UT	1.50	1.55	UU70	39.3	37.1	139	71	1.82	1.31	50	2.0	69	7.9	I	34	Greenish brown mottled brown and grey CLAY. Lathed to 70mm.
BH03	20UT	6.00	6.15	UU100	32.0	30.9	205	103	1.92	1.46	125	1.5	89	1.5	S	44	Brown mottled orange CLAY with rare selenite
BH03	26UT	9.00	9.00	UU100	24.2	24.7	205	104	2.04	1.64	175	1.5	320	4.4	S	160	Brown CLAY
BH03	32UT	12.00	12.00	UU100	26.3	27.7	205	104	2.00	1.59	250	1.5	172	2.4	S	86	Brown CLAY
BH03	38UT	15.00	15.00	UU100	28.6	31.2	205	103	1.99	1.55	300	2.0	158	7.8	S	79	Dark brown CLAY
BH03	44UT	18.00	18.00	UU100	25.2	26.0	205	104	2.02	1.61	375	1.0	461	4.4	S	231	Dark brown CLAY

general remarks:

* shear strength taken as half deviator stress at failure for each stage
membrane correction applied
sample taken vertically (unless otherwise specified)
strain rate 2%/min (unless otherwise specified)

code:

UU - unconsolidated undrained
M - multi stage
S - set of three
R - remoulded

failure mode:

B - barrel (plastic failure)
S - shear (brittle failure)
I - intermediate
O - other (see remarks)

membrane type/thickness:

latex membrane used (unless otherwise specified)
38 - 0.2mm
70 - 0.4mm
100 - 0.4mm

CONTRACT	CHECKED
37013	**EC**

Geotechnical Engineering Limited

UNDRAINED TRIAXIAL COMPRESSION

BS EN ISO 17892-8: 2018

CLIENT RAMBOLL UK LTD

SITE VANTAGE LHR21, NORTH ACTON ROAD, LONDON

borehole /trial pit no.	sample		specimen depth	code	water content		dimensions		density		cell pressure	rate of strain	deviator stress	failure strain	failure mode	shear strength*	description and remarks
	no./type	depth (m)	(m)		initial (%)	final (%)	length (mm)	diameter (mm)	bulk (Mg/m3)	dry (Mg/m3)	(kPa)	(%/min)	(kPa)	(%)		(kPa)	
BH03	50UT	21.00	21.00	UU100	25.2	25.8	200	104	2.03	1.62	425	1.0	305	2.2	S	153	Dark brown CLAY
BH03	56UT	24.00	24.10	UU100	27.5	27.4	205	104	2.00	1.57	500	1.0	285	2.9	S	143	Dark brown CLAY

general remarks:

* shear strength taken as half deviator stress at failure for each stage
membrane correction applied
sample taken vertically (unless otherwise specified)
strain rate 2%/min (unless otherwise specified)

code:

UU - unconsolidated undrained
M - multi stage
S - set of three
R - remoulded

failure mode:

B - barrel (plastic failure)
S - shear (brittle failure)
I - intermediate
O - other (see remarks)

membrane type/thickness:

latex membrane used (unless otherwise specified)
38 - 0.2mm
70 - 0.4mm
100 - 0.4mm

CONTRACT	CHECKED
37013	**EC**

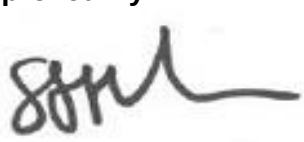
Eurofins Chemtest Ltd
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

Final Report

Report No.:	22-17981-1
Initial Date of Issue:	20-May-2022
Client	Geotechnical Engineering Ltd
Client Address:	Centurion House Olympus Park Quedgeley Gloucester Gloucestershire GL2 4NF
Contact(s):	GEL Tom Best
Project	37013 Vantage LHR21, North Acton Road, London

Quotation No.:		**Date Received:**	16-May-2022
Order No.:	5742	**Date Instructed:**	16-May-2022
No. of Samples:	13		
Turnaround (Wkdays):	5	**Results Due:**	20-May-2022
Date Approved:	20-May-2022		

Approved By:



Details: Stuart Henderson, Technical Manager

Results - Soil

Project: 37013 Vantage LHR21, North Acton Road, London

Client: Geotechnical Engineering Ltd					**Chemtest Job No.:**	22-17981	22-17981	22-17981	22-17981	22-17981	22-17981	22-17981
Quotation No.:					**Chemtest Sample ID.:**	1428903	1428904	1428905	1428906	1428907	1428908	1428909	1428910
Order No.: 5742					Client Sample Ref.:	2	6	15	33	47	3	9	25
					Sample Location:	BH01	BH01	BH01	BH01	BH01	BH02	BH02	BH02
					Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
					Top Depth (m):	0.35	1.70	5.00	13.00	20.00	0.80	2.50	8.50
					Bottom Depth (m):	0.50					1.00	2.95	
					Date Sampled:	12-May-2022	12-May-2022	12-May-2022	12-May-2022	12-May-2022	12-May-2022	12-May-2022	12-May-2022
Determinand	**Accred.**	**SOP**	**Units**	**LOD**									
Moisture	N	2030	%	0.020		24	17	22	22	15	23	19	17
pH (2.5:1)	N	2010		4.0		7.9	8.2	7.9	8.5	8.7	8.2	8.1	8.2
Magnesium (Water Soluble)	N	2120	g/l	0.010		0.012	0.023	0.10	0.010	< 0.010	0.012	0.045	0.061
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010		0.31	0.16	0.84	0.15	0.11	0.17	0.46	0.53
Total Sulphur	U	2175	%	0.010		0.23	0.21	0.47	0.55	0.44	0.099	0.43	0.92
Chloride (Water Soluble)	U	2220	g/l	0.010		0.13	0.033	0.060	0.034	0.039	0.019	< 0.010	0.038
Nitrate (Water Soluble)	N	2220	g/l	0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Sulphate (Acid Soluble)	U	2430	%	0.010		0.26	0.11	0.55	0.13	0.062	0.072	0.26	0.27

Results - Soil

Project: 37013 Vantage LHR21, North Acton Road, London

Client: Geotechnical Engineering Ltd			**Chemtest Job No.:**		22-17981	22-17981	22-17981	22-17981	22-17981
Quotation No.:			**Chemtest Sample ID.:**		1428911	1428912	1428913	1428914	1428915
Order No.: 5742			Client Sample Ref.:		65	3	11	22	71
			Sample Location:		BH02	BH03	BH03	BH03	BH03
			Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL
			Top Depth (m):		28.50	0.80	3.50	7.00	31.50
			Bottom Depth (m):			1.00			31.95
			Date Sampled:		12-May-2022	12-May-2022	12-May-2022	12-May-2022	12-May-2022
Determinand	**Accred.**	**SOP**	**Units**	**LOD**					
Moisture	N	2030	%	0.020	17	22	18	17	17
pH (2.5:1)	N	2010		4.0	8.8	8.0	8.0	8.2	8.6
Magnesium (Water Soluble)	N	2120	g/l	0.010	< 0.010	0.028	0.090	0.059	< 0.010
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010	0.16	0.36	1.0	0.45	0.21
Total Sulphur	U	2175	%	0.010	0.61	0.16	1.5	0.42	0.48
Chloride (Water Soluble)	U	2220	g/l	0.010	0.020	0.019	0.034	< 0.010	0.026
Nitrate (Water Soluble)	N	2220	g/l	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Sulphate (Acid Soluble)	U	2430	%	0.010	0.097	0.12	1.3	0.18	0.12

Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2175	Total Sulphur in Soils	Total Sulphur	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2220	Water soluble Chloride in Soils	Chloride	Aqueous extraction and measuremernt by 'Aquakem 600' Discrete Analyser using ferric nitrate / mercuric thiocyanate.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.

Report Information

Key

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

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis

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

For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 30 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com

APPENDIX 3
LABORATORY CERTIFICATES (ENVIRONMENTAL TESTING)

Charles Collins
Ramboll UK
240 Blackfriars Road
London
SE1 8NW

t: 0207 631 5291

e: ccollins@ramboll.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 : 22-53424

Project / Site name:	LHR21	**Samples received on:**	22/04/2022
Your job number:	1620013218	**Samples instructed on/ Analysis started on:**	22/04/2022
Your order number:	PO1620048110	**Analysis completed by:**	29/04/2022
Report Issue Number:	1	**Report issued on:**	29/04/2022
Samples Analysed:	3 soil samples		

Signed:

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

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

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

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

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

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

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

Analytical Report Number: 22-53424
Project / Site name: LHR21

Lab Sample Number				2248394	2248395	2248396
Sample Reference				BH1	BH2	BH2
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				0.50-0.50	0.50-0.50	1.00-1.00
Date Sampled				19/04/2022	21/04/2022	21/04/2022
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**			
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	24	12	20
Total mass of sample received	kg	0.001	NONE	1	1	1
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	-
Asbestos Analyst ID	N/A	N/A	N/A	PDO	PDO	N/A
General Inorganics						
pH - Automated	pH Units	N/A	MCERTS	7.7	8.8	7.9
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Water Soluble Sulphate as SO4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	1200	3600	560
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.61	1.8	0.28
Total Phenols						
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Speciated PAHs						
Naphthalene	mg/kg	0.05	MCERTS	0.21	< 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	0.35	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	4	1.7	< 0.05
Anthracene	mg/kg	0.05	MCERTS	1.2	0.42	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	7.9	3.3	< 0.05
Pyrene	mg/kg	0.05	MCERTS	6.6	2.8	< 0.05
Benzo(a)anthracene	mg/kg	0.05	MCERTS	4.3	1.9	< 0.05
Chrysene	mg/kg	0.05	MCERTS	3.5	1.8	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	4.9	2.6	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	1.3	0.76	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	3.9	2.1	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	2.2	1.2	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.47	0.29	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	2.3	1.5	< 0.05
Total PAH						
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	43	20.3	< 0.80

Analytical Report Number: 22-53424
Project / Site name: LHR21

Lab Sample Number				2248394	2248395	2248396
Sample Reference				BH1	BH2	BH2
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				0.50-0.50	0.50-0.50	1.00-1.00
Date Sampled				19/04/2022	21/04/2022	21/04/2022
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**			
Heavy Metals / Metalloids						
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	21	14	15
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	3.5	0.95	1.3
Boron (water soluble)	mg/kg	0.2	MCERTS	3.4	4.8	4.6
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	1.2	NONE	< 1.2	< 1.2	< 1.2
Chromium (III)	mg/kg	1	NONE	42	27	53
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	43	27	53
Copper (aqua regia extractable)	mg/kg	1	MCERTS	81	43	21
Lead (aqua regia extractable)	mg/kg	1	MCERTS	120	190	27
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	0.8	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	48	20	23
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	99	45	90
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	210	210	63
Monoaromatics & Oxygenates						
Benzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Toluene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
p & m-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
o-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Petroleum Hydrocarbons						
TPH-CWG - Aliphatic >EC5 - EC6 $_{HS\_1D\_AL}$	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8 $_{HS\_1D\_AL}$	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10 $_{HS\_1D\_AL}$	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001
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	2.6	< 2.0
TPH-CWG - Aliphatic >EC16 - EC21 $_{EH\_CU\_1D\_AL}$	mg/kg	8	MCERTS	< 8.0	12	< 8.0
TPH-CWG - Aliphatic >EC21 - EC35 $_{EH\_CU\_1D\_AL}$	mg/kg	8	MCERTS	< 8.0	53	< 8.0
TPH-CWG - Aliphatic (EC5 - EC35) $_{EH\_CU+HS\_1D\_AL}$	mg/kg	10	MCERTS	< 10	68	< 10
TPH-CWG - Aromatic >EC5 - EC7 $_{HS\_1D\_AR}$	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC7 - EC8 $_{HS\_1D\_AR}$	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC8 - EC10 $_{HS\_1D\_AR}$	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC10 - EC12 $_{EH\_CU\_1D\_AR}$	mg/kg	1	MCERTS	< 1.0	3.2	< 1.0
TPH-CWG - Aromatic >EC12 - EC16 $_{EH\_CU\_1D\_AR}$	mg/kg	2	MCERTS	9	6.7	< 2.0
TPH-CWG - Aromatic >EC16 - EC21 $_{EH\_CU\_1D\_AR}$	mg/kg	10	MCERTS	30	16	< 10
TPH-CWG - Aromatic >EC21 - EC35 $_{EH\_CU\_1D\_AR}$	mg/kg	10	MCERTS	70	65	< 10
TPH-CWG - Aromatic (EC5 - EC35) $_{EH\_CU+HS\_1D\_AR}$	mg/kg	10	MCERTS	110	92	< 10

Analytical Report Number: 22-53424
Project / Site name: LHR21

Lab Sample Number				2248394	2248395	2248396
Sample Reference				BH1	BH2	BH2
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				0.50-0.50	0.50-0.50	1.00-1.00
Date Sampled				19/04/2022	21/04/2022	21/04/2022
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**			
PCBs by GC-MS						
PCB Congener 28	mg/kg	0.001	MCERTS	-	< 0.001	-
PCB Congener 52	mg/kg	0.001	MCERTS	-	< 0.001	-
PCB Congener 101	mg/kg	0.001	MCERTS	-	< 0.001	-
PCB Congener 118	mg/kg	0.001	MCERTS	-	< 0.001	-
PCB Congener 138	mg/kg	0.001	MCERTS	-	< 0.001	-
PCB Congener 153	mg/kg	0.001	MCERTS	-	< 0.001	-
PCB Congener 180	mg/kg	0.001	MCERTS	-	< 0.001	-
Total PCBs by GC-MS						
Total PCBs	mg/kg	0.007	MCERTS	-	< 0.007	-

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number : 22-53424
Project / Site name: LHR21

* 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 *
2248394	BH1	None Supplied	0.50-0.50	Brown clay and loam with gravel.
2248395	BH2	None Supplied	0.50-0.50	Brown loam and clay with gravel.
2248396	BH2	None Supplied	1.00-1.00	Brown clay and loam.

Analytical Report Number : 22-53424
Project / Site name: LHR21

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
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion 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 EPA-16 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
PCB's By GC-MS in soil	Determination of PCB by extraction with acetone and hexane followed by GC-MS.	In-house method based on USEPA 8082	L027-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
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.	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
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' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' 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

The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number : 22-53424
Project / Site name: LHR21

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

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

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Analytical Report Number : 22-54052

Project / Site name:	North Acton - LHR21	**Samples received on:**	26/04/2022
Your job number:	1620013218	**Samples instructed on/ Analysis started on:**	26/04/2022
Your order number:	PO1620048110	**Analysis completed by:**	04/05/2022
Report Issue Number:	1	**Report issued on:**	04/05/2022
Samples Analysed:	6 soil samples		

Signed:

Adam Fenwick
Technical Reviewer
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: 22-54052
Project / Site name: North Acton - LHR21

Lab Sample Number				2252244	2252245	2252246	2252247	2252248
Sample Reference				WS03	WS03	WS05	WS05	WS05
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.30-0.50	0.60	0.30-0.50	0.60-0.80	1.00
Date Sampled				25/04/2022	25/04/2022	25/04/2022	25/04/2022	25/04/2022
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	59	45	76	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	8.1	14	5.5	16	25
Total mass of sample received	kg	0.001	NONE	0.9	0.9	0.9	0.3	0.8
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	-	Not-detected	-	-
Asbestos Analyst ID	N/A	N/A	N/A	PDO	N/A	PDO	N/A	N/A
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	11.2	10.2	11.2	9.2	8.7
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	1.9	< 1.0
Water Soluble Sulphate as SO4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	1200	1200	570	1200	1000
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.58	0.6	0.29	0.58	0.52
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	0.28	< 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	0.4	0.97	1.4	1.4	1.7
Anthracene	mg/kg	0.05	MCERTS	< 0.05	0.26	0.4	0.25	0.39
Fluoranthene	mg/kg	0.05	MCERTS	1.1	1.6	2.4	2.4	4.8
Pyrene	mg/kg	0.05	MCERTS	1.3	1.5	2.4	2.1	4.3
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.91	0.71	1.3	1.4	2.2
Chrysene	mg/kg	0.05	MCERTS	0.61	0.81	1.1	1.2	2.2
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	0.84	0.77	1.6	1.9	2.6
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	0.34	0.41	0.54	0.49	0.91
Benzo(a)pyrene	mg/kg	0.05	MCERTS	0.75	0.78	1.4	1.2	2.3
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.43	0.35	0.71	0.79	1.4
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	0.37
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.51	0.43	0.86	0.9	1.4
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	7.14	8.51	14.1	14.3	24.6

Analytical Report Number: 22-54052
Project / Site name: North Acton - LHR21

Lab Sample Number				2252244	2252245	2252246	2252247	2252248
Sample Reference				WS03	WS03	WS05	WS05	WS05
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.30-0.50	0.60	0.30-0.50	0.60-0.80	1.00
Date Sampled				25/04/2022	25/04/2022	25/04/2022	25/04/2022	25/04/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	15	14	11	31	19
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	0.88	0.98	0.54	2.9	1.6
Boron (water soluble)	mg/kg	0.2	MCERTS	4.4	2.9	1.8	3.9	5.6
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	3.6	< 0.2
Chromium (hexavalent)	mg/kg	1.2	NONE	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Chromium (III)	mg/kg	1	NONE	31	31	19	36	40
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	31	31	19	36	41
Copper (aqua regia extractable)	mg/kg	1	MCERTS	60	48	24	140	86
Lead (aqua regia extractable)	mg/kg	1	MCERTS	84	92	66	1300	280
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	1	1.2
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	21	21	15	43	25
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	49	46	28	75	67
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	120	150	55	870	280
Monoaromatics & Oxygenates								
Benzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p & m-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Petroleum Hydrocarbons								
TPH-CWG - Aliphatic >EC5 - EC6 $_{HS\_1D\_AL}$	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8 $_{HS\_1D\_AL}$	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10 $_{HS\_1D\_AL}$	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
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	14	< 8.0
TPH-CWG - Aliphatic >EC21 - EC35 $_{EH\_CU\_1D\_AL}$	mg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0	65	< 8.0
TPH-CWG - Aliphatic (EC5 - EC35) $_{EH\_CU+HS\_1D\_AL}$	mg/kg	10	MCERTS	< 10	< 10	< 10	79	< 10
TPH-CWG - Aromatic >EC5 - EC7 $_{HS\_1D\_AR}$	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC7 - EC8 $_{HS\_1D\_AR}$	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC8 - EC10 $_{HS\_1D\_AR}$	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
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	< 2.0
TPH-CWG - Aromatic >EC16 - EC21 $_{EH\_CU\_1D\_AR}$	mg/kg	10	MCERTS	< 10	< 10	< 10	18	15
TPH-CWG - Aromatic >EC21 - EC35 $_{EH\_CU\_1D\_AR}$	mg/kg	10	MCERTS	25	23	19	62	33
TPH-CWG - Aromatic (EC5 - EC35) $_{EH\_CU+HS\_1D\_AR}$	mg/kg	10	MCERTS	34	30	28	80	48

Analytical Report Number: 22-54052
Project / Site name: North Acton - LHR21

Lab Sample Number				2252244	2252245	2252246	2252247	2252248
Sample Reference				WS03	WS03	WS05	WS05	WS05
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.30-0.50	0.60	0.30-0.50	0.60-0.80	1.00
Date Sampled				25/04/2022	25/04/2022	25/04/2022	25/04/2022	25/04/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
VOCs								
Chloromethane	µg/kg	1	ISO 17025	< 1.0	-	-	< 1.0	-
Chloroethane	µg/kg	1	NONE	< 1.0	-	-	< 1.0	-
Bromomethane	µg/kg	1	ISO 17025	< 1.0	-	-	< 1.0	-
Vinyl Chloride	µg/kg	1	NONE	< 1.0	-	-	< 1.0	-
Trichlorofluoromethane	µg/kg	1	NONE	< 1.0	-	-	< 1.0	-
1,1-Dichloroethene	µg/kg	1	NONE	< 1.0	-	-	< 1.0	-
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	< 1.0	-	-	< 1.0	-
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	< 1.0	-	-	< 1.0	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	-	-	< 1.0	-
1,1-Dichloroethane	µg/kg	1	MCERTS	< 1.0	-	-	< 1.0	-
2,2-Dichloropropane	µg/kg	1	MCERTS	< 1.0	-	-	< 1.0	-
Trichloromethane	µg/kg	1	MCERTS	< 1.0	-	-	< 1.0	-
1,1,1-Trichloroethane	µg/kg	1	MCERTS	< 1.0	-	-	< 1.0	-
1,2-Dichloroethane	µg/kg	1	MCERTS	< 1.0	-	-	< 1.0	-
1,1-Dichloropropene	µg/kg	1	MCERTS	< 1.0	-	-	< 1.0	-
Trans-1,2-dichloroethene	µg/kg	1	NONE	< 1.0	-	-	< 1.0	-
Benzene	µg/kg	1	MCERTS	< 1.0	-	-	< 1.0	-
Tetrachloromethane	µg/kg	1	MCERTS	< 1.0	-	-	< 1.0	-
1,2-Dichloropropane	µg/kg	1	MCERTS	< 1.0	-	-	< 1.0	-
Trichloroethene	µg/kg	1	MCERTS	< 1.0	-	-	< 1.0	-
Dibromomethane	µg/kg	1	MCERTS	< 1.0	-	-	< 1.0	-
Bromodichloromethane	µg/kg	1	MCERTS	< 1.0	-	-	< 1.0	-
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	< 1.0	-	-	< 1.0	-
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	< 1.0	-	-	< 1.0	-
Toluene	µg/kg	1	MCERTS	< 1.0	-	-	< 1.0	-
1,1,2-Trichloroethane	µg/kg	1	MCERTS	< 1.0	-	-	< 1.0	-
1,3-Dichloropropane	µg/kg	1	ISO 17025	< 1.0	-	-	< 1.0	-
Dibromochloromethane	µg/kg	1	ISO 17025	< 1.0	-	-	< 1.0	-
Tetrachloroethene	µg/kg	1	NONE	< 1.0	-	-	< 1.0	-
1,2-Dibromoethane	µg/kg	1	ISO 17025	< 1.0	-	-	< 1.0	-
Chlorobenzene	µg/kg	1	MCERTS	< 1.0	-	-	< 1.0	-
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	< 1.0	-	-	< 1.0	-
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	-	-	< 1.0	-
p & m-Xylene	µg/kg	1	MCERTS	< 1.0	-	-	< 1.0	-
Styrene	µg/kg	1	MCERTS	< 1.0	-	-	< 1.0	-
Tribromomethane	µg/kg	1	NONE	< 1.0	-	-	< 1.0	-
o-Xylene	µg/kg	1	MCERTS	< 1.0	-	-	< 1.0	-
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	< 1.0	-	-	< 1.0	-
Isopropylbenzene	µg/kg	1	MCERTS	< 1.0	-	-	< 1.0	-
Bromobenzene	µg/kg	1	MCERTS	< 1.0	-	-	< 1.0	-
n-Propylbenzene	µg/kg	1	ISO 17025	< 1.0	-	-	< 1.0	-
2-Chlorotoluene	µg/kg	1	MCERTS	< 1.0	-	-	< 1.0	-
4-Chlorotoluene	µg/kg	1	MCERTS	< 1.0	-	-	< 1.0	-
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	< 1.0	-	-	< 1.0	-
tert-Butylbenzene	µg/kg	1	MCERTS	< 1.0	-	-	< 1.0	-
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	< 1.0	-	-	< 1.0	-
sec-Butylbenzene	µg/kg	1	MCERTS	< 1.0	-	-	< 1.0	-
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	< 1.0	-	-	< 1.0	-
p-Isopropyltoluene	µg/kg	1	ISO 17025	< 1.0	-	-	< 1.0	-
1,2-Dichlorobenzene	µg/kg	1	MCERTS	< 1.0	-	-	< 1.0	-
1,4-Dichlorobenzene	µg/kg	1	MCERTS	< 1.0	-	-	< 1.0	-
Butylbenzene	µg/kg	1	MCERTS	< 1.0	-	-	< 1.0	-
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	< 1.0	-	-	< 1.0	-
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	< 1.0	-	-	< 1.0	-
Hexachlorobutadiene	µg/kg	1	MCERTS	< 1.0	-	-	< 1.0	-

Analytical Report Number: 22-54052
Project / Site name: North Acton - LHR21

Lab Sample Number				2252244	2252245	2252246	2252247	2252248
Sample Reference				WS03	WS03	WS05	WS05	WS05
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.30-0.50	0.60	0.30-0.50	0.60-0.80	1.00
Date Sampled				25/04/2022	25/04/2022	25/04/2022	25/04/2022	25/04/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	< 1.0	-	-	< 1.0	-

