

Geo-Environmental Investigation & Assessment

For a site at

Whiston Hospital, Prescot

Undertaken on behalf of

St. Helens & Knowsley
Teaching Hospitals NHS Trust

Report Title:	Whiston Hospital, Prescot Geo-environmental Investigation and Assessment
Report Reference:	9163G-WML-XX-ZZ RP-G-0001
Client:	St. Helens & Knowsley Teaching Hospitals NHS Trust
Issue Date:	31st August 2022
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Revision Status / History

Rev	Date	Issue / Purpose/ Comment	Prepared	Checked	Authorised
-	31/08/2022	Final	TJS	SCS	SCS

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Executive Summary

Site Location	The site comprises land forming part of the Whiston Hospital site in Prescott. It is centred on Ordnance Survey National Grid Reference 347950E, 391820N with an indicative postcode of L35 5DR.
Development Proposals	It is understood that the proposed development will comprise the construction of a new four-storey extension to the existing main hospital building, which is to be developed as a new Decontamination Unit, Endoscopy Suite, plant and expansion space.
Ground Conditions	Ground conditions encountered during the intrusive investigation comprised Made Ground to depths of between 3.10m and 3.20mbgl, underlain by Glacial Till to depths of between 5.0m and 5.30mbgl, where it is in turn underlain by completely weathered Kinnerton Sandstone to depths of 7.10m and 7.20mbgl at the higher elevations of the site.
Site Preparation	No localised demolition should proceed until an appropriate Asbestos survey of the existing building has been undertaken and any Asbestos Containing Materials (ACM) removed by an appropriately licensed contractor. Any buried structures which may form an obstruction to new foundations and drainage should be removed for crushing and re-use as bulk fill. Services may also need to be diverted to facilitate construction and a detailed service location survey is recommended in this respect. No significant earthworks are anticipated due to the proposed construction of an open lower ground floor.
Slopes and Retaining Walls	Any new/modified slopes should be stable at angles of up to 1 vertical in 3 horizontal (18 degrees). Where steeper slopes are envisaged, specific detailed analysis may be required to ensure their stability both in the short and long-term, resulting in the possibility of requiring reinforced soil slopes or retaining structures. New retaining walls would need to be supported by spread foundations on competent bearing strata, being the weathered sandstone at reduced levels between 62.85m to 63.15m AOD (Sand) or 60.95m to 62.15m AOD (anticipated solid strata).
Foundations and Floor Slabs	In consideration of the anticipated loadings of the proposed new four storey extension together with the requirement to construct the extension over the existing concrete ramp and slope, a piled foundation solution is considered the most appropriate option. Pile type, selection and design would need to be undertaken in conjunction with a reputable, specialist piling contractor, ideally with local experience. New floor slabs are to be suspended due to the construction of an open lower ground floor level.
Pavement Design	New road pavement design, where required, should be based on a California Bearing Ratio (CBR) value of no more than 3% in Made Ground and cohesive glacial strata.
Concrete Classification	Typical design sulphate (DS) class and "Aggressive Chemical Environment for Concrete" (ACEC) class for the site are DS-2 and AC-2 respectively.
Ground Gas	No specific ground gas protection is required.
Ground Contamination	The site does not contain any significant and/or widespread contamination sources with no specific environmental remediation required in this respect.
Waste Soils	For guidance and based on the current information, it is likely that the majority of Made Ground would be classified as Non-Hazardous, with natural deposits classified as Inert for landfill disposal. This would need to be confirmed with the landfill operator.

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1.0 INTRODUCTION

Appointment

- 1.1 WML Consulting has been commissioned by Halliday Meecham on behalf of St. Helens & Knowsley Teaching Hospitals NHS Trust Ltd to undertake a Geo-environmental Investigation and Assessment of a site within the bounds of Whiston Hospital.

Proposed Development

- 1.2 The proposed development is understood to comprise a new four-storey extension with undercroft, to the existing main hospital building, for use as a new Decontamination Unit, Endoscopy Suite, plant and expansion space.
- 1.3 A preliminary proposed drawing is included within Appendix 01.

Objective

- 1.4 The objective of the ground investigation and assessment was to provide geotechnical recommendations for construction design purposes together with a geo-environmental risk assessment in terms of possible ground contamination.
- 1.5 To achieve the objective, the following tasks were undertaken:
- Review available environmental setting information relating to the site and design and carry out a Phase 2 Ground Investigation in accordance with the Environment Agency (2004) Land Contamination Risk Management (LCRM), April 2021.
 - Characterise the ground conditions in terms of geology, existing foundation design detail, soil geotechnical parameters and ground contamination from information provided by the ground investigation.
 - Provide recommendations regarding suitable foundations, floor slabs and new pavement construction, together with any other geotechnical considerations that could affect possible future development.
 - Determine a ground conceptual model for the site so as to undertake a ground contamination Generic Quantitative Risk Assessment (GQRA).

Scope

- 1.6 The ground investigation comprised the formation of cable percussion boreholes undertaken with reference to BS5930:2015 + A1:2020 Code of Practice for Ground Investigation and BS10175:2011 together with A1:2013, "Investigation of Potentially Contaminated Sites - Code of Practice" except where superseded by EN ISO 22475-1 "Geotechnical Investigation and Assessment – Sampling by Drilling and Excavation and Groundwater Measurements".
- 1.7 Geotechnical soil testing has been undertaken in general accordance with guidelines provided in BS1377:1990 – Parts 1-9, "Method of Test for Soils for Civil Engineering Purposes". Samples for chemical analysis were obtained and handled generally in accordance with the current guidelines (BS10175: 2011 and A2:2017).

2.0 SITE LOCATION AND DESCRIPTION

Site Location

- 2.1 The site comprises land forming a section of the larger Whiston Hospital site in Prescott. It is centred on approximate Ordnance Survey National Grid Reference 347950E, 391820N with an indicative postcode of L35 5DR.
- 2.2 The proposed development site is bounded to the north by an area of hospital visitors' car parking and a vehicle turning area; to the east by visitor parking and the wider Whiston Hospital structures. To the south and west are further hospital building and a materials and waste storage and logistics yard.

Site Description

- 2.3 At the time of the intrusive investigation on 25th July 2022, the northern part of the subject site comprised a mixture of soft landscaping, managed shrubbery, pedestrian footways and vehicle parking and manoeuvring areas associated with the main entrance to Whiston Hospital. These were in constant use during the site investigations.
- 2.4 The central section of the site comprised a steep grassed slope and concrete retaining walls, with a wooden fence to the grassed area.
- 2.5 The southern section of the site primarily comprised a concrete access ramp, descending from the first storey of the Whiston Hospital building at the western end of the site to an open storage area used for management of refuse and laundry bins. Prior to the investigation, a single storey metal framed temporary structure was also located at the base of the ramp on the area of hardstanding adjacent to the refuse area.

Topography

- 2.6 The topographical and utilities survey by Malcolm Hughes, referenced 58607/UG1, is presented in Appendix 01.
- 2.7 The survey indicates that the subject site reduces in elevation from around 68.10m Above Ordnance Datum (AOD) in the north to approximately 62.70m AOD at the base of the concrete ramp in the southern area of the site.
- 2.8 The changes in elevation between the base of the ramp and the car park are accommodated by a series of concrete retaining walls and south-easterly facing grassed slopes.

3.0 SUMMARY OF ENVIRONMENTAL AND HISTORICAL SETTING

- 3.1 It has been indicated that a Phase 1 Desk Study is not required as part of planning. However, the following paragraphs summarise a review of available information for the site with regards to environmental and geotechnical considerations.

Geology

- 3.2 The British Geological Survey (BGS) geological plans indicate the site is underlain by Devensian Glacial Till, described as 'red-brown sandy and silty stony clay with impersistent beds of sand' and at greater depths by undifferentiated Permo-Triassic Sandstones, likely to be Kinnerton Sandstone Formation.

Radon

- 3.3 The property is in an area as defined by the UK Health Security Agency where the maximum radon potential is 1-3%.

Environmental Setting

- 3.4 The superficial deposits underlying the site is classified as a 'Secondary Undifferentiated' Aquifer, and the bedrock underlying the site is classified as a 'Principal Aquifer'. The southern part of the site lies within Zone 3 ('Total Catchment') of an Environment Agency Source Protection Zone (SPZ). No groundwater abstractions have been identified within 500m of the site.
- 3.5 The regional hydrogeological map by the BGS indicates on-site groundwater standing levels to be approximately 0m above Ordnance Datum (m AOD), i.e. approximately 60.00m to 70.00mbgl.
- 3.6 There are no surface watercourses situated within 250m of the site, and no surface water abstractions within 500m.
- 3.7 There are no active or historic landfills recorded within 500m of the site.

Site History

- 3.8 The site was first developed in 1843, with the construction of the Prescott Union Workhouse (later a poor law infirmary), prior to which the site is understood to have comprised farmland. The site formally became the County Hospital in 1930, and Whiston Hospital by 1955. The majority of the Whiston Hospital site, including the proposed development area, was redeveloped into its present configuration between 2011 and 2012.

Summary of Previous Intrusive Investigations

- 3.9 Intrusive ground investigations were previously carried out on the larger Whiston Hospital site by Sub Soil Surveys in December 2002 and Ove Arup in 2004.
- 3.10 The ground conditions across the site generally comprised Made Ground to depths of between 0.05m and very locally 5.30mbgl (in areas outside the current development plan). These were underlain by interbedded cohesive and granular Glacial Deposits to depths of between 0.30m and 3.80mbgl, below which a weathered sandstone recovered as silty fine and medium sand grading into a very weak sandstone, extended to depths in excess of 18.00mbgl.
- 3.11 Groundwater monitoring carried out by Arup in 2004 recorded the standpipes installed within the exploratory holes to be dry.
- 3.12 Chemical analyses of samples of shallow soils indicated that the site did not pose a significant risk to human health when compared to its end use. Risks to controlled waters were also considered to be low.

4.0 SITE INVESTIGATION

Rationale

- 4.1 Intrusive investigations were undertaken primarily to provide geotechnical parameters for pile design purposes with limited testing of shallow soils to confirm the anticipated low environmental risks.
- 4.2 Due to a need to minimise surface disruption and the requirement to install monitoring standpipes, two cable percussion boreholes (BH01 and BH02) were undertaken to provide information on shallow and deeper deposits and to obtain samples for chemical analysis.
- 4.3 At the time of the investigation, the southern area of the proposed development site (ramp and waste storage/management area) could not be accessed due to the active use of this area for waste storage and management, and the presence of several structures and obstructions including a waste management building, stored materials and a tented storage area. Therefore, the originally proposed no of cable percussive holes had to be reduced due to accessibility issues.
- 4.4 One foundation inspection pit (HP01) was excavated on the north-eastern face of the eastern end of the concrete retaining wall.
- 4.5 Chemical analysis of a general suite of contaminants was undertaken on selected samples of soil to confirm the anticipated low contamination risk.

Intrusive Works

- 4.6 Ground investigation work was undertaken by MacGeo Ltd between the 25th and 27th July 2022. This comprised the formation of 2no cable percussion boreholes to a maximum depth of 7.20mbgl and 1no foundation pit.
- 4.7 The exploratory hole records are presented in Appendix 03 whilst the exploratory hole locations are presented on drawing 9163G-SK01, in Appendix 01.
- 4.8 Site investigation photographs are presented within Appendix 02.

Geotechnical and Chemical Testing

- 4.9 In-situ geotechnical testing was undertaken at regular intervals during the formation of the cable percussive holes in the form of Standard Penetration Tests (SPTs). The results for this testing are presented on the descriptive logs in Appendix 03.
- 4.10 Laboratory geotechnical testing was carried out on selected soil samples retrieved during the ground investigation. Analysis was scheduled for the following:
- Natural Moisture Content.
 - Liquid and Plastic Limit.
- 4.11 The results of the geotechnical testing are presented in Appendix 04.
- 4.12 Chemical analysis was undertaken on selected soil samples for the following contaminants of concern:
- Total Arsenic, Boron, Cadmium, Chromium VI, Copper, Lead, Mercury, Nickel, Selenium, Vanadium, Zinc.
 - Total Cyanide, Phenols, Sulphur, Sulphate.
 - Speciated USEPA Polyaromatic Hydrocarbons (PAH).
 - Total Petroleum Hydrocarbons (TPHCWG Aromatic/aliphatic split).
 - Asbestos Screen and Identification.
 - 2:1 water/soil sulphate extract, pH.

