

BARLOW MOOR BUSINESS CENTRE CHORLTON

PHASE 2 GEO-ENVIRONMENTAL INVESTIGATION, RISK ASSESSMENT AND REMEDIATION STRATEGY

Job Number: LKC 20 1970

Date: 7th April 2021

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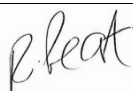
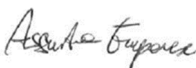
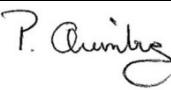


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EXECUTIVE SUMMARY

Site Details

Site Location:	North of Malton Avenue and west of Barlow Moor Road, Chorlton. Centred at approximate National Grid Reference 381800E 393550N.
Site Area:	700m ² .
Current Land Use:	Vacant car repair garage comprising of an 'L' shaped building in the south and west and a tarmacadam yard area over the remainder of the site.
Proposed Development:	Planning Application No. 124236/FO/2019: Erection of a 2-storey building to form offices (Class A2 and Class B1) with associated car parking and landscaping.
Purpose of Report:	Contamination and Geotechnical Assessment.

Preliminary Risk Assessment

PRA Details:	Undertaken by LKC in June 2019. Ref: LKC 19 1315-01.
History:	Unreferenced buildings from earliest mapping. Current L-shaped garage building annotated from 1974 mapping. Historically the surrounding area was a mixture of residential and industrial uses.
Geology / Hydrogeology:	Artificial: None recorded. Superficial: Glaciofluvial Sheet Deposits (sand and gravel). Secondary A Aquifer. Bedrock: Wilmslow Sandstone Formation (sandstone). Principal Aquifer. Not within a Source Protection Zone. No groundwater abstractions within 1km.
Mining:	Outside the Coal Reporting Area and not within a Development High Risk Area.
Relevant Environmental Setting:	No nearby surface water features. No surface water abstractions within 1km. No historical registered landfill within 250m of the site. No potential infilled features within 250m of the site.
Preliminary Conceptual Model: PL=Pollutant Linkage	PL1 Direct Contact (Human Health): Moderate Risk (metals, PAHs, Petroleum Hydrocarbons). PL2 Inhalation of Vapours: Moderate Risk (volatile contaminants). PL3 Gas: Low Risk (hazardous and ground gas). PL4 Controlled waters: Moderate Risk (mobile contaminants). PL5 Sulphate Attack: Moderate Risk (sulphate). PL6 Water Pipelines: Moderate Risk (organic contaminants). PL7 Phytotoxic: Very Low Risk (metals).
Recommendations:	Site Investigation was recommended to further assess PL1, PL2, PL4, PL5, PL6 and PL7.

Ground Investigation Work Undertaken

Date of Investigation:	24 th February 2021.
Intrusive Investigation Work Undertaken:	5no. window sample boreholes (WS101-WS105).
Monitoring Wells:	Installed in WS101, WS103 and WS104.
Soil Sampling:	2no. samples tested for metals, speciated PAHs, pH, sulphate, asbestos and SOM. 3no. samples tested for metals, speciated PAHs, cyanide, pH, sulphate, asbestos, phenol, TPHCWG, BTEX and SOM.
Groundwater Sampling:	2no samples tested for metals, speciated PAHs, cyanide, pH, sulphate, hardness, phenol, TPHCWG and BTEX.
Insitu and Laboratory Geotechnical Testing:	SPTs in all boreholes. 5no. PSDs 3no. BRE SD1 Short suites.

Ground Conditions and Geotechnical Assessment

Location	General Ground conditions	Allowable Bearing Pressure	Anticipated Foundation Type	Other Considerations
Whole Site	Made Ground to approx. 0.4-0.8mbgl. Medium dense SAND to a max depth of 4.9mbgl. Firm to stiff gravelly CLAY to >5.45mbgl Groundwater at 3.3-3.9mbgl.	150kN/m² at approx. 1.0mbgl in medium dense granular soils for standard strip foundations. 236kN/m² for pad foundations of 1m² at 1.0mbgl in granular soils.	Strip foundations for the wall and pad foundations for the supporting columns.	Consideration of effects of trees also needs to be considered. Temporary supports of excavations may be required. Detailed design should be carried out by structural engineer. Concrete Requirements DS1-AC-1. Subject to excavation and recompaction of the Made Ground a CBR of 2-5% may be achievable, this will require confirmation through in-situ tests.

Contamination Risk Assessment

The table below shows a summary of the risk assessments undertaken for each pollutant linkage, the revised conceptual model and recommendation for either remediation and / or further investigation.