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number: 22-54052
Project / Site name: North Acton - LHR21

Lab Sample Number				2252249
Sample Reference				Bund 1
Sample Number				None Supplied
Depth (m)				None Supplied
Date Sampled				25/04/2022
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	
Stone Content	%	0.1	NONE	< 0.1
Moisture Content	%	0.01	NONE	4.3
Total mass of sample received	kg	0.001	NONE	1

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	PDO

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	7.9
Total Cyanide	mg/kg	1	MCERTS	< 1.0
Water Soluble Sulphate as SO4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	3500
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	1.7

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	0.52
Anthracene	mg/kg	0.05	MCERTS	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	1.2
Pyrene	mg/kg	0.05	MCERTS	1
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.86
Chrysene	mg/kg	0.05	MCERTS	0.72
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	1.1
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	0.44
Benzo(a)pyrene	mg/kg	0.05	MCERTS	1.1
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.64
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.77

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	8.27

Analytical Report Number: 22-54052
Project / Site name: North Acton - LHR21

Lab Sample Number				2252249
Sample Reference				Bund 1
Sample Number				None Supplied
Depth (m)				None Supplied
Date Sampled				25/04/2022
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	
Heavy Metals / Metalloids				
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	18
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	0.87
Boron (water soluble)	mg/kg	0.2	MCERTS	7.4
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2
Chromium (hexavalent)	mg/kg	1.2	NONE	< 1.2
Chromium (III)	mg/kg	1	NONE	27
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	27
Copper (aqua regia extractable)	mg/kg	1	MCERTS	50
Lead (aqua regia extractable)	mg/kg	1	MCERTS	1100
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	0.6
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	18
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	43
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	380
Monoaromatics & Oxygenates				
Benzene	µg/kg	1	MCERTS	< 1.0
Toluene	µg/kg	1	MCERTS	< 1.0
Ethylbenzene	µg/kg	1	MCERTS	< 1.0
p & m-xylene	µg/kg	1	MCERTS	< 1.0
o-xylene	µg/kg	1	MCERTS	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0
Petroleum Hydrocarbons				
TPH-CWG - Aliphatic >EC5 - EC6 $_{HS\_1D\_AL}$	mg/kg	0.001	MCERTS	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8 $_{HS\_1D\_AL}$	mg/kg	0.001	MCERTS	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10 $_{HS\_1D\_AL}$	mg/kg	0.001	MCERTS	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12 $_{EH\_CU\_1D\_AL}$	mg/kg	1	MCERTS	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16 $_{EH\_CU\_1D\_AL}$	mg/kg	2	MCERTS	< 2.0
TPH-CWG - Aliphatic >EC16 - EC21 $_{EH\_CU\_1D\_AL}$	mg/kg	8	MCERTS	< 8.0
TPH-CWG - Aliphatic >EC21 - EC35 $_{EH\_CU\_1D\_AL}$	mg/kg	8	MCERTS	< 8.0
TPH-CWG - Aliphatic (EC5 - EC35) $_{EH\_CU+HS\_1D\_AL}$	mg/kg	10	MCERTS	< 10
TPH-CWG - Aromatic >EC5 - EC7 $_{HS\_1D\_AR}$	mg/kg	0.001	MCERTS	< 0.001
TPH-CWG - Aromatic >EC7 - EC8 $_{HS\_1D\_AR}$	mg/kg	0.001	MCERTS	< 0.001
TPH-CWG - Aromatic >EC8 - EC10 $_{HS\_1D\_AR}$	mg/kg	0.001	MCERTS	< 0.001
TPH-CWG - Aromatic >EC10 - EC12 $_{EH\_CU\_1D\_AR}$	mg/kg	1	MCERTS	< 1.0
TPH-CWG - Aromatic >EC12 - EC16 $_{EH\_CU\_1D\_AR}$	mg/kg	2	MCERTS	< 2.0
TPH-CWG - Aromatic >EC16 - EC21 $_{EH\_CU\_1D\_AR}$	mg/kg	10	MCERTS	11
TPH-CWG - Aromatic >EC21 - EC35 $_{EH\_CU\_1D\_AR}$	mg/kg	10	MCERTS	37
TPH-CWG - Aromatic (EC5 - EC35) $_{EH\_CU+HS\_1D\_AR}$	mg/kg	10	MCERTS	48

Analytical Report Number: 22-54052
Project / Site name: North Acton - LHR21

Lab Sample Number				2252249
Sample Reference				Bund 1
Sample Number				None Supplied
Depth (m)				None Supplied
Date Sampled				25/04/2022
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	
VOCs				
Chloromethane	µg/kg	1	ISO 17025	-
Chloroethane	µg/kg	1	NONE	-
Bromomethane	µg/kg	1	ISO 17025	-
Vinyl Chloride	µg/kg	1	NONE	-
Trichlorofluoromethane	µg/kg	1	NONE	-
1,1-Dichloroethene	µg/kg	1	NONE	-
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	-
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-
1,1-Dichloroethane	µg/kg	1	MCERTS	-
2,2-Dichloropropane	µg/kg	1	MCERTS	-
Trichloromethane	µg/kg	1	MCERTS	-
1,1,1-Trichloroethane	µg/kg	1	MCERTS	-
1,2-Dichloroethane	µg/kg	1	MCERTS	-
1,1-Dichloropropene	µg/kg	1	MCERTS	-
Trans-1,2-dichloroethene	µg/kg	1	NONE	-
Benzene	µg/kg	1	MCERTS	-
Tetrachloromethane	µg/kg	1	MCERTS	-
1,2-Dichloropropane	µg/kg	1	MCERTS	-
Trichloroethene	µg/kg	1	MCERTS	-
Dibromomethane	µg/kg	1	MCERTS	-
Bromodichloromethane	µg/kg	1	MCERTS	-
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	-
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	-
Toluene	µg/kg	1	MCERTS	-
1,1,2-Trichloroethane	µg/kg	1	MCERTS	-
1,3-Dichloropropane	µg/kg	1	ISO 17025	-
Dibromochloromethane	µg/kg	1	ISO 17025	-
Tetrachloroethene	µg/kg	1	NONE	-
1,2-Dibromoethane	µg/kg	1	ISO 17025	-
Chlorobenzene	µg/kg	1	MCERTS	-
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	-
Ethylbenzene	µg/kg	1	MCERTS	-
p & m-Xylene	µg/kg	1	MCERTS	-
Styrene	µg/kg	1	MCERTS	-
Tribromomethane	µg/kg	1	NONE	-
o-Xylene	µg/kg	1	MCERTS	-
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	-
Isopropylbenzene	µg/kg	1	MCERTS	-
Bromobenzene	µg/kg	1	MCERTS	-
n-Propylbenzene	µg/kg	1	ISO 17025	-
2-Chlorotoluene	µg/kg	1	MCERTS	-
4-Chlorotoluene	µg/kg	1	MCERTS	-
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	-
tert-Butylbenzene	µg/kg	1	MCERTS	-
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	-
sec-Butylbenzene	µg/kg	1	MCERTS	-
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	-
p-Isopropyltoluene	µg/kg	1	ISO 17025	-
1,2-Dichlorobenzene	µg/kg	1	MCERTS	-
1,4-Dichlorobenzene	µg/kg	1	MCERTS	-
Butylbenzene	µg/kg	1	MCERTS	-
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	-
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	-
Hexachlorobutadiene	µg/kg	1	MCERTS	-

Analytical Report Number: 22-54052
Project / Site name: North Acton - LHR21

Lab Sample Number				2252249
Sample Reference				Bund 1
Sample Number				None Supplied
Depth (m)				None Supplied
Date Sampled				25/04/2022
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	-

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number : 22-54052
Project / Site name: North Acton - LHR21

* 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 *
2252244	WS03	None Supplied	0.30-0.50	Brown loam with gravel and stones.
2252245	WS03	None Supplied	0.6	Brown loam with gravel and stones.
2252246	WS05	None Supplied	0.30-0.50	Brown gravelly sand with stones.
2252247	WS05	None Supplied	0.60-0.80	Brown loam with gravel and vegetation.
2252248	WS05	None Supplied	1	Brown clay and sand.
2252249	Bund 1	None Supplied	None Supplied	Brown gravelly sand with vegetation and plastic.

Analytical Report Number : 22-54052
Project / Site name: North Acton - LHR21

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
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
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 disperion 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 EPA-16 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
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
Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS

Analytical Report Number : 22-54052
Project / Site name: North Acton - LHR21

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
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
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' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' 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

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Analytical Report Number : 22-54694

Project / Site name:	North Acton - LHR21	**Samples received on:**	27/04/2022
Your job number:	1620013218	**Samples instructed on/ Analysis started on:**	27/04/2022
Your order number:	1620048110	**Analysis completed by:**	06/05/2022
Report Issue Number:	1	**Report issued on:**	06/05/2022
Samples Analysed:	10 soil samples		

Izabela Wójcik

Signed:

Izabela Wójcik
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.

Analytical Report Number: 22-54694
Project / Site name: North Acton - LHR21
Your Order No: 1620048110

Lab Sample Number				2255130	2255131	2255132	2255133	2255134
Sample Reference				WS04	WS04	WS04	WS01	WS01
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.60	1.00	2.00	0.30-0.60	0.60-1.20
Date Sampled				26/04/2022	26/04/2022	26/04/2022	26/04/2022	26/04/2022
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	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	23	24	19	23	23
Total mass of sample received	kg	0.001	NONE	0.8	0.4	0.4	0.8	0.8
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	-	-	Not-detected	-
Asbestos Analyst ID	N/A	N/A	N/A	LFT	N/A	N/A	LFT	N/A
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	7.7	7.9	7.9	7.5	8
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Water Soluble Sulphate as SO4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	1000	1600	4900	410	560
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.51	0.8	2.4	0.21	0.28
Fraction Organic Carbon (FOC) Automated	N/A	0.001	MCERTS	-	-	0.0044	-	-
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	0.24	< 0.05	< 0.05	3.9	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	0.31	< 0.05	< 0.05	0.53	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	0.51	< 0.05	< 0.05	7.1	< 0.05
Fluorene	mg/kg	0.05	MCERTS	0.71	< 0.05	< 0.05	6.7	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	9	0.31	1.1	70	1.6
Anthracene	mg/kg	0.05	MCERTS	2.8	< 0.05	0.21	13	0.25
Fluoranthene	mg/kg	0.05	MCERTS	21	0.68	1.8	120	3.5
Pyrene	mg/kg	0.05	MCERTS	17	0.6	1.7	100	3.4
Benzo(a)anthracene	mg/kg	0.05	MCERTS	11	0.33	0.81	50	1.5
Chrysene	mg/kg	0.05	MCERTS	8.9	0.33	0.79	45	1.5
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	11	0.33	0.84	45	2.1
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	5.2	0.22	0.4	46	0.88
Benzo(a)pyrene	mg/kg	0.05	MCERTS	11	0.34	0.8	58	1.7
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	5.2	< 0.05	0.38	27	1
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	1.4	< 0.05	< 0.05	7.7	0.28
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	6.2	< 0.05	0.51	32	1.2
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	111	3.14	9.3	633	18.8

Analytical Report Number: 22-54694
Project / Site name: North Acton - LHR21
Your Order No: 1620048110

Lab Sample Number				2255130	2255131	2255132	2255133	2255134
Sample Reference				WS04	WS04	WS04	WS01	WS01
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.60	1.00	2.00	0.30-0.60	0.60-1.20
Date Sampled				26/04/2022	26/04/2022	26/04/2022	26/04/2022	26/04/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	18	13	16	16	16
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	1.9	1.2	1.2	1.3	1.5
Boron (water soluble)	mg/kg	0.2	MCERTS	6.4	4.1	1.5	4.3	1.5
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	1.2	NONE	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Chromium (III)	mg/kg	1	NONE	41	46	51	37	57
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	41	46	51	38	57
Copper (aqua regia extractable)	mg/kg	1	MCERTS	87	19	27	170	26
Lead (aqua regia extractable)	mg/kg	1	MCERTS	220	27	20	140	21
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	1.4	< 0.3	< 0.3	0.9	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	26	20	38	25	32
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	74	75	74	68	88
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	160	57	71	160	68
Monoaromatics & Oxygenates								
Benzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p & m-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Petroleum Hydrocarbons								
TPH-CWG - Aliphatic >EC5 - EC6 $_{HS\_1D\_AL}$	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8 $_{HS\_1D\_AL}$	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10 $_{HS\_1D\_AL}$	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12 $_{EH\_CU\_1D\_AL}$	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	11	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16 $_{EH\_CU\_1D\_AL}$	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	13	< 2.0
TPH-CWG - Aliphatic >EC16 - EC21 $_{EH\_CU\_1D\_AL}$	mg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0	9.3	< 8.0
TPH-CWG - Aliphatic >EC21 - EC35 $_{EH\_CU\_1D\_AL}$	mg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0	19	< 8.0
TPH-CWG - Aliphatic (EC5 - EC35) $_{EH\_CU+HS\_1D\_AL}$	mg/kg	10	MCERTS	< 10	< 10	< 10	53	< 10
TPH-CWG - Aromatic >EC5 - EC7 $_{HS\_1D\_AR}$	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC7 - EC8 $_{HS\_1D\_AR}$	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC8 - EC10 $_{HS\_1D\_AR}$	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC10 - EC12 $_{EH\_CU\_1D\_AR}$	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	24	< 1.0
TPH-CWG - Aromatic >EC12 - EC16 $_{EH\_CU\_1D\_AR}$	mg/kg	2	MCERTS	4.2	< 2.0	< 2.0	55	4
TPH-CWG - Aromatic >EC16 - EC21 $_{EH\_CU\_1D\_AR}$	mg/kg	10	MCERTS	47	< 10	< 10	250	< 10
TPH-CWG - Aromatic >EC21 - EC35 $_{EH\_CU\_1D\_AR}$	mg/kg	10	MCERTS	100	< 10	19	320	15
TPH-CWG - Aromatic (EC5 - EC35) $_{EH\_CU+HS\_1D\_AR}$	mg/kg	10	MCERTS	150	< 10	29	650	28

Analytical Report Number: 22-54694
Project / Site name: North Acton - LHR21
Your Order No: 1620048110

Lab Sample Number				2255130	2255131	2255132	2255133	2255134
Sample Reference				WS04	WS04	WS04	WS01	WS01
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.60	1.00	2.00	0.30-0.60	0.60-1.20
Date Sampled				26/04/2022	26/04/2022	26/04/2022	26/04/2022	26/04/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
VOCs								
Chloromethane	µg/kg	1	ISO 17025	-	-	-	-	-
Chloroethane	µg/kg	1	NONE	-	-	-	-	-
Bromomethane	µg/kg	1	ISO 17025	-	-	-	-	-
Vinyl Chloride	µg/kg	1	NONE	-	-	-	-	-
Trichlorofluoromethane	µg/kg	1	NONE	-	-	-	-	-
1,1-Dichloroethene	µg/kg	1	NONE	-	-	-	-	-
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	-	-	-	-	-
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	-	-	-	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	-	-	-	-
1,1-Dichloroethane	µg/kg	1	MCERTS	-	-	-	-	-
2,2-Dichloropropane	µg/kg	1	MCERTS	-	-	-	-	-
Trichloromethane	µg/kg	1	MCERTS	-	-	-	-	-
1,1,1-Trichloroethane	µg/kg	1	MCERTS	-	-	-	-	-
1,2-Dichloroethane	µg/kg	1	MCERTS	-	-	-	-	-
1,1-Dichloropropene	µg/kg	1	MCERTS	-	-	-	-	-
Trans-1,2-dichloroethene	µg/kg	1	NONE	-	-	-	-	-
Benzene	µg/kg	1	MCERTS	-	-	-	-	-
Tetrachloromethane	µg/kg	1	MCERTS	-	-	-	-	-
1,2-Dichloropropane	µg/kg	1	MCERTS	-	-	-	-	-
Trichloroethene	µg/kg	1	MCERTS	-	-	-	-	-
Dibromomethane	µg/kg	1	MCERTS	-	-	-	-	-
Bromodichloromethane	µg/kg	1	MCERTS	-	-	-	-	-
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	-	-	-	-	-
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	-	-	-	-	-
Toluene	µg/kg	1	MCERTS	-	-	-	-	-
1,1,2-Trichloroethane	µg/kg	1	MCERTS	-	-	-	-	-
1,3-Dichloropropane	µg/kg	1	ISO 17025	-	-	-	-	-
Dibromochloromethane	µg/kg	1	ISO 17025	-	-	-	-	-
Tetrachloroethene	µg/kg	1	NONE	-	-	-	-	-
1,2-Dibromoethane	µg/kg	1	ISO 17025	-	-	-	-	-
Chlorobenzene	µg/kg	1	MCERTS	-	-	-	-	-
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	-	-	-	-	-
Ethylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
p & m-Xylene	µg/kg	1	MCERTS	-	-	-	-	-
Styrene	µg/kg	1	MCERTS	-	-	-	-	-
Tribromomethane	µg/kg	1	NONE	-	-	-	-	-
o-Xylene	µg/kg	1	MCERTS	-	-	-	-	-
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	-	-	-	-	-
Isopropylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
Bromobenzene	µg/kg	1	MCERTS	-	-	-	-	-
n-Propylbenzene	µg/kg	1	ISO 17025	-	-	-	-	-
2-Chlorotoluene	µg/kg	1	MCERTS	-	-	-	-	-
4-Chlorotoluene	µg/kg	1	MCERTS	-	-	-	-	-
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	-	-	-	-	-
tert-Butylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	-	-	-	-	-
sec-Butylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	-	-	-	-	-
p-Isopropyltoluene	µg/kg	1	ISO 17025	-	-	-	-	-
1,2-Dichlorobenzene	µg/kg	1	MCERTS	-	-	-	-	-
1,4-Dichlorobenzene	µg/kg	1	MCERTS	-	-	-	-	-
Butylbenzene	µg/kg	1	MCERTS	-	-	-	-	-

Analytical Report Number: 22-54694
Project / Site name: North Acton - LHR21
Your Order No: 1620048110

Lab Sample Number				2255130	2255131	2255132	2255133	2255134
Sample Reference				WS04	WS04	WS04	WS01	WS01
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.60	1.00	2.00	0.30-0.60	0.60-1.20
Date Sampled				26/04/2022	26/04/2022	26/04/2022	26/04/2022	26/04/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	-	-	-	-	-
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	-	-	-	-	-
Hexachlorobutadiene	µg/kg	1	MCERTS	-	-	-	-	-
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	-	-	-	-	-

PCBs by GC-MS

PCB Congener 28	mg/kg	0.001	MCERTS	< 0.001	-	< 0.001	-	-
PCB Congener 52	mg/kg	0.001	MCERTS	< 0.001	-	< 0.001	-	-
PCB Congener 101	mg/kg	0.001	MCERTS	< 0.001	-	< 0.001	-	-
PCB Congener 118	mg/kg	0.001	MCERTS	< 0.001	-	< 0.001	-	-
PCB Congener 138	mg/kg	0.001	MCERTS	< 0.001	-	< 0.001	-	-
PCB Congener 153	mg/kg	0.001	MCERTS	< 0.001	-	< 0.001	-	-
PCB Congener 180	mg/kg	0.001	MCERTS	< 0.001	-	< 0.001	-	-

Total PCBs by GC-MS

Total PCBs	mg/kg	0.007	MCERTS	< 0.007	-	< 0.007	-	-

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number: 22-54694
Project / Site name: North Acton - LHR21
Your Order No: 1620048110

Lab Sample Number				2255135	2255136	2255137	2255138	2255139
Sample Reference				WS01	WS02	WS02	BH03	BH03
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				2.00	0.00-0.30	0.50-1.00	0.30-0.50	0.80-1.00
Date Sampled				26/04/2022	26/04/2022	26/04/2022	26/04/2022	26/04/2022
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	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	19	11	27	6.6	26
Total mass of sample received	kg	0.001	NONE	0.8	0.8	0.8	0.8	0.4
Asbestos in Soil	Type	N/A	ISO 17025	-	Not-detected	-	Not-detected	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	N/A	LFT	N/A	LFT	LFT

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.1	9.5	7.7	10.2	7.7
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Water Soluble Sulphate as SO4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	2000	710	330	570	720
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	1	0.36	0.16	0.28	0.36
Fraction Organic Carbon (FOC) Automated	N/A	0.001	MCERTS	0.0018	-	-	-	-

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	0.33	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	0.23	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	2.1	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	2.3	< 0.05	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	0.65	18	< 0.05	< 0.05	< 0.05
Anthracene	mg/kg	0.05	MCERTS	< 0.05	3.3	< 0.05	< 0.05	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	1	22	< 0.05	0.41	< 0.05
Pyrene	mg/kg	0.05	MCERTS	0.71	16	< 0.05	0.57	< 0.05
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.46	10	< 0.05	0.36	< 0.05
Chrysene	mg/kg	0.05	MCERTS	0.31	8.5	< 0.05	0.23	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	0.52	11	< 0.05	0.32	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	0.25	4.6	< 0.05	0.18	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	0.35	9.6	< 0.05	0.32	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.27	6.4	< 0.05	< 0.05	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	1.6	< 0.05	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.28	6.2	< 0.05	< 0.05	< 0.05

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	4.81	121	< 0.80	2.39	< 0.80

Analytical Report Number: 22-54694
Project / Site name: North Acton - LHR21
Your Order No: 1620048110

Lab Sample Number				2255135	2255136	2255137	2255138	2255139
Sample Reference				WS01	WS02	WS02	BH03	BH03
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				2.00	0.00-0.30	0.50-1.00	0.30-0.50	0.80-1.00
Date Sampled				26/04/2022	26/04/2022	26/04/2022	26/04/2022	26/04/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	16	14	14	13	17
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	1.1	1.9	1.3	0.4	1.4
Boron (water soluble)	mg/kg	0.2	MCERTS	2.6	1.6	1.9	2.1	3.9
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	1.2	NONE	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Chromium (III)	mg/kg	1	NONE	45	29	49	19	39
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	45	29	49	19	39
Copper (aqua regia extractable)	mg/kg	1	MCERTS	21	51	33	54	91
Lead (aqua regia extractable)	mg/kg	1	MCERTS	22	160	53	18	190
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	0.9	< 0.3	< 0.3	1.4
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	35	23	22	9.9	22
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	67	53	80	34	69
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	58	150	78	33	130
Monoaromatics & Oxygenates								
Benzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p & m-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Petroleum Hydrocarbons								
TPH-CWG - Aliphatic >EC5 - EC6 $_{HS\_1D\_AL}$	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8 $_{HS\_1D\_AL}$	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10 $_{HS\_1D\_AL}$	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
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	MCERTS	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >EC5 - EC7 $_{HS\_1D\_AR}$	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC7 - EC8 $_{HS\_1D\_AR}$	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC8 - EC10 $_{HS\_1D\_AR}$	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
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	26	< 2.0	< 2.0	< 2.0
TPH-CWG - Aromatic >EC16 - EC21 $_{EH\_CU\_1D\_AR}$	mg/kg	10	MCERTS	< 10	54	< 10	< 10	< 10
TPH-CWG - Aromatic >EC21 - EC35 $_{EH\_CU\_1D\_AR}$	mg/kg	10	MCERTS	< 10	110	< 10	< 10	< 10
TPH-CWG - Aromatic (EC5 - EC35) $_{EH\_CU+HS\_1D\_AR}$	mg/kg	10	MCERTS	10	190	< 10	< 10	< 10

Analytical Report Number: 22-54694
Project / Site name: North Acton - LHR21
Your Order No: 1620048110