4.13 The results of the chemical analysis are presented in Appendix 05.

Gas and Groundwater Monitoring

4.14 Gas and Groundwater monitoring has been carried out on one occasion on 19th August 2022. The monitoring results are presented in Appendix 06.

5.0 GROUND CONDITIONS

Stratigraphy

- 5.1 Ground conditions comprised Made Ground to depths of between 3.10m and 3.20mbgl, underlain by Glacial clay to depths of between 5.00m and 5.30mbgl. Below these depths the Kinnerton Sandstone was encountered and was noted to be completely weathered to the consistency of a sand to depths of 7.10m and 7.20mbgl.

Made Ground

- 5.2 Made Ground was encountered within all of the exploratory holes, from ground level to depths of between 3.10m and 3.20mbgl.
- 5.3 Exploratory hole BH01 was surfaced with a concrete paving slab to a depth of 0.06mbgl in turn underlain by 0.10m of sand blinding. However, BH02 comprised a surface horizon of asphalt underlain by concrete to a depth of 0.25mbgl. HP01, formed on the grassed slope recorded topsoil to 0.10mbgl.
- 5.4 Below the surface hardstanding and topsoil the Made Ground generally comprised a mid to dark grey/brown gravelly, cobbly slightly silty sand. The gravel and cobble content included mixed lithology stone, brick and concrete.
- 5.5 Within HP01, a vertical layer of geotextile separated the Made Ground from the adjacent retaining wall surface, and a horizontal geomembrane was also encountered at 0.75 mbgl within the Made Ground.
- 5.6 Made Ground described in the vicinity of the site in the Arup 2004 ground investigation comprised brown slightly clayey fine and medium sand with occasional gravel of black carbonaceous material, iron pyrite and coal. It should be noted that this area of the site was subsequently redeveloped and the Made Ground deposits specifically described may have been removed or redistributed as part of the redevelopment works.
- 5.7 SPT 'N' values within Made Ground deposits ranged from 15 to greater than 50 indicating their very variable nature.

Glacial Till

- 5.8 Glacial Till was encountered within BH01 and BH02 at depths of 3.10m and 3.20mbgl and extended to depths of 5.00m and 5.30mbgl.
- 5.9 These were typically encountered as a firm, slightly silty, slightly sandy gravelly clay with occasional lenses of fine to coarse sand. The gravel was fine to coarse of mixed lithology.
- 5.10 SPT 'N' values within the Devensian Till ranged from 10 to 45 and did not consistently increase with depth
- 5.11 Natural moisture contents of between 15% and 25% are recorded within the Glacial Till. Liquid Limits from 24% to 36% together with corresponding Plasticity Indices between 10% and 16% (modified to between 8.5% and 12.8%) indicate clay of low to intermediate plasticity and low to medium volume change potential.

Kinnerton Sandstone Formation

- 5.12 Strata considered to represent the Kinnerton Sandstone Formation were encountered beneath the Glacial Till at depths of between 5.00 and 5.30mbgl and extended to a maximum proven depth of 7.20mbgl. This broadly concurs with the 2004 Arup investigations where suspected sandstone were noted at depths of between 3.10 and 4.15 mbgl, prior to the changes in site elevation.

- 5.13 The Kinnerton Sandstone deposits were completely weathered to the consistency of a dense, fine to coarse grained, slightly silty, slightly gravelly sand to depths of 7.10m and 7.20mbgl, where the SPT refusal indicated that solid sandstone strata would be encountered.
- 5.14 SPT 'N' values within the completely weathered Kinnerton Sandstone were consistently greater than 50. This indicates a very dense sand or very weak rock.
- 5.15 A series of point load testing in the 2004 investigations (Arup) was undertaken on samples at depths of between 7.30m to 11.50mbgl. The resultant Point Load Index values ranged between 0.03 and 0.63MPa. The report also recorded Uniaxial Compressible Strength testing values of 3.0MPa.

Existing Foundations

- 5.16 Inspection pit HP01 was formed to expose the foundations to the existing retaining wall structure. The inspection pit was excavated on the north-eastern face of the retaining wall within an area of soft landscaping. The foundation pit was extended to 0.90mbgl and was terminated due to the heavily compacted fill, without reaching the foundation depth of the retaining wall.
- 5.17 However, in consideration of the elevation change between BH01/ BH02 and the hand pit, it is anticipated that foundations would be founded either on the weathered sandstone or more solid underlying sandstone at reduced levels of between 62.85m to 63.15m AOD or 60.95m to 62.15m AOD respectively.

Visual/Olfactory Evidence of Contamination

- 5.18 No visual and/or olfactory evidence of significant ground contamination was identified within the exploratory holes during the investigation.

Groundwater

- 5.19 A suspected groundwater strike was recorded at approximately 5.50mbgl within BH01. However, the addition of water to aid drilling can mask true groundwater strikes. BH02 was noted to be dry.
- 5.20 Subsequent monitoring of BH02 recorded the installation to be dry to its full depth of 6.75mbgl. This is consistent with the findings of previous investigations undertaken prior to the redevelopment of the Hospital.
- 5.21 It should be appreciated that the groundwater observations described above have been undertaken during a very short period of time. Significant variations in the long-term groundwater regime may occur at other times, particularly with prolonged, extreme weather conditions, and that no account can be taken of such in this report.

General

- 5.22 It should also be appreciated that ground conditions may vary between and away from the exploratory hole positions, and that no account can be taken in this report of such variations.

6.0 GEOTECHNICAL APPRAISAL

Site Preparation

- 6.1 No localised demolition should proceed until an appropriate Asbestos survey of the existing building has been undertaken and any Asbestos Containing Materials (ACM) removed by an appropriately licensed contractor.
- 6.2 All residual vegetation and Topsoil (where encountered) should be cleared from the development area.
- 6.3 The presence of residual buried structures in the form of floor slabs, foundations cannot be fully discounted. Such buried structures may form an obstruction to the construction of foundations and drainage and should ideally be removed for crushing and re-use as bulk fill. Any concrete could then be crushed to a suitable grading before being replaced in the excavations to a suitable engineering specification for piling and other construction plant.
- 6.4 The stability of existing adjacent infrastructure would need to be considered where excavations extend up to the development boundary. Services may also need to be diverted to facilitate construction and a detailed service location survey is recommended in this respect.
- 6.5 No significant earthworks are anticipated due to the proposed construction of an open lower ground floor.

Modified Slopes and New Retaining Walls

- 6.6 Any new/modified slopes should be stable at angles of up to 1 vertical in 3 horizontal (18 degrees). Where steeper slopes are envisaged, specific detailed analysis may be required to ensure their stability both in the short and long-term, resulting in the possibility of requiring reinforced soil slopes or retaining structures.
- 6.7 New retaining walls would need to be supported by spread foundations on competent bearing strata, being the weathered sandstone at reduced levels between 62.85m to 63.15m AOD (Sand) or 60.95m to 62.15m AOD (anticipated solid strata).
- 6.8 Suitable crest, toe and slope drainage will need to be incorporated into any new slopes and/or retaining structures constructed at the site.

Foundations

- 6.9 In consideration of the anticipated loadings of the proposed new four storey extension together with the requirement to construct the extension over the existing concrete ramp and slope, a piled foundation solution is considered the most appropriate option.
- 6.10 Pile design should assume no side support (skin friction) for the pile sections surrounded by Made Ground or sand and may also need to be designed to withstand potentially negative skin friction effects from clay heave. Pile type, selection and design should be undertaken in conjunction with a reputable, specialist piling contractor, ideally with experience of the local ground conditions.
- 6.11 For preliminary considerations, a pre-cast driven (end bearing) pile would minimise waste soil arisings but potential noise and vibration effects on nearby properties would need to be assessed to determine if this would be suitable.
- 6.12 However, careful consideration of the reduced levels to rock head should be undertaken due to its anticipated shallow depths at the base of the slope, where the extension connects to the existing structure.

- 6.13 Therefore, it would be prudent to undertake additional investigation in this area once the temporary structures have been removed and the storage area has been relocated.

Floor Slabs

- 6.14 New floor slabs are to be suspended due to the construction of an open lower ground floor level.

Excavations and Groundwater

- 6.15 Excavations at the site will be feasible using conventional hydraulic plant, although hydraulic breakers may be required where excavations are required to extend into the Sandstone bedrock beneath the southern section of the proposed building footprint.
- 6.16 All excavations deeper than around 1.20mbgl and requiring man-entry will require adequate lateral support, or will need to be battering back to a safe angle to ensure their stability.
- 6.17 On the basis of groundwater monitoring observations, no significant groundwater inflows are anticipated with conventional 'sump and pump' dewatering measures considered adequate to keep excavations dry.

Pavement Design

- 6.18 In consideration of the ground conditions, it is recommended that new road pavement design, where required, should be based on a California Bearing Ratio (CBR) value of no more than 3% in Made Ground and natural cohesive Glacial strata.
- 6.19 The CBR will need to be reviewed and confirmed by site inspection and possibly by suitable in-situ testing at formation levels following any earthwork operations and prior to pavement construction.
- 6.20 In any event, all formations should be proof-rolled with any soft, loose or otherwise unsuitable material being removed and replaced with compacted granular fill.

Concrete Design

- 6.21 Design/mix of buried concrete should be undertaken in accordance with the "Aggressive Chemical Environment for Concrete" (ACEC) classification, of BRE Special Digest 1:2005 (Concrete in Aggressive Ground). With reference to the site history, it is deemed appropriate to classify the site as "Brownfield", with respect to BRE Special Digest.
- 6.22 The values of 2:1 water/soil extract for sulphate range from 79 to 540mg/l. Values of pH range between 7.7 and 11.6 indicating neutral to alkaline conditions.
- 6.23 Based on the results of chemical analysis, the typical design sulphate (DS) class and "Aggressive Chemical Environment for Concrete" (ACEC) class for the site are DS-2 and AC-2 respectively.

7.0 GENERIC QUANTITATIVE RISK ASSESSMENT (GQRA)

General

- 7.1 A review of the desk study and historic ground investigation information had concluded that the potential for a significant pollution linkage to be present at the site is low with corresponding low risk to human health and the environment.
- 7.2 No visual or olfactory evidence of significant ground contamination has been recorded from the intrusive investigations.
- 7.3 However, it has been considered prudent to adopt a precautionary principal and undertake chemical analysis of the sub-surface soils to confirm the low human health risk status of the site.

Human Health

- 7.4 Selected samples have been analysed for a general suite of contaminants of concern and compared against Screening Levels (SL's) for human health to determine the significance of the measured concentrations in relation to the site conceptual model. Thus, a Generic Quantitative Risk Assessment has been undertaken in line with guidelines provided in the Environment Agencies Model Procedures for the Land Contamination Risk Management (LCRM), April 2021.
- 7.5 The criteria for a limited number of contaminants have been derived by DEFRA in their document entitled SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination, April 2014.
- 7.6 Within the document, Category 4 Screening Levels (C4SL's) are described as being more pragmatic than previous screening criteria and represent concentrations in soil that present an 'acceptable' level of risk within the context of Part 2A.
- 7.7 The National Planning Policy Framework states that 'after development, as a minimum, land should not be capable of being determined as contaminated land under Part 2A of the Environmental Protection Act 1990'. Therefore, by inference, the C4SL's are appropriate for use in the planning context.
- 7.8 Although the SP1010 document states that C4SL only apply for a 'sandy loam soil with 6% soil organic matter', it is generally accepted that assessment criteria for metals are not sensitive to changes in soil organic content (SOM). The C4SL's have therefore been adopted as assessment criteria in this report for the listed metals within the SP1010.
- 7.9 Subsequent to SP1010, LQM/CIEH have published a document entitled 'The LQM/CIEH S4ULs for Human Health Risk Assessment' 2015. In brief, the document provides updated assessment criteria which have been derived in accordance with UK legislation, national as well as EA policy and using a modified version of the CLEA software and available guidance. The new screening criteria, or Suitable 4 Use Levels (S4ULs), are intended to provide a complete and updated replacement to the previous LQM/CIEH GAC of 2009. As such they are considered appropriate for use in this assessment for other contaminants not covered by C4SL's and/or for organic contaminants assuming a worst-case Soil Organic Matter (SOM) of 1% as an initial conservative assessment.
- 7.10 For each contaminant, S4UL's and C4SL's have been calculated for six land use scenarios, namely:
- Residential with homegrown produce.
 - Residential without homegrown produce.
 - Allotments.
 - Commercial.
 - Public Open Space, near residential housing.
 - Public Parks, remote from residential housing.