Pollutant Linkage		Risk	Recommendations
1	Contaminants posing a risk to site users via dermal contact, ingestion and inhalation (of soil, dust and fibres).	Low	No elevated metals, PAHs, petroleum hydrocarbons identified and no ACMs detected in any of the soil samples tested. Recommendations: No remediation required.
2	Volatile contaminants posing a risk to site users via the inhalation of vapours.	Low	No elevated levels of volatile contamination identified across the site. Recommendations: No remediation required.
3	Gas posing a risk to buildings and site users via the migration of gas into building causing explosion and asphyxiation.	Moderate / Low	No significant source of hazardous gas identified nearby or within the shallow made ground (<0.8m thick). Recommendations: No remediation required.
4	Mobile contamination posing a risk to controlled waters via the migration through permeable strata.	Low	No elevated contaminants identified in groundwater. Recommendations: No remediation required.
5	Sulphate posing a risk to building via direct contact (sulphate attack).	Low	No elevated levels of sulphate identified. Recommendations: No remediation required.
6	Organic contaminants posing a risk to water pipes.	Moderate	Organic contamination (naphthalene) identified at potable pipe depth of 0.75-1.35mbgl. Recommendations: UU risk assessment to be completed. The site will likely require barrier piping if installed in made ground.
7	Phytotoxic metals posing a risk to flora via root uptake.	Low	Elevated zinc identified in one location. Recommendations: No remediation required as not considered a significant risk for any small areas of landscaping.

The results show that all the samples tested are classified as NON-HAZARDOUS WASTE

Recommendations and Remedial Strategy

The table below shows the remediation and validation requirements for the site. This information should be documented in a Site Completion Report for submission to the local authority.

PL	Remediation Requirements	Validation Requirements
ALL	<u>Earthworks Inspections / Unexpected Contamination</u> The relevant contractors should be briefed that during development works at the site, should any unusual ground conditions and / or visual or olfactory evidence of contamination (including asbestos containing material) be encountered at the site, LKC and the Local Authority should be informed, and further assessment of the material may be required. Should asbestos be identified during groundworks, precautions should be taken to ensure the safety of the construction workers and nearby land users. It would be advisable to introduce an asbestos management strategy in line with CIRIA C733¹.	Log of work undertaken including photographs. Details of any sampling undertaken and validation of any potential additional remedial work.
6	<u>Potable Water Pipes</u> It is recommended that a Water Pipeline Assessment is undertaken once the location and depth of potable water pipes are known. It is likely that barrier pipe will be required if installed in the made ground.	Delivery Notes of Pipe Material. Photographs of the Installed Pipe.

The remediation recommended in the table above should be validated to ensure it has been carried out appropriately. This should be documented in a Completion/Validation Report and submitted to the Local Authority for completion.

¹ CIRIA (2014). "Asbestos in Soil and Made Ground: A Guide to Understanding and Managing Risks". C733.

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1 Introduction

1.1 Background

LK Consult Ltd (LKC) has been commissioned by BOS2 Manchester Limited to carry out a Phase 2 Geo-Environmental Investigation, Risk Assessment and Remediation Strategy for Barlow Moor Road Business Centre, Chorlton. The investigation was undertaken in support of a planning application (reference number 124236/FO/2019) to develop the site for a commercial end use.

The following work has previously been undertaken:

- » Preliminary Risk Assessment (PRA) report, undertaken by LKC (Ref: LKC 19 1315, dated 27th June 2019).

This investigation has been undertaken to confirm the ground conditions below the site and to allow a contamination and geotechnical assessment to be undertaken.

The investigation will aim to confirm the risks of the potential pollutant linkages identified in the PRA and recommend further assessment / remediation, as required.

1.2 Site Details

A summary of the site details is presented in Table 1-1. Figures 1 and 2 indicate the site location and boundary. Figure 3 indicates the proposed development.

Location	North of Malton Avenue and west of Barlow Moor Road, Chorlton. Centred at approximate National Grid Reference 381800E 393550N.
Area	700m ² .
Topography	28 metres Above Ordnance Datum (AOD). Site is approximately level.
Land Use	<u>Site</u> Vacant car repair garage comprising of an 'L' shaped building in the south and west and a tarmacadam yard area over the remainder of the site. <u>Surrounding Area</u> North: Commercial properties. East: Car repair garage. South: Residential properties. West: Residential properties.
Proposed Development	Erection of a 2-storey building to form offices (Class A2 and Class B1) with associated car parking and landscaping.