Lab Sample Number				2255135	2255136	2255137	2255138	2255139
Sample Reference				WS01	WS02	WS02	BH03	BH03
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				2.00	0.00-0.30	0.50-1.00	0.30-0.50	0.80-1.00
Date Sampled				26/04/2022	26/04/2022	26/04/2022	26/04/2022	26/04/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
VOCs								
Chloromethane	µg/kg	1	ISO 17025	-	-	< 1.0	< 1.0	-
Chloroethane	µg/kg	1	NONE	-	-	< 1.0	< 1.0	-
Bromomethane	µg/kg	1	ISO 17025	-	-	< 1.0	< 1.0	-
Vinyl Chloride	µg/kg	1	NONE	-	-	< 1.0	< 1.0	-
Trichlorofluoromethane	µg/kg	1	NONE	-	-	< 1.0	< 1.0	-
1,1-Dichloroethene	µg/kg	1	NONE	-	-	< 1.0	< 1.0	-
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	-	-	< 1.0	< 1.0	-
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	-	-	< 1.0	< 1.0	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	-	< 1.0	< 1.0	-
1,1-Dichloroethane	µg/kg	1	MCERTS	-	-	< 1.0	< 1.0	-
2,2-Dichloropropane	µg/kg	1	MCERTS	-	-	< 1.0	< 1.0	-
Trichloromethane	µg/kg	1	MCERTS	-	-	< 1.0	< 1.0	-
1,1,1-Trichloroethane	µg/kg	1	MCERTS	-	-	< 1.0	< 1.0	-
1,2-Dichloroethane	µg/kg	1	MCERTS	-	-	< 1.0	< 1.0	-
1,1-Dichloropropene	µg/kg	1	MCERTS	-	-	< 1.0	< 1.0	-
Trans-1,2-dichloroethene	µg/kg	1	NONE	-	-	< 1.0	< 1.0	-
Benzene	µg/kg	1	MCERTS	-	-	< 1.0	< 1.0	-
Tetrachloromethane	µg/kg	1	MCERTS	-	-	< 1.0	< 1.0	-
1,2-Dichloropropane	µg/kg	1	MCERTS	-	-	< 1.0	< 1.0	-
Trichloroethene	µg/kg	1	MCERTS	-	-	< 1.0	< 1.0	-
Dibromomethane	µg/kg	1	MCERTS	-	-	< 1.0	< 1.0	-
Bromodichloromethane	µg/kg	1	MCERTS	-	-	< 1.0	< 1.0	-
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	-	-	< 1.0	< 1.0	-
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	-	-	< 1.0	< 1.0	-
Toluene	µg/kg	1	MCERTS	-	-	< 1.0	< 1.0	-
1,1,2-Trichloroethane	µg/kg	1	MCERTS	-	-	< 1.0	< 1.0	-
1,3-Dichloropropane	µg/kg	1	ISO 17025	-	-	< 1.0	< 1.0	-
Dibromochloromethane	µg/kg	1	ISO 17025	-	-	< 1.0	< 1.0	-
Tetrachloroethene	µg/kg	1	NONE	-	-	< 1.0	< 1.0	-
1,2-Dibromoethane	µg/kg	1	ISO 17025	-	-	< 1.0	< 1.0	-
Chlorobenzene	µg/kg	1	MCERTS	-	-	< 1.0	< 1.0	-
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	-	-	< 1.0	< 1.0	-
Ethylbenzene	µg/kg	1	MCERTS	-	-	< 1.0	< 1.0	-
p & m-Xylene	µg/kg	1	MCERTS	-	-	< 1.0	< 1.0	-
Styrene	µg/kg	1	MCERTS	-	-	< 1.0	< 1.0	-
Tribromomethane	µg/kg	1	NONE	-	-	< 1.0	< 1.0	-
o-Xylene	µg/kg	1	MCERTS	-	-	< 1.0	< 1.0	-
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	-	-	< 1.0	< 1.0	-
Isopropylbenzene	µg/kg	1	MCERTS	-	-	< 1.0	< 1.0	-
Bromobenzene	µg/kg	1	MCERTS	-	-	< 1.0	< 1.0	-
n-Propylbenzene	µg/kg	1	ISO 17025	-	-	< 1.0	< 1.0	-
2-Chlorotoluene	µg/kg	1	MCERTS	-	-	< 1.0	< 1.0	-
4-Chlorotoluene	µg/kg	1	MCERTS	-	-	< 1.0	< 1.0	-
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	-	-	< 1.0	< 1.0	-
tert-Butylbenzene	µg/kg	1	MCERTS	-	-	< 1.0	< 1.0	-
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	-	-	< 1.0	< 1.0	-
sec-Butylbenzene	µg/kg	1	MCERTS	-	-	< 1.0	< 1.0	-
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	-	-	< 1.0	< 1.0	-
p-Isopropyltoluene	µg/kg	1	ISO 17025	-	-	< 1.0	< 1.0	-
1,2-Dichlorobenzene	µg/kg	1	MCERTS	-	-	< 1.0	< 1.0	-
1,4-Dichlorobenzene	µg/kg	1	MCERTS	-	-	< 1.0	< 1.0	-
Butylbenzene	µg/kg	1	MCERTS	-	-	< 1.0	< 1.0	-

Analytical Report Number: 22-54694
Project / Site name: North Acton - LHR21
Your Order No: 1620048110

Lab Sample Number				2255135	2255136	2255137	2255138	2255139
Sample Reference				WS01	WS02	WS02	BH03	BH03
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				2.00	0.00-0.30	0.50-1.00	0.30-0.50	0.80-1.00
Date Sampled				26/04/2022	26/04/2022	26/04/2022	26/04/2022	26/04/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	-	-	< 1.0	< 1.0	-
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	-	-	< 1.0	< 1.0	-
Hexachlorobutadiene	µg/kg	1	MCERTS	-	-	< 1.0	< 1.0	-
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	-	-	< 1.0	< 1.0	-

PCBs by GC-MS

PCB Congener 28	mg/kg	0.001	MCERTS	-	-	< 0.001	-	-
PCB Congener 52	mg/kg	0.001	MCERTS	-	-	< 0.001	-	-
PCB Congener 101	mg/kg	0.001	MCERTS	-	-	< 0.001	-	-
PCB Congener 118	mg/kg	0.001	MCERTS	-	-	< 0.001	-	-
PCB Congener 138	mg/kg	0.001	MCERTS	-	-	< 0.001	-	-
PCB Congener 153	mg/kg	0.001	MCERTS	-	-	< 0.001	-	-
PCB Congener 180	mg/kg	0.001	MCERTS	-	-	< 0.001	-	-

Total PCBs by GC-MS

Total PCBs	mg/kg	0.007	MCERTS	-	-	< 0.007	-	-

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number : 22-54694
Project / Site name: North Acton - LHR21

* 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 *
2255130	WS04	None Supplied	0.6	Brown clay and loam with gravel.
2255131	WS04	None Supplied	1	Brown clay and loam.
2255132	WS04	None Supplied	2	Brown clay and loam.
2255133	WS01	None Supplied	0.30-0.60	Brown clay and loam with gravel.
2255134	WS01	None Supplied	0.60-1.20	Brown clay and loam with gravel.
2255135	WS01	None Supplied	2	Brown clay.
2255136	WS02	None Supplied	0.00-0.30	Brown clay and loam with gravel and brick.
2255137	WS02	None Supplied	0.50-1.00	Brown clay and sand.
2255138	BH03	None Supplied	0.30-0.50	Brown sand with gravel and vegetation.
2255139	BH03	None Supplied	0.80-1.00	Brown clay and loam.

Analytical Report Number : 22-54694
Project / Site name: North Acton - LHR21

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
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
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 disperion 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 EPA-16 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
PCB's By GC-MS in soil	Determination of PCB by extraction with acetone and hexane followed by GC-MS.	In-house method based on USEPA 8082	L027-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
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
Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	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
Fraction Organic Carbon FOC Automated	Determination of fraction of organic carbon in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method	L009	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

Analytical Report Number : 22-54694
Project / Site name: North Acton - LHR21

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

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' 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

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Analytical Report Number : 22-56361

Project / Site name:	LHR21	**Samples received on:**	05/05/2022
Your job number:	1620013218-002	**Samples instructed on/ Analysis started on:**	05/05/2022
Your order number:	PO1620048110	**Analysis completed by:**	12/05/2022
Report Issue Number:	1	**Report issued on:**	12/05/2022
Samples Analysed:	1 water sample		

Signed:

Joanna Wawrzeczko
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.

Analytical Report Number: 22-56361
Project / Site name: LHR21

Lab Sample Number				2264805
Sample Reference				BH3
Sample Number				None Supplied
Depth (m)				None Supplied
Date Sampled				04/05/2022
Time Taken				1400
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	
General Inorganics				
pH	pH Units	N/A	ISO 17025	7.4
Total Cyanide	µg/l	10	ISO 17025	< 10
Sulphate as SO4	mg/l	0.045	ISO 17025	3500
Ammoniacal Nitrogen as N	µg/l	15	ISO 17025	1800
Hardness - Total	mgCaCO3/l	1	ISO 17025	1490
Total Phenols				
Total Phenols (monohydric)	µg/l	10	ISO 17025	< 10
Speciated PAHs				
Naphthalene	µg/l	0.01	ISO 17025	< 0.01
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01
Fluorene	µg/l	0.01	ISO 17025	< 0.01
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01
Anthracene	µg/l	0.01	ISO 17025	< 0.01
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01
Pyrene	µg/l	0.01	ISO 17025	< 0.01
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01
Chrysene	µg/l	0.01	ISO 17025	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01
Total PAH				
Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16
Heavy Metals / Metalloids				
Boron (dissolved)	µg/l	10	ISO 17025	330
Calcium (dissolved)	mg/l	0.012	ISO 17025	280
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0
Chromium (III)	µg/l	5	NONE	< 5.0
Magnesium (dissolved)	mg/l	0.005	ISO 17025	190
Arsenic (dissolved)	µg/l	0.15	ISO 17025	2.03
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1
Cadmium (dissolved)	µg/l	0.02	ISO 17025	0.2
Chromium (dissolved)	µg/l	0.2	ISO 17025	< 0.2
Copper (dissolved)	µg/l	0.5	ISO 17025	2
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05
Nickel (dissolved)	µg/l	0.5	ISO 17025	27
Selenium (dissolved)	µg/l	0.6	ISO 17025	210
Vanadium (dissolved)	µg/l	0.2	ISO 17025	1
Zinc (dissolved)	µg/l	0.5	ISO 17025	25

Analytical Report Number: 22-56361
Project / Site name: LHR21

Lab Sample Number				2264805
Sample Reference				BH3
Sample Number				None Supplied
Depth (m)				None Supplied
Date Sampled				04/05/2022
Time Taken				1400
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	
Monoaromatics & Oxygenates				
Benzene	µg/l	1	ISO 17025	< 1.0
Toluene	µg/l	1	ISO 17025	< 1.0
Ethylbenzene	µg/l	1	ISO 17025	< 1.0
p & m-xylene	µg/l	1	ISO 17025	< 1.0
o-xylene	µg/l	1	ISO 17025	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0
Petroleum Hydrocarbons				
TPH-CWG - Aliphatic >C5 - C6 $_{HS\_1D\_AL}$	µg/l	1	ISO 17025	< 1.0
TPH-CWG - Aliphatic >C6 - C8 $_{HS\_1D\_AL}$	µg/l	1	ISO 17025	< 1.0
TPH-CWG - Aliphatic >C8 - C10 $_{HS\_1D\_AL}$	µg/l	1	ISO 17025	< 1.0
TPH-CWG - Aliphatic >C10 - C12 $_{EH\_1D\_AL\_\#1\_\#2\_MS}$	µg/l	10	NONE	< 10
TPH-CWG - Aliphatic >C12 - C16 $_{EH\_1D\_AL\_\#1\_\#2\_MS}$	µg/l	10	NONE	< 10
TPH-CWG - Aliphatic >C16 - C21 $_{EH\_1D\_AL\_\#1\_\#2\_MS}$	µg/l	10	NONE	< 10
TPH-CWG - Aliphatic >C21 - C35 $_{EH\_1D\_AL\_\#1\_\#2\_MS}$	µg/l	10	NONE	< 10
TPH-CWG - Aliphatic (C5 - C35) $_{HS+EH\_1D\_AL\_\#1\_\#2\_MS}$	µg/l	10	NONE	< 10
TPH-CWG - Aromatic >C5 - C7 $_{HS\_1D\_AR}$	µg/l	1	ISO 17025	< 1.0
TPH-CWG - Aromatic >C7 - C8 $_{HS\_1D\_AR}$	µg/l	1	ISO 17025	< 1.0
TPH-CWG - Aromatic >C8 - C10 $_{HS\_1D\_AR}$	µg/l	1	ISO 17025	< 1.0
TPH-CWG - Aromatic >C10 - C12 $_{EH\_1D\_AR\_\#1\_\#2\_MS}$	µg/l	10	NONE	< 10
TPH-CWG - Aromatic >C12 - C16 $_{EH\_1D\_AR\_\#1\_\#2\_MS}$	µg/l	10	NONE	< 10
TPH-CWG - Aromatic >C16 - C21 $_{EH\_1D\_AR\_\#1\_\#2\_MS}$	µg/l	10	NONE	< 10
TPH-CWG - Aromatic >C21 - C35 $_{EH\_1D\_AR\_\#1\_\#2\_MS}$	µg/l	10	NONE	< 10
TPH-CWG - Aromatic (C5 - C35) $_{HS+EH\_1D\_AR\_\#1\_\#2\_MS}$	µg/l	10	NONE	< 10

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number : 22-56361
Project / Site name: LHR21

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
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
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
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	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
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
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.	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
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

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' 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 : 22-56361
Project / Site name: LHR21

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

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Analytical Report Number : 22-58035

Project / Site name:	North Acton, LHR21	**Samples received on:**	12/05/2022
Your job number:	1620013218-002	**Samples instructed on/ Analysis started on:**	12/05/2022
Your order number:	1620048110	**Analysis completed by:**	18/05/2022
Report Issue Number:	1	**Report issued on:**	18/05/2022
Samples Analysed:	5 water samples		

Izabela Wójcik

Signed:

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

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

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

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

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

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

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

Analytical Report Number: 22-58035
Project / Site name: North Acton, LHR21

Your Order No: 1620048110

Lab Sample Number				2273677	2273678	2273679	2273680	2273681
Sample Reference				BH01	WS02	WS03	WS04	WS05
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				11/05/2022	11/05/2022	11/05/2022	11/05/2022	11/05/2022
Time Taken				1000	1030	1300	1120	1230
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
General Inorganics								
pH	pH Units	N/A	ISO 17025	7.1	6.8	7.5	7.2	7.3
Total Cyanide	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10	< 10
Sulphate as SO4	mg/l	0.045	ISO 17025	4510	68.5	255	1220	45.1
Ammoniacal Nitrogen as N	µg/l	15	ISO 17025	1400	8500	660	2900	5900
Hardness - Total	mgCaCO3/l	1	ISO 17025	4950	1890	280	1940	882
Total Phenols								
Total Phenols (monohydric)	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10	< 10
Speciated PAHs								
Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01

Analytical Report Number: 22-58035
Project / Site name: North Acton, LHR21

Your Order No: 1620048110

Lab Sample Number				2273677	2273678	2273679	2273680	2273681
Sample Reference				BH01	WS02	WS03	WS04	WS05
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				11/05/2022	11/05/2022	11/05/2022	11/05/2022	11/05/2022
Time Taken				1000	1030	1300	1120	1230
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Total PAH								
Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16
Heavy Metals / Metalloids								
Boron (dissolved)	µg/l	10	ISO 17025	910	150	150	290	370
Calcium (dissolved)	mg/l	0.012	ISO 17025	530	530	80	390	210
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Chromium (III)	µg/l	5	NONE	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Magnesium (dissolved)	mg/l	0.005	ISO 17025	880	140	19	230	88
Arsenic (dissolved)	µg/l	0.15	ISO 17025	1.5	1.1	7.36	2.73	4.18
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Cadmium (dissolved)	µg/l	0.02	ISO 17025	0.43	0.21	0.11	0.24	< 0.02
Chromium (dissolved)	µg/l	0.2	ISO 17025	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Copper (dissolved)	µg/l	0.5	ISO 17025	4.9	3.8	6.7	7.7	< 0.5
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2	< 0.2	0.5	0.7	< 0.2
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Nickel (dissolved)	µg/l	0.5	ISO 17025	54	29	22	21	17
Selenium (dissolved)	µg/l	0.6	ISO 17025	44	3	3.7	3.9	3.1
Vanadium (dissolved)	µg/l	0.2	ISO 17025	0.5	< 0.2	1.9	0.6	0.4
Zinc (dissolved)	µg/l	0.5	ISO 17025	18	12	6	8.9	4.6
Monoaromatics & Oxygenates								
Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p & m-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Petroleum Hydrocarbons								
TPH-CWG - Aliphatic >C5 - C6 $_{HS\_1D\_AL}$	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C6 - C8 $_{HS\_1D\_AL}$	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C8 - C10 $_{HS\_1D\_AL}$	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C10 - C12 $_{EH\_1D\_AL\_\#1\_\#2\_MS}$	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C12 - C16 $_{EH\_1D\_AL\_\#1\_\#2\_MS}$	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C16 - C21 $_{EH\_1D\_AL\_\#1\_\#2\_MS}$	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C21 - C35 $_{EH\_1D\_AL\_\#1\_\#2\_MS}$	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic (C5 - C35) $_{HS+EH\_1D\_AL\_\#1\_\#2\_MS}$	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C5 - C7 $_{HS\_1D\_AR}$	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C7 - C8 $_{HS\_1D\_AR}$	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C8 - C10 $_{HS\_1D\_AR}$	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C10 - C12 $_{EH\_1D\_AR\_\#1\_\#2\_MS}$	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C12 - C16 $_{EH\_1D\_AR\_\#1\_\#2\_MS}$	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C16 - C21 $_{EH\_1D\_AR\_\#1\_\#2\_MS}$	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C21 - C35 $_{EH\_1D\_AR\_\#1\_\#2\_MS}$	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic (C5 - C35) $_{HS+EH\_1D\_AR\_\#1\_\#2\_MS}$	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10

Analytical Report Number: 22-58035
Project / Site name: North Acton, LHR21

Your Order No: 1620048110

Lab Sample Number				2273677	2273678	2273679	2273680	2273681
Sample Reference				BH01	WS02	WS03	WS04	WS05
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				11/05/2022	11/05/2022	11/05/2022	11/05/2022	11/05/2022
Time Taken				1000	1030	1300	1120	1230
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
VOCs								
Chloromethane	µg/l	1	ISO 17025	-	< 1.0	< 1.0	< 1.0	-
Chloroethane	µg/l	1	ISO 17025	-	< 1.0	< 1.0	< 1.0	-
Bromomethane	µg/l	1	ISO 17025	-	< 1.0	< 1.0	< 1.0	-
Vinyl Chloride	µg/l	1	NONE	-	< 1.0	< 1.0	< 1.0	-
Trichlorofluoromethane	µg/l	1	NONE	-	< 1.0	< 1.0	< 1.0	-
1,1-Dichloroethene	µg/l	1	ISO 17025	-	< 1.0	< 1.0	< 1.0	-
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	1	ISO 17025	-	< 1.0	< 1.0	< 1.0	-
Cis-1,2-dichloroethene	µg/l	1	ISO 17025	-	< 1.0	< 1.0	< 1.0	-
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	-	< 1.0	< 1.0	< 1.0	-
1,1-Dichloroethane	µg/l	1	ISO 17025	-	< 1.0	< 1.0	< 1.0	-
2,2-Dichloropropane	µg/l	1	ISO 17025	-	< 1.0	< 1.0	< 1.0	-
Trichloromethane	µg/l	1	ISO 17025	-	< 1.0	< 1.0	< 1.0	-
1,1,1-Trichloroethane	µg/l	1	ISO 17025	-	< 1.0	< 1.0	< 1.0	-
1,2-Dichloroethane	µg/l	1	ISO 17025	-	< 1.0	< 1.0	< 1.0	-
1,1-Dichloropropene	µg/l	1	ISO 17025	-	< 1.0	< 1.0	< 1.0	-
Trans-1,2-dichloroethene	µg/l	1	ISO 17025	-	< 1.0	< 1.0	< 1.0	-
Benzene	µg/l	1	ISO 17025	-	< 1.0	< 1.0	< 1.0	-
Tetrachloromethane	µg/l	1	ISO 17025	-	< 1.0	< 1.0	< 1.0	-
1,2-Dichloropropane	µg/l	1	ISO 17025	-	< 1.0	< 1.0	< 1.0	-
Trichloroethene	µg/l	1	ISO 17025	-	< 1.0	< 1.0	< 1.0	-
Dibromomethane	µg/l	1	ISO 17025	-	< 1.0	< 1.0	< 1.0	-
Bromodichloromethane	µg/l	1	ISO 17025	-	< 1.0	< 1.0	< 1.0	-
Cis-1,3-dichloropropene	µg/l	1	ISO 17025	-	< 1.0	< 1.0	< 1.0	-
Trans-1,3-dichloropropene	µg/l	1	ISO 17025	-	< 1.0	< 1.0	< 1.0	-
Toluene	µg/l	1	ISO 17025	-	< 1.0	< 1.0	< 1.0	-
1,1,2-Trichloroethane	µg/l	1	ISO 17025	-	< 1.0	< 1.0	< 1.0	-
1,3-Dichloropropane	µg/l	1	ISO 17025	-	< 1.0	< 1.0	< 1.0	-
Dibromochloromethane	µg/l	1	ISO 17025	-	< 1.0	< 1.0	< 1.0	-
Tetrachloroethene	µg/l	1	ISO 17025	-	< 1.0	< 1.0	< 1.0	-
1,2-Dibromoethane	µg/l	1	ISO 17025	-	< 1.0	< 1.0	< 1.0	-
Chlorobenzene	µg/l	1	ISO 17025	-	< 1.0	< 1.0	< 1.0	-
1,1,1,2-Tetrachloroethane	µg/l	1	ISO 17025	-	< 1.0	< 1.0	< 1.0	-
Ethylbenzene	µg/l	1	ISO 17025	-	< 1.0	< 1.0	< 1.0	-
p & m-Xylene	µg/l	1	ISO 17025	-	< 1.0	< 1.0	< 1.0	-
Styrene	µg/l	1	ISO 17025	-	< 1.0	< 1.0	< 1.0	-
Tribromomethane	µg/l	1	ISO 17025	-	< 1.0	< 1.0	< 1.0	-
o-Xylene	µg/l	1	ISO 17025	-	< 1.0	< 1.0	< 1.0	-
1,1,2,2-Tetrachloroethane	µg/l	1	ISO 17025	-	< 1.0	< 1.0	< 1.0	-
Isopropylbenzene	µg/l	1	ISO 17025	-	< 1.0	< 1.0	< 1.0	-
Bromobenzene	µg/l	1	ISO 17025	-	< 1.0	< 1.0	< 1.0	-
n-Propylbenzene	µg/l	1	ISO 17025	-	< 1.0	< 1.0	< 1.0	-
2-Chlorotoluene	µg/l	1	ISO 17025	-	< 1.0	< 1.0	< 1.0	-
4-Chlorotoluene	µg/l	1	ISO 17025	-	< 1.0	< 1.0	< 1.0	-
1,3,5-Trimethylbenzene	µg/l	1	ISO 17025	-	< 1.0	< 1.0	< 1.0	-
tert-Butylbenzene	µg/l	1	ISO 17025	-	< 1.0	< 1.0	< 1.0	-
1,2,4-Trimethylbenzene	µg/l	1	ISO 17025	-	< 1.0	< 1.0	< 1.0	-
sec-Butylbenzene	µg/l	1	ISO 17025	-	< 1.0	< 1.0	< 1.0	-
1,3-Dichlorobenzene	µg/l	1	ISO 17025	-	< 1.0	< 1.0	< 1.0	-
p-Isopropyltoluene	µg/l	1	ISO 17025	-	< 1.0	< 1.0	< 1.0	-
1,2-Dichlorobenzene	µg/l	1	ISO 17025	-	< 1.0	< 1.0	< 1.0	-
1,4-Dichlorobenzene	µg/l	1	ISO 17025	-	< 1.0	< 1.0	< 1.0	-
Butylbenzene	µg/l	1	ISO 17025	-	< 1.0	< 1.0	< 1.0	-
1,2-Dibromo-3-chloropropane	µg/l	1	ISO 17025	-	< 1.0	< 1.0	< 1.0	-
1,2,4-Trichlorobenzene	µg/l	1	ISO 17025	-	< 1.0	< 1.0	< 1.0	-
Hexachlorobutadiene	µg/l	1	ISO 17025	-	< 1.0	< 1.0	< 1.0	-