- 7.11 In light of the proposed development, the SLs for a "Commercial" end-use are considered appropriate for the assessment.
- 7.12 A table of relevant SL's are provided in Appendix 06.

Soil Test Results

- 7.13 4no samples of near surface soil were analysed for suites of metals, semi-metals and hydrocarbons. All of the concentrations measured were below the stringent SL's for a proposed a "Commercial" end-use.
- 7.14 Two samples submitted for TPH testing indicated that all the carbon bands and BTEX were below the relevant reference values for the required end-use.
- 7.15 No asbestos fibres were detected in any of the 4no samples of shallow soils submitted for screening.

Discussion and Conclusions

- 7.16 In consideration of the chemical test results collected to date, it is concluded that the subject site does not contain any significant and/or widespread contamination sources with no specific environmental remediation required in this respect.
- 7.17 Following site development, the entire proposed redevelopment area will be surfaced with buildings and hardstanding, therefore there will be no mechanism for a direct contact pollution linkage in the event that localised contamination is encountered.

8.0 GROUND GAS RISK ASSESSMENT

Methodology

- 8.1 Current guidance for the assessment of risk associated with the presence of hazardous ground gases (principally methane and carbon dioxide) is provided in two key documents, namely:
- Code of practice for the Characterisation and remediation from Ground Gas in Affected Developments. British Standard Institution (BS 8485: 2015 & A1:2019); and
 - Assessing Risks posed by Hazardous Ground Gases to Buildings CIRIA (C665, 2007).
- 8.2 The assessment presented herein is primarily based on the BS8485 document.
- 8.3 Hazardous ground gas qualitative risk assessment is based on a conceptual model similar to that used for soil and groundwater contamination sources (i.e., source-pathway-receptor pollutant linkages). A semi-quantitative estimate of risk can be assessed based on knowledge of the conceptual model and a measure of hazardous gas concentration and gas flow at the site within monitoring standpipes.
- 8.4 Based on the measured flow rates and hazardous gas concentrations, individual "hazardous gas flow rates" (Q_{hg}) can be derived for each monitoring point, from which the "site characteristic hazardous gas flow rate" (Q_{hgs}), and then the "Characteristic Situation" (CS) can be determined.
- 8.5 BS8485 provides guidance on the level of gas protection requirements based upon the characteristic situation and the proposed development based on building type as outlined in Table 3.

Table 3 - Building Types

	Type A	Type B	Type C	Type D
Ownership	Private	Private or commercial/ Public, possible multiple	Commercial / Public	Commercial / Industrial
Control (Change of use)	None	Some but not all	Full	Full
Room Sizes	Small	Small/ medium	Small to Large	Large Industrial/ Retail Park

- 8.6 The proposed development therefore is indicated to comprise the construction of Type C buildings which include commercial/public structures with central building management and small to large room sizes.

Ground Gas Conceptual Model

- 8.7 No radon protection measures are necessary for new structures as described in publication BR211 by the Building Research Establishment.
- 8.8 Ground investigations have confirmed that no areas of deep Made Ground with the potential to generate hazardous concentrations and volumes of ground gas occur beneath the site. Where Made Ground was encountered, this was not observed to include significant quantities of potentially putrescible materials.
- 8.9 There are no recorded landfills within influencing distance of the site.
- 8.10 In consideration of the above, a low risk to the proposed development from ground gas has been determined. Furthermore, the enclosed portion of the proposed development (Level 0) is due to be elevated, with the lower ground level (Level -1) being open-air.

- 8.11 Nevertheless, it has been considered prudent to undertaking a single monitoring visit to provide further information on the ground gas conceptual model. Subsequently on 19th August 2022, BH02 was monitored for concentrations of methane and carbon dioxide, with associated flow rates.

Results and Recommendations

- 8.12 The results indicate that concentrations of methane were below detectable limits with carbon dioxide concentrations up to 1.80% by volume in air (v/v). Gas flows were also below detectable limits.
- 8.13 The results give a maximum composite Q_{hg} value of 0.002l/hr (based on the highest detected carbon dioxide concentration and a presumed flow of 0.1l/hr) and indicate the site to classify as Characteristic Gas Situation (CGS) 1 – Very Low Gas Risk' in accordance with BS8485:2007, with no specific gas protection measures required.

10.0 OTHER POTENTIAL DEVELOPMENT CONSIDERATIONS

Excavated Soils

- 10.1 Groundworks undertaken during the development will produce excavated soil which will require appropriate site management.
- 10.2 Principally, and in line with the sustainable development agenda, any soils arising from site excavations should firstly be considered for re-use where possible by incorporation into the development. However, it is anticipated that all site won soils will likely be surplus to requirements and will need to be removed under appropriate duty of care.
- 10.3 For guidance and based on the current information, it is likely that the majority of Made Ground would be classified as Non-Hazardous and natural strata Inert, for landfill disposal. This would need to be confirmed with the landfill operator.
- 10.4 It should be noted that the chemical analysis results for disposal classification are assessed against different assessment criteria to those relating to contamination risk assessment. Soils that are deemed suitable for use in terms of risk to human health and the environment may not necessary be uncontaminated and could be classified as Non-Hazardous or even Hazardous for disposal purposes.
- 10.5 It will be the responsibility of the waste producer to undertake testing and classification of any waste soils for disposal to an appropriately licenced landfill in accordance with current guidelines.

Imported Fill

- 10.6 Imported fill will be subject to specific quality requirements and should be accompanied by appropriate certification to confirm its suitability. Allowance should also be made for testing imported fill materials prior to placement to ensure suitability.

Water Supply Pipes

- 10.7 The relevant water supply provider will need to be consulted with regards the selection of suitable water supply pipe materials for the development, should these be required. In light of the ground conditions encountered, the requirement for specific materials and measures to protect the water supply from ground contamination are not anticipated.