Table 1-1: Summary of site details.

2 Previous Work

2.1 Summary of Existing Information

A PRA report (Ref: CL-602-LKC 19 1315-01, dated 27th June 2019) has previously been undertaken by LKC and is summarised in Section 2.2-2.6.

The conceptual model (Section 2.6) has been updated to be in line with LKC current risk assessment methodology.

2.2 Site History

The site history is summarised in Table 2-1.

Site Features	Location	Map Dates Present	Comments
Unreferenced Building	SW	1893-1911	- Illustrated as a 'Glasshouse' from 1907 mapping. - No longer present from 1923 mapping.
Unreferenced Building	W	1893-1911	- No longer present from 1923 mapping.
Unreferenced Building	W	1893-1893	- No longer present from 1907 mapping.
Track	SW	1893-1911	- No longer present from 1923 mapping.
Unreferenced Building	SE	1933 only	- No longer present from 1934 mapping.
Unreferenced Building	S and W	1934-Present	- 'L' shaped building. - Annotated 'Garage' from 1974 mapping.
Unreferenced Building	E	1955-1956	- No longer present from 1974 mapping.
Surrounding Area Features	Distance / Location	Map Dates Present	Comments
Garage	90m E	1955-Present	- Annotated 'Warehouse' from 1974 mapping.
Electricity Substation	55m SE	1955-Present	
Manchester Corporation Transport Depot	50m SE	1955-Present	- Annotated 'Bus Station' from 1992 mapping.

Table 2-1: Summary of significant historical features.

2.3 Environmental Setting

The environmental setting is summarised in Table 2-2.

Categories		Details
Geology	Artificial	- None recorded on the database.
	Superficial	- Glaciofluvial Sheet Deposits (sand and gravel).
	Bedrock	- Wilmslow Sandstone Formation.
	BGS logs	- BH Ref: SJ89SW4 (No. 54), 190m N: surface soil to 0.61m, SAND to 3.05m, coarse SAND to 3.51m, fine sandy GRAVEL to 4.27m, tough CLAY to >8.23m.

Table 2-2: Summary of the environmental setting.

Categories			Details
Hydro-geology	Aquifer Designation	Superficial	- Secondary A Aquifer.
		Bedrock	- Principal Aquifer.
	Source Protection Zone (SPZ)		- Site is not within an SPZ.
	Groundwater Abstractions		- None within 250m. Nearest 1,485m S operated by Chorlton Cum Hardy Golf Co Ltd where groundwater is abstracted from a borehole for spray irrigation.
Hydrology	Nearest Surface Water		- Chorlton Brook 298m S, flowing W. - River Mersey 1,115m SW, flowing W.
	Water Quality Data		- 398m S, Chorlton Brook – River Quality B.
	Flooding		- No risk from rivers or sea. - Limited potential for groundwater flooding to occur.
	Surface Water Abstractions		- None within 250m. Nearest 1,903m W operated by Mr Barton abstracting water for amenity: lake and pond throughflow.
	Discharge Consent		- None within 250m. Nearest 304m S operated by United Utilities Water Plc discharging public sewage: storm sewage overflow into Chorlton Brook.
	Pollution Incidents		- None within 250m. Nearest 252m SW where rubble/litter or solids were released into Chorlton Brook in February 1993. This was a Category 3 – Minor incident.
Minerals / Mining	Coal Report		- Not within coal reporting area.
	Coal Mining Development High Risk Area (DHRA)		- Not within DHRA.
	Surface Extractions		- No mineral extraction within 500m of the site.
	Cheshire Brine Compensation District		- Not within site area.
	Mining Instability / Non-Coal Mining Area ¹		- No hazard.
Ground Stability ¹ (on-site)	Collapsible Ground		- Very low hazard.
	Compressible Ground		- No hazard.
	Ground Dissolution		- No hazard.
	Landslide		- Very low hazard.
	Running Sand		- Very low hazard.
	Shrinking / Swelling Clay		- No hazard.
Landfill sites	Known/Registered		- None within 250m.
	Potential		- None within 250m.
Radon			- Probability of <1% of homes above Action Level. - No further action required.
Designated Sites			- Adopted Green Belt 532m W. - Local Nature Reserves (Chorlton Ess & Ivy Green) 504m SW.
Contemporary Trade Directory			- 8 within 100m (2 onsite): SW - Spraycraft Ltd (car body repairers) listed as inactive. NW - Miller Autos (garage services) listed as active.
Fuel Station Entries			- None within 100m. Nearest 251m SE Barlow Moor Service Station (Texaco), listed as obsolete.
Unexploded Bomb Risk (UXO) ⁶			- Moderate. - A detailed desk study, whilst always prudent, is not considered essential in this instance.