Analytical Report Number: 22-58035
Project / Site name: North Acton, LHR21

Your Order No: 1620048110

Lab Sample Number				2273677	2273678	2273679	2273680	2273681
Sample Reference				BH01	WS02	WS03	WS04	WS05
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				11/05/2022	11/05/2022	11/05/2022	11/05/2022	11/05/2022
Time Taken				1000	1030	1300	1120	1230
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
1,2,3-Trichlorobenzene	µg/l	1	ISO 17025	-	< 1.0	< 1.0	< 1.0	-
PCBs by GC-MS								
PCB Congener 28	µg/l	0.02	NONE	-	-	-	< 0.02	-
PCB Congener 52	µg/l	0.02	NONE	-	-	-	< 0.02	-
PCB Congener 101	µg/l	0.02	NONE	-	-	-	< 0.02	-
PCB Congener 118	µg/l	0.02	NONE	-	-	-	< 0.02	-
PCB Congener 138	µg/l	0.02	NONE	-	-	-	< 0.02	-
PCB Congener 153	µg/l	0.02	NONE	-	-	-	< 0.02	-
PCB Congener 180	µg/l	0.02	NONE	-	-	-	< 0.02	-
PCBs by GC-MS								
Total PCBs	µg/l	0.14	NONE	-	-	-	< 0.14	-

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number : 22-58035
Project / Site name: North Acton, LHR21

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
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
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
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	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
PCB's By GC-MS in water	Determination of PCB by extraction with acetone and hexane followed by GC-MS.	In-house method based on USEPA 8082	L028-PL	W	NONE
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
Total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
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.	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
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 : 22-58035
Project / Site name: North Acton, LHR21

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

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' 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

APPENDIX 4
GQRA SCREENING TABLES AND LEGISLATIVE BACKGROUND

16200013128: 37-39 NORTH ACTON ROAD

SOIL ANALYTICAL RESULTS SUMMARY

RAMBOLL

Lab Sample Number					2248394	2248395	2248396	2255138	2255139	2255133	2255134	2255135	2255136	2255137	2252244	2252245	2255130	2255131	2255132	2252246	2252247	2252248	2252249
Sample Reference					**BH1**	**BH2**	**BH2**	**BH03**	**BH03**	**WS01**	**WS01**	**WS01**	**WS02**	**WS02**	**WS03**	**WS03**	**WS04**	**WS04**	**WS04**	**WS05**	**WS05**	**WS05**	**BUND 1**
Sample Number					None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)					0.50-0.50	0.50-0.50	1.00-1.00	0.30-0.50	0.80-1.00	0.30-0.60	0.60-1.20	2.00	0.00-0.30	0.50-1.00	0.30-0.50	0.60	0.60	1.00	2.00	0.30-0.50	0.60-0.80	1.00	None Supplied
Date Sampled					19/04/2022	21/04/2022	21/04/2022	26/04/2022	26/04/2022	26/04/2022	26/04/2022	26/04/2022	26/04/2022	26/04/2022	25/04/2022	25/04/2022	26/04/2022	26/04/2022	26/04/2022	25/04/2022	25/04/2022	25/04/2022	25/04/2022
Time Taken					None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**GAC (Commercial Use)**	**Units**	**Limit of detection**	**Accreditation Status**																			
Stone Content		%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	59	45	< 0.1	< 0.1	< 0.1	76	< 0.1	< 0.1	< 0.1
Moisture Content		%	0.01	NONE	24	12	20	6.6	26	23	23	19	11	27	8.1	14	23	24	19	5.5	16	25	4.3
Total mass of sample received		kg	0.001	NONE	1	1	1	0.8	0.4	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.8	0.4	0.4	0.9	0.3	0.8	1
Asbestos in Soil	Detect	Type	N/A	ISO 17025	Not-detected	Not-detected	-	Not-detected	Not-detected	Not-detected	-	-	Not-detected	-	Not-detected	-	Not-detected	-	-	Not-detected	-	-	Not-detected
Asbestos Analyst ID		N/A	N/A	N/A	PDO	PDO	N/A	LFT	LFT	LFT	N/A	N/A	LFT	N/A	PDO	N/A	LFT	N/A	N/A	PDO	N/A	N/A	PDO
General Inorganics																							
pH - Automated		pH Units	N/A	MCERTS	7.7	8.8	7.9	10.2	7.7	7.5	8	8.1	9.5	7.7	11.2	10.2	7.7	7.9	7.9	11.2	9.2	8.7	7.9
Total Cyanide	49	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	1.9	< 1.0	< 1.0
Water Soluble Sulphate as SO4 16hr extraction (2:1)		mg/kg	2.5	MCERTS	1200	3600	560	570	720	410	560	2000	710	330	1200	1200	1000	1600	4900	570	1200	1000	3500
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)		g/l	0.00125	MCERTS	0.61	1.8	0.28	0.28	0.36	0.21	0.28	1	0.36	0.16	0.58	0.6	0.51	0.8	2.4	0.29	0.58	0.52	1.7
Total Phenols																							
Total Phenols (monohydric)	380	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Speciated PAHs																							
Naphthalene	110	mg/kg	0.05	MCERTS	0.21	< 0.05	< 0.05	< 0.05	< 0.05	3.9	< 0.05	< 0.05	0.33	< 0.05	< 0.05	< 0.05	0.24	< 0.05	< 0.05	< 0.05	0.28	< 0.05	< 0.05
Acenaphthylene	170	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.53	< 0.05	< 0.05	0.23	< 0.05	< 0.05	< 0.05	0.31	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthene	200	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	7.1	< 0.05	< 0.05	2.1	< 0.05	< 0.05	< 0.05	0.51	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluorene	60000	mg/kg	0.05	MCERTS	0.35	< 0.05	< 0.05	< 0.05	< 0.05	6.7	< 0.05	< 0.05	2.3	< 0.05	< 0.05	< 0.05	0.71	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Phenanthrene	22000	mg/kg	0.05	MCERTS	4	1.7	< 0.05	< 0.05	< 0.05	70	1.6	0.65	18	< 0.05	0.4	0.97	9	0.31	1.1	1.4	1.4	1.7	0.52
Anthracene	52000	mg/kg	0.05	MCERTS	1.2	0.42	< 0.05	< 0.05	< 0.05	13	0.25	< 0.05	3.3	< 0.05	< 0.05	0.26	2.8	< 0.05	0.21	0.4	0.25	0.39	< 0.05
Fluoranthene	23000	mg/kg	0.05	MCERTS	7.9	3.3	< 0.05	0.41	< 0.05	120	3.5	1	22	< 0.05	1.1	1.6	21	0.68	1.8	2.4	2.4	4.8	1.2
Pyrene	54000	mg/kg	0.05	MCERTS	6.6	2.8	< 0.05	0.57	< 0.05	100	3.4	0.71	16	< 0.05	1.3	1.5	17	0.6	1.7	2.4	2.1	4.3	1
Benzo(a)anthracene	170	mg/kg	0.05	MCERTS	4.3	1.9	< 0.05	0.36	< 0.05	50	1.5	0.46	10	< 0.05	0.91	0.71	11	0.33	0.81	1.3	1.4	2.2	0.86
Chrysene	350	mg/kg	0.05	MCERTS	3.5	1.8	< 0.05	0.23	< 0.05	45	1.5	0.31	8.5	< 0.05	0.61	0.81	8.9	0.33	0.79	1.1	1.2	2.2	0.72
Benzo(b)fluoranthene	45	mg/kg	0.05	MCERTS	4.9	2.6	< 0.05	0.32	< 0.05	45	2.1	0.52	11	< 0.05	0.84	0.77	11	0.33	0.84	1.6	1.9	2.6	1.1
Benzo(k)fluoranthene	12000	mg/kg	0.05	MCERTS	1.3	0.76	< 0.05	0.18	< 0.05	46	0.88	0.25	4.6	< 0.05	0.34	0.41	5.2	0.22	0.4	0.54	0.49	0.91	0.44
Benzo(a)pyrene	76	mg/kg	0.05	MCERTS	3.9	2.1	< 0.05	0.32	< 0.05	58	1.7	0.35	9.6	< 0.05	0.75	0.78	11	0.34	0.8	1.4	1.2	2.3	1.1
Indeno(1,2,3-cd)pyrene	510	mg/kg	0.05	MCERTS	2.2	1.2	< 0.05	< 0.05	< 0.05	27	1	0.27	6.4	< 0.05	0.43	0.35	5.2	< 0.05	0.38	0.71	0.79	1.4	0.64
Dibenz(a,h)anthracene	3.5	mg/kg	0.05	MCERTS	0.47	0.29	< 0.05	< 0.05	< 0.05	7.7	0.28	< 0.05	1.6	< 0.05	< 0.05	< 0.05	1.4	< 0.05	< 0.05	< 0.05	< 0.05	0.37	< 0.05
Benzo(ghi)perylene	3900	mg/kg	0.05	MCERTS	2.3	1.5	< 0.05	< 0.05	< 0.05	32	1.2	0.28	6.2	< 0.05	0.51	0.43	6.2	< 0.05	0.51	0.86	0.9	1.4	0.77
Total PAH																							
Speciated Total EPA-16 PAHs		mg/kg	0.8	MCERTS	43	20.3	< 0.80	2.39	< 0.80	633	18.8	4.81	121	< 0.80	7.14	8.51	111	3.14	9.3	14.1	14.3	24.6	8.27
Heavy Metals / Metalloids																							
Arsenic (aqua regia extractable)	640	mg/kg	1	MCERTS	21	14	15	13	17	16	16	16	14	14	15	14	18	13	16	11	31	19	18
Beryllium (aqua regia extractable)	12	mg/kg	0.06	MCERTS	3.5	0.95	1.3	0.4	1.4	1.3	1.5	1.1	1.9	1.3	0.88	0.98	1.9	1.2	1.2	0.54	2.9	1.6	0.87
Boron (water soluble)	240,000	mg/kg	0.2	MCERTS	3.4	4.8	4.6	2.1	3.9	4.3	1.5	2.6	1.6	1.9	4.4	2.9	6.4	4.1	1.5	1.8	3.9	5.6	7.4
Cadmium (aqua regia extractable)	410	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	3.6	< 0.2	< 0.2
Chromium (hexavalent)	49	mg/kg	1.2	NONE	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Chromium (III)	8,600	mg/kg	1	NONE	42	27	53	19	39	37	57	45	29	49	31	31	41	46	51	19	36	40	27
Chromium (aqua regia extractable)	8,600	mg/kg	1	MCERTS	43	27	53	19	39	38	57	45	29	49	31	31	41	46	51	19	36	41	27
Copper (aqua regia extractable)	68,000	mg/kg	1	MCERTS	81	43	21	54	91	170	26	21	51	33	60	48	87	19	27	24	140	86	50
Lead (aqua regia extractable)	2300	mg/kg	1	MCERTS	120	190	27	18	190	140	21	22	160	53	84	92	220	27	20	66	1300	280	1100
Mercury (aqua regia extractable)	40	mg/kg	0.3	MCERTS	0.8	< 0.3	< 0.3	< 0.3	1.4	0.9	< 0.3	< 0.3	0.9	< 0.3	< 0.3	< 0.3	1.4	< 0.3	< 0.3	< 0.3	1	1.2	0.6
Nickel (aqua regia extractable)	180	mg/kg	1	MCERTS	48	20	23	9.9	22	25	32	35	23	22	21	21	26	20	38	15	43	25	18
Selenium (aqua regia extractable)	250	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Vanadium (aqua regia extractable)	410	mg/kg	1	MCERTS	99	45	90	34	69	68	88	67	53	80	49	46	74	75	74	28	75	67	43
Zinc (aqua regia extractable)	730,000	mg/kg	1	MCERTS	210	210	63	33	130	160	68	58	150	78	120	150	160	57	71	55	870	280	380
Monoaromatics & Oxygenates																							
Benzene	15,000	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	33,000,000	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	3,200,000	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p & m-xylene	3,300,000	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-xylene	3,700,000	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	3,800,000	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Petroleum Hydrocarbons																							
TPH-CWG - Aliphatic >EC5 - EC6 $_{HS\_1D\_AL}$	2,400	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8 $_{HS\_1D\_AL}$	5,300	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10 $_{HS\_1D\_AL}$	1,300	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12 $_{EH\_CU\_1D\_AL}$	6,100	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	11	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16 $_{EH\_CU\_1D\_AL}$	43,000	mg/kg	2	MCERTS	< 2.0	2.6	< 2.0	< 2.0	< 2.0	13	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
TPH-CWG - Aliphatic >EC16 - EC21 $_{EH\_CU\_1D\_AL}$	1,000,000	mg/kg	8	MCERTS	< 8.0	12	< 8.0	< 8.0	< 8.0	9.3	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0	14	< 8.0	< 8.0
TPH-CWG - Aliphatic >EC21 - EC35 $_{EH\_CU\_1D\_AL}$	1,000,000	mg/kg	8	MCERTS	< 8.0	53	< 8.0	< 8.0	< 8.0	19	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0	65	< 8.0	< 8.0
TPH-CWG - Aliphatic (EC5 - EC35) $_{EH\_CU+HS\_1D\_AL}$	NC	mg/kg	10	MCERTS	< 10	68	< 10	< 10	< 10	53	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	79	< 10	< 10
TPH-CWG - Aromatic >EC5 - EC7 $_{HS\_1D\_AR}$	NC	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC7 - EC8 $_{HS\_1D\_AR}$	NC	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC8 - EC10 $_{HS\_1D\_AR}$	2,200	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC10 - EC12 $_{EH\_CU\_1D\_AR}$	11,000	mg/kg	1	MCERTS	< 1.0	3.2	< 1.0	< 1.0	< 1.0	24	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >EC12 - EC16 $_{EH\_CU\_1D\_AR}$	35,000	mg/kg	2	MCERTS	9	6.7	< 2.0	< 2.0	< 2.0	55	4	< 2.0	26	< 2.0	< 2.0	< 2.0	4.2	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
TPH-CWG - Aromatic >EC16 - EC21 $_{EH\_CU\_1D\_AR}$	29,000	mg/kg	10	MCERTS	30	16	< 10	< 10	< 10	250	< 10	< 10	54	< 10	< 10	< 10	47	< 10	< 10	< 10	18	15	11
TPH-CWG - Aromatic >EC21 - EC35 $_{EH\_CU\_1D\_AR}$	29,000	mg/kg	10	MCERTS	70	65	< 10	< 10	< 10	320	15	< 10	110	< 10	25	23	100	< 10	19	19	62	33	37
TPH-CWG - Aromatic (EC5 - EC35) $_{EH\_CU+HS\_1D\_AR}$	NC	mg/kg	10	MCERTS	110	92	< 10	< 10	< 10	650	28	10	190	< 10	34	30	150	< 10	29	28	80	48	48
VOCs																							
Chloromethane		µg/kg	1	ISO 17025	-	-	-	< 1.0	-	-	-	-	-	< 1.0	< 1.0	-	-	-	-	-	< 1.0	-	-
Chloroethane		µg/kg	1	NONE	-	-	-	< 1.0	-	-	-	-	-	< 1.0	< 1.0	-	-	-	-	-	< 1.0	-	-
Bromomethane		µg/kg	1	ISO 17025	-	-	-	< 1.0	-	-	-	-	-	< 1.0	< 1.0	-	-	-	-	-	< 1.0	-	-
Vinyl Chloride		µg/kg	1	NONE	-	-	-	< 1.0	-	-	-	-	-	< 1.0	< 1.0	-	-	-	-	-	< 1.0	-	-
Trichlorofluoromethane		µg/kg	1	NONE	-	-	-	< 1.0	-	-	-	-	-	< 1.0	< 1.0	-	-	-	-	-	< 1.0	-	-
1,1-Dichloroethene		µg/kg	1	NONE	-	-	-	< 1.0	-	-	-	-	-	< 1.0	< 1.0	-	-	-	-	-	< 1.0	-	-
1,1,2-Trichloro 1,2,2-Trifluoroethane		µg/kg	1	ISO 17025	-	-	-	< 1.0	-	-	-	-	-	< 1.0	< 1.0	-	-	-	-	-	< 1.0	-	-
Cis-1,2-dichloroethene		µg/kg	1	MCERTS	-	-	-	< 1.0	-	-	-	-	-	< 1.0	< 1.0	-	-	-	-	-	< 1.0	-	-
MTBE (Methyl Tertiary Butyl Ether)		µg/kg	1	MCERTS	-	-	-	< 1.0	-	-	-	-	-	< 1.0	< 1.0	-	-	-	-	-	< 1.0	-	-
1,1-Dichloroethane		µg/kg	1	MCERTS	-	-	-	< 1.0	-	-	-	-	-	< 1.0	< 1.0	-	-	-	-	-	< 1.0	-	-
2,2-Dichloropropane		µg/kg	1	MCERTS	-	-	-	< 1.0	-	-	-	-	-	< 1.0	< 1.0	-	-	-	-	-	< 1.0	-	-
Trichloromethane		µg/kg	1	MCERTS	-	-	-	< 1.0	-	-	-	-	-	< 1.0	< 1.0	-	-	-	-	-	< 1.0	-	-
1,1,1-Trichloroethane		µg/kg	1	MCERTS	-	-	-	< 1.0	-	-	-	-	-	< 1.0	< 1.0	-	-	-	-	-	< 1.0	-	-
1,2-Dichloroethane		µg/kg	1	MCERTS	-	-	-	< 1.0	-	-	-	-	-	< 1.0	< 1.0	-	-	-	-	-	< 1.0	-	-
1,1-Dichloropropene		µg/kg	1	MCERTS	-	-	-	< 1.0	-	-	-	-	-	< 1.0	< 1.0	-	-	-	-	-	< 1.0	-	-
Trans-1,2-dichloroethene		µg/kg	1	NONE	-	-	-	< 1.0	-	-	-	-	-	< 1.0	< 1.0	-	-	-	-	-	< 1.0	-	-
Benzene		µg/kg	1	MCERTS	-	-	-	< 1.0	-	-	-	-	-	< 1.0	< 1.0	-	-	-	-	-	< 1.0	-	-
Tetrachloromethane		µg/kg	1	MCERTS	-	-	-	< 1.0	-	-	-	-	-	< 1.0	< 1.0	-	-	-	-	-	< 1.0	-	-
1,2-Dichloropropane		µg/kg	1	MCERTS	-	-	-	< 1.0	-	-	-	-	-	< 1.0	< 1.0	-	-	-	-	-	< 1.0	-	-
Trichloroethene		µg/kg	1	MCERTS	-	-	-	< 1.0	-	-	-	-	-	< 1.0	< 1.0	-	-	-	-	-	< 1.0	-	-
Dibromomethane		µg/kg	1	MCERTS	-	-	-	< 1.0	-	-	-	-	-	< 1.0	< 1.0	-	-	-	-	-	< 1.0	-	-
Bromodichloromethane		µg/kg	1	MCERTS	-	-	-	< 1.0	-	-	-	-	-	< 1.0	< 1.0	-	-	-	-	-	< 1.0	-	-
Cis-1,3-dichloropropene		µg/kg	1	ISO 17025	-	-	-	< 1.0	-	-	-	-	-	< 1.0	< 1.0	-	-	-	-	-	< 1.0	-	-
Trans-1,3-dichloropropene		µg/kg	1	ISO 17025	-	-	-	< 1.0	-	-	-	-	-	< 1.0	< 1.0	-	-	-	-	-	< 1.0	-	-
Toluene		µg/kg	1	MCERTS	-	-	-	< 1.0	-	-	-	-	-	< 1.0	< 1.0	-	-	-	-	-	< 1.0	-	-
1,1,2-Trichloroethane		µg/kg	1	MCERTS	-	-	-	< 1.0	-	-	-	-	-	< 1.0	< 1.0	-	-	-	-	-	< 1.0	-	-
1,3-Dichloropropane		µg/kg	1	ISO 17025	-	-	-	< 1.0	-	-	-	-	-	< 1.0	< 1.0	-	-	-	-	-	< 1.0	-	-
Dibromochloromethane		µg/kg	1	ISO 17025	-	-	-	< 1.0	-	-	-	-	-	< 1.0	< 1.0	-	-	-	-	-	< 1.0	-	-
Tetrachloroethene		µg/kg	1	NONE	-	-	-	< 1.0	-	-	-	-	-	< 1.0	< 1.0	-	-	-	-	-	< 1.0	-	-
1,2-Dibromoethane		µg/kg	1	ISO 17025	-	-	-	< 1.0	-	-	-	-	-	< 1.0	< 1.0	-	-	-	-	-	< 1.0	-	-
Chlorobenzene		µg/kg	1	MCERTS	-	-	-	< 1.0	-	-	-	-	-	< 1.0	< 1.0	-	-	-	-	-	< 1.0	-	-
1,1,1,2-Tetrachloroethane		µg/kg	1	MCERTS	-	-	-	< 1.0	-	-	-	-	-	< 1.0	< 1.0	-	-	-	-	-	< 1.0	-	-
Ethylbenzene		µg/kg	1	MCERTS	-	-	-	< 1.0	-	-	-	-	-	< 1.0	< 1.0	-	-	-	-	-	< 1.0	-	-
p & m-Xylene		µg/kg	1	MCERTS	-	-	-	< 1.0	-	-	-	-	-	< 1.0	< 1.0	-	-	-	-	-	< 1.0	-	-
Styrene		µg/kg	1	MCERTS	-	-	-	< 1.0	-	-	-	-	-	< 1.0	< 1.0	-	-	-	-	-	< 1.0	-	-
Tribromomethane		µg/kg	1	NONE	-	-	-	< 1.0	-	-	-	-	-	< 1.0	< 1.0	-	-	-	-	-	< 1.0	-	-
o-Xylene		µg/kg	1	MCERTS	-	-	-	< 1.0	-	-	-	-	-	< 1.0	< 1.0	-	-	-	-	-	< 1.0	-	-
1,1,2,2-Tetrachloroethane		µg/kg	1	MCERTS	-	-	-	< 1.0	-	-	-	-	-	< 1.0	< 1.0	-	-	-	-	-	< 1.0	-	-
Isopropylbenzene		µg/kg	1	MCERTS	-	-	-	< 1.0	-	-	-	-	-	< 1.0	< 1.0	-	-	-	-	-	< 1.0	-	-
Bromobenzene		µg/kg	1	MCERTS	-	-	-	< 1.0	-	-	-	-	-	< 1.0	< 1.0	-	-	-	-	-	< 1.0	-	-
n-Propylbenzene		µg/kg	1	ISO 17025	-	-	-	< 1.0	-	-	-	-	-	< 1.0	< 1.0	-	-	-	-	-	< 1.0	-	-
2-Chlorotoluene		µg/kg	1	MCERTS	-	-	-	< 1.0	-	-	-	-	-	< 1.0	< 1.0	-	-	-	-	-	< 1.0	-	-
4-Chlorotoluene		µg/kg	1	MCERTS	-	-	-	< 1.0	-	-	-	-	-	< 1.0	< 1.0	-	-	-	-	-	< 1.0	-	-
1,3,5-Trimethylbenzene		µg/kg	1	ISO 17025	-	-	-	< 1.0	-	-	-	-	-	< 1.0	< 1.0	-	-	-	-	-	< 1.0	-	-
tert-Butylbenzene		µg/kg	1	MCERTS	-	-	-	< 1.0	-	-	-	-	-	< 1.0	< 1.0	-	-	-	-	-	< 1.0	-	-
1,2,4-Trimethylbenzene		µg/kg	1	ISO 17025	-	-	-	< 1.0	-	-	-	-	-	< 1.0	< 1.0	-	-	-	-	-	< 1.0	-	-
sec-Butylbenzene		µg/kg	1	MCERTS	-	-	-	< 1.0	-	-	-	-	-	< 1.0	< 1.0	-	-	-	-	-	< 1.0	-	-
1,3-Dichlorobenzene		µg/kg	1	ISO 17025	-	-	-	< 1.0	-	-	-	-	-	< 1.0	< 1.0	-	-	-	-	-	< 1.0	-	-
p-Isopropyltoluene		µg/kg	1	ISO 17025	-	-	-	< 1.0	-	-	-	-	-	< 1.0	< 1.0	-	-	-	-	-	< 1.0	-	-
1,2-Dichlorobenzene		µg/kg	1	MCERTS	-	-	-	< 1.0	-	-	-	-	-	< 1.0	< 1.0	-	-	-	-	-	< 1.0	-	-
1,4-Dichlorobenzene		µg/kg	1	MCERTS	-	-	-	< 1.0	-	-	-	-	-	< 1.0	< 1.0	-	-	-	-	-	< 1.0	-	-
Butylbenzene		µg/kg	1	MCERTS	-	-	-	< 1.0	-	-	-	-	-	< 1.0	< 1.0	-	-	-	-	-	< 1.0	-	-
1,2-Dibromo-3-chloropropane		µg/kg	1	ISO 17025	-	-	-	< 1.0	-	-	-	-	-	< 1.0	< 1.0	-	-	-	-	-	< 1.0	-	-
1,2,4-Trichlorobenzene		µg/kg	1	MCERTS	-	-	-	< 1.0	-	-	-	-	-	< 1.0	< 1.0	-	-	-	-	-	< 1.0	-	-
Hexachlorobutadiene		µg/kg	1	MCERTS	-	-	-	< 1.0	-	-	-	-	-	< 1.0	< 1.0	-	-	-	-	-	< 1.0	-	-
1,2,3-Trichlorobenzene		µg/kg	1	ISO 17025	-	-	-	< 1.0	-	-	-	-	-	< 1.0	< 1.0	-	-	-	-	-	< 1.0	-	-
PCBs by GC-MS																							
PCB Congener 28		mg/kg	0.001	MCERTS	-	< 0.001	-	-	-	-	-	-	-	< 0.001	-	-	< 0.001	-	< 0.001	-	-	-	-
PCB Congener 52		mg/kg	0.001	MCERTS	-	< 0.001	-	-	-	-	-	-	-	< 0.001	-	-	< 0.001	-	< 0.001	-	-	-	-
PCB Congener 101		mg/kg	0.001	MCERTS	-	< 0.001	-	-	-	-	-	-	-	< 0.001	-	-	< 0.001	-	< 0.001	-	-	-	-
PCB Congener 118		mg/kg	0.001	MCERTS	-	< 0.001	-	-	-	-	-	-	-	< 0.001	-	-	< 0.001	-	< 0.001	-	-	-	-
PCB Congener 138		mg/kg	0.001	MCERTS	-	< 0.001	-	-	-	-	-	-	-	< 0.001	-	-	< 0.001	-	< 0.001	-	-	-	-
PCB Congener 153		mg/kg	0.001	MCERTS	-	< 0.001	-	-	-	-	-	-	-	< 0.001	-	-	< 0.001	-	< 0.001	-	-	-	-
PCB Congener 180		mg/kg	0.001	MCERTS	-	< 0.001	-	-	-	-	-	-	-	< 0.001	-	-	< 0.001	-	< 0.001	-	-	-	-
Total PCBs by GC-MS																							
Total PCBs		mg/kg	0.007	MCERTS	-	< 0.007	-	-	-	-	-	-	-	< 0.007	-	-	< 0.007	-	< 0.007	-	-	-	-