APPENDIX 01

Drawings

2.1 Site Analysis: wider site context



LOCAL COUNCIL POLICY MAP

--- KNOWSLEY / ST HELENS COUNCIL BOUNDARY

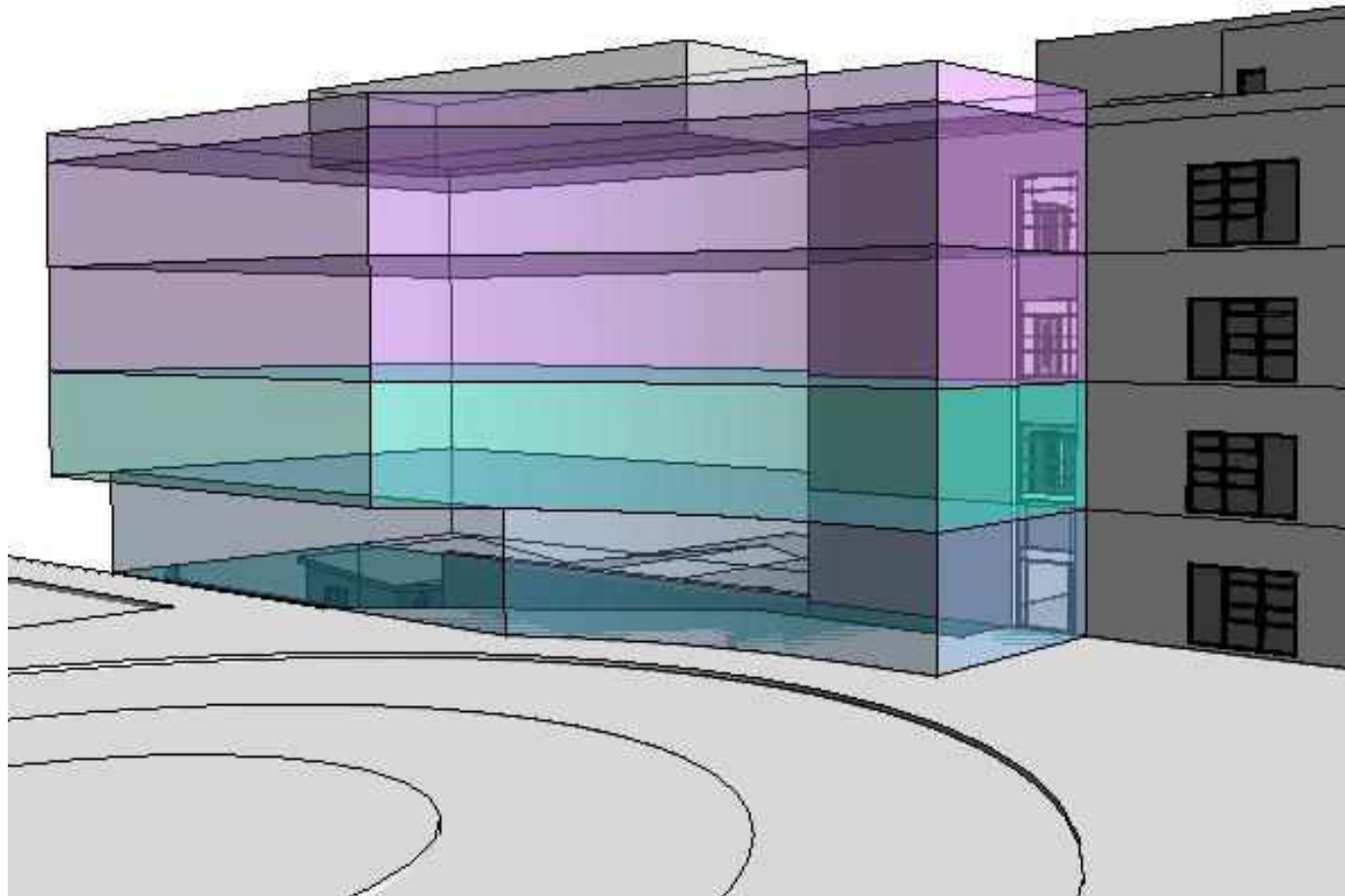
KNOWSLEY COUNCIL

- PRIMARILY RESIDENTIAL AREA
- INDUSTRIAL AREA
- MAJOR SPORTING USE
- URBAN GREENSPACE / EDUCATION LAND
- GREENBELT

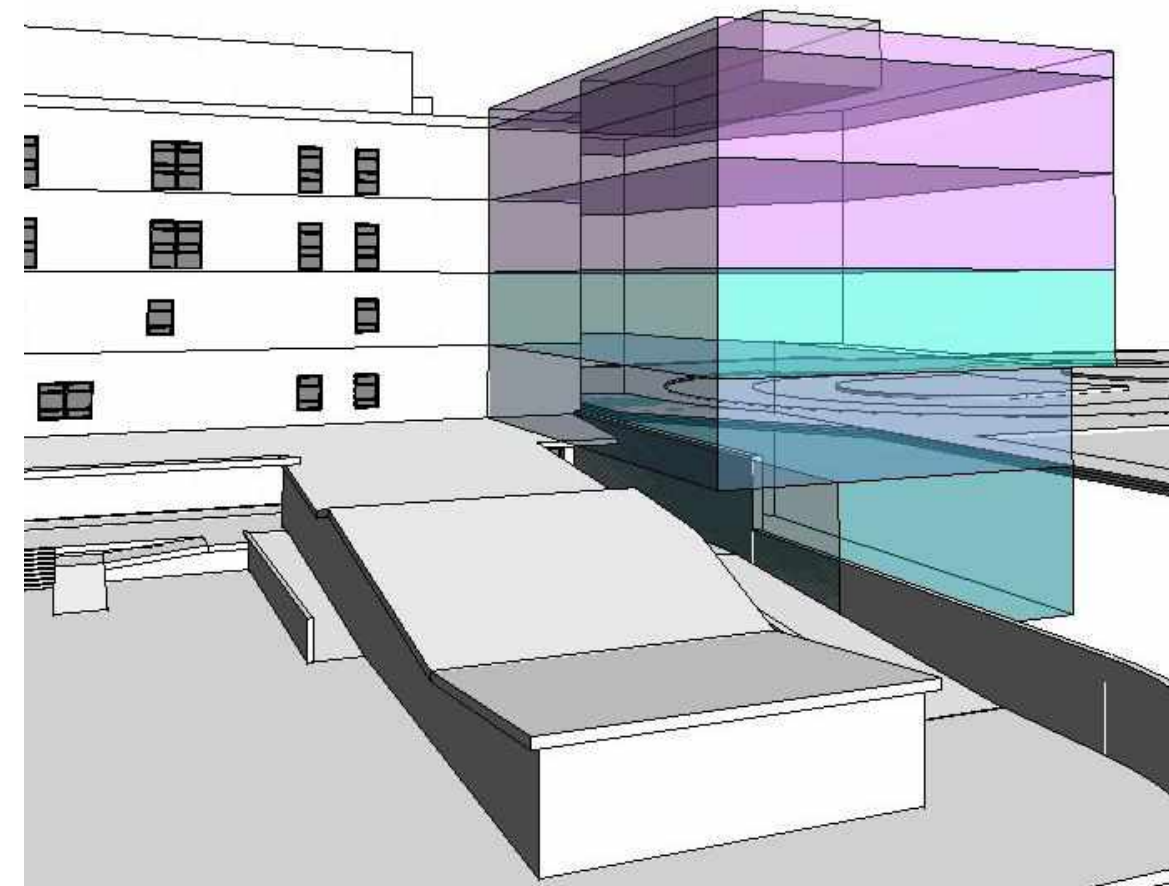
ST. HELEN'S COUNCIL

- SAFEGUARDED HOUSING LAND
- OUTDOOR SPORTS & RECREATION
- GREENBELT
- HOSPITAL OWNERSHIP BOUNDARY
- SITE BOUNDARY

5.4 3D Views: elevational treatment



View from hospital main entrance



View from bin stores



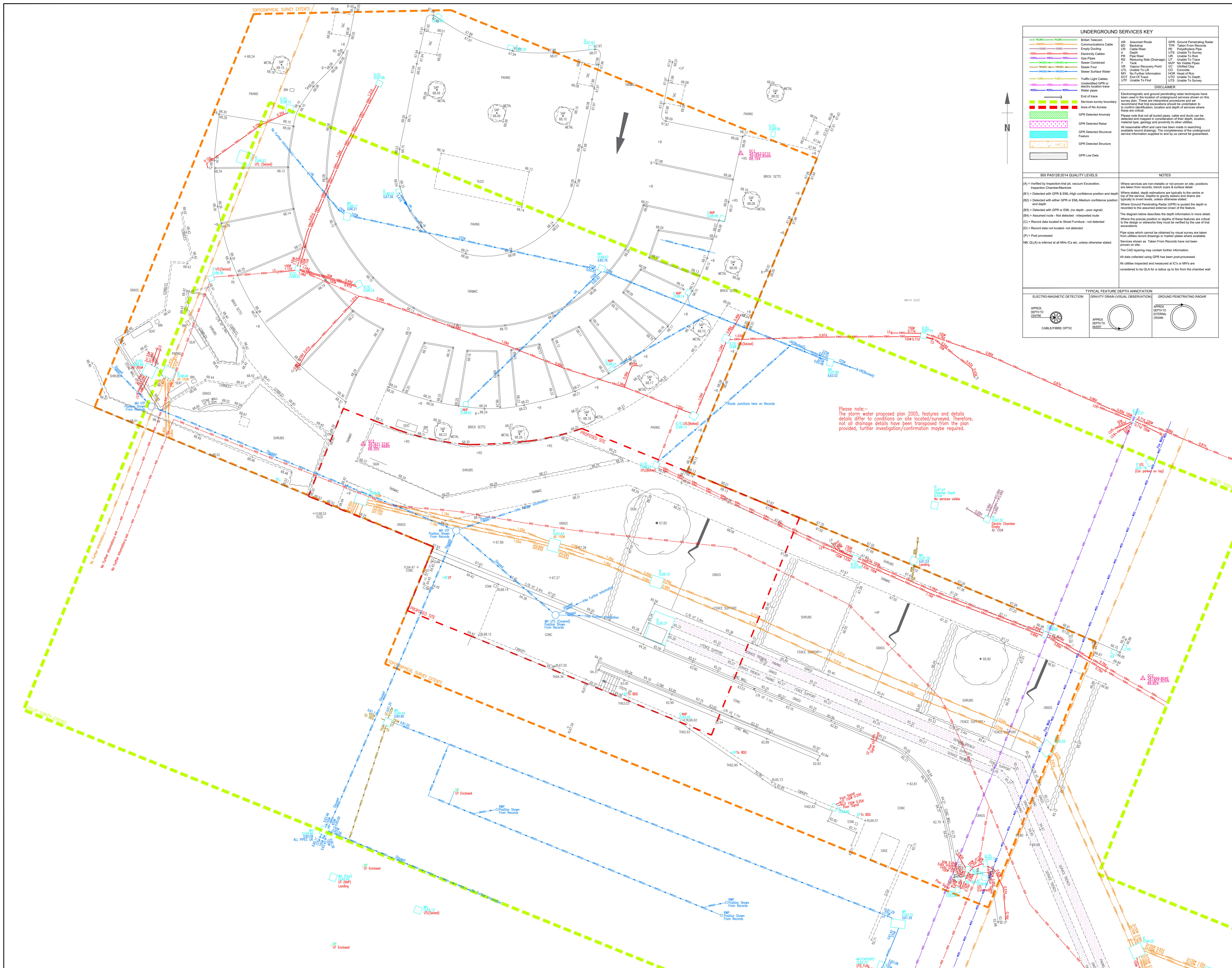
Vertical cladding with regular windows providing flexibility of locating walls on upper levels.



Tiled cladding or brick facade with punched and ribbon windows to upper levels. Colonnade at ground floor.



Metal cladding to upper floors with picture windows at the end.



Survey Notes	
Grid:	Local Plane Metric related to National Grid at survey control SC1
Levels:	OS Datum from GNSS positioning converted using the National Geoid Model OSGM15

[illegible]

Sheet Index

[illegible]



MALCOLM
HUGHES
CHARTERED
LAND SURVEYORS

65 Cross Street, Sale, Manchester
M33 7PZ. Tel 0161 605 1056
www.malcolmhughes.co.uk
survey@mhfs.co.uk

Accreditations








Client
HALLIDAY MEECHAM ARCHITECTS LTD
111 PICCADILLY
MANCHESTER, M1 2HY

Project

WHISTON HOSPITAL
WARRINGTON ROAD, PRESCOT
MERSEYSIDE, L35 5DR

Drawing Title	
TOPOGRAPHICAL AND UTILITY MAPPING SURVEY	
Drawn By	Survey Date
AS/DH 21/06/22	May 2022
Checked by	Scale
ED/DJ 23/06/22	1 : 100
Drawing No.	Revision
58607/UG1	



GENERAL NOTES

- DO NOT SCALE FROM THIS DRAWING WORK TO FIGURED DIMENSIONS ONLY.
- NO DEVIATION FROM THE DETAILS SHOWN ON THIS DRAWING IS ALLOWED WITHOUT PRIOR PERMISSION IN WRITING.
- ALL DRAWINGS ARE TO BE READ IN CONJUNCTION WITH ALL ARCHITECTS, ENGINEERS AND SPECIALISTS DRAWINGS AND THE SPECIFICATION.
- THE CONTRACTOR SHALL INCORPORATE ALL THE REQUIREMENTS OF THE PRE-TENDER STAGE HEALTH & SAFETY PLAN.

KEY

- BH01 Cable Percussive Borehole
- HP01 Hand Excavated Trial Pit

Rev.	Amendment	Date	By	Chkd
Project Whiston Hospital, Prescott				
ARCHITECT Halliday Meecham				
Title EXPLORATORY HOLE LOCATION PLAN				
Drawn TS	Checked SS	Date 15/08/22	Scale 1:100	
WML CONSULTING Chartered Civil and Structural Engineers No.8 Oak Green Earl Road Stanley Green Business Park Cheadle Hulme Cheshire SK8 6QL Tel 0161 482 0600 Fax 0161 486 9210 e-mail info@wmlconsulting.com www.wmlconsulting.com				
Job No. 9163G		Drawing No. SK-01-		

APPENDIX 02

Site Photographs



Photograph 1
Concrete hardstanding at base of retaining wall / ramp in southern area of site



Photograph 2
View north-east across site. Retaining wall and ramp visible in left of image, covered utility ducting visible to right of image, and steep grassed slope in centre of image.



Photograph 3
Retaining wall, bin store and ramp in south of site



Photograph 4
View west along pedestrian footpath approach toward main Hospital building



Photograph 5
View North-East from Hospital entrance towards BH01 location



Photograph 6
View East from Hospital entrance toward steeply sloping soft landscaped area



Photograph 7
View South-West past BH01 toward Hospital entrance



Photograph 8
View of proposed borehole location BH02



Photograph 10
Hand pit HP01 prior to start of excavation



Photograph 11
Hand pit HP01 open excavation showing vertical geotextile membrane on far edge of hole and horizontal geotextile at depth



Photograph 12
HP01 arisings including fragments of geotextile



Photograph 13
BH01 at start of works



Photograph 14
Sandstone arisings from SPT at base of BH01



Photograph 15
BH01 reinstatement

APPENDIX 03
Exploratory Hole Records

	Project Title: Whiston Hospital		HP01
	Project Number: 9163G	Client: Halliday Meecham	
	GL (mAOD):	N Coord: 0	E Coord: 0
Date: 25/07/2022	Method: Hand Dug	Logged By: TJS	Scale: 1:40



Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water
0.30 - 0.40	ES				0.10	Grass overlying mid/dark brown slightly sandy slightly gravelly clay with many rootlets. (TOPSOIL)	
					0.50	Mid brown slightly clayey slightly silty slightly gravelly cobbly sand. Gravel is fine to coarse of brick. (MADE GROUND)	
					0.90	Mid reddish brown gravelly fine to coarse sand. Gravel is fine to medium of mixed lithology including brick and concrete. (MADE GROUND)	
					1.00	End Of Trial Pit At 0.90 m	
					2.00		
					3.00		
KEY D - Disturbed Sample B - Bulk Sample W - Water Sample V - Hand Shear Vane kPa  - Groundwater Strike  - Groundwater Level 						REMARKS No Groundwater Encountered Excavation limited by ground conditions	

		Project Title: Whiston Hospital				BH01	
		Project Number: 9163G		Client: Halliday Meecham			
		GL (mAOD):		N Coord: 0		E Coord: 0	
Date: 26/07/2022-27/07/2022		Method: Cable Percussion		Driller: K Rogerson		Logged By: TJS	