Table 2-2 (continued): Summary of the environmental setting.

2.4 Site Reconnaissance

A site reconnaissance was carried out on 21st June 2019. Hand dug trial holes were not possible as the entire site was hardstood or occupied by buildings.

Relevant features identified on site are summarised below:

- » The site is accessible through a narrow alleyway between shops off Barlow Moor Road. The alleyway is wide enough for cars but access with larger vehicles such as vans may be difficult.
- » The site is currently occupied by a vacant car repair garage with an L-shaped building occupying the south and western edges of the site.
- » A tarmac yard area is present across the remainder of the site. The surfacing was generally in good condition with no evidence of hydrocarbon staining.
- » The L-shaped building which was used for car repair is single storey with a pitched roof and several roller shutter doors for access.
- » Internally, most of the building is open plan with a small internal office and reception area in the south western corner.
- » A shallow vehicle inspection pit and car lift is present in the centre of the southern section of the building. Oil staining was noted on the floor of the pit.
- » An above ground metal tank is present in the south eastern corner of the building. The tank is labelled as 'heating oil' and, anecdotally, the tank has been emptied. Some limited oil staining was noted on the floor near the tank.
- » A below ground pit with wooden covers is also present in the south eastern section of the building. It was not possible to lift the covers during the site reconnaissance, but it is assumed the pit was a former vehicle inspection pit.
- » A second above ground oil tank is present in the centre of the southern section of the building. Anecdotally, this tank has also been emptied.
- » The floor of the garage building was noted to be concrete and, in the southern section of the building, this was observed to be in good condition with little evidence of cracking or deterioration. Oil staining was present across much of the floor in this area of the building.
- » The concrete floor in the western part of the building was in fair condition but some evidence of degradation was noted. Localised oil staining was also noted.
- » Suspected asbestos containing material (ACM) as corrugated cement bound asbestos was noted forming the roof across most of the garage building.
- » Evidence of site drainage and below ground services was noted in the tarmac yard and alleyway to the north east.
- » The site is open to the east and the rear building walls appear to form the site boundary with residential gardens to the west and south.
- » A large ash tree was noted immediately adjacent to the south eastern corner of the building.

The surrounding area comprises residential properties and gardens to the south and west, commercial properties to the north/north east and an operational car repair garage adjacent to the east.

2.5 Contamination Sources / Pathways and Receptors

Potential contamination sources are detailed in Table 2-3.

Source	Contaminants
Onsite garage	- Typical contaminants from a repair garage include: metals and metal compounds (chromium, copper, lead, zinc); organic compounds such as oil and waste oil (may contain PAHs and heavy metals), ethylene glycol (antifreeze), inorganic compounds such as asbestos; sulphuric acid, lubricants². - If vehicle washing/valeting occurred contaminants may include detergents, but not anticipated. - Contamination associated with any bodywork repairs could include paints. - Site walkover noted above ground heating oil and oil tanks with some localised staining nearby and vehicle inspection pits.
Onsite made ground	- Ash and clinker (e.g. from hearths and boilers, often historically used for site raising / levelling): Heavy metals, sulphates and PAHs³. - If significant depth of organic / putrescible material: Hazardous gas (principally carbon dioxide and methane).
Offsite potentially infilled ground	- No known/registered landfills or areas of potentially infilled ground within 250m of the site.
Surrounding area (garage, warehouse, electricity substation, bus depot)	- No contamination sources within influencing distance of the site more significant than already identified onsite.

Table 2-3: Potential contamination sources.

Potential receptors are detailed in Table 2-4.

Receptors	
Human Health	- Future site users (including visitors and site workers). - Offsite land users. - As the proposed development is for commercial use, the most sensitive receptors (children) have not been included in this assessment.
Controlled Waters	- Principal and Secondary A Aquifers. - Chorlton Brook 298m S is not considered to be a significant receptor given the distance from the site.
Buildings and structures.	
Potable water pipes.	
Flora within future gardens/landscaping.	

Table 2-4: Potential receptors.

Potential pathways are detailed in Table 2-5.

² Department of the Environment Industry Profile (1996). "Road Vehicle Fuelling, Service and Repair: Garages and Filling Stations".