RED INDICATES EXCEEDANCE OF GAC

16200013128: 37-39 NORTH ACTON ROAD

GROUNDWATER ANALYTICAL RESULTS SUMMARY: CONTROLLED WATERS ASSESMENT

				Lab Sample Number		2264805	2273677	2273678	2273679	2273680	2273681
				Sample Reference		**BH03**	**BH01**	**WS02**	**WS03**	**WS04**	**WS05**
				Sample Number		None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
				Depth (m)		None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
				Date Sampled		04/05/2022	11/05/2022	11/05/2022	11/05/2022	11/05/2022	11/05/2022
				Time Taken		1400	1000	1030	1300	1120	1230
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	**GAC (Controlled Waters)**	**No. >GAC**						
General Inorganics											
pH	pH Units	N/A	ISO 17025	NC	0	7.4	7.1	6.8	7.5	7.2	7.3
Total Cyanide	µg/l	10	ISO 17025	50,000	0	< 10	< 10	< 10	< 10	< 10	< 10
Sulphate as SO4	mg/l	0.045	ISO 17025	188,000	0	3500	4510	68.5	255	1220	45.1
Ammoniacal Nitrogen as N	µg/l	15	ISO 17025	290	0	1800	1400	8500	660	2900	5900
Hardness - Total	mgCaCO3/l	1	ISO 17025	NC	0	1490	4950	1890	280	1940	882
Total Phenols											
Total Phenols (monohydric)	µg/l	10	ISO 17025	NC	0	< 10	< 10	< 10	< 10	< 10	< 10
Speciated PAHs											
Naphthalene	µg/l	0.01	ISO 17025	0.075	0	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthylene	µg/l	0.01	ISO 17025	NC	0	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	NC	0	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluorene	µg/l	0.01	ISO 17025	NC	0	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Phenanthrene	µg/l	0.01	ISO 17025	NC	0	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Anthracene	µg/l	0.01	ISO 17025	0.05	0	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluoranthene	µg/l	0.01	ISO 17025	0.075	0	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Pyrene	µg/l	0.01	ISO 17025	NC	0	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)anthracene	µg/l	0.01	ISO 17025	NC	0	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chrysene	µg/l	0.01	ISO 17025	NC	0	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	µg/l	0.01	ISO 17025	0.0075	0	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	Sum of four compounds		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025			< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025			< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(ghi)perylene	µg/l	0.01	ISO 17025			< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
				0.1	0	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	NC	0	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Total PAH											
Total EPA-16 PAHs	µg/l	0.16	ISO 17025		0	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16
Heavy Metals / Metalloids											
Boron (dissolved)	µg/l	10	ISO 17025	750	1	330	910	150	150	290	370
Calcium (dissolved)	mg/l	0.012	ISO 17025	NC	0	280	530	530	80	390	210
Chromium (hexavalent)	µg/l	5	ISO 17025	37.5	0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Chromium (III)	µg/l	5	NONE	37.5	0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Magnesium (dissolved)	mg/l	0.005	ISO 17025	NC	0	190	880	140	19	230	88
Arsenic (dissolved)	µg/l	0.15	ISO 17025	7.5	0	2.03	1.5	1.1	7.36	2.73	4.18
Beryllium (dissolved)	µg/l	0.1	ISO 17025	4	0	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Cadmium (dissolved)	µg/l	0.02	ISO 17025	3.75	0	0.2	0.43	0.21	0.11	0.24	< 0.02
Chromium (dissolved)	µg/l	0.2	ISO 17025	37.5	0	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Copper (dissolved)	µg/l	0.5	ISO 17025	1500	0	2	4.9	3.8	6.7	7.7	< 0.5
Lead (dissolved)	µg/l	0.2	ISO 17025	7.5	0	< 0.2	< 0.2	< 0.2	0.5	0.7	< 0.2
Mercury (dissolved)	µg/l	0.05	ISO 17025	0.75	0	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Nickel (dissolved)	µg/l	0.5	ISO 17025	15	5	27	54	29	22	21	17
Selenium (dissolved)	µg/l	0.6	ISO 17025	7.5	2	210	44	3	3.7	3.9	3.1
Vanadium (dissolved)	µg/l	0.2	ISO 17025	60	0	1	0.5	< 0.2	1.9	0.6	0.4
Zinc (dissolved)	µg/l	0.5	ISO 17025	5000	0	25	18	12	6	8.9	4.6
Monoaromatics & Oxygenates											
Benzene	µg/l	1	ISO 17025	0.75	0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	µg/l	1	ISO 17025	700	0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/l	1	ISO 17025	300	0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p & m-xylene	µg/l	1	ISO 17025	500	0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-xylene	µg/l	1	ISO 17025	500	0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	15	0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Petroleum Hydrocarbons											
TPH-CWG - Aliphatic >C5 - C6 $_{HS\_1D\_AL}$	µg/l	1	ISO 17025		0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C6 - C8 $_{HS\_1D\_AL}$	µg/l	1	ISO 17025		0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C8 - C10 $_{HS\_1D\_AL}$	µg/l	1	ISO 17025		0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C10 - C12 $_{EH\_1D\_AL\_\#1\_\#2\_MS}$	µg/l	10	NONE		0	< 10	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C12 - C16 $_{EH\_1D\_AL\_\#1\_\#2\_MS}$	µg/l	10	NONE		0	< 10	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C16 - C21 $_{EH\_1D\_AL\_\#1\_\#2\_MS}$	µg/l	10	NONE		0	< 10	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C21 - C35 $_{EH\_1D\_AL\_\#1\_\#2\_MS}$	µg/l	10	NONE		0	< 10	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic (C5 - C35) $_{HS+EH\_1D\_AL\_\#1\_\#2\_MS}$	µg/l	10	NONE		0	< 10	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C5 - C7 $_{HS\_1D\_AR}$	µg/l	1	ISO 17025		0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C7 - C8 $_{HS\_1D\_AR}$	µg/l	1	ISO 17025		0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C8 - C10 $_{HS\_1D\_AR}$	µg/l	1	ISO 17025		0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C10 - C12 $_{EH\_1D\_AR\_\#1\_\#2\_MS}$	µg/l	10	NONE		0	< 10	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C12 - C16 $_{EH\_1D\_AR\_\#1\_\#2\_MS}$	µg/l	10	NONE		0	< 10	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C16 - C21 $_{EH\_1D\_AR\_\#1\_\#2\_MS}$	µg/l	10	NONE		0	< 10	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C21 - C35 $_{EH\_1D\_AR\_\#1\_\#2\_MS}$	µg/l	10	NONE		0	< 10	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic (C5 - C35) $_{HS+EH\_1D\_AR\_\#1\_\#2\_MS}$	µg/l	10	NONE		0	< 10	< 10	< 10	< 10	< 10	< 10
VOCs											
Chloromethane	µg/l	1	ISO 17025		0	-	-	< 1.0	< 1.0	< 1.0	-
Chloroethane	µg/l	1	ISO 17025		0	-	-	< 1.0	< 1.0	< 1.0	-
Bromomethane	µg/l	1	ISO 17025		0	-	-	< 1.0	< 1.0	< 1.0	-
Vinyl Chloride	µg/l	1	NONE		0	-	-	< 1.0	< 1.0	< 1.0	-
Trichlorofluoromethane	µg/l	1	NONE		0	-	-	< 1.0	< 1.0	< 1.0	-
1,1-Dichloroethene	µg/l	1	ISO 17025		0	-	-	< 1.0	< 1.0	< 1.0	-
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	1	ISO 17025		0	-	-	< 1.0	< 1.0	< 1.0	-
Cis-1,2-dichloroethene	µg/l	1	ISO 17025		0	-	-	< 1.0	< 1.0	< 1.0	-
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025		0	-	-	< 1.0	< 1.0	< 1.0	-
1,1-Dichloroethane	µg/l	1	ISO 17025		0	-	-	< 1.0	< 1.0	< 1.0	-
2,2-Dichloropropane	µg/l	1	ISO 17025		0	-	-	< 1.0	< 1.0	< 1.0	-
Trichloromethane	µg/l	1	ISO 17025		0	-	-	< 1.0	< 1.0	< 1.0	-
1,1,1-Trichloroethane	µg/l	1	ISO 17025		0	-	-	< 1.0	< 1.0	< 1.0	-
1,2-Dichloroethane	µg/l	1	ISO 17025		0	-	-	< 1.0	< 1.0	< 1.0	-
1,1-Dichloropropene	µg/l	1	ISO 17025		0	-	-	< 1.0	< 1.0	< 1.0	-
Trans-1,2-dichloroethene	µg/l	1	ISO 17025		0	-	-	< 1.0	< 1.0	< 1.0	-
Benzene	µg/l	1	ISO 17025		0	-	-	< 1.0	< 1.0	< 1.0	-
Tetrachloromethane	µg/l	1	ISO 17025		0	-	-	< 1.0	< 1.0	< 1.0	-
1,2-Dichloropropane	µg/l	1	ISO 17025		0	-	-	< 1.0	< 1.0	< 1.0	-
Trichloroethene	µg/l	1	ISO 17025		0	-	-	< 1.0	< 1.0	< 1.0	-
Dibromomethane	µg/l	1	ISO 17025		0	-	-	< 1.0	< 1.0	< 1.0	-
Bromodichloromethane	µg/l	1	ISO 17025		0	-	-	< 1.0	< 1.0	< 1.0	-
Cis-1,3-dichloropropene	µg/l	1	ISO 17025		0	-	-	< 1.0	< 1.0	< 1.0	-
Trans-1,3-dichloropropene	µg/l	1	ISO 17025		0	-	-	< 1.0	< 1.0	< 1.0	-
Toluene	µg/l	1	ISO 17025		0	-	-	< 1.0	< 1.0	< 1.0	-
1,1,2-Trichloroethane	µg/l	1	ISO 17025		0	-	-	< 1.0	< 1.0	< 1.0	-
1,3-Dichloropropane	µg/l	1	ISO 17025		0	-	-	< 1.0	< 1.0	< 1.0	-
Dibromochloromethane	µg/l	1	ISO 17025		0	-	-	< 1.0	< 1.0	< 1.0	-
Tetrachloroethene	µg/l	1	ISO 17025		0	-	-	< 1.0	< 1.0	< 1.0	-
1,2-Dibromoethane	µg/l	1	ISO 17025		0	-	-	< 1.0	< 1.0	< 1.0	-
Chlorobenzene	µg/l	1	ISO 17025		0	-	-	< 1.0	< 1.0	< 1.0	-
1,1,1,2-Tetrachloroethane	µg/l	1	ISO 17025		0	-	-	< 1.0	< 1.0	< 1.0	-
Ethylbenzene	µg/l	1	ISO 17025		0	-	-	< 1.0	< 1.0	< 1.0	-
p & m-Xylene	µg/l	1	ISO 17025		0	-	-	< 1.0	< 1.0	< 1.0	-
Styrene	µg/l	1	ISO 17025		0	-	-	< 1.0	< 1.0	< 1.0	-
Tribromomethane	µg/l	1	ISO 17025		0	-	-	< 1.0	< 1.0	< 1.0	-
o-Xylene	µg/l	1	ISO 17025		0	-	-	< 1.0	< 1.0	< 1.0	-
1,1,2,2-Tetrachloroethane	µg/l	1	ISO 17025		0	-	-	< 1.0	< 1.0	< 1.0	-
Isopropylbenzene	µg/l	1	ISO 17025		0	-	-	< 1.0	< 1.0	< 1.0	-
Bromobenzene	µg/l	1	ISO 17025		0	-	-	< 1.0	< 1.0	< 1.0	-
n-Propylbenzene	µg/l	1	ISO 17025		0	-	-	< 1.0	< 1.0	< 1.0	-
2-Chlorotoluene	µg/l	1	ISO 17025		0	-	-	< 1.0	< 1.0	< 1.0	-
4-Chlorotoluene	µg/l	1	ISO 17025		0	-	-	< 1.0	< 1.0	< 1.0	-
1,3,5-Trimethylbenzene	µg/l	1	ISO 17025		0	-	-	< 1.0	< 1.0	< 1.0	-
tert-Butylbenzene	µg/l	1	ISO 17025		0	-	-	< 1.0	< 1.0	< 1.0	-
1,2,4-Trimethylbenzene	µg/l	1	ISO 17025		0	-	-	< 1.0	< 1.0	< 1.0	-
sec-Butylbenzene	µg/l	1	ISO 17025		0	-	-	< 1.0	< 1.0	< 1.0	-
1,3-Dichlorobenzene	µg/l	1	ISO 17025		0	-	-	< 1.0	< 1.0	< 1.0	-
p-Isopropyltoluene	µg/l	1	ISO 17025		0	-	-	< 1.0	< 1.0	< 1.0	-
1,2-Dichlorobenzene	µg/l	1	ISO 17025		0	-	-	< 1.0	< 1.0	< 1.0	-
1,4-Dichlorobenzene	µg/l	1	ISO 17025		0	-	-	< 1.0	< 1.0	< 1.0	-
Butylbenzene	µg/l	1	ISO 17025		0	-	-	< 1.0	< 1.0	< 1.0	-
1,2-Dibromo-3-chloropropane	µg/l	1	ISO 17025		0	-	-	< 1.0	< 1.0	< 1.0	-
1,2,4-Trichlorobenzene	µg/l	1	ISO 17025		0	-	-	< 1.0	< 1.0	< 1.0	-
Hexachlorobutadiene	µg/l	1	ISO 17025		0	-	-	< 1.0	< 1.0	< 1.0	-
1,2,3-Trichlorobenzene	µg/l	1	ISO 17025		0	-	-	< 1.0	< 1.0	< 1.0	-
PCBs by GC-MS											
PCB Congener 28	µg/l	0.02	NONE	0.5	0	-	-	-	-	< 0.02	-
PCB Congener 52	µg/l	0.02	NONE	0.5	0	-	-	-	-	< 0.02	-
PCB Congener 101	µg/l	0.02	NONE	0.5	0	-	-	-	-	< 0.02	-
PCB Congener 118	µg/l	0.02	NONE	0.5	0	-	-	-	-	< 0.02	-
PCB Congener 138	µg/l	0.02	NONE	0.5	0	-	-	-	-	< 0.02	-
PCB Congener 153	µg/l	0.02	NONE	0.5	0	-	-	-	-	< 0.02	-
PCB Congener 180	µg/l	0.02	NONE	0.5	0	-	-	-	-	< 0.02	-
PCBs by GC-MS											
Total PCBs	µg/l	0.14	NONE		0	-	-	-	-	< 0.14	-

Excdeedance of GAC

WFD Threshold Values (TVs) for 'Good' Status. General Quality of Groundwater Body

WFD Threshold Values (TVs) for 'Good' Status. Drinking Water Protection Area

Scotland Resource Protection Values (Non-Hazardous Substances)

Scotland Resource Protection Value (Significant Pollution of Contaminated Land

Permitting Standards (England) Freshwater Annual Average EQS

Scotland Drinking Water Standards

UKTAG Technical Report on Groundwater Hazardous Substances Sept 2016. Concentration in Groundwater Below Which Danger of Deterioration in Receiving Groundwater is Avoided[1]