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe
0.40 - 0.50	ES	pp 50/117mm			0.06 0.16 0.20	Concrete paving slabs (CONCRETE)		
1.30 - 1.50	D				1.00 1.20	Mid/dark brown slightly silty fine to medium sand (MADE GROUND)		
2.30 - 2.50	D		N=34			2.00		
3.30 - 3.50	D	N=15			3.00 3.20 3.30	Mid/dark brown slightly clayey gravelly cobbly sand. Gravel and cobbles comprise fine to coarse subangular to angular stone, brick, concrete with rare fragments of wood, nails and tile. (MADE GROUND)		
4.40 - 4.60	D	N=10			4.00	1.20 - 3.20 Arisings slightly damp		
4.90 - 5.00	D				5.00	Firm mid brown slightly silty slightly sandy gravelly CLAY. Gravel is fine to coarse subrounded to subangular of mixed lithology. (GLACIAL TILL)		
5.30 - 5.40	D	pp 56/209mm			5.30	Firm mid reddish brown slightly silty, sandy slightly, gravelly CLAY with occasional lenses of yellowish brown fine to coarse sand. Gravel is fine to coarse subangular to subrounded of mixed lithology. (GLACIAL TILL)		
6.00 - 7.20	D	pp 20/52mm			6.00	Very dense mid reddish brown slightly silty SAND. (POSSIBLE SANDSTONE)		
		pp 100/192mm			7.00 7.20	5.50 - 7.20 Poor recovery - arisings disturbed and very wet		
						End Of Borehole At 7.20 m		
						8.00		

KEY D - Disturbed Sample B - Bulk Sample U - Undisturbed W - Water Sample S - Standard Penetration Test C - Cone Penetration Test N - Penetration Test 'N' Value V - Hand Shear Vane kPa  - Groundwater Strike  - Groundwater Level 		REMARKS Scale: 1:50		Water Strikes																									
				<table border="1"> <tr> <th>Date</th> <th>Strike</th> <th>Level</th> <th>Minutes</th> <th>Casing</th> <th>Sealed</th> </tr> <tr> <td>26/07/2022</td> <td>5.5</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>						Date	Strike	Level	Minutes	Casing	Sealed	26/07/2022	5.5												
Date	Strike	Level	Minutes	Casing	Sealed																								
26/07/2022	5.5																												
				Daily Log Of Depths																									
				<table border="1"> <tr> <th>Date</th> <th>Casing</th> <th>Water</th> <th>From</th> <th>To</th> <th>Hours</th> </tr> <tr> <td></td> <td></td> <td></td> <td>6</td> <td>7.2</td> <td>1h</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>						Date	Casing	Water	From	To	Hours				6	7.2	1h								
Date	Casing	Water	From	To	Hours																								
			6	7.2	1h																								

WML CONSULTING			Project Title: Whiston Hospital				BH02					
			Project Number: 9163G		Client: Halliday Meecham					Sheet 1 Of 1		
			GL (mAOD):		N Coord: 0		E Coord: 0					
Date: 27/07/2022-28/07/2022			Method: Cable Percussion		Driller: K Rogerson		Logged By: TJS					
Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe				
0.30 - 0.50	ES	N=34			0.25	Red asphalt. (ASPHALT)						
0.70 - 0.80	ES				0.50	Pale grey concrete. (CONCRETE)						
1.30 - 1.50	D				1.00	Mid brown slightly clayey slightly silty sand and gravel. Gravel is subrounded to subangular of limestone and rare fragments of rubber. (MADE GROUND)						
2.30 - 2.50	D	N=15			2.00	Mid / dark greyish brown slightly silty gravelly cobbly sand. Gravel and cobbles of mixed lithology including brick and concrete with a fine black ash. (MADE GROUND)						
3.30 - 3.50	D	N=12			3.00 3.10	Mid brown clayey slightly silty gravelly cobbly sand. Gravel is of mixed lithology including brick and concrete. (MADE GROUND)						
4.30 - 4.50	D	N=45			4.00	Mid brown with pale grey and mottled orange slightly silty sandy slightly gravelly CLAY. (MADE GROUND)						
5.30 - 5.50	D	pp 50/210mm			5.00	Firm mid reddish brown slightly silty slightly gravelly sandy CLAY. Gravel is mixed lithology of subrounded to subangular fine to medium of mixed lithologies. (GLACIAL TILL)						
6.30 - 6.50	D	pp 50/116mm			6.00	Very dense mid reddish brown fine to coarse slightly silty SAND. (POSSIBLE SANDSTONE)						
7.00 - 7.10	D	pp 100/217mm			7.00 7.10	End Of Borehole At 7.10 m						
					8.00							
KEY D - Disturbed Sample B - Bulk Sample U - Undisturbed W - Water Sample S - Standard Penetration Test C - Cone Penetration Test N - Penetration Test 'N' Value V - Hand Shear Vane kPa  - Groundwater Strike  - Groundwater Level 			REMARKS No Groundwater Encountered			Water Strikes						
						Date		Strike	Level	Minutes	Casing	Sealed
						Daily Log Of Depths			Chiselling			
						Date		Casing	Water	From	To	Hours
										6.7	7.1	1h

APPENDIX 04

Geotechnical Testing Results



LABORATORY REPORT



4043

Contract Number: PSL22/5117

Report Date: 10 August 2022

Client's Reference: 9163G

Client Name: WML Consultants
No 8 Oak Green Earl Road
Stanley Green Business Park
Cheadle Hulme
Cheshire
SK8 6QL

For the attention of: Sam Seddon

Contract Title: Whiston Hospital

Date Received: 4/8/2022

Date Commenced: 4/8/2022

Date Completed: 10/08/2022

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced other than in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

A Watkins
(Director)

R Berriman
(Quality Manager)

S Royle
(Laboratory Manager)

L Knight
(Assistant Laboratory Manager)

S Eyre
(Senior Technician)

M Fennell
(Senior Technician)

5 – 7 Hexthorpe Road, Hexthorpe,
Doncaster DN4 0AR
tel: +44 (0)844 815 6641
fax: +44 (0)844 815 6642
e-mail: rberriman@prosoils.co.uk
awatkins@prosoils.co.uk

Page 1 of

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

[illegible]

4043

PSL
Professional Soils Laboratory

Whiston Hospital

Contract No:

PSL22/5117

Client Ref:

9163G

SUMMARY OF SOIL CLASSIFICATION TESTS

(BS1377 : PART 2 : 1990)

[illegible]

SYMBOLS : NP : Non Plastic

*** : Liquid Limit and Plastic Limit Wet Sieved.**



4043

PSL
Professional Soils Laboratory

Whiston Hospital

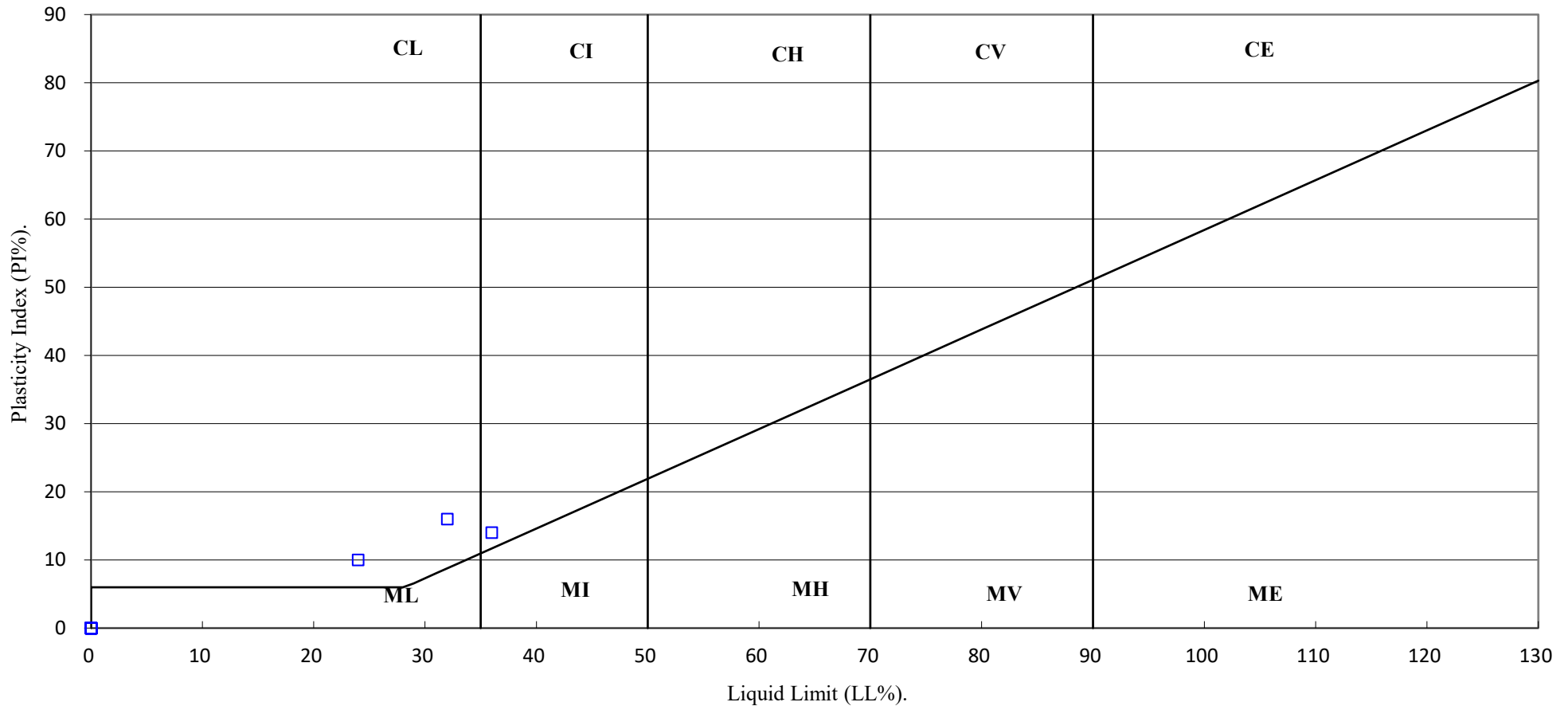
Contract No:

PSL22/5117

Client Ref:

9163G

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



4043

PSL
Professional Soils Laboratory

Whiston Hospital

Contract No:

PSL22/5117

Client Ref:

9163G



Certificate of Analysis

Certificate Number 22-15504

Issued: 12-Aug-22

Client Professional Soils Laboratory Ltd
5/7 Hexthorpe Road
Hexthorpe
DN4 0AR

Our Reference 22-15504

Client Reference PSL22/5117

Order No (not supplied)

Contract Title Whiston Hospital

Description 6 Soil samples.