³ Defra (2002). "Potential Contaminants for the Assessment of Land". R&D Publication CLR 8.

Pathways		
Soil	Human Health ⁴ (commercial land use with soft landscaping)	- Ingestion of soil. - Ingestion of soil-derived indoor dust. - Dermal contact with soil. - Dermal contact with soil-derived indoor dust. - Inhalation of soil-derived outdoor dust. - Inhalation of soil-derived indoor dust. - Inhalation of vapours outside. - Inhalation of vapours inside.
		- Omitted: ingestion of contaminated vegetables and ingestion of soil attached to vegetables.
		- Windblown dust and fibres to adjacent receptors.
		- Direct contact with receptors (building foundations, services).
Water		- Root uptake.
		- Surface run-off over impermeable surface.
		- Infiltration into the ground, through potentially contaminated material (contamination possibly going into solution).
		- Site is predominantly hardstood; therefore, infiltration is likely to be limited.
Gas		- Migration through potentially permeable strata and preferential pathways.
		- Superficial (sand and gravel) is likely to be relatively permeable.
		- Bedrock (sandstone) likely to be relatively permeable.
		- Preferential pathways: services.
		- Migration through potentially permeable strata and preferential pathways.
		- Superficial (sand and gravel) is likely to be relatively permeable.
		- Bedrock (sandstone) likely to be relatively permeable.
		- Preferential pathways: services.
		- Migration into buildings (e.g. via services) and accumulation of gases in confined spaces (potentially causing explosion if methane is present).

Table 2-5: Potential pathways.

2.6 LKC Preliminary Contamination Conceptual Model

The preliminary contamination conceptual model using contaminant-pathway-receptor linkages based on guidance in LCRM⁵ has been summarised in Table 2-6.

The aim of the conceptual model is to provide a preliminary assessment of the likelihood of a pollutant linkage for each potential combination of contaminant, pathway and receptor. A conceptual model can be used to make an informed decision on the contamination risks associated with the site and determine what site investigation work is required.

The preliminary contamination conceptual model has identified seven generic potential pollutant linkages. Each linkage is described along with an assessment of the risk based upon guidance on probabilities and consequences outlined in CIRIA C552⁶.

In order to assess the potential risk for each pollutant linkage, an assessment of the magnitude of the potential consequence (severity) of the risk occurring and the magnitude of the probability (likelihood) of the risk occurring has been considered and classified. This is based on the guidance provided in CIRIA C552 and further details including a risk matrix is provided in Appendix A.

⁴ EA (2008). "Updated Technical Background to the CLEA Model". Science Report – SC050021/SR3.

⁵ Land Contamination Risk Management (LCRM) <https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm>

⁶ CIRIA (2001). "Contaminated land risk assessment: A guide to good practice". C552.

Where LKC identified a low to very low risk, limited intrusive investigation work, a watching brief (during construction work) or no investigation work will be recommended. This will be dependent on the nature of the site and the proposed development.

Where the risk falls into the moderate/low risk, LKC will undertake an assessment to establish what category the pollutant linkage will fall into (i.e. moderate or low risk will be chosen).

Where LKC identifies a moderate or higher risk, intrusive work or precautionary remedial measures will be recommended.

The conceptual model is based on the future use of the site (post development), in line with proposed development scheme.

2.7 Recommendations

Based upon the Preliminary Contamination Conceptual Model a site investigation was recommended to assess the potential pollutant linkages further.