England and Wales Minimum Reporting Values for Hazardous Substances

WHO Drinking Water Guideline Values

16200013128: 37-39 NORTH ACTON ROAD

GROUNDWATER ANALYTICAL RESULTS SUMMARY: HUMAN HEALTH ASSESSMENT

					Lab Sample Number		2264805	2273677	2273678	2273679	2273680	2273681
					Sample Reference		**BH03**	**BH01**	**WS02**	**WS03**	**WS04**	**WS05**
					Sample Number		None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
					Depth (m)		None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
					Date Sampled		04/05/2022	11/05/2022	11/05/2022	11/05/2022	11/05/2022	11/05/2022
					Time Taken		1400	1000	1030	1300	1120	1230
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	**Method**	**GAC (Groundwater Volatilisation)**	**No. >GAC**						
General Inorganics												
pH	pH Units	N/A	ISO 17025	TM73/PM0	NV	0	7.4	7.1	6.8	7.5	7.2	7.3
Total Cyanide	µg/l	10	ISO 17025	TM89/PM0	NV	0	< 10	< 10	< 10	< 10	< 10	< 10
Sulphate as SO4	mg/l	0.05	ISO 17025	TM38/PM0	NV	0	3500	4510	68.5	255	1220	45.1
Ammoniacal Nitrogen as N	µg/l	15	ISO 17025	TM38/PM0	NV	0	1800	1400	8500	660	2900	5900
Hardness - Total	mgCaCO3/l	1	ISO 17025			0	1490	4950	1890	280	1940	882
Total Phenols												
Total Phenols (monohydric)	µg/l	10	ISO 17025	TM26/PM0	NV	0	< 10	< 10	< 10	< 10	< 10	< 10
Speciated PAHs												
Naphthalene	µg/l	0.01	ISO 17025	TM4/PM30	23,000	0	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthylene	µg/l	0.01	ISO 17025	TM4/PM30	20,000,000	0	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	TM4/PM30	15,000,000	0	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluorene	µg/l	0.01	ISO 17025	TM4/PM30	18,000,000	0	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Phenanthrene	µg/l	0.01	ISO 17025	TM4/PM30	NV	0	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Anthracene	µg/l	0.01	ISO 17025	TM4/PM30	NV	0	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluoranthene	µg/l	0.01	ISO 17025	TM4/PM30	NV	0	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Pyrene	µg/l	0.01	ISO 17025	TM4/PM30	NV	0	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)anthracene	µg/l	0.01	ISO 17025	TM4/PM30	NV	0	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chrysene	µg/l	0.01	ISO 17025	TM4/PM30	NV	0	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	µg/l	0.01	ISO 17025	TM4/PM30	NV	0	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	TM4/PM30	NV	0	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	TM4/PM30	NV	0	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	TM4/PM30	NV	0	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	TM4/PM30	NV	0	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	TM4/PM30	NC	0	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Total PAH												
Total EPA-16 PAHs	µg/l	0.16	ISO 17025			0	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16
Heavy Metals / Metalloids												
Boron (dissolved)	µg/l	10	ISO 17025	TM30/PM14	NV	0	330	910	150	150	290	370
Calcium (dissolved)	mg/l	0.01	ISO 17025	TM30/PM14	NV	0	280	530	530	80	390	210
Chromium (hexavalent)	µg/l	5	ISO 17025	TM30/PM14	NV	0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Chromium (III)	µg/l	5	NONE	TM30/PM14	NV	0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Magnesium (dissolved)	mg/l	0.01	ISO 17025	TM30/PM14	NV	0	190	880	140	19	230	88
Arsenic (dissolved)	µg/l	0.15	ISO 17025	TM30/PM14	NV	0	2.03	1.5	1.1	7.36	2.73	4.18
Beryllium (dissolved)	µg/l	0.1	ISO 17025	TM30/PM14	NV	0	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Cadmium (dissolved)	µg/l	0.02	ISO 17025	TM30/PM14	NV	0	0.2	0.43	0.21	0.11	0.24	< 0.02
Chromium (dissolved)	µg/l	0.2	ISO 17025	TM30/PM14	NV	0	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Copper (dissolved)	µg/l	0.5	ISO 17025	TM30/PM14	NV	0	2	4.9	3.8	6.7	7.7	< 0.5
Lead (dissolved)	µg/l	0.2	ISO 17025	TM30/PM14	NV	0	< 0.2	< 0.2	< 0.2	0.5	0.7	< 0.2
Mercury (dissolved)	µg/l	0.05	ISO 17025	TM30/PM14	95	0	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Nickel (dissolved)	µg/l	0.5	ISO 17025	TM30/PM14	NV	0	27	54	29	22	21	17
Selenium (dissolved)	µg/l	0.6	ISO 17025	TM30/PM14	NV	0	210	44	3	3.7	3.9	3.1
Vanadium (dissolved)	µg/l	0.2	ISO 17025	TM30/PM14	NV	0	1	0.5	< 0.2	1.9	0.6	0.4
Zinc (dissolved)	µg/l	0.5	ISO 17025	TM30/PM14	NV	0	25	18	12	6	8.9	4.6
Monoaromatics & Oxygenates												
Benzene	µg/l	1	ISO 17025	TM15/PM10	20,000	0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	µg/l	1	ISO 17025	TM15/PM10	21,000,000	0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/l	1	ISO 17025	TM15/PM10	960,000	0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p & m-xylene	µg/l	1	ISO 17025	TM15/PM10	940,000	0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-xylene	µg/l	1	ISO 17025	TM15/PM10	1,100,000	0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	TM15/PM10	7,800,000	0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Petroleum Hydrocarbons												
TPH-CWG - Aliphatic >C5 - C6 $_{HS\_1D\_AL}$	µg/l	1	ISO 17025	TM36/PM12	190,000	0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C6 - C8 $_{HS\_1D\_AL}$	µg/l	1	ISO 17025	TM36/PM12	150,000	0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C8 - C10 $_{HS\_1D\_AL}$	µg/l	1	ISO 17025	TM36/PM12	5,700	0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C10 - C12 $_{EH\_1D\_AL\_\#1\_\#2\_MS}$	µg/l	10	NONE	TM5/PM16/PM30	3,600	0	< 10	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C12 - C16 $_{EH\_1D\_AL\_\#1\_\#2\_MS}$	µg/l	10	NONE	TM5/PM16/PM30	NV	0	< 10	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C16 - C21 $_{EH\_1D\_AL\_\#1\_\#2\_MS}$	µg/l	10	NONE	TM5/PM16/PM30	NV	0	< 10	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C21 - C35 $_{EH\_1D\_AL\_\#1\_\#2\_MS}$	µg/l	10	NONE	TM5/PM16/PM30	NV	0	< 10	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic (C5 - C35) $_{HS+EH\_1D\_AL\_\#1\_\#2\_MS}$	µg/l	10	NONE	TM5/TM36/PM12/PM16/PM30	N/A	0	< 10	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C5 - C7 $_{HS\_1D\_AR}$	µg/l	1	ISO 17025	TM36/PM12	20,000	0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C7 - C8 $_{HS\_1D\_AR}$	µg/l	1	ISO 17025	TM36/PM12	960,000	0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C8 - C10 $_{HS\_1D\_AR}$	µg/l	1	ISO 17025	TM36/PM12	190,000	0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C10 - C12 $_{EH\_1D\_AR\_\#1\_\#2\_MS}$	µg/l	10	NONE	TM5/PM16/PM30	660,000	0	< 10	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C12 - C16 $_{EH\_1D\_AR\_\#1\_\#2\_MS}$	µg/l	10	NONE	TM5/PM16/PM30	3,700,000	0	< 10	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C16 - C21 $_{EH\_1D\_AR\_\#1\_\#2\_MS}$	µg/l	10	NONE	TM5/PM16/PM30	NV	0	< 10	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C21 - C35 $_{EH\_1D\_AR\_\#1\_\#2\_MS}$	µg/l	10	NONE	TM5/PM16/PM30	NV	0	< 10	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic (C5 - C35) $_{HS+EH\_1D\_AR\_\#1\_\#2\_MS}$	µg/l	10	NONE	TM5/TM36/PM12/PM16/PM30	N/A	0	< 10	< 10	< 10	< 10	< 10	< 10
VOCs												
Chloromethane	µg/l	1	ISO 17025	TM15/PM10	1,400	0	-	-	< 1.0	< 1.0	< 1.0	-
Chloroethane	µg/l	1	ISO 17025	TM15/PM10	1,000,000	0	-	-	< 1.0	< 1.0	< 1.0	-
Bromomethane	µg/l	1	ISO 17025	TM15/PM10	NC	0	-	-	< 1.0	< 1.0	< 1.0	-
Vinyl Chloride	µg/l	1	NONE	TM15/PM10	63	0	-	-	< 1.0	< 1.0	< 1.0	-
Trichlorofluoromethane	µg/l	1	NONE	TM15/PM10	NC	0	-	-	< 1.0	< 1.0	< 1.0	-
1,1-Dichloroethene	µg/l	1	ISO 17025	TM15/PM10	260,000	0	-	-	< 1.0	< 1.0	< 1.0	-
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	1	ISO 17025	TM15/PM10	49,000	0	-	-	< 1.0	< 1.0	< 1.0	-
Cis-1,2-dichloroethene	µg/l	1	ISO 17025	TM15/PM10	13,000	0	-	-	< 1.0	< 1.0	< 1.0	-
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	TM15/PM10	7,800,000	0	-	-	< 1.0	< 1.0	< 1.0	-
1,1-Dichloroethane	µg/l	1	ISO 17025	TM15/PM10	260,000	0	-	-	< 1.0	< 1.0	< 1.0	-
2,2-Dichloropropane	µg/l	1	ISO 17025	TM15/PM10	NC	0	-	-	< 1.0	< 1.0	< 1.0	-
Trichloromethane	µg/l	1	ISO 17025	TM15/PM10	530	0	-	-	< 1.0	< 1.0	< 1.0	-
1,1,1-Trichloroethane	µg/l	1	ISO 17025	TM15/PM10	290,000	0	-	-	< 1.0	< 1.0	< 1.0	-
1,2-Dichloroethane	µg/l	1	ISO 17025	TM15/PM10	850	0	-	-	< 1.0	< 1.0	< 1.0	-
1,1-Dichloropropene	µg/l	1	ISO 17025	TM15/PM10	NC	0	-	-	< 1.0	< 1.0	< 1.0	-
Trans-1,2-dichloroethene	µg/l	1	ISO 17025	TM15/PM10	16,000	0	-	-	< 1.0	< 1.0	< 1.0	-
Benzene	µg/l	1	ISO 17025	TM15/PM10	20,000	0	-	-	< 1.0	< 1.0	< 1.0	-
Tetrachloromethane	µg/l	1	ISO 17025	TM15/PM10	4,600	0	-	-	< 1.0	< 1.0	< 1.0	-
1,2-Dichloropropane	µg/l	1	ISO 17025	TM15/PM10	22,000	0	-	-	< 1.0	< 1.0	< 1.0	-
Trichloroethene	µg/l	1	ISO 17025	TM15/PM10	530	0	-	-	< 1.0	< 1.0	< 1.0	-
Dibromomethane	µg/l	1	ISO 17025	TM15/PM10	NC	0	-	-	< 1.0	< 1.0	< 1.0	-
Bromodichloromethane	µg/l	1	ISO 17025	TM15/PM10	1,600	0	-	-	< 1.0	< 1.0	< 1.0	-
Cis-1,3-dichloropropene	µg/l	1	ISO 17025	TM15/PM10	13,000	0	-	-	< 1.0	< 1.0	< 1.0	-
Trans-1,3-dichloropropene	µg/l	1	ISO 17025	TM15/PM10	NC	0	-	-	< 1.0	< 1.0	< 1.0	-
Toluene	µg/l	1	ISO 17025	TM15/PM10	21,000,000	0	-	-	< 1.0	< 1.0	< 1.0	-
1,1,2-Trichloroethane	µg/l	1	ISO 17025	TM15/PM10	49,000	0	-	-	< 1.0	< 1.0	< 1.0	-
1,3-Dichloropropane	µg/l	1	ISO 17025	TM15/PM10	NC	0	-	-	< 1.0	< 1.0	< 1.0	-
Dibromochloromethane	µg/l	1	ISO 17025	TM15/PM10	NC	0	-	-	< 1.0	< 1.0	< 1.0	-
Tetrachloroethene	µg/l	1	ISO 17025	TM15/PM10	22,000	0	-	-	< 1.0	< 1.0	< 1.0	-
1,2-Dibromoethane	µg/l	1	ISO 17025	TM15/PM10	NC	0	-	-	< 1.0	< 1.0	< 1.0	-
Chlorobenzene	µg/l	1	ISO 17025	TM15/PM10	15,000	0	-	-	< 1.0	< 1.0	< 1.0	-
1,1,1,2-Tetrachloroethane	µg/l	1	ISO 17025	TM15/PM10	150,000	0	-	-	< 1.0	< 1.0	< 1.0	-
Ethylbenzene	µg/l	1	ISO 17025	TM15/PM10	960,000	0	-	-	< 1.0	< 1.0	< 1.0	-
p & m-Xylene	µg/l	1	ISO 17025	TM15/PM10	940,000	0	-	-	< 1.0	< 1.0	< 1.0	-
Styrene	µg/l	1	ISO 17025	TM15/PM10	810,000	0	-	-	< 1.0	< 1.0	< 1.0	-
Tribromomethane	µg/l	1	ISO 17025	TM15/PM10		0	-	-	< 1.0	< 1.0	< 1.0	-
o-Xylene	µg/l	1	ISO 17025	TM15/PM10	1,100,000	0	-	-	< 1.0	< 1.0	< 1.0	-
1,1,2,2-Tetrachloroethane	µg/l	1	ISO 17025	TM15/PM10	150,000	0	-	-	< 1.0	< 1.0	< 1.0	-
Isopropylbenzene	µg/l	1	ISO 17025	TM15/PM10	86,000	0	-	-	< 1.0	< 1.0	< 1.0	-
Bromobenzene	µg/l	1	ISO 17025	TM15/PM10	20,000	0	-	-	< 1.0	< 1.0	< 1.0	-
n-Propylbenzene	µg/l	1	ISO 17025	TM15/PM10		0	-	-	< 1.0	< 1.0	< 1.0	-
2-Chlorotoluene	µg/l	1	ISO 17025	TM15/PM10	640,000	0	-	-	< 1.0	< 1.0	< 1.0	-
4-Chlorotoluene	µg/l	1	ISO 17025	TM15/PM10	NC	0	-	-	< 1.0	< 1.0	< 1.0	-
1,3,5-Trimethylbenzene	µg/l	1	ISO 17025	TM15/PM10	2,200	0	-	-	< 1.0	< 1.0	< 1.0	-
tert-Butylbenzene	µg/l	1	ISO 17025	TM15/PM10	NC	0	-	-	< 1.0	< 1.0	< 1.0	-
1,2,4-Trimethylbenzene	µg/l	1	ISO 17025	TM15/PM10	2,200	0	-	-	< 1.0	< 1.0	< 1.0	-
sec-Butylbenzene	µg/l	1	ISO 17025	TM15/PM10	NC	0	-	-	< 1.0	< 1.0	< 1.0	-
1,3-Dichlorobenzene	µg/l	1	ISO 17025	TM15/PM10	2,800	0	-	-	< 1.0	< 1.0	< 1.0	-
p-Isopropyltoluene	µg/l	1	ISO 17025	TM15/PM10		0	-	-	< 1.0	< 1.0	< 1.0	-
1,2-Dichlorobenzene	µg/l	1	ISO 17025	TM15/PM10	220,000	0	-	-	< 1.0	< 1.0	< 1.0	-
1,4-Dichlorobenzene	µg/l	1	ISO 17025	TM15/PM10	460,000	0	-	-	< 1.0	< 1.0	< 1.0	-
Butylbenzene	µg/l	1	ISO 17025	TM15/PM10	NC	0	-	-	< 1.0	< 1.0	< 1.0	-
1,2-Dibromo-3-chloropropane	µg/l	1	ISO 17025	TM15/PM10	NC	0	-	-	< 1.0	< 1.0	< 1.0	-
1,2,4-Trichlorobenzene	µg/l	1	ISO 17025	TM15/PM10	7,200	0	-	-	< 1.0	< 1.0	< 1.0	-
Hexachlorobutadiene	µg/l	1	ISO 17025	TM15/PM10	230	0	-	-	< 1.0	< 1.0	< 1.0	-
1,2,3-Trichlorobenzene	µg/l	1	ISO 17025	TM15/PM10	3,100	0	-	-	< 1.0	< 1.0	< 1.0	-
PCBs by GC-MS												
PCB Congener 28	µg/l	0.02	NONE	TM17/PM30	NC	0	-	-	-	-	< 0.02	-
PCB Congener 52	µg/l	0.02	NONE	TM17/PM30	NC	0	-	-	-	-	< 0.02	-
PCB Congener 101	µg/l	0.02	NONE	TM17/PM30	NC	0	-	-	-	-	< 0.02	-
PCB Congener 118	µg/l	0.02	NONE	TM17/PM30	NC	0	-	-	-	-	< 0.02	-
PCB Congener 138	µg/l	0.02	NONE	TM17/PM30	NC	0	-	-	-	-	< 0.02	-
PCB Congener 153	µg/l	0.02	NONE	TM17/PM30	NC	0	-	-	-	-	< 0.02	-
PCB Congener 180	µg/l	0.02	NONE	TM17/PM30	NC	0	-	-	-	-	< 0.02	-
PCBs by GC-MS												
Total PCBs	µg/l	0.14	NONE	TM17/PM30	NC	0	-	-	-	-	< 0.14	-

Excdeedance of GAC

LEGISLATIVE BACKGROUND

England

The regime for contaminated land was set out in Part 2A (ss.78A-78YC) of the Environmental Protection Act 1990 (EPA), as inserted by S.57 of The Environment Act 1995 and came into effect in England on 1st April 2000 as The Contaminated Land (England) Regulations 2000 (SI 2000/227). These regulations were subsequently revoked with the provision of The Contaminated Land (England) Regulations 2006 (SI 2006/1380) (as amended), which came into force in August 2006, and consolidated the previous regulations and amendments. Revised statutory guidance ("the Guidance") for local authorities on how to implement the regime, including the decision-making process on whether land is contaminated land in the legal sense, has been published by Defra and entered into force in April 2012.

Under Part 2A of the EPA Section 78A(2), "contaminated land" is defined as "land which appears… to be in such a condition, by reason of substances in, on or under the land, that –

a) significant harm is being caused or there is a significant possibility of such harm being caused[7]; or

b) significant pollution of controlled waters is being caused, or there is a significant possibility of such pollution being caused".

"Significant harm" is defined in the Guidance on risk-based criteria and must be the result of one or more relevant 'contaminant linkages' relating to the land. The presence of a contaminant linkage relies on the Source-Pathway-Receptor concept, where all three factors must be present and potentially or actually linked for a potential risk to exist. Under the Guidance, a 'significant contaminant linkage' is one which gives rise to a level of risk sufficient to justify a piece of land being determined as contaminated land. Should the authority consider that there is an unacceptably high probability, supported by robust science-based evidence that significant harm would occur if no action is taken to stop it, the land should be deemed a Category 1: Human Health. Land should be placed into Category 2 if the authority concludes, on the basis that there is a strong case for considering that the risks from the land are of sufficient concern, that the land poses a significant possibility of significant harm. Both Category 1 and Category 2 cases would be capable of being determined as contaminated land under Part 2A on the grounds of significant possibility of significant harm to human health. If the legal test for significant possibility of significant harm is not met, the authority should place the land into Category 3. If the local authority considers that there is no risk or that the level of risk posed is low, the land should be placed into Category 4.

For six common contaminants (benzo(a)pyrene, cadmium, arsenic, benzene, hexavalent chromium and lead), a set of screening values have been developed and endorsed for use by Defra[8] (the Category 4 Screening Levels, or C4SLs) that describe a level of risk just below the Category 3/4 boundary set in the Statutory Guidance, i.e. where concentrations are below the C4SL, there is no risk or the level of risk is acceptably low.

The pollution of controlled waters is defined in Section 78A(9) of the Act as "the entry into controlled waters of any poisonous, noxious or polluting matter or any solid waste matter". The new Guidance stresses that the Part 2A regime is designed to identify and deal with 'significant pollution' and not lesser levels of pollution. As with human health risk, Categories 1 and 2 comprise land where the local authority considers that a significant possibility of significant pollution of controlled waters exists and Categories 3 and 4 comprises cases where the authority considers that a significant possibility of such pollution does not exist. The local authority should be satisfied that a substance is continuing to enter controlled waters or is likely to enter controlled waters.

[7] Water Act 2003 (Commencement No. 11) Order 2012
[8] SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination – Policy Companion Document, Defra, revised December 2014

APPENDIX 5
GAS AND GROUNDWATER MONITORING RECORDS

APPENDIX 5: GAS MONITORING FIELD DATA

RAMBOLL

Project:	**1620013218-002**	**Site:**	**North Acton Road**
Monitored by:	**SD**	**Date:**	**04.05.2022**
Equipment:	Geotech Interface Dip Meter, Ion Science Tiger s/n T-105779, GFM 430 Gas Analyser s/n 10244.	**Weather:**	Mostly sunny, 13˚C warming to 16˚C at midday.
Atmospheric Pressure:	1015		

Location	Time	DTW (m bgl)	DTB (m bgl)	Time From Start (Secs)	Baro Pressure	Flow	CH4	CO2	O2	LEL	PID	Notes/
					mb	l/hr	% v/v	% v/v	% v/v	% v/v	ppm	Comments
BH01	10:00	7.255	7.995	0	1015	0.0	0.0	3.8	17.2	0.0	0.0	Flow was 8l/h falling to 0l/h after approximately 1 minute. Purged approximately 10L of GW from well, recharge was observed to be slow. No GW sample taken. GW has no obvious odour or visible sheen.
				30			0.0	4.3	16.3	0.0		
				60			0.0	4.7	15.9	0.0		
				90			0.0	5.0	15.5	0.0		
				120			0.0	5.3	15.2	0.0		
				150			0.0	5.5	15.1	0.0		
				180			0.0	5.6	15.0	0.0		
				210			0.0	5.7	14.9	0.0		
				240			0.0	5.8	14.9	0.0		
				270			0.0	5.8	14.9	0.0		
				300			0.0	5.8	14.8	0.0		
				330			0.0	5.9	14.8	0.0		
BH02	09:20	Dry	35.000	0	1015	0.0	0.0	0.5	20.3	0.0	0.0	Well is dry.
				30			0.0	0.6	17.9	0.0		
				60			0.0	0.6	17.8	0.0		
				90			0.0	0.6	17.8	0.0		
				120			0.0	0.6	17.7	0.0		
				150			0.0	0.6	17.7	0.0		
				180			0.0	0.6	17.7	0.0		
BH03	12:30	18.395	19.485	0	1014	0.0	0.0	0.6	19.3	0.0	0.9	Purged approx 10L of water from well. Recharge was observed, sample taken. GW has no obvious odour or visible sheen.
				30			0.0	0.6	17.5	0.0		
				60			0.0	0.6	17.5	0.0		
				90			0.0	0.6	17.5	0.0		
				120			0.0	0.6	17.5	0.0		
				150			0.0	0.6	17.5	0.0		
				180			0.0	0.6	17.5	0.0		
WS01	11:10	Dry	1.065	0	1014	0.0	0.0	1.9	18.7	0.0	0.0	Well is dry.
				30			0.0	2.0	17.6	0.0		
				60			0.0	1.9	17.6	0.0		
				90			0.0	1.8	17.6	0.0		
				120			0.0	1.7	17.6	0.0		
				150			0.0	1.6	17.7	0.0		
				180			0.0	1.5	17.8	0.0		
				210			0.0	1.4	17.8	0.0		
				240			0.0	1.3	17.9	0.0		
				270			0.0	1.1	18.0	0.0		
				300			0.0	1.1	18.1	0.0		
				330			0.0	1.0	18.2	0.0		
				360			0.0	0.9	18.4	0.0		
				390			0.0	0.9	18.4	0.0		
				420			0.0	0.9	18.4	0.0		
WS02	10:40	0.565	0.995	0	1014	0.0	0.0	0.4	20.6	0.0	0.1	Screened section of well flooded (0.5m slotted pipe). GW was purged from well until well ran dry and did not recharge. GW has no obvious odour or visible sheen.
				30			0.0	0.5	20.2	0.0		
				60			0.0	0.5	20.2	0.0		
				90			0.0	0.5	20.2	0.0		
				120			0.0	0.5	20.2	0.0		
				150			0.0	0.5	20.2	0.0		
				180			0.0	0.5	20.2	0.0		
WS03	12:10	0.805	1.080	0	1014	0.0	0.0	0.7	18.4	0.0	0.1	Approx. 5l of water purged from well. Slow recharge was observed. No sample collected due to poor recharge rate. GW has no obvious odour or visible sheen.
				30			0.0	0.7	16.5	0.0		
				60			0.0	0.6	16.4	0.0		
				90			0.0	0.6	16.4	0.0		
				120			0.0	0.5	16.4	0.0		
				150			0.0	0.4	16.3	0.0		
				180			0.0	0.4	16.3	0.0		
				210			0.0	0.3	16.3	0.0		
				240			0.0	0.2	16.3	0.0		
				270			0.0	0.1	16.3	0.0		
				300			0.0	0.1	16.3	0.0		
				330			0.0	0	16.3	0.0		
				360			0.0	0	16.3	0.0		
				390			0.0	0	16.2	0.0		
				420			0.0	0	16.2	0.0		
				450			0.0	0	16.2	0.0		
WS04	11:40	0.805	1.045	0	1014	0.0	0.0	0.9	18.4	0.0	0.1	Approx. 5l of water purged from well. Slow recharge was observed. No sample collected due to poor recharge rate. GW has no obvious odour or visible sheen.
				30			0.0	1	14.2	0.0		
				60			0.0	0.9	13.8	0.0		
				90			0.0	0.8	13.6	0.0		
				120			0.0	0.8	13.4	0.0		
				150			0.0	0.8	13.3	0.0		
				180			0.0	0.8	13.2	0.0		
				210			0.0	0.7	13.1	0.0		
				240			0.0	0.7	13.1	0.0		
				270			0.0	0.7	13.1	0.0		
WS05	12:40	0.960	2.010	0	1014	0.0	0.0	0	18.2	0.0	0.0	Purged approx. 8l of water from well. Well ran dry and recharge was observed to be slow. No GW sample taken. GW has no obvious odour or visible sheen.
				30			0.0	0	14.5	0.0		
				60			0.0	0	14.3	0.0		
				90			0.0	0	14.3	0.0		
				120			0.0	0	14.3	0.0		
				150			0.0	0	14.3	0.0		
				180			0.0	0	14.4	0.0		
				210			0.0	0	14.4	0.0		
				240			0.0	0	14.6	0.0		
				270			0.0	0	14.6	0.0		
				300			0.0	0	14.6	0.0		
BHA	13:10	0.965	5.335									
BHB	13:20	1.400	4.770									

Met Office website: https://wow.metoffice.gov.uk/
Cave Weather Station

Date	Time	Atmospheric Pressure
48 hours before (02/05/2022)	11:00-11:59	1021
24 hours before (03/05/2022)	11:00-11:59	1021
Day of monitoring (04/05/2022)	11:00-11:59	1019
24 hours after (05/05/2022)	11:00-11:59	1024.2
48 hours after (06/08/2022)	11:00-11:59	1025

APPENDIX 5: GAS MONITORING FIELD DATA

RAMBOLL

Project:	**1620013218-002**	**Site:**	**North Acton Road**
Monitored by:	**SD**	**Date:**	**11.05.2022**
Equipment:	Geotech Interface Dip Meter, Ion Science Tiger s/n T-105779, GFM 430 Gas Analyser s/n 10244.	**Weather:**	Mostly cloudy, 14˚C warming to 17˚C at midday. Rain showers at 11:00am.
Atmospheric Pressure:	1006		

Location	Time	DTW (m bgl)	DTB (m bgl)	Time From Start (Secs)	Baro Pressure	Flow	CH4	CO2	O2	LEL	PID	Notes/
					mb	l/hr	% v/v	% v/v	% v/v	% v/v	ppm	Comments
BH01	09:10	7.295	7.995	0	1006	0.0	0.0	4.5	16.6	0.0	0.0	Flow was 2.4l/h falling to 0l/h after approximately 30 secs. Purged approximately 3L of GW from well and sampled. GW has no obvious odour or visible sheen. GW was clear, turning slightly silty.
				30			0.0	4.7	14.9	0.0		
				60			0.0	4.8	14.7	0.0		
				90			0.0	5.1	14.5	0.0		
				120			0.0	5.3	14.4	0.0		
				150			0.0	5.5	14.2	0.0		
				180			0.0	5.8	14.1	0.0		
				210			0.0	5.9	14.0	0.0		
				240			0.0	6.0	14.0	0.0		
				270			0.0	6.1	13.9	0.0		
				300			0.0	6.1	13.9	0.0		
				330			0.0	6.2	13.8	0.0		
				360			0.0	6.2	13.8	0.0		
				390			0.0	6.2	13.8	0.0		
BH02	10:30	Dry	35.000	0	1004	0.0	0.0	0.3	20.5	0.0	0.0	Well is dry.
				30			0.0	0.8	16.7	0.0		
				60			0.0	0.8	16.6	0.0		
				90			0.0	0.8	16.6	0.0		
				120			0.0	0.8	16.6	0.0		
				150			0.0	0.8	16.8	0.0		
				180			0.0	0.8	16.9	0.0		
				210			0.0	0.8	17.0	0.0		
				240			0.0	0.8	17.0	0.0		
				270			0.0	0.8	17.0	0.0		
BH03	12:00	16.405	19.470	0	1005	0.0	0.0	1.4	19.0	0.0	1.4	No groundwater sample collected as sample taken on previous visit.
				30			0.0	1.6	15.9	0.0		
				60			0.0	1.6	15.8	0.0		
				90			0.0	1.6	15.8	0.0		
				120			0.0	1.6	15.8	0.0		
				150			0.0	1.6	15.8	0.0		
				180			0.0	1.6	15.8	0.0		
WS01	10:10	Dry	1.065	0	1005	0.0	0.0	0.7	20.1	0.0	0.0	Well is dry. No sample taken.
				30			0.0	0.9	18.9	0.0		
				60			0.0	0.9	18.8	0.0		
				90			0.0	0.9	18.8	0.0		
				120			0.0	0.9	18.8	0.0		
				150			0.0	0.9	18.8	0.0		
				180			0.0	0.9	18.8	0.0		
WS02	09:40	0.600	0.995	0	1005	0.0	0.0	0.3	20.6	0.0	0.1	Purged approx. 2L of GW from well and sampled. GW has no obvious odour or visible sheen. Water was clear.
				30			0.0	0.6	19.9	0.0		
				60			0.0	0.6	19.9	0.0		
				90			0.0	0.6	19.9	0.0		
				120			0.0	0.6	19.9	0.0		
				150			0.0	0.6	19.9	0.0		
				180			0.0	0.6	19.9	0.0		
WS03	12:30	0.805	1.080	0	1004	0.0	0.0	0.1	20.6	0.0	0.1	Purged approx. 1L of water from well. GW has no obvious odour or visible sheen. Sample taken.
				30			0.0	0	19.9	0.0		
				60			0.0	0	19.9	0.0		
				90			0.0	0	20.0	0.0		
				120			0.0	0	20.0	0.0		
				150			0.0	0	20.0	0.0		
				180			0.0	0	20.0	0.0		
WS04	11:00	0.815	1.045	0	1004	0.0	0.0	1	17.3	0.0	0.1	Approx. 1L of perched groundwater purged from well. GW has no obvious odour or visible sheen. Sample collected.
				30			0.0	1.1	14.3	0.0		
				60			0.0	1.2	14.1	0.0		
				90			0.0	1.2	14.1	0.0		
				120			0.0	1.2	14.0	0.0		
				150			0.0	1.2	14.0	0.0		
				180			0.0	1.2	14.0	0.0		
WS05	11:30	0.935	2.010	0	1005	0.0	0.0	0.1	15.8	0.0	0.2	Perged approx. 5L of water from well. GW sample taken. GW has no obvious odour or visible sheen. Water appeared silty.
				30			0.0	0.1	13.6	0.0		
				60			0.0	0.1	13.5	0.0		
				90			0.0	0.1	13.4	0.0		
				120			0.0	0.1	13.3	0.0		
				150			0.0	0.1	13.1	0.0		
				180			0.0	0.1	13.0	0.0		
				210			0.0	0.1	13.0	0.0		
				240			0.0	0.1	13.0	0.0		
BHA	13:00	1.080	5.335									
BHB	13:20	0.925	4.770									