Date Received 10-Aug-22

Date Started 10-Aug-22

Date Completed 12-Aug-22

Test Procedures Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By

Kirk Bridgewood
General Manager



Summary of Chemical Analysis

Soil Samples

Our Ref 22-15504

Client Ref PSL22/5117

Contract Title Whiston Hospital

Lab No	2043975	2043976	2043977	2043978	2043979	2043980
Sample ID	BH01	BH01	BH01	BH02	BH02	BH02
Depth	4.40	5.30	6.00	2.30	5.30	7.00
Other ID						
Sample Type	D	D	D	D	D	D
Sampling Date	n/s	n/s	n/s	n/s	n/s	n/s
Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s

Test	Method	LOD	Units						
Inorganics									
pH	DETSC 2008#		pH	8.4	8.9	8.6	11.6	7.7	8.7
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	160	85	160	540	79	84

Information in Support of the Analytical Results

Our Ref 22-15504
Client Ref PSL22/5117
Contract Whiston Hospital

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
2043975	BH01 4.40 SOIL		PT 1L	Sample date not supplied, Anions 2:1 (30 days), pH + Conductivity (7 days)	
2043976	BH01 5.30 SOIL		PT 1L	Sample date not supplied, Anions 2:1 (30 days), pH + Conductivity (7 days)	
2043977	BH01 6.00 SOIL		PT 1L	Sample date not supplied, Anions 2:1 (30 days), pH + Conductivity (7 days)	
2043978	BH02 2.30 SOIL		PT 1L	Sample date not supplied, Anions 2:1 (30 days), pH + Conductivity (7 days)	
2043979	BH02 5.30 SOIL		PT 1L	Sample date not supplied, Anions 2:1 (30 days), pH + Conductivity (7 days)	
2043980	BH02 7.00 SOIL		PT 1L	Sample date not supplied, Anions 2:1 (30 days), pH + Conductivity (7 days)	

Key: P-Plastic T-Tub

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/- 2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

End of Report

APPENDIX 05

Chemical Analyses

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 22/07351
Issue Number: 1

Date: 03 August, 2022

Client: WML Construction
No 8 Oak Green
Earl Road
Stanley Green Business Park
Cheadle Hulme
Cheshire
SK8 6QL

Project Manager: Sam Seddon/Thomas Sheen
Project Name: Whiston Hospital, Prescott
Project Ref: 9163G
Order No: 9163G
Date Samples Received: 28/07/22
Date Instructions Received: 28/07/22
Date Analysis Completed: 03/08/22

Approved by:



Danielle Brierley
Deputy Client Services Supervisor

Envirolab Job Number: 22/07351

Client Project Name: Whiston Hospital, Prescot

Client Project Ref: 9163G

Lab Sample ID	22/07351/1	22/07351/2						Units	Limit of Detection	Method ref
Client Sample No	1	1								
Client Sample ID	HP01	BH01								
Depth to Top	0.30	0.40								
Depth To Bottom	0.40	0.50								
Date Sampled	25-Jul-22	26-Jul-22								
Sample Type	Soil - ES	Soil - ES								
Sample Matrix Code	4AE	4AB								
% Stones >10mm _A	<0.1	27.8						% w/w	0.1	A-T-044
pH _D ^{M#}	8.26	10.51						pH	0.01	A-T-031s
Sulphate (water sol 2:1) _D ^{M#}	<0.01	0.22						g/l	0.01	A-T-026s
Sulphate (acid soluble) _D ^{M#}	390	3900						mg/kg	200	A-T-028s
Sulphur (total) _D	393	1650						mg/kg	50	A-T-024s
Cyanide (total) _A ^{M#}	<1	<1						mg/kg	1	A-T-042sTCN
Phenols - Total by HPLC _A	<0.2	<0.2						mg/kg	0.2	A-T-050s
Organic Matter _D ^{M#}	5.0	1.5						% w/w	0.1	A-T-032 OM
Arsenic _D ^{M#}	6	4						mg/kg	1	A-T-024s
Boron (water soluble) _D	<1.0	3.5						mg/kg	1	A-T-027s
Cadmium _D ^{M#}	1.0	0.8						mg/kg	0.5	A-T-024s
Copper _D ^{M#}	44	21						mg/kg	1	A-T-024s
Chromium (hexavalent) _D	<1	<1						mg/kg	1	A-T-040s
Lead _D ^{M#}	96	64						mg/kg	1	A-T-024s
Mercury _D	<0.17	1.39						mg/kg	0.17	A-T-024s
Nickel _D ^{M#}	19	11						mg/kg	1	A-T-024s
Selenium _D ^{M#}	<1	<1						mg/kg	1	A-T-024s
Vanadium _D ^{M#}	20	15						mg/kg	1	A-T-024s
Zinc _D ^{M#}	198	81						mg/kg	5	A-T-024s

Envirolab Job Number: 22/07351

Client Project Name: Whiston Hospital, Prescot

Client Project Ref: 9163G

Lab Sample ID	22/07351/1	22/07351/2						Units	Limit of Detection	Method ref
Client Sample No	1	1								
Client Sample ID	HP01	BH01								
Depth to Top	0.30	0.40								
Depth To Bottom	0.40	0.50								
Date Sampled	25-Jul-22	26-Jul-22								
Sample Type	Soil - ES	Soil - ES								
Sample Matrix Code	4AE	4AB								
Asbestos in Soil (inc. matrix)										
Asbestos in soil ^o	NAD	NAD								A-T-045
Asbestos Matrix (visual) ^o	-	-								A-T-045
Asbestos Matrix (microscope) ^o	-	-								A-T-045
Asbestos ACM - Suitable for Water Absorption Test? ^o	N/A	N/A								A-T-045

Envirolab Job Number: 22/07351

Client Project Name: Whiston Hospital, Prescot

Client Project Ref: 9163G

Lab Sample ID	22/07351/1	22/07351/2						Units	Limit of Detection	Method ref
Client Sample No	1	1								
Client Sample ID	HP01	BH01								
Depth to Top	0.30	0.40								
Depth To Bottom	0.40	0.50								
Date Sampled	25-Jul-22	26-Jul-22								
Sample Type	Soil - ES	Soil - ES								
Sample Matrix Code	4AE	4AB								
PAH-16MS										
Acenaphthene _A ^{M#}	0.08	0.14						mg/kg	0.01	A-T-019s
Acenaphthylene _A ^{M#}	0.01	0.02						mg/kg	0.01	A-T-019s
Anthracene _A ^{M#}	0.15	0.33						mg/kg	0.02	A-T-019s
Benzo(a)anthracene _A ^{M#}	0.66	1.16						mg/kg	0.04	A-T-019s
Benzo(a)pyrene _A ^{M#}	0.56	0.89						mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene _A ^{M#}	0.62	0.92						mg/kg	0.05	A-T-019s
Benzo(ghi)perylene _A ^{M#}	0.37	0.48						mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene _A ^{M#}	0.16	0.27						mg/kg	0.07	A-T-019s
Chrysene _A ^{M#}	0.64	1.06						mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene _A ^{M#}	0.07	0.09						mg/kg	0.04	A-T-019s
Fluoranthene _A ^{M#}	1.36	2.25						mg/kg	0.08	A-T-019s
Fluorene _A ^{M#}	0.05	0.09						mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene _A ^{M#}	0.43	0.59						mg/kg	0.03	A-T-019s
Naphthalene _A ^{M#}	<0.03	0.03						mg/kg	0.03	A-T-019s
Phenanthrene _A ^{M#}	0.61	1.48						mg/kg	0.03	A-T-019s
Pyrene _A ^{M#}	1.27	2.52						mg/kg	0.07	A-T-019s
Total PAH-16MS _A ^{M#}	7.04	12.3						mg/kg	0.01	A-T-019s

Envirolab Job Number: 22/07351

Client Project Name: Whiston Hospital, Prescot

Client Project Ref: 9163G

Lab Sample ID	22/07351/1	22/07351/2						Units	Limit of Detection	Method ref
Client Sample No	1	1								
Client Sample ID	HP01	BH01								
Depth to Top	0.30	0.40								
Depth To Bottom	0.40	0.50								
Date Sampled	25-Jul-22	26-Jul-22								
Sample Type	Soil - ES	Soil - ES								
Sample Matrix Code	4AE	4AB								
TPH CWG with Clean Up										
Ali >C5-C6 _A [#]	-	<0.01						mg/kg	0.01	A-T-022s
Ali >C6-C8 _A [#]	-	<0.01						mg/kg	0.01	A-T-022s
Ali >C8-C10 _A	-	<1						mg/kg	1	A-T-055s
Ali >C10-C12 _A ^{M#}	-	<1						mg/kg	1	A-T-055s
Ali >C12-C16 _A ^{M#}	-	2						mg/kg	1	A-T-055s
Ali >C16-C21 _A ^{M#}	-	5						mg/kg	1	A-T-055s
Ali >C21-C35 _A ^{M#}	-	308						mg/kg	1	A-T-055s
Total Aliphatics _A	-	315						mg/kg	1	A-T-055s
Aro >C5-C7 _A [#]	-	<0.01						mg/kg	0.01	A-T-022s
Aro >C7-C8 _A [#]	-	<0.01						mg/kg	0.01	A-T-022s
Aro >C8-C10 _A	-	<2						mg/kg	1	A-T-055s
Aro >C10-C12 _A	-	<1						mg/kg	1	A-T-055s
Aro >C12-C16 _A	-	3						mg/kg	1	A-T-055s
Aro >C16-C21 _A ^{M#}	-	16						mg/kg	1	A-T-055s
Aro >C21-C35 _A ^{M#}	-	88						mg/kg	1	A-T-055s
Total Aromatics _A	-	107						mg/kg	1	A-T-055s
TPH (Ali & Aro >C5-C35) _A	-	422						mg/kg	1	A-T-055s
BTEX - Benzene _A [#]	-	<0.01						mg/kg	0.01	A-T-022s
BTEX - Toluene _A [#]	-	<0.01						mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene _A [#]	-	<0.01						mg/kg	0.01	A-T-022s
BTEX - m & p Xylene _A [#]	-	<0.01						mg/kg	0.01	A-T-022s
BTEX - o Xylene _A [#]	-	<0.01						mg/kg	0.01	A-T-022s
MTBE _A [#]	-	<0.01						mg/kg	0.01	A-T-022s

REPORT NOTES

General

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 A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.
 The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:

All results are reported as dry weight (<40°C).
 For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
 For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any "A" subscripts
 All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:

Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:

Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:

Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
 Stones etc. are not removed from the sample prior to analysis.
 Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:

1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample, 9 = INCINERATOR ASH.
 Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.

Secondary Matrix Codes:

A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,
 E = contains roots/twigs.

Key:

IS indicates Insufficient Sample for analysis.
 US indicates Unsuitable Sample for analysis.
 NDP indicates No Determination Possible.
 NAD indicates No Asbestos Detected.
 N/A indicates Not Applicable.
 Superscript # indicates method accredited to ISO 17025.
 Superscript "M" indicates method accredited to MCERTS.
 Subscript "A" indicates analysis performed on the sample as received.
 Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve
 Subscript "A" indicates analysis has dependant options against results. Testing dependant on results appear in the comments area of your sample receipt.
 EPH CWG results have humics mathematically subtracted through instrument calculation
 TPH results "with Cleanup" indicates results cleaned up with Silica during extraction

EPH CWG GCxGC ID from TPH CWG

Where we have identified humic substances in any ID's from TPH CWG with Clean Up please note that the concentration of these humic substances is not included in the quantified results and are included in the ID for information.

Please contact us if you need any further information.

v2

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client:	WML Construction , No 8 Oak Green, Earl Road, Stanley Green Business Park, Cheadle Hulme, Cheshire, SK8 6QL	Project No:	22/07351
Project:	Whiston Hospital, Prescot	Date Received:	28/07/2022 (am)
Clients Project No:	9163G	Cool Box Temperatures (°C):	23.1

NO DEVIATIONS IDENTIFIED with respect to sampling dates or containers received.