Pollutant Linkage	Pathway	Receptor	Contaminant (source)	Probability	Consequence	Risk	Assessment & Recommendations
PL1	- Dermal contact. - Inhalation of soil, fibres and dust. - Ingestion of soils, dust. - Windblown dust.	- Future site users. - Offsite receptors.	- Heavy metals, PAHs, hydrocarbons, ACMs, other inorganic and organic contaminants (made ground, garage).	Likely	Medium	Moderate	- Likely probability given site history and potential pathway to receptors in proposed landscaping. - Recommendation: Intrusive investigation required to include soil samples.
PL2	- Inhalation of vapours. - Migration through permeable strata and preferential pathways.	- Future site users. - Offsite receptors.	- Volatile contaminants such as hydrocarbons, solvents, antifreeze (made ground, garage).	Low likelihood	Medium	Moderate / Low	- Low likelihood as former garage onsite with above ground oil tanks noted during walkover with some localised spillages noted on concrete. Contamination is expected to be minimal and localised as significant leakages / spillages of volatile contamination not anticipated given hardstood ground. - Moderate risk assumed at this stage given former site use. - Recommendation: Intrusive investigation required and sampling to include volatile testing.
PL3	- Inhalation of gas. - Migration through permeable strata and preferential pathways. - Explosion in confined spaces.	- Future site users. - Buildings. - Offsite land users.	- Ground gas. - Hazardous gas.	Unlikely	Severe	Moderate / Low	- Unlikely probability as no viable source of gas identified and low sensitivity nature of development (commercial). - Low risk assumed at this stage. - Recommendation: No gas monitoring required unless significant depth of putrescible made ground is encountered.
PL4	- Surface run-off. - Migration through permeable strata and preferential pathways. - Perched waters migration.	- Groundwater (Principal Aquifer).	- Mobile contaminants such as metals, PAHs, hydrocarbons, (made ground, garage).	Low likelihood	Medium	Moderate / Low	- Low likelihood as former garage onsite with above ground oil tanks noted during walkover with some localised spillages noted on concrete. Contamination is expected to be minimal and localised as significant leakages / spillages of mobile contamination not anticipated given hardstood ground. - Moderate risk assumed at this stage given sensitive nature of the receptor (Principal Aquifer) and anticipated geology (sands and gravels). - Recommendation: Groundwater sampling required.
PL5	- Sulphate attack on concrete.	- Building structure.	- Sulphate (made ground).	Likely	Mild	Moderate / Low	- Likely probability as ash is likely in made ground, which may be in contact with concrete used in future buildings. - Moderate risk assumed at this stage. - Recommendation: Intrusive investigation. required as part of PL1.
PL6	- Ingestion of tainted water supply.	- Future site users. - Water pipes.	- Organic contaminants such as hydrocarbons, solvents (made ground, garage).	Low likelihood	Medium	Moderate / Low	- Low likelihood given former site use, although significant contamination not anticipated at pipeline depth (0.75-1.35m). - Risk is considered moderate at this stage due to unknown depth of made ground. - Recommendation: Sampling required if made ground or contamination present at pipeline installation depths.
PL7	- Direct contact (plant uptake).	- Flora.	- Phytotoxic contaminants (made ground).	Low likelihood	Minor	Very Low	- Low probability as contamination considered possible, which may be taken up by flora in soft landscaping. - Recommendation: Investigation work as part of PL1.

Table 2-6: Preliminary Contamination Conceptual Model.

3 Ground Investigation

3.1 Site Investigation Design and Methodology

In order to assess the ground conditions at the site and to investigate the potential pollutant linkages identified in the preliminary contamination conceptual model an intrusive investigation was undertaken.

The investigation was carried out on 24th February 2021 and comprised 5no. window sample boreholes drilled to 5.45 metres below ground level (mbgl) (ref. WS101 to WS105).

WS104 had to be re-positioned slightly as the window sample rig was unable to pass across the inspection pit due to the wooden covering collapsing.

All site investigation locations are shown in Figure 4.

The locations were chosen to allow a good spread across the site as well as target areas of concern. Table 3-1 details the targeted and general coverage (non-targeted) site investigation locations.

Site Investigation Locations	Rationale
WS101	General site coverage.
WS102	General site coverage.
WS103	Close to above ground heating oil tank and vehicle inspection pit.
WS104	Close to above ground fuel/oil tank and vehicle inspection pit.
WS105	General site coverage.

Table 3-1: Summary of sampling locations.

The number of non-targeted site investigation points corresponds to approximately one location per 15m square centres. This is considered to be a conservative sampling density and is in line with BS10175⁷ for a 'main investigation'.

All profile logs are provided in Appendix B and are in line with BS14688-1⁸ and BS5930⁹.

3.2 Well Installations

3no. (WS101, WS103 and WS104) of the boreholes were installed with monitoring wells for groundwater monitoring and groundwater sampling. Monitoring wells were installed in accordance with BS10175 and CIRIA C665¹⁰ and generally comprised approximately 0.8m-1m of plain pipe over a length of slotted pipe surrounded by pea gravel and sealed at the top with bentonite and concrete.

The response zones for the window sample boreholes were installed along the entire length of the borehole. Well installation details are provided in Profile Logs in Appendix B.

It should be noted that WS103 and WS104 were installed in the area of the above ground tanks for groundwater sampling.

⁷ British Standard (2017). "Investigation of Potentially Contaminated Sites – Code of Practice." BS10175:2017.