Met Office website: https://wow.metoffice.gov.uk/
Cave Weather Station

Date	Time	Atmospheric Pressure
48 hours before (09/05/2022)	11:00-11:59	1022.9
24 hours before (10/05/2022)	11:00-11:59	1014.8
Day of monitoring (11/05/2022)	11:00-11:59	1009.2
24 hours after (12/05/2022)	11:00-11:59	1018.8
48 hours after (13/08/2022)	11:00-11:59	1020

APPENDIX 5: GAS MONITORING FIELD DATA

Project:	**1620013218-002**	**Site:**	**North Acton Road**
Monitored by:	**SD**	**Date:**	**18.05.2022**
Equipment:	Geotech Interface Dip Meter, Ion Science Tiger s/n T-105779, GFM 430 Gas Analyser s/n 10244.	**Weather:**	Partly cloudy, 16˚C warming to 19˚C at midday. Slight breeze.
Atmospheric Pressure:	1018		

Location	Time	DTW (m bgl)	DTB (m bgl)	Time From Start (Secs)	Baro Pressure	Flow	CH4	CO2	O2	LEL	PID	Notes/
					mb	l/hr	% v/v	% v/v	% v/v	% v/v	ppm	Comments
BH01	09:10	7.120	7.995	0	1017	0.0	0.0	3.8	17.1	0.0	0.1	Flow was 34.6l/h falling to 0l/h after approximately 1.5 mins. Clean probe with no odour. No GW sample collected.
				30			0.0	3.9	15.9	0.0		
				60			0.0	4.4	15.4	0.0		
				90			0.0	4.8	14.8	0.0		
				120			0.0	4.9	14.5	0.0		
				150			0.0	5.5	13.9	0.0		
				180			0.0	5.9	13.5	0.0		
				210			0.0	6.1	13.4	0.0		
				240			0.0	6.2	13.3	0.0		
				270			0.0	6.3	13.2	0.0		
				300			0.0	6.3	13.1	0.0		
				330			0.0	6.4	13.1	0.0		
				360			0.0	6.4	13.1	0.0		
				290			0.0	6.4	13.1	0.0		
BH02	10:20	N/A	35.000	0	1017	0.0	0.0	0.2	20.9	0.0	0.7	Water in well, can't determine DTW due to length of dip meter (30m). Clean probe with no odour. No sample taken.
				30			0.0	0.8	16.0	0.0		
				60			0.0	0.8	15.9	0.0		
				90			0.0	0.8	15.9	0.0		
				120			0.0	0.8	16.0	0.0		
				150			0.0	0.8	16.2	0.0		
				180			0.0	0.8	16.5	0.0		
				210			0.0	0.8	16.6	0.0		
				240			0.0	0.8	16.7	0.0		
				270			0.0	0.8	16.7	0.0		
				300			0.0	0.8	16.7	0.0		
BH03	11:30	14.485	19.465	0	1018	0.0	0.0	2.2	13.5	0.0	2.2	Clean probe with no odour. No sample collected.
				30			0.0	2.2	13.0	0.0		
				60			0.0	2.2	13.0	0.0		
				90			0.0	2.2	13.0	0.0		
				120			0.0	2.2	12.9	0.0		
				150			0.0	2.2	12.9	0.0		
				180			0.0	2.2	12.9	0.0		
WS01	10:00	Dry	1.075	0	1017	0.0	0.0	0.2	20.6	0.0	0.1	Well is dry. No sample taken.
				30			0.0	0.9	18.8	0.0		
				60			0.0	0.9	18.7	0.0		
				90			0.0	0.9	18.7	0.0		
				120			0.0	0.9	18.7	0.0		
				150			0.0	0.9	18.8	0.0		
				180			0.0	0.9	18.8	0.0		
				210			0.0	0.9	18.8	0.0		
WS02	09:35	0.630	1.050	0	1019	0.0	0.0	0.6	20.7	0.0	0.1	Clean probe with no odour. No sample collected.
				30			0.0	0.7	19.9	0.0		
				60			0.0	0.7	19.9	0.0		
				90			0.0	0.7	19.9	0.0		
				120			0.0	0.7	19.9	0.0		
				150			0.0	0.7	19.9	0.0		
				180			0.0	0.7	19.9	0.0		
WS03	10:50	0.790	1.085	0	1017	0.0	0.0	0.1	21.4	0.0	0.1	Clean probe, no odour. No sample taken.
				30			0.0	0	19.4	0.0		
				60			0.0	0	19.3	0.0		
				90			0.0	0	19.3	0.0		
				120			0.0	0	19.3	0.0		
				150			0.0	0	19.3	0.0		
				180			0.0	0	19.3	0.0		
WS04	11:05	1.810	1.045	0	1017	0.0	0.0	0.9	20.1	0.0	0.2	Clean probe, no odour. No sampled collected.
				30			0.0	1.5	13.6	0.0		
				60			0.0	1.5	13.5	0.0		
				90			0.0	1.5	13.5	0.0		
				120			0.0	1.5	13.5	0.0		
				150			0.0	1.5	13.5	0.0		
				180			0.0	1.5	13.5	0.0		
WS05	11:20	0.995	2.010	0	1019	0.0	0.0	0	18.9	0.0	0.1	Clean probe, no odour. No sampled collected.
				30			0.0	0.1	13.8	0.0		
				60			0.0	0.1	13.7	0.0		
				90			0.0	0.1	13.6	0.0		
				120			0.0	0.1	13.6	0.0		
				150			0.0	0.1	13.6	0.0		
				180			0.0	0.1	13.6	0.0		
BHA	13:10	1.034	5.335									
BHB	13:20	0.930	4.776									

Met Office website: https://wow.metoffice.gov.uk/
Cave Weather Station

Date	Time	Atmospheric Pressure
48 hours before (16/05/2022)	11:00-11:59	1015.4
24 hours before (17/05/2022)	11:00-11:59	1017.7
Day of monitoring (18/05/2022)	11:00-11:59	1020.9
24 hours after (19/05/2022)	11:00-11:59	1018.8
48 hours after (20/08/2022)	11:00-11:59	1017.9

GROUND GAS ASSESSMENT

Ground gases can be produced as a result of the decomposition of organic materials and may also originate from natural sources, such as coal seams and organic-rich soils. The principal components of ground gas are methane and carbon dioxide, although other gases may be present in trace concentrations. Ground gas can present a hazard to site occupants and property as result of flammable/explosive hazards, physiological effects, odour and effects on vegetation.

There is no single specific guidance document relating to ground gas measurement methods, risk assessment, and gas protection measures. Several documents have been published since the early 1990s to provide guidance for new developments, some of which have been more recently revised.

The following guidance documents were used in this assessment:

Ground Gas	**Reference Documents**
Methane and Carbon Dioxide	• Assessing Risks Posed by Hazardous Ground Gases to Buildings. Report C665, Construction Industry Research and Information Association (CIRIA), 2007. • Code of Practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings. BS 8485:2015. • The Building Regulations, Approved Document C: site preparation and resistance to contaminants and moisture, (2004 as amended) • Guidance on Evaluation of Development Proposals on sites where Methane and Carbon Dioxide are Present. Report Edition No. 4, NHBC, March 2007.
Oxygen	• Waste Management Paper 27 – Guidelines for Building Houses near Landfill sites. Department of the Environment 1991.

It is recommended in CIRIA C665 that six rounds of ground gas monitoring are conducted over a period of three months in order to sufficiently understand a site's ground gas regime.

Methane and Carbon Dioxide

Guidance on undertaking ground gas risk assessment is provided in CIRIA Report C665 "Assessing Risks Posed by Hazardous Ground Gases to Buildings" (2007). The guidance consolidates the requirement for good practice in site investigation, collection of relevant data and monitoring programmes in the context of a risk-based approach to gas contaminated ground.

Two semi-quantitative methods are set out in the guidance for the assessment of ground gas risk; one method for low rise housing with gardens (the NHBC "traffic light" system) and the other for all remaining development types, including commercial/industrial development (the "Modified Wilson and Card System").

With the exception of low-rise housing, the method applicable for all developments is the Modified Wilson and Card Classification. This makes no assumption that an underfloor void is present within the development. The method by Wilson and Card was developed based on the method proposed in CIRIA publication R149 (1995).

This method uses gas concentrations and borehole flow rates to define a characteristic situation for the site, by calculating a site Gas Screening Value (SGSV). The SGSV is calculated using a worst-case scenario (i.e. the maximum gas concentration and flow rates detected) across the entire site during the monitoring period. The SGSV is calculated for both methane and carbon dioxide, and the 'Characteristic Situation' is derived by comparison with a table relevant to each method. It is important to note that SGSVs are not absolute thresholds but guideline values.

The NHBC traffic light system described in Guidance on Evaluation of Development Proposals on sites where Methane and Carbon Dioxide are Present (NHBC, March 2007). The guidance defines a series of

'Traffic Light' scenarios specific to a low-rise housing development with a clear ventilated sub floor void. The Traffic Lights include 'Typical Maximum Concentrations' which are provided for screening purposes and risk-based Gas Screening Values (GSVs) for consideration for situations where the Typical Maximum Concentrations are exceeded.

It is important to note that GSVs are not absolute thresholds but guideline values. The method makes a number of assumptions regarding the proposed structures and designers should ensure the design is appropriate to the ground gas condition identified.

The Building Regulations, Approved Document C (2004) states that where methane concentrations do not exceed 1% and that the floor of the building to be constructed is suspended and ventilated, no further protection needs to be provided. Above 1% by volume there is a need to consider possible measures to prevent gas ingress into new buildings.

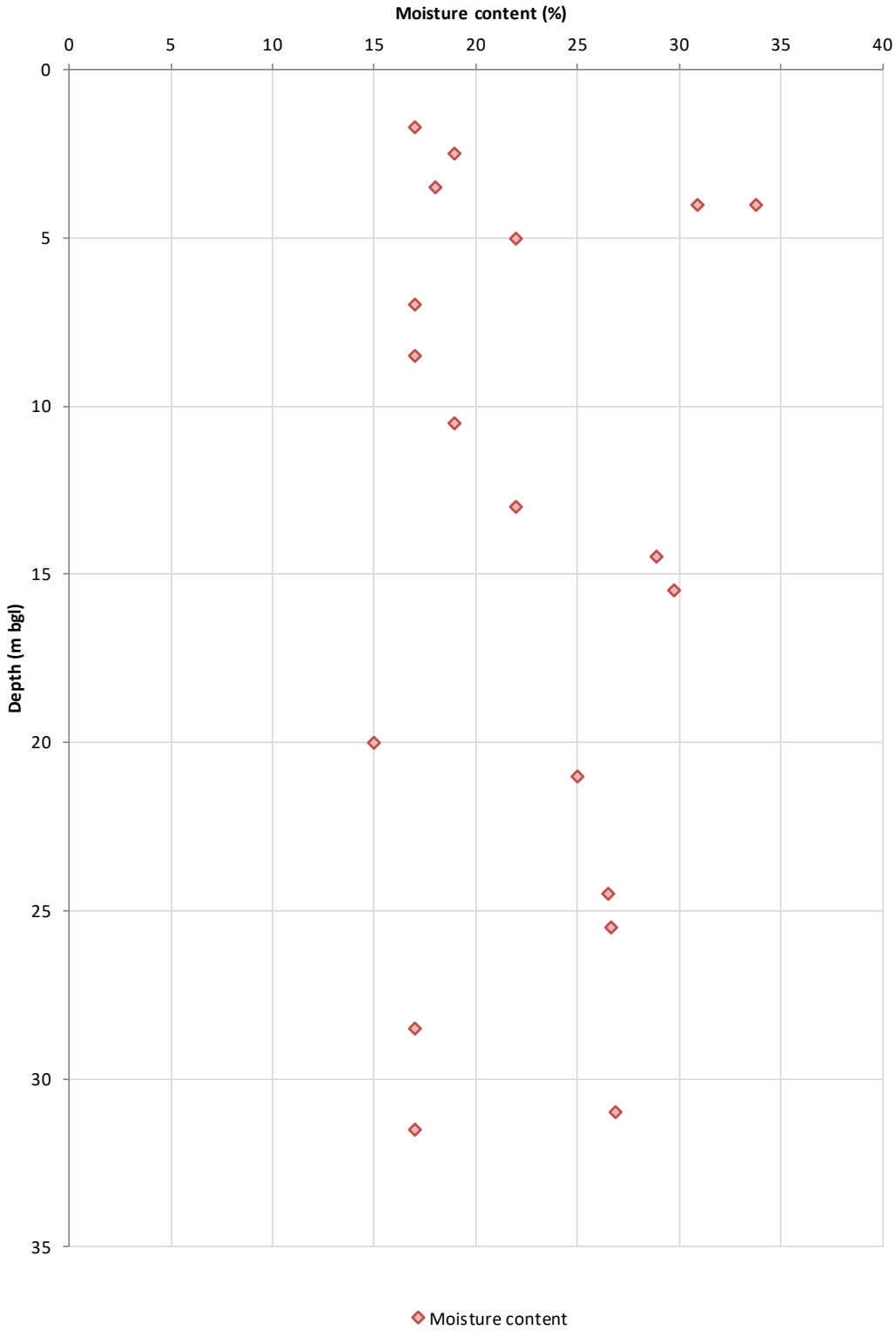
Approved Document C also states that there is a need to consider possible measures to prevent gas ingress into new buildings if concentrations of carbon dioxide above 1.5% are detected in the ground, and that measures are definitely required at concentrations above 5%.

Oxygen

Waste Management Paper 27 (WMP27) states that a minimum concentration of 18% oxygen is required to prevent asphyxiation.

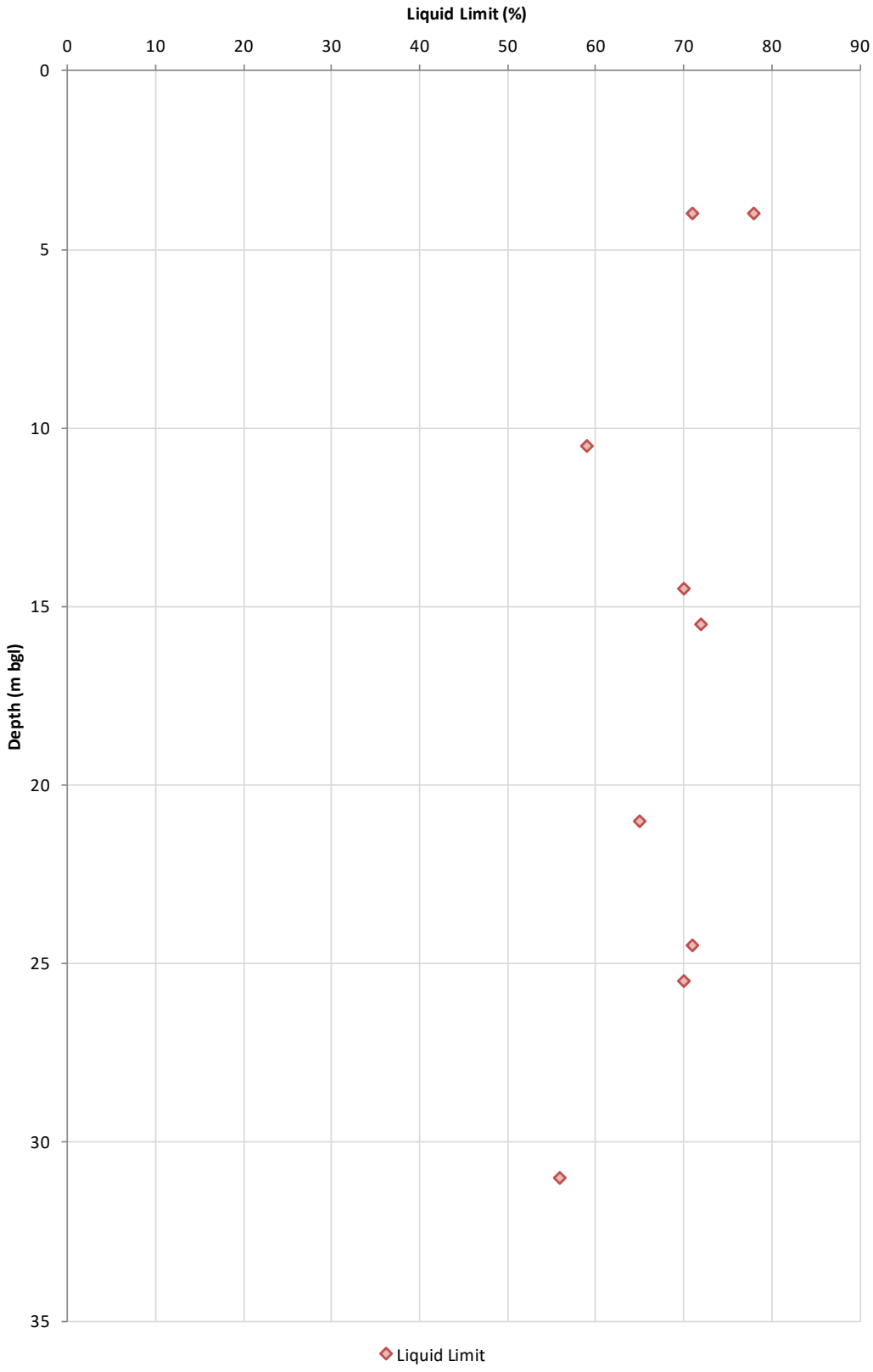
APPENDIX 6
GEOTECHNICAL GROUND INVESTIGATION DATA PLOTS

RAMBOLL	**Project:** North Acton Road	**Job No:**	1620013218
	Location: London	**Client:**	Vantage Data Centers



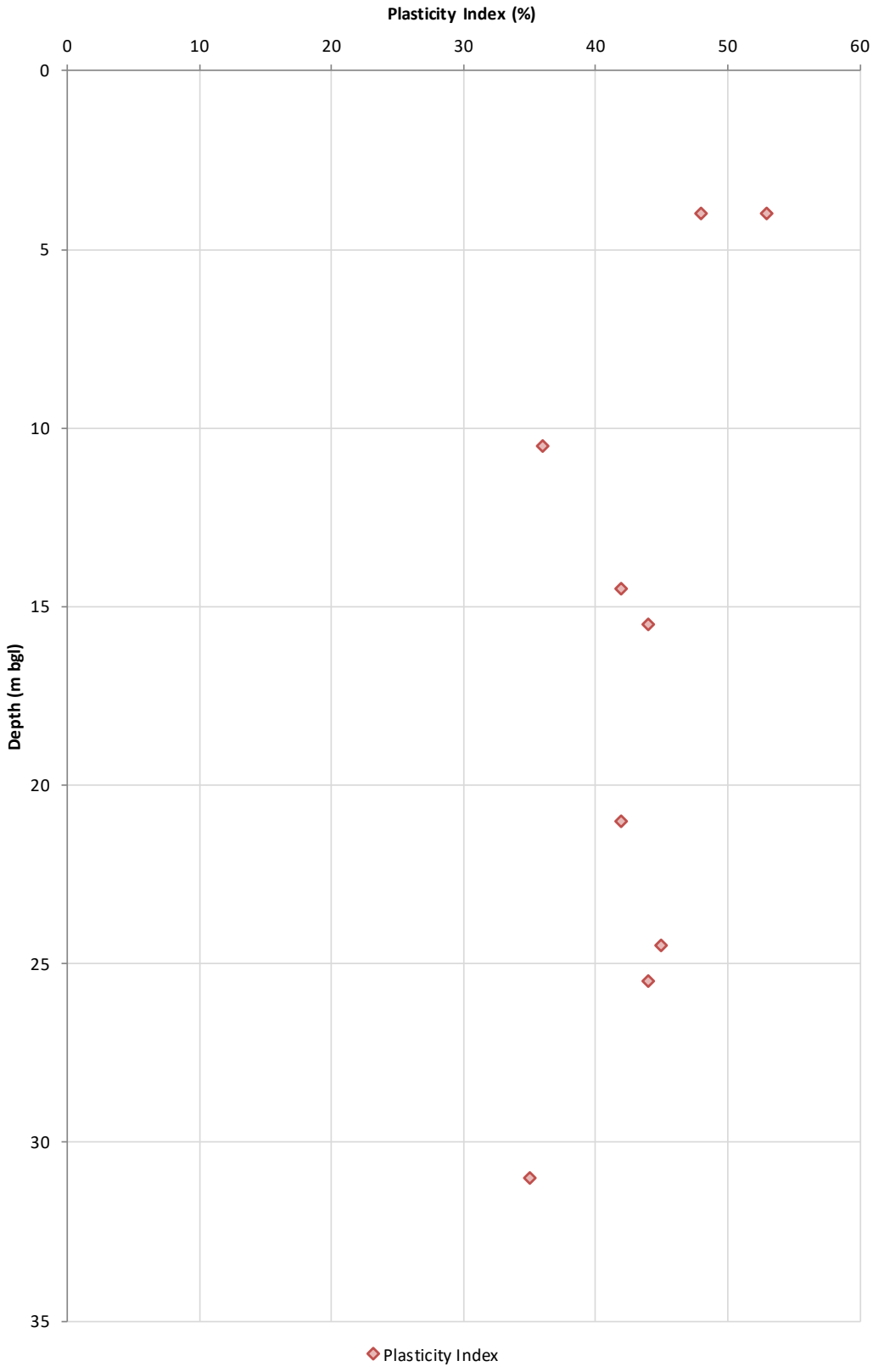
Title:	Moisture content by Depth for London Clay Formation				

RAMBOLL	Project: North Acton Road	Job No: 1620013218
	Location: London	Client: Vantage Data Centers