Note: If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3 (for water samples $5 \pm 3^{\circ}\text{C}$), ISO 18400-105:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	22/07351/1	22/07351/2
Client Sample No	1	1
Client Sample ID/Depth	HP01 0.30-0.40m	BH01 0.40-0.50m
Date Sampled	25/07/22	26/07/22
A-T-019s	03/08/2022	03/08/2022
A-T-022s		02/08/2022
A-T-024s	02/08/2022	02/08/2022
A-T-026s	02/08/2022	02/08/2022
A-T-027s	02/08/2022	02/08/2022
A-T-028s	02/08/2022	02/08/2022
A-T-031s	02/08/2022	02/08/2022
A-T-032 OM	03/08/2022	03/08/2022
A-T-040s	02/08/2022	02/08/2022
A-T-042sTCN	03/08/2022	03/08/2022
A-T-044	02/08/2022	02/08/2022
A-T-045	29/07/2022	29/07/2022
A-T-050s	01/08/2022	01/08/2022
A-T-055s		02/08/2022

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 22/07387
Issue Number: 1

Date: 05 August, 2022

Client: WML Construction
No 8 Oak Green
Earl Road
Stanley Green Business Park
Cheadle Hulme
Cheshire
SK8 6QL

Project Manager: Sam Seddon/Thomas Sheen
Project Name: Whiston Hospital, Prescott
Project Ref: 9163G
Order No: 9163G
Date Samples Received: 29/07/22
Date Instructions Received: 29/07/22
Date Analysis Completed: 05/08/22

Approved by:



Richard Wong
Client Manager

Envirolab Job Number: 22/07387

Client Project Name: Whiston Hospital, Prescot

Client Project Ref: 9163G

Lab Sample ID	22/07387/1	22/07387/2	22/07387/3	22/07387/4	22/07387/5	22/07387/6		Units	Limit of Detection	Method ref
Client Sample No	1	2	2	3	4	5				
Client Sample ID	BH02	BH02	BH01	BH01	BH01	BH01				
Depth to Top	0.30	0.70	1.30	2.30	3.30	4.40				
Depth To Bottom	0.50	0.80	1.50	2.50	3.50	4.60				
Date Sampled	27-Jul-22	27-Jul-22	26-Jul-22	26-Jul-22	26-Jul-22	26-Jul-22				
Sample Type	Soil - ES	Soil - ES	Soil - D	Soil - D	Soil - D	Soil - D				
Sample Matrix Code	6AB	6AB	6AB	6AB	6A	6				
% Stones >10mm _A	15.7	10.6	11.5	<0.1	<0.1	<0.1		% w/w	0.1	A-T-044
pH _D ^{M#}	8.96	8.91	9.08	8.95	8.88	8.29		pH	0.01	A-T-031s
Sulphate (water sol 2:1) _D ^{M#}	0.83	1.28	0.55	1.74	0.21	0.12		g/l	0.01	A-T-026s
Sulphate (acid soluble) _D ^{M#}	3700	8400	-	-	-	-		mg/kg	200	A-T-028s
Sulphur (total) _D	2280	2760	-	-	-	-		mg/kg	50	A-T-024s
Cyanide (total) _A ^{M#}	<1	<1	-	-	-	-		mg/kg	1	A-T-042sTCN
Phenols - Total by HPLC _A	<0.2	<0.2	-	-	-	-		mg/kg	0.2	A-T-050s
Organic Matter _D ^{M#}	3.1	4.3	-	-	-	-		% w/w	0.1	A-T-032 OM
Arsenic _D ^{M#}	<1	6	-	-	-	-		mg/kg	1	A-T-024s
Boron (water soluble) _D	1.2	1.8	-	-	-	-		mg/kg	1	A-T-027s
Cadmium _D ^{M#}	1.4	0.7	-	-	-	-		mg/kg	0.5	A-T-024s
Copper _D ^{M#}	40	74	-	-	-	-		mg/kg	1	A-T-024s
Chromium (hexavalent) _D	<1	<1	-	-	-	-		mg/kg	1	A-T-040s
Lead _D ^{M#}	59	177	-	-	-	-		mg/kg	1	A-T-024s
Mercury _D	2.09	0.63	-	-	-	-		mg/kg	0.17	A-T-024s
Nickel _D ^{M#}	13	17	-	-	-	-		mg/kg	1	A-T-024s
Selenium _D ^{M#}	<1	<1	-	-	-	-		mg/kg	1	A-T-024s
Vanadium _D ^{M#}	21	24	-	-	-	-		mg/kg	1	A-T-024s
Zinc _D ^{M#}	164	147	-	-	-	-		mg/kg	5	A-T-024s

Envirolab Job Number: 22/07387

Client Project Name: Whiston Hospital, Prescot

Client Project Ref: 9163G

Lab Sample ID	22/07387/1	22/07387/2	22/07387/3	22/07387/4	22/07387/5	22/07387/6		Units	Limit of Detection	Method ref
Client Sample No	1	2	2	3	4	5				
Client Sample ID	BH02	BH02	BH01	BH01	BH01	BH01				
Depth to Top	0.30	0.70	1.30	2.30	3.30	4.40				
Depth To Bottom	0.50	0.80	1.50	2.50	3.50	4.60				
Date Sampled	27-Jul-22	27-Jul-22	26-Jul-22	26-Jul-22	26-Jul-22	26-Jul-22				
Sample Type	Soil - ES	Soil - ES	Soil - D	Soil - D	Soil - D	Soil - D				
Sample Matrix Code	6AB	6AB	6AB	6AB	6A	6				
Asbestos in Soil (inc. matrix)										
Asbestos in soil _D [#]	NAD	NAD	-	-	-	-				A-T-045
Asbestos Matrix (visual) _D	-	-	-	-	-	-				A-T-045
Asbestos Matrix (microscope) _D	-	-	-	-	-	-				A-T-045
Asbestos ACM - Suitable for Water Absorption Test? _D	N/A	N/A	-	-	-	-				A-T-045

Envirolab Job Number: 22/07387

Client Project Name: Whiston Hospital, Prescot

Client Project Ref: 9163G

Lab Sample ID	22/07387/1	22/07387/2	22/07387/3	22/07387/4	22/07387/5	22/07387/6		Units	Limit of Detection	Method ref
Client Sample No	1	2	2	3	4	5				
Client Sample ID	BH02	BH02	BH01	BH01	BH01	BH01				
Depth to Top	0.30	0.70	1.30	2.30	3.30	4.40				
Depth To Bottom	0.50	0.80	1.50	2.50	3.50	4.60				
Date Sampled	27-Jul-22	27-Jul-22	26-Jul-22	26-Jul-22	26-Jul-22	26-Jul-22				
Sample Type	Soil - ES	Soil - ES	Soil - D	Soil - D	Soil - D	Soil - D				
Sample Matrix Code	6AB	6AB	6AB	6AB	6A	6				
PAH-16MS										
Acenaphthene _A ^{M#}	0.46	0.03	-	-	-	-		mg/kg	0.01	A-T-019s
Acenaphthylene _A ^{M#}	0.02	<0.01	-	-	-	-		mg/kg	0.01	A-T-019s
Anthracene _A ^{M#}	1.96	0.12	-	-	-	-		mg/kg	0.02	A-T-019s
Benzo(a)anthracene _A ^{M#}	1.86	0.47	-	-	-	-		mg/kg	0.04	A-T-019s
Benzo(a)pyrene _A ^{M#}	1.23	0.43	-	-	-	-		mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene _A ^{M#}	1.36	0.51	-	-	-	-		mg/kg	0.05	A-T-019s
Benzo(ghi)perylene _A ^{M#}	0.51	0.24	-	-	-	-		mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene _A ^{M#}	0.54	0.19	-	-	-	-		mg/kg	0.07	A-T-019s
Chrysene _A ^{M#}	1.85	0.54	-	-	-	-		mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene _A ^{M#}	0.13	0.05	-	-	-	-		mg/kg	0.04	A-T-019s
Fluoranthene _A ^{M#}	5.01	1.02	-	-	-	-		mg/kg	0.08	A-T-019s
Fluorene _A ^{M#}	0.37	0.02	-	-	-	-		mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene _A ^{M#}	0.65	0.27	-	-	-	-		mg/kg	0.03	A-T-019s
Naphthalene _A ^{M#}	0.04	<0.03	-	-	-	-		mg/kg	0.03	A-T-019s
Phenanthrene _A ^{M#}	5.61	0.44	-	-	-	-		mg/kg	0.03	A-T-019s
Pyrene _A ^{M#}	4.38	1.01	-	-	-	-		mg/kg	0.07	A-T-019s
Total PAH-16MS _A ^{M#}	26	5.34	-	-	-	-		mg/kg	0.01	A-T-019s

Envirolab Job Number: 22/07387

Client Project Name: Whiston Hospital, Prescot

Client Project Ref: 9163G

Lab Sample ID	22/07387/1	22/07387/2	22/07387/3	22/07387/4	22/07387/5	22/07387/6		Units	Limit of Detection	Method ref
Client Sample No	1	2	2	3	4	5				
Client Sample ID	BH02	BH02	BH01	BH01	BH01	BH01				
Depth to Top	0.30	0.70	1.30	2.30	3.30	4.40				
Depth To Bottom	0.50	0.80	1.50	2.50	3.50	4.60				
Date Sampled	27-Jul-22	27-Jul-22	26-Jul-22	26-Jul-22	26-Jul-22	26-Jul-22				
Sample Type	Soil - ES	Soil - ES	Soil - D	Soil - D	Soil - D	Soil - D				
Sample Matrix Code	6AB	6AB	6AB	6AB	6A	6				
TPH CWG with Clean Up										
Ali >C5-C6 _A [#]	-	<0.01	-	-	-	-		mg/kg	0.01	A-T-022s
Ali >C6-C8 _A [#]	-	<0.01	-	-	-	-		mg/kg	0.01	A-T-022s
Ali >C8-C10 _A	-	<1	-	-	-	-		mg/kg	1	A-T-055s
Ali >C10-C12 _A ^{M#}	-	<1	-	-	-	-		mg/kg	1	A-T-055s
Ali >C12-C16 _A ^{M#}	-	<1	-	-	-	-		mg/kg	1	A-T-055s
Ali >C16-C21 _A ^{M#}	-	3	-	-	-	-		mg/kg	1	A-T-055s
Ali >C21-C35 _A ^{M#}	-	153	-	-	-	-		mg/kg	1	A-T-055s
Total Aliphatics _A	-	157	-	-	-	-		mg/kg	1	A-T-055s
Aro >C5-C7 _A [#]	-	<0.01	-	-	-	-		mg/kg	0.01	A-T-022s
Aro >C7-C8 _A [#]	-	<0.01	-	-	-	-		mg/kg	0.01	A-T-022s
Aro >C8-C10 _A	-	<1	-	-	-	-		mg/kg	1	A-T-055s
Aro >C10-C12 _A	-	<1	-	-	-	-		mg/kg	1	A-T-055s
Aro >C12-C16 _A	-	3	-	-	-	-		mg/kg	1	A-T-055s
Aro >C16-C21 _A ^{M#}	-	16	-	-	-	-		mg/kg	1	A-T-055s
Aro >C21-C35 _A ^{M#}	-	93	-	-	-	-		mg/kg	1	A-T-055s
Total Aromatics _A	-	112	-	-	-	-		mg/kg	1	A-T-055s
TPH (Ali & Aro >C5-C35) _A	-	269	-	-	-	-		mg/kg	1	A-T-055s
BTEX - Benzene _A [#]	-	<0.01	-	-	-	-		mg/kg	0.01	A-T-022s
BTEX - Toluene _A [#]	-	<0.01	-	-	-	-		mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene _A [#]	-	<0.01	-	-	-	-		mg/kg	0.01	A-T-022s
BTEX - m & p Xylene _A [#]	-	<0.01	-	-	-	-		mg/kg	0.01	A-T-022s
BTEX - o Xylene _A [#]	-	<0.01	-	-	-	-		mg/kg	0.01	A-T-022s
MTBE _A [#]	-	<0.01	-	-	-	-		mg/kg	0.01	A-T-022s

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Asbestos:

Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.

Stones etc. are not removed from the sample prior to analysis.

Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:

1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample, 9 = INCINERATOR ASH.

Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.

Secondary Matrix Codes:

A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,

E = contains roots/twigs.

Key:

IS indicates Insufficient Sample for analysis.

US indicates Unsuitable Sample for analysis.

NDP indicates No Determination Possible.

NAD indicates No Asbestos Detected.

N/A indicates Not Applicable.

Superscript # indicates method accredited to ISO 17025.

Superscript "M" indicates method accredited to MCERTS.

Subscript "A" indicates analysis performed on the sample as received.

Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve

Subscript ""^" indicates analysis has dependant options against results. Testing dependant on results appear in the comments area of your sample receipt.

EPH CWG results have humics mathematically subtracted through instrument calculation

TPH results "with Cleanup" indicates results cleaned up with Silica during extraction

EPH CWG GCxGC ID from TPH CWG

Where we have identified humic substances in any ID's from TPH CWG with Clean Up please note that the concentration of these

humic substances is not included in the quantified results and are included in the ID for information.

Please contact us if you need any further information.