⁸ British Standards (2002) Geotechnical investigation and testing – Identification and Classification of Soil. Part 1: Identification and description. BS EN ISO 14688-1:2002.

⁹ British Standard (2015). "Code of Practice for Ground Investigations". BS5930:2015.

¹⁰ CIRIA (2007). "Assessing Risks Posed by Hazardous Ground Gases to Buildings." CIRIA C665.

3.3 Sampling Protocol

3.3.1 Soil Sampling (Contamination)

Standard sampling protocol and preservation of samples was undertaken as described in the EA guidance on site investigation¹¹.

Soil was collected for onsite testing. A plastic zip bag was half filled with soil allowing a suitably sized headspace. The bag was sealed and stored for at least 20 minutes before being tested for total volatile organic compounds (TVOCs) using a PhoCheck Tiger photoionisation detector (PID). Results of the PID readings are presented on the profile logs (Appendix B). The on-site monitoring was carried out in line CIRIA C665¹² to aid in screening samples for volatile analysis.

Soil samples of approximately 500g were recovered in amber jars, amber vials for volatile analysis and plastic tubs. All the samples were labelled and stored in cool boxes prior to being collected by courier at the end of the day for delivery to the Chemtest laboratory in Newmarket for chemical testing. If collection was not possible the same day then samples were stored in the sample storage fridge at the LK Group offices below 4°C. Samples were tracked using appropriate Chain of Custody forms provided by Chemtest.

Many of the contamination tests are UKAS or MCERTS accredited and further details are given in the Certificate of Analysis presented in Appendix C. Table 3-2 shows the soil testing undertaken.

Suites and Contaminants	No. Samples	Location & Depth	Justification
Metals / metalloids, pH, water soluble sulphate, speciated PAHs, SOM and asbestos screen.	2	WS102 0.15-0.6m WS105 0.2-0.6m	A basic suite with a broad selection of contaminants tested on samples across the site where no significant evidence of contamination was identified (with the exception of occasional ash, brick and tarmacadam) and no TVOCs identified from the PID tests.
Metals / metalloids, pH, water soluble sulphate, cyanide suite, phenol, TPHCWG, BTEX, MTBE, speciated PAHs, SOM and asbestos screen.	3	WS101 0.1-0.8m WS103 0.1-0.7m WS104 0.1-0.4m	Although no visual/olfactory evidence of contamination was identified in WS104 (with the exception of some ash), due to location of above ground fuel/oil tanks, detailed suite undertaken on WS104 0.1-0.4m. A possible faint hydrocarbon odour was noted in WS103 therefore a detailed suite was undertaken on WS103 0.1-0.7m. No evidence of unusual ground conditions was observed in WS101 0.1-0.8, however tested as a precaution.
Glycol	2	WS101 0.1-0.8m WS103 0.1-0.7m	WS101 0.1-0.8m and WS103 0.1-0.7m tested for glycol due to location of former garages and vehicle service area. No evidence of unusual ground conditions was observed, however tested as a precaution.

Table 3-2: Summary of soil sample testing undertaken.

Notes: If asbestos present during screen identification and quantification will be undertaken.

Metal/metalloids=arsenic, cadmium, chromium, (total and hexavalent), copper, lead, mercury, nickel, selenium, vanadium, zinc and boron; TPHCWG=carbon banded and aromatic/aliphatic split petroleum hydrocarbons; PAH=polycyclic aromatic hydrocarbons, BTEX=benzene, toluene, ethylbenzene and xylenes; MTBE=Methyl tert-butyl ether, SOM=Soil Organic Matter.

¹¹ EA (2000). "Technical Aspects of Site Investigation. Volumes 1 & 2 Text Supplements Research and Development Technical Report." P5-065/Tr.

¹² CIRIA (2007). "Assessing Risks Posed by Hazardous Ground Gases to Buildings." CIRIA C665.

3.3.2 Groundwater Sampling

To establish the condition of shallow groundwater LKC undertook 2no. groundwater samples.

The groundwater samples were collected a minimum of 1 week after drilling had finished and following well development. Sample collection was undertaken using a low flow sampling pump using thin-walled tubing to encourage laminar flow and minimise the potential loss of volatiles during sampling. The borehole was purged of all standing water and the sample collected from the recharged water. The sample was collected in glass and plastic bottles and a glass vial. A water meter was used to test the pH, temperature and conductivity before sampling until equilibrium conditions were met, as per BS10175¹³ guidelines. A CrVI resident time exceedance (note B) has been noted by the laboratory, however, this does not impact the assessment as CrVI is not anticipated.