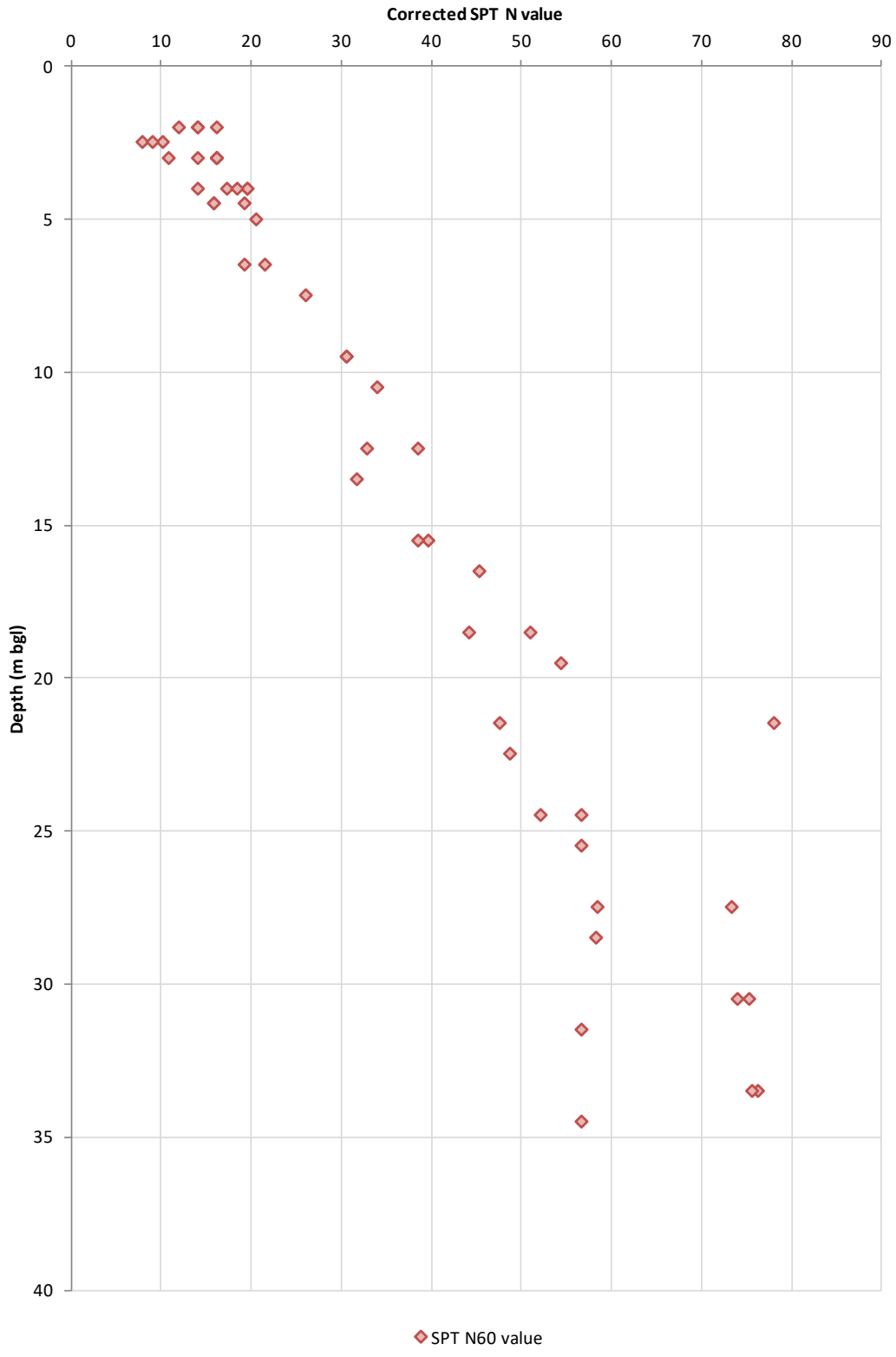
Title:	Liquid Limit by Depth for London Clay Formation			

RAMBOLL	**Project:** North Acton Road	**Job No:** 1620013218	
	Location: London	**Client:** Vantage Data Centers	



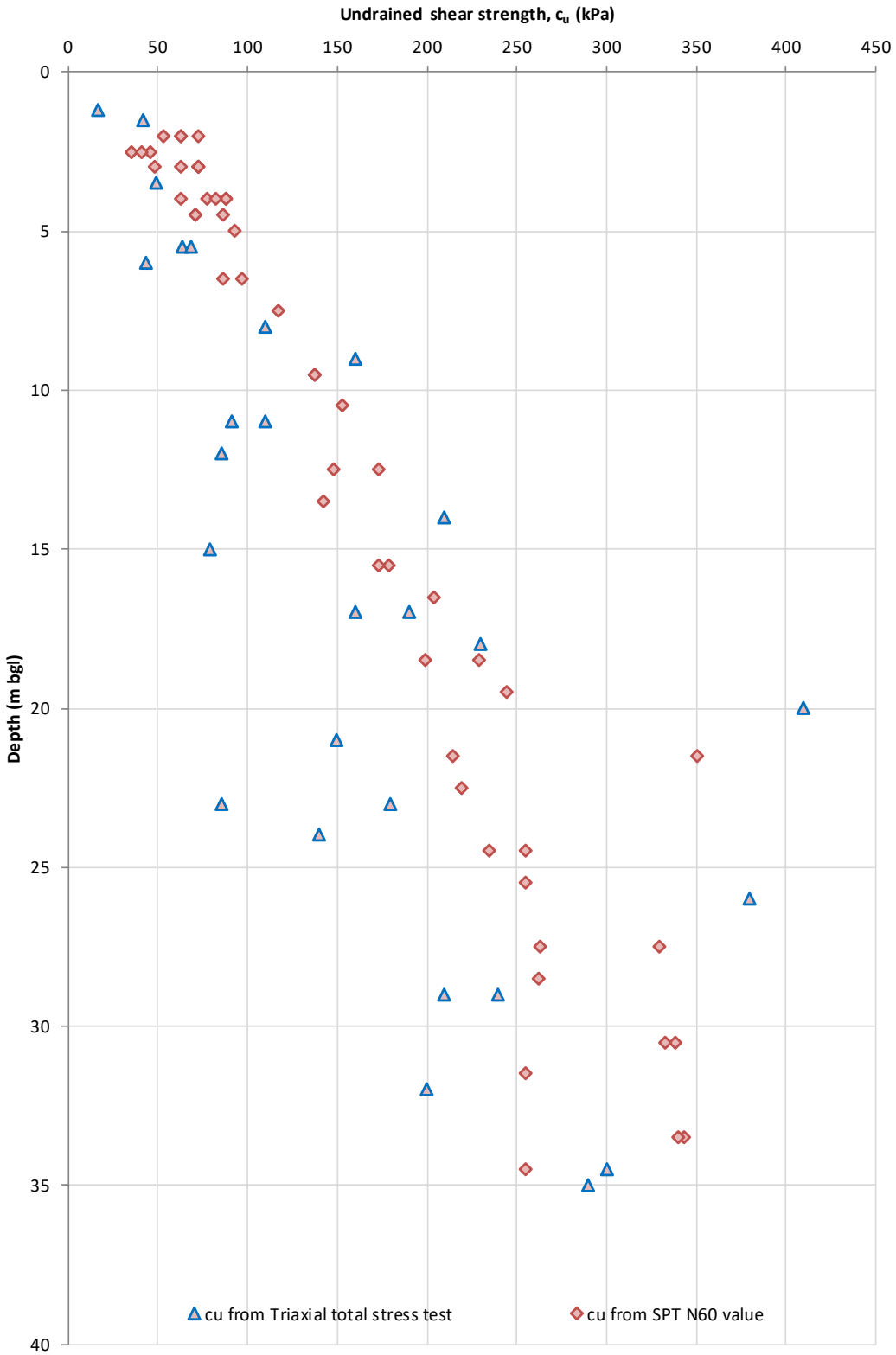
Title:	Plasticity Index by Depth for London Clay Formation			

RAMBOLL	Project: North Acton Road	Job No: 1620013218
	Location: London	Client: Vantage Data Centers



Title:	Corrected SPT N value by Depth for London Clay Formation

RAMBOLL	Project: North Acton Road	Job No: 1620013218
	Location: London	Client: Vantage Data Centers



Title:	Undrained shear strength by Depth for London Clay Formation

Appendix 4
Environmental Risk Assessment

Intended for
VDC LHR21 LIMITED

Document type
Environmental Risk Assessment

Date
November 2023

Project Number
1620013218-007

Environmental Permit Application: Environmental Risk Assessment

37-39 North Acton Road, London, NW10 6PF

RAMBOLL Bright ideas. Sustainable change.

Environmental Permit Application: Environmental Risk Assessment

37-39 North Acton Road, London, NW10 6PF

Project name	**LHR21 Environmental Permitting Application**
Project no.	**1620013218-007**
Recipient	**VDC LHR21 Limited**
Document type	**Environmental Risk Assessment**
Version	**1**
Date	**November 2023**
Prepared by	**Lydia Hall**
Checked by	**Aakanksha Sinha**
Approved by	**Richard Wood**
Description	**Environmental Permit Application**

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Contents

1. Introduction

This document supports the application submitted by VDC LHR21 Limited ("Vantage") to the Environment Agency ("EA") under the Environmental Permitting (England and Wales) Regulations 2016 (as amended) (the "Regulations") for a Part A(1) Environmental Permit (application reference EPR/VP3225SC/P001) associated with the proposed operation of combustion plant at a planned data centre to be operated by Vantage and located at 37-39 North Acton Road, London, NW10 6PF ("the site" or "the Facility").

The application relates to the proposed operation of combustion plant at the site, comprising diesel or Hydrotreated Vegetable Oil (HVO) fired electricity generators with an aggregated net rated thermal input capacity of >50MWth.

The application process for bespoke permits requires that an Environmental Risk Assessment (ERA) is completed in accordance with the Environment Agency's guidance[1].

In accordance with the Environment Agency's guidance, this ERA is structured as follows:

- Identification and consideration of risks at the Installation and sources of the risks;
- Identification of receptors (people, animals, property and anything else that could be affected by the hazard) at risk from the Installation;
- Identification of possible pathways from the sources of the risks to receptors;
- Assessment of the risks relevant to the specific activities carried out at the Installation and consideration of which risks can be screened out as negligible; and
- Description of measures to control identified risks.

2. Risk assessment Methodology

2.1 Overview

This risk assessment has been developed in accordance with the Environment Agency guidance[1] for the preparation of risk assessments. The Environment Agency guidance promotes the following process:

- Identify and consider risks for the Installation, and the sources of the risks;
- Identify the receptors (people, animals, property and anything else that could be affected by the hazard) at risk from the Installation;
- Identify the possible pathways from the sources of the risks to the receptors;
- Assess risks relevant to the activity at the Installation and check they're acceptable and can be screened out;
- State what measures are applied to control risks if they're too high; and
- Submit the risk assessment as part of the environmental permit application.

The risk assessment should identify whether any of the following risks could occur and what the environmental impact could be:

- any emission to air or discharge, for example sewage or trade effluent to surface or groundwater;
- accidents;
- odour;

[1] https://www.gov.uk/guidance/risk-assessments-for-your-environmental-permit Environment Agency website. Accessed on 27/10/2023

- noise and vibration;
- uncontrolled or unintended ('fugitive') emissions, for which risks include dust, litter, pests and pollutants that shouldn't be in the discharge; and
- visible emissions (e.g. smoke or visible plumes).

2.2 Risk Assessment Layout

A qualitative assessment for generic risks identified at the Installation is provided in Section 4, and quantitative assessments derived from specific operations and release points are provided in Section 5.

For the qualitative assessment, each actual or possible hazard is identified, and the assessment is then tabulated taking into account the following criteria:

- the hazard - for example dust, litter, type of visible emission;
- the receptors - people, animals, property and anything else that could be affected by the hazard;
- the pathways - how the hazard can get to a receptor;
- what measures will be taken to reduce risks;
- probability of exposure, for example whether a risk is unlikely or highly likely;
- consequences - what harm could be caused; and
- what the overall risk is, based on what the information presented in the table - for example 'low if management techniques applied'.

For the quantitative assessment, it is possible to 'screen out' potential risks from emissions to air, discharges to water or deposition onto land by carrying out quantitative tests to check whether they're within acceptable limits or environmental standards. If they are, the risk to the environment is considered to be insignificant and no further assessment is required.

2.3 Assessing Likelihood and Consequence

Within the risk assessment, each hypothesised relationship between contaminants, pathways and receptors is assessed to determine the likelihood of the receptor being exposed to pollution and the consequences of exposure using the rankings listed in the tables below.

Table 1: Likelihood Rankings

Very Low	Low	Medium	High
Exposure to pollution is considered to be *highly unlikely.*	Exposure is considered to be *unlikely.*	Exposure is considered to be *likely.*	Exposure is considered to be *highly likely* to occur.

Table 2: Consequence Ranking

Very Low	Low	Medium	High
No impact or imperceptible impact on the receptor.	Low level impact easily and quickly mitigated or may not require any intervention to rectify any impact.	Moderate impact which will not be rectified without some mitigation / intervention.	High impact requiring significant intervention / mitigation and may have caused irreparable damage to the receptor.

2.4 Assessment of Risk

Following the determination of the likelihood and consequence rankings for the hypothesised relationships developed using the source-pathway-receptor concept, the matrix in the table below is used to determine the overall risk of the pollution exposure occurring.

Table 3: Risk Matrix

		Likelihood			
		Very Low	**Low**	**Medium**	**High**
Consequence	**High**	Low	Medium	High	High
	Medium	Low	Medium	Medium	High
	Low	Low	Low	Medium	Medium
	Very Low	Very Low	Low	Low	Low

3. Identification of Risks

As part of the application, the Client is required to identify the environmental risks (sources of potential contamination) which could occur during the operation of the Facility, including any risks which may arise from accidents. The EA online guidance[2] stipulates that the Client, as the operator of the site, must consider the following potential risks:

- any discharge (e.g. sewage or trade effluent to surface water or groundwater);
- accidents;
- odour;
- noise and vibration;
- uncontrolled and unintended ('fugitive') emissions (for which risks include dust, litter, pests; and pollutants that shouldn't be in the discharge); and
- visible emissions (e.g. smoke or visible plumes).

In considering the risk, the Client can determine that a potential risk is not considered to be significant in terms of its potential impact on the environment; however, a justification must be provided for any risk which is 'screened out'.

Based on the guidance summarised above, the potential environmental risks at the Facility have been identified and have been determined as either applicable or not applicable based on the potential environmental impact arising from the risk. A summary of these risks is presented in the table below which also provides justifications where risks are considered to be insignificant. The risks which have been identified as significant have been included in the risk assessment in Section 5 of this report.

[2] https://www.gov.uk/guidance/risk-assessments-for-your-environmental-permit#risks-from-your-site Environment Agency website. Accessed on 27/10/2023.

Environmental Risk	Applicability	Justification
Controlled discharges to surface waters	Not Applicable	There are to be no controlled discharges to surface waters from the combustion activities at the Installation, therefore this risk has not been considered for further assessment.
Controlled discharges to Groundwater	Not Applicable	There are to be no controlled discharges to groundwater from the Installation. This risk has been discounted from further assessment.
Accidents	Applicable	Equipment Failure: The failure of equipment may result in an incident occurring which could potentially impact on the environment (e.g. storage tanks, drainage systems etc.). Materials Handling: Fuels are stored on-site in 20,000L (usable capacity) belly tanks associated with each generator.[3] These are filled directly from road tankers via the fill point. There is the potential for accidents (e.g. spills, leaks etc.) to occur during the filling of the belly tanks, which may result in contaminated run-off. Vandalism: The Facility is located in an urban area and may be targeted for vandalism and theft. Operator Error: Delivery and transfer of fuels. Flooding: According to publicly available information obtained in the 2021 Phase I Environmental Site Assessment[4], the southern boundary of the site is located in an area of 'low' and 'medium' flooding probability from pluvial sources. Fire: Emissions to air or contaminated runoff.
Odour	Not Applicable	There are no odour emissions from the Installation. This risk has not been considered for further assessment.
Noise & Vibration	Applicable	The operation of generators has the potential to generate noise and vibration.

[3] 25034 Litre Brimful (20000Litres Usable) Bunded Mild Steel Belly Tank Drawing. Metcraft Group Ltd. Dated 07/09/2023.

[4] Phase I Environmental Site Assessment. Ramboll UK Limited. Dated 12/11/2021.

Environmental Risk	Applicability	Justification
Visual Impact	Not Applicable	The Installation is positioned within an urban area of mixed commercial, industrial and residential use. Visible emissions from the regulated activity are limited to flue gases emitted during the operation and testing of the generators. Given the irregular short-term duration of generator operations. These emissions are not considered to be significant in terms of visual impact. Based on this, visual impact has not been included for further assessment.
Fugitive Emissions to Air & water	Not Applicable	Fugitive emissions to air and water are not anticipated to arise at the Installation and therefore fugitive emissions to air and water have been excluded from further assessment.
Controlled Releases to Air	Applicable	Air emissions associated with the regulated activity comprise flue gases arising from the operation of the electricity generators.

4. Potential Pollution Pathways

4.1 Identification of Pollution Pathways

The potential pollution pathways between the sources identified in Section 2 (excluding those which have been screened out) and the receptors identified in Section 3 are summarised in the table below.

Source	Potential Pathway	Receptor
Accidents: equipment failure; materials handling; vandalism; operator error; fire; and flooding.	Over Installation surfaces; through Installation drainage systems; and through the air.	Surface water; groundwater; ground; atmosphere, and humans including: workers/ visitors present at the Installation; workers / occupants / visitors on adjacent premises; local residents; intermittent presence on pedestrian routes / roadways surrounding the Installation.
Noise and Vibration: arising from the operation of the combustion plant present at the Installation (i.e. generators) and from traffic movements.	Transmitted through the air and through ground vibration.	Humans including: workers/ visitors present at the Installation; workers / occupants / visitors on adjacent premises; local residents; intermittent presence on pedestrian routes / roadways surrounding the Installation.

Controlled Releases to Air: from point sources (e.g. generator flues).	Through the air; windblown.	Atmosphere, and humans including: workers/ visitors present at the Installation; workers / occupants / visitors on adjacent premises; local residents; intermittent presence on pedestrian routes / roadways surrounding the Installation.

5. Environmental Risk Assessment

5.1 Accidents

The risk assessment for accidents at the Installation is provided below.

Source-Pathway-Receptor Hypothetical Model			Risk Management Techniques	Assessing the Risk		
Source of Pollution	**Receptor**	**Pathway**		**Likelihood of Exposure**	**Consequence of Exposure**	**Overall Risk**
Accident: Failure in containment of fuel storage tanks (belly tanks) and associated equipment (valves, pipes etc.).	*Ground* *Groundwater* *Surface Water*	Over Installation surfaces; and, through Installation drainage systems.	• Fuel belly tank bunds shall be fitted with a vacuum leak detection system associated with the interstitial space.[5] An alarm will sound should an inner or outer tank leak be detected.[5] The belly tanks will also have an analogue level gauge with transmitter, a low-level sensor alarm which is triggered at 25% normal fuel level and a level switch with four level contacts at very low, low, high and very high.[5] • All storage tanks will have integral secondary containment providing 110% of the capacity of the primary storage container. Any tanks not having integral bunding will be stored appropriately within suitably sized bunds. • The fuel (diesel or HVO) is to be stored in double skinned belly tanks.[3] • All above ground pipework and where the pipework is exposed and has potential to be in contact with flames or hazardous products will be single walled and metallic.	Very Low	High	**Low**

[5] Belly Tank Data Sheet. KHOLER. Dated 06/10/2021.

			• Drainage for the hardstanding will be served by a class 1 by-pass separator and class 1 full retention interceptor which will be routed belowground.[6] • Fuel storage tanks will be fitted with high-level switches, overfill protection devices and bund alarms,[5] which are linked into the building management system. • Spill kits will be present in fuel storage areas to minimise the impacts of any spillage. • Fuel storage tanks shall have access hatches for inspection[3] on a regular basis to identify defects (if any).			
Accident: Spillage during refuelling (e.g. pipe rupture, tanker rupture, connection fault etc.)	*Ground* *Groundwater* *Surface Water*	Over Installation surfaces; and, through Installation drainage systems.	• All deliveries of fuel will be attended to identify any issues during delivery. • All deliveries of fuel will take place in areas of hard standing coated with an impermeable non-slip coating resistant to hydrocarbons. • The belly tanks, which will be fitted with an analogue level gauge with transmitter and a level switch with four contact levels,[5] are to be filled directly from tankers via a fill point. The filling point will have overfill protection equipment.[5] • The fuel delivery area will comprise a hard standing area and be served by a below ground class 1 full retention interceptor.[6] • Spill kits will be provided in refuelling areas.	Very Low	High	**Low**

[6] Proposed Storm Water and Foul Water Drainage General Arrangement. Pinnacle Consulting Engineers. Dated March 2023.

			• The Operator will establish formal refuelling and spill response procedures as part of the environmental management system. • Deliveries of fuel are expected to be infrequent since the generators are only to be used for emergency operations. • Drip trays shall be provided underneath the fuel pumps in case of a leakage.			
Accident: Flooding potential to impact drainage system and generators.	*Surface Water*	Through flood water, over surfaces & through Installation drainage systems.	• Metal and concrete construction of the tanks, connective pipework and containment infrastructure, so that there is minimal risk of water damage leading to spillage in a single flooding event. • Part of the Facility (southern boundary) is located in an area of elevated flood risk (low and medium flooding probability)[4], however, the generators are located on four levels of a gantry[7] suggesting it would be unlikely for floodwater to make contact with the generators.	Low	Medium	**Medium**
Accidents (Fire): Fire and arson attacks	*Humans including:* workers/ visitors present at the Installation; workers / occupants / visitors on adjacent	Over Installation surfaces; through the air; and, through Installation drainage systems.	• A perimeter fence will be present along the site boundary and all access points are to be secured with gates, which will only open for authorised personnel.[7] • Video surveillance will be present covering surrounding areas of the Installation and roadways leading up to the site to capture and record images of personnel movement.[7]	Very Low	High	**Low**

[7] Draft Basis of Design WS4. Vantage Data Centers. Burns & McDonnell Global, Inc. Dated 13/01/2023.

	premises; local residents; intermittent presence on pedestrian routes / roadways surrounding the Installation.		• A Security team shall be present at the site on a permanent basis.[7] Regular site surveillance walks will be undertaken by the security team.[7] • The generator containers and fill points will be kept locked. • The generator sets are set away from the perimeter fencing located on a gantry.[8] • All generator sets have fire detection systems present within the generator containers, which when triggered activate fuel cut off valves. • All above ground pipework and where the pipework is exposed and has potential to be in contact with flames or hazardous products shall be single walled and metallic. • Fire detection and sprinkler systems shall be provided throughout the installation.			
Accidents (Vandalism): Damage / theft of externally located equipment / tanks	*Surface Water* *Atmosphere* *Ground* *Groundwater*	Over Installation surfaces; through the air; and, through Installation drainage systems.	• A perimeter fence will be present along the site boundary and all access points are to be secured with gates, which will only open for authorised personnel.[7] • Video surveillance will be present covering surrounding areas of the Installation.[7] The site will be monitored staffed and patrolled 24-hours a day.[7] • As part of the security deployment, cameras shall be installed in surrounding areas, including corridors and roadways leading to, or around the Installation to	Low	Medium	**Medium**

[8] Space Allocation & Material Path Sheets 1 and 2. Pinnacle Consulting Engineers. Dated 24/04/2023.

			capture and record images of personnel movement.[7] • A Security team shall be present at the site on a permanent basis.[7] Regular site surveillance walks will be undertaken by the security team.[7] • The generator containers and fill points will be kept locked. • The generator sets are located on a gantry set away from the perimeter fencing.[8]			

5.2 Noise

There is a potential for noise to arise from the operation of the electricity generators and from the occasional movement of refuelling / maintenance vehicles at the Facility. The risk assessment for individual noise sources is provided below.

Source-Pathway-Receptor Hypothetical Model			Risk Management Techniques	Assessing the Risk		
Source of Pollution	**Receptor**	**Pathway**		**Likelihood of Exposure**	**Consequence of Exposure**	**Overall Risk**
Noise and vibrations: arising from the movement of vehicles, and engine noise / alarms when visiting the Installation.	*Humans including:* workers/ visitors present at the Installation; workers / occupants / visitors on adjacent premises; local residents; intermittent presence on pedestrian routes / roadways surrounding the Installation.		• Deliveries of fuel are expected to be very infrequent, limiting potential for disturbance. • Generators will only be used as emergency provision in the event of a failure in the National Grid supply; therefore, the generators do not require regular refuelling.	Low	Low	**Low**
Noise and vibration: arising from the operation of plant (comprising electricity generators)			• The generators are all housed within containers which is expected to provide some noise attenuation. • All generators at the site are expected to be maintained in accordance with manufacturers' specifications to minimise excessive noise from poor performance. • Generators will only be used as emergency provision in the event of a failure in the National Grid supply; therefore, the generators will only be run for testing purposes, or in the event of a National Grid power failure.	Low	Low	**Low**

			• Noise Impact Assessment undertaken demonstrates that the operation of the Generators will not have a significant impact on background daytime and night time noise levels.			

5.3 Controlled Releases to Air

The risk assessment for controlled releases to air is presented in the table below.

Source-Pathway-Receptor Hypothetical Model			Risk Management Techniques	Assessing the Risk		
Source of Pollution	**Receptor**	**Pathway**		**Likelihood of Exposure**	**Consequence of Exposure**	**Overall Risk**
Controlled Releases to Air: Generator emissions	*Humans including:* workers/ visitors present at the Installation; workers / occupants / visitors on adjacent premises; local residents; intermittent presence on pedestrian routes / roadways surrounding the Installation. *Atmosphere*	Through the air	• Generators run very infrequently (<50 hours a year). • Generators do not significantly impact background NOx concentrations. • Generators will be maintained under a service agreement, undertaking inspections and carrying out any required maintenance. • As far as reasonably practicable, the testing of generators will not be co-incidental.	Medium	Low	**Low**

6. Conclusions

The review of potential environmental impacts at the Installation has identified a range of potential impacts from releases to air, noise generation and accidents at the Installation. The site will apply both physical and procedural measures to reduce the risks from these activities to a level considered to represent BAT for the installation.