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client:	WML Construction , No 8 Oak Green, Earl Road, Stanley Green Business Park, Cheadle Hulme, Cheshire, SK8 6QL	Project No:	22/07387
Project:	Whiston Hospital, Prescot	Date Received:	29/07/2022 (am)
Clients Project No:	9163G	Cool Box Temperatures (°C):	20.5

NO DEVIATIONS IDENTIFIED

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	22/07387/1	22/07387/2	22/07387/3	22/07387/4	22/07387/5	22/07387/6
Client Sample No	1	2	2	3	4	5
Client Sample ID/Depth	BH02 0.30-0.50m	BH02 0.70-0.80m	BH01 1.30-1.50m	BH01 2.30-2.50m	BH01 3.30-3.50m	BH01 4.40-4.60m
Date Sampled	27/07/22	27/07/22	26/07/22	26/07/22	26/07/22	26/07/22
A-T-019s	02/08/2022	02/08/2022				
A-T-022s		03/08/2022				
A-T-024s	03/08/2022	03/08/2022				
A-T-026s	03/08/2022	03/08/2022	03/08/2022	03/08/2022	03/08/2022	03/08/2022
A-T-027s	03/08/2022	03/08/2022				
A-T-028s	03/08/2022	03/08/2022				
A-T-031s	03/08/2022	03/08/2022	03/08/2022	03/08/2022	03/08/2022	03/08/2022
A-T-032 OM	04/08/2022	04/08/2022				
A-T-040s	03/08/2022	03/08/2022				
A-T-042sTCN	05/08/2022	05/08/2022				
A-T-044	03/08/2022	03/08/2022	03/08/2022	03/08/2022	03/08/2022	03/08/2022
A-T-045	01/08/2022	01/08/2022				
A-T-050s	02/08/2022	02/08/2022				
A-T-055s		04/08/2022				

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report

APPENDIX 05

Gas and Groundwater Monitoring

Gas & Groundwater Monitoring Record Sheet



Project Name:- Whiston Hospital
Project No:- 9163G
Client:- St. Helens & Knowsley NHS Hospitals Trust
Date:- 19/08/2022
Start Time:- 09:45
End Time:- 10:10
Ground Conditions:- Dry
Weather Conditions:- Clear, warm, light br
Atmospheric Pressure
Start:- 1003
End:- 1003
Trend:- Steady

Instrument:- Gas Data GFM436
Operator:- T Sheen

Hole ID	Peak Flow l/hr	Steady Flow l/hr	DP	CH4			CO2			Min O2 %	Peak H2S ppm	Peak CO ppm	Hexane %	Water Level mbgl	Base of Hole mbgl
				Peak %	Steady %	Qhg l/hr	Peak %	Steady %	Qhg l/hr						
BH02	<0.1	<0.1	0	0.0	0.0	0.0000	1.8	1.8	0.0018	10.1	0	0	0.025	Dry	6.75

Additional Comments

TEST DATE AND CONDITIONS	
Date	04/10/21
Atmospheric pressure	993mb
Ambient Temp	22.9°C
Enviroics Serial No.	2518

GAS DATA LTD
Unit 4 Fairfield court
Seven Stars Estate
Coventry
CV3 4LJ, UK
+44 (0) 24 7630 3311



GFM436-1 FINAL INSPECTION & CALIBRATION CHECK CERTIFICATE

INSTRUMENT DETAILS	
Serial No	Customer
12969	WML Consulting Ltd

INSTRUMENT CHECKS			
Keyboard	✓	Pump Flow	500cc/min
Display Contrast	✓	Pump Flow @ -200mB	300cc/min
Clock Set / Running	✓	S/W Version	G436.0027/0010
Labels Fitted	✓	Recalibration Date	04/10/22

GAS CHECKS							
Calibration Gas		Instrument Gas Channels Read					
Gas Type	Applied Conc.	CH4 (%)	tol. (% vol.)	CO2 (%)	tol. (% vol.)	O2 (%)	tol. (% vol.)
N2	100%	0.0	0.0	0.0	0.0	0.0	+/-0.1
CH4	5%	5.0	+/-0.3	0.0	0.0	0.0	+/-0.1
	60%	59.8	+/-3.0	0.0	0.0	0.0	+/-0.1
CO2	5%	0.0	0.0	4.9	+/-0.3	0.0	+/-0.1
	40%	0.0	0.0	39.7	+/-3.0	0.0	+/-0.1
O2	20.9%	0.0	0.0	0.1	+0.1	20.8	+/-0.5

OPTIONAL GAS CHECKS							
Calibration Gas		Instrument Gas Channels Read					
Gas Type	Applied Conc.	Label	H2S	CO		Hexane	tol. (% vol.)
		Range	5000ppm	2000ppm		2.00%	
N2	100%		0	0		0	+/- 5.0
H2S	1500ppm		1500	0			+/- 5.0
CO	1000ppm		70	1002			+/- 5.0
Hexane	2.00%					1.912	+/- 10.0

TEST DATE AND CONDITIONS	
Date	04/10/21
Atmospheric pressure	993mb
Ambient Temp	22.9°C
EnviroNics Serial No.	2518

GAS DATA LTD	
Unit 4 Fairfield court	
Seven Stars Estate	
Coventry	
CV3 4LJ, UK	
+44 (0) 24 7630 3311	

GFM436-1 FINAL INSPECTION & CALIBRATION CHECK CERTIFICATE

PRESSURE CHECKS							
Calibration Pressure		Instrument Pressure Channels Read					
Pressure @	Applied Pressure	Atmospheric [Ap] (mB)	tol. (mB)				
All ports	current atmospheric	992	+/-2.0				
Ap port (internal)	+800mB(a)	801	+/-5.0				
	+1200mB(a)	1197	+/-5.0				

FLOW CHECKS					
Calibration Flow		Instrument Flow Channels Read			
Applied Flow	Applied Pressure (Pa)	Flow [Flow] (l/hour)	tol. (l/hour)	Differential Pressure [Dp] (Pa)	tol. (Pa)
-30.0 l/hour	-360	-29.2	+/-3.0	-388	+/-50
-3.0 l/hour	-16	-3.2	+/-1.0	-14	+/-6
0.0 l/hour	0	0.0	0.0	0	+/-0.5
+3.0 l/hour	14	3.1	+/-0.5	16	+/-3
+30.0 l/hour	343	29.5	+/-3.0	353	+/-50
+60.0 l/hour	1030	59.4	+/-6.0	1075	+/-130
+90.0 l/hour	2019	88.3	+/-9.0	2006	+/-250

TEMPERATURE CHECK		
Calibration Temperature	Instrument Temperature Channel Read	
Applied Equivalent Temperature	Temperature [Temp] (°C)	tol. (°C)
-10.0 °C	-10.0	+/- 2.0
0.0 °C	0.0	+/- 1.0
30.0 °C	30.0	+/- 1.0
60.0 °C	60.0	+/- 1.0
100.0 °C	100.0	+/- 1.0

Notes:

The instrument identified by the serial number stated above has been tested by Gas Data personnel for calibration accuracy on the date and under the ambient conditions stated. Gas Data Ltd internal BS EN ISO9001:2015, BS EN ISO 14001:2015 and BS EN ISO 45001:2018 compliant workshop procedures were followed to apply known calibration test gases, gas flow rates, pressures and temperatures of the values stated. The results displayed on the instrument at each stage are recorded above.

Gas Data Ltd is certified to: BS EN ISO 9001:2015
BS EN ISO 14001:2015
BS EN ISO 45001:2018

TEST DATE AND CONDITIONS	
Date	5/14/21
Atmospheric pressure	983 mb
Ambient Temp	23.4 °C
EnviroNics Serial No.	N/A

GAS DATA LTD
Unit 4 Fairfield court
Seven Stars Estate
Coventry
CV3 4LJ, UK
+44 (0) 24 7630 3311



GFM436-1 OUTWARD INSPECTION & QUALITY CHECK SHEET

INSTRUMENT DETAILS			
SO Number	Instrument Banner	Instrument Serial Number + SW Version	Job Number(s)
329344	GFM 436	12969 / 27-14	22124

Calibration Technician *[Signature]*

DATE 6-10-21

Inspection Technician *[Signature]*

DATE 5/14/21

INSTRUMENT CHECKS		Pass (P), Fail (F) or not applicable(NA)	INSTRUMENT PACKING LIST		Tick if included
Function Tests	Dust Caps Fitted	P	Instrument		✓
	Keyboard Test (All keys)	P	Leather Case		✓
	Backlight Test	P	Instrument Strap		✓
	Clock Set / Running	P	AC Battery Charger (UK)		✓
	Comms Test	P	AC Battery Charger (EURO)		X
	Pump Flow Test (In & Out)	P	AC Battery Charger (US)		X
	Overall Leak Test (30mb)	N/A	AC Battery Charger (AUS)		X
	Battery Charge Test	P	Gas Sample Pipe		✓
	Service Date set to?	4/14/22	Hard Carry Case		✓
Channel Tests	Data Logging Enabled?	P	Spares Pot		✓
	Verify CH4/LEL/Hexane/PID	P	Allen Key		X
	Verify CO2	P	Flow Sample Pipe		✓
	Verify O2	P	Temperature Probe		X
	Verify H2S	P	Vane Anemometer		X
	Verify CO	P	USB Cable		X
	Verify LEL	P	USB Memory Stick		X
	Verify 1st Option gas	N/A	SM V5 Software	Ver	X
	Verify atmospheric pressure	P	Internal Filter Pack	Qty 1	✓
	Verify differential pressure	P	External Filter Pack	Qty	X
	Verify flow	P	Field Guide		X
	Verify temperature probe input	P	Extra Items: CUSTOMER'S TOOLS - (SCREWDRIVERS, ADJUSTABLE + ALLEN KEYS)		
	Verify vane anemometer input	P			
	Jobcard(s) completed and signed	P			
	Jobcard(s) booked off database	P			
DataBase Checks	Calibration certificate completed	P			
	Complete & print QI record	N/A			
	No. of Calibration label fitted	10723	Comments		
	MCERTS label not displayed	P			
H2S Range	Warranty label fitted	P			
	H2S Range from SO	5000 ppm			
	H2S Range from cal cert	5000 ppm			
	Over-range value correct?	P			

APPENDIX 06

Screening Levels - Comercial

Screening Levels for "Commercial" end use assuming a 1% SOM for Hydrocarbons.

Contaminant	Screening Levels for Commercial End Use (mg/kg)
Metals	
Arsenic	640
Boron	240,000
Cadmium	190
Chromium III	8,600
Chromium VI	33
Copper	68,000
Lead*	2330
Mercury	58
Nickel	980
Selenium	12,000
Vanadium	9,000
Zinc	730,000
Non Metals	
Phenol	440
Polyaromatic Hydrocarbons (PAHs)	
Benz[a]anthracene	170
Benzo[a]pyrene	35
Benzo[b]fluoranthene	44
Benzo[ghi]perylene	3,900
Benzo[k]fluoranthene	1,200
Chrysene	350
Dibenz[ah]anthracene	3.5
Fluoranthene	23,000
Indeno[123-cd]pyrene	500
Naphthalene	190
Pyrene	54,000

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* Where not included in the S4UL's criteria for a limited number of contaminants, namely lead, have been derived by DEFRA in their document entitled SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination, April 2014.

Contaminant	Screening Levels for Commercial End Use (mg/kg)
Volatile Organic Compounds	
Benzene	27
Ethylbenzene	5,700
Toluene	56,000
M - Xylene	6,200
O - Xylene	6,600
P - Xylene	5,900
Total Petroleum Hydrocarbons	
Aliphatic C5-6	3,200
Aliphatic C6-8	7,800
Aliphatic C8-10	2,000
Aliphatic C10-12	9,700
Aliphatic C12-16	59,000
Aliphatic C16-35	1,600,000
Aliphatic C35 - 44	1,600,000
Aromatic C5 - 7	26,000
Aromatic C7 - 8	56,000
Aromatic C8-10	3,500
Aromatic C10-12	16,000
Aromatic C12-16	36,000
Aromatic C16-21	28,000
Aromatic C21-35	28,000
Aromatic C35 - 44	28,000

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