WS101 had limited groundwater present at the time of sampling. Therefore, only limited purging was possible and only one vial of groundwater was collected and no testing was carried out as a result.

All water samples were placed in glass bottles, plastic bottles and septum topped vials and stored in ice packed cool boxes. The samples were sent to Chemtest on the same day for analysis. The sampling suite is presented in Table 3-3.

Sampling was carried out in accordance with BS5930¹⁴ and BS5667-11¹⁵.

Many of the tests are UKAS or MCERTS accredited and further details are given in the Certificate of Analysis presented in Appendix D. Table 3-3 shows the groundwater / leachate testing undertaken.

Suites and Contaminants	No. Samples	Location	Justification
Metals / metalloids, pH, sulphate, cyanide suite, TPHCWG, BTEX, MTBE, speciated PAHs, phenol and hardness.	2	WS103 WS104	Although no significant contamination risk identified from the investigation and the soil results detailed suite undertaken in WS103 and WS104 due to proximity of above ground fuel/oil tanks to confirm the absence of contamination.

Table 3-3: Summary of groundwater sampling tests undertaken.

Notes:

Metal/metalloids=arsenic, cadmium, chromium, (total and hexavalent), copper, lead, mercury, nickel, selenium, vanadium, zinc and boron; TPHCWG=carbon banded and aromatic/aliphatic split petroleum hydrocarbons; PAH=polycyclic aromatic hydrocarbons, BTEX=benzene, toluene, ethylbenzene and xylenes; MTBE=Methyl tert-butyl ether.

3.4 Gas Monitoring

Gas monitoring was not carried out as part of this investigation.

A low risk was identified in the preliminary contamination conceptual model for gas (pollutant linkage 3) and further action was only recommended if significant organic / putrescible material was identified on site. Based on the ground conditions encountered, LKC did not consider gas monitoring to be required. This is discussed further in Section 6.3.

¹³ British Standard (2017). "Investigation of Potentially Contaminated Sites – Code of Practice." BS10175:2017.

¹⁴ British Standard (2015). "Code of Practice for Ground Investigations". BS5930:2015.

¹⁵ British Standard (2009). "Water Quality – Sampling. Part 11: Guidance on Sampling of Groundwaters". BS ISO 5667-11:2009.

3.5 Site Investigation Scope

The scope of the contaminated land investigation was agreed with the Local Authority prior to undertaking the work (SI Scope dated 26th January 2021, approved by Sharon Andrews by email dated 29th January 2021). This investigation was in line with the scope however a location (WS104) had to be re-positioned slightly as the window sample rig was unable to pass across the inspection pit due to the wooden covering collapsing.

LKC do not consider the changes to be significant and sufficient investigation work has been undertaken to thoroughly investigate the site.

3.6 Geotechnical Testing

3.6.1 In-situ Onsite Geotechnical Testing

In-situ geotechnical tests were performed in the boreholes to further characterise the sub-soil conditions. The following tests were undertaken:

- » Standard Penetration Tests (SPTs) were performed in the window sample boreholes and cable percussion boreholes at approximately 1m intervals, generally within the natural strata.

The SPT readings are provided within the profile logs (Appendix B).

3.6.2 Laboratory Geotechnical Testing

Soil samples taken during the investigation were collected in tubs and bulk bags and sent to Murray Rix Laboratories and Chemtest for geotechnical testing.

Many of the tests are UKAS accredited and further details are given in the laboratory report presented in Appendix E. Table 3-4 shows the geotechnical testing undertaken.

Suites and Contaminants	No. Samples	Location	Justification
BRE SD1 Short Suite	3	WS101 0.1-0.8m WS101 0.8-1.2m WS102 0.15-0.6m	Additional samples of natural ground taken across the site to assess the pH and sulphate for geotechnical purposes. pH and water-soluble sulphate are also included in the testing detailed in Table 3-2.
Particle Size Distribution (PSD)	5	WS101 0.8-1.2m WS102 0.6-1.2m WS103 1.2-2.0m WS104 1.5-2.0 WS105 1.5-2.0m	PSD undertaken to confirm grading of granular material.

Table 3-4: Summary of geotechnical testing undertaken.

4 Ground Conditions

4.1 Geology – Generalised Sequence

The ground conditions beneath the site comprised made ground underlain by natural silty sand over sand which was further underlain by sand and gravel over slightly gravelly clay. A summary section of the logs is provided in Plate 4-1, with additional comments below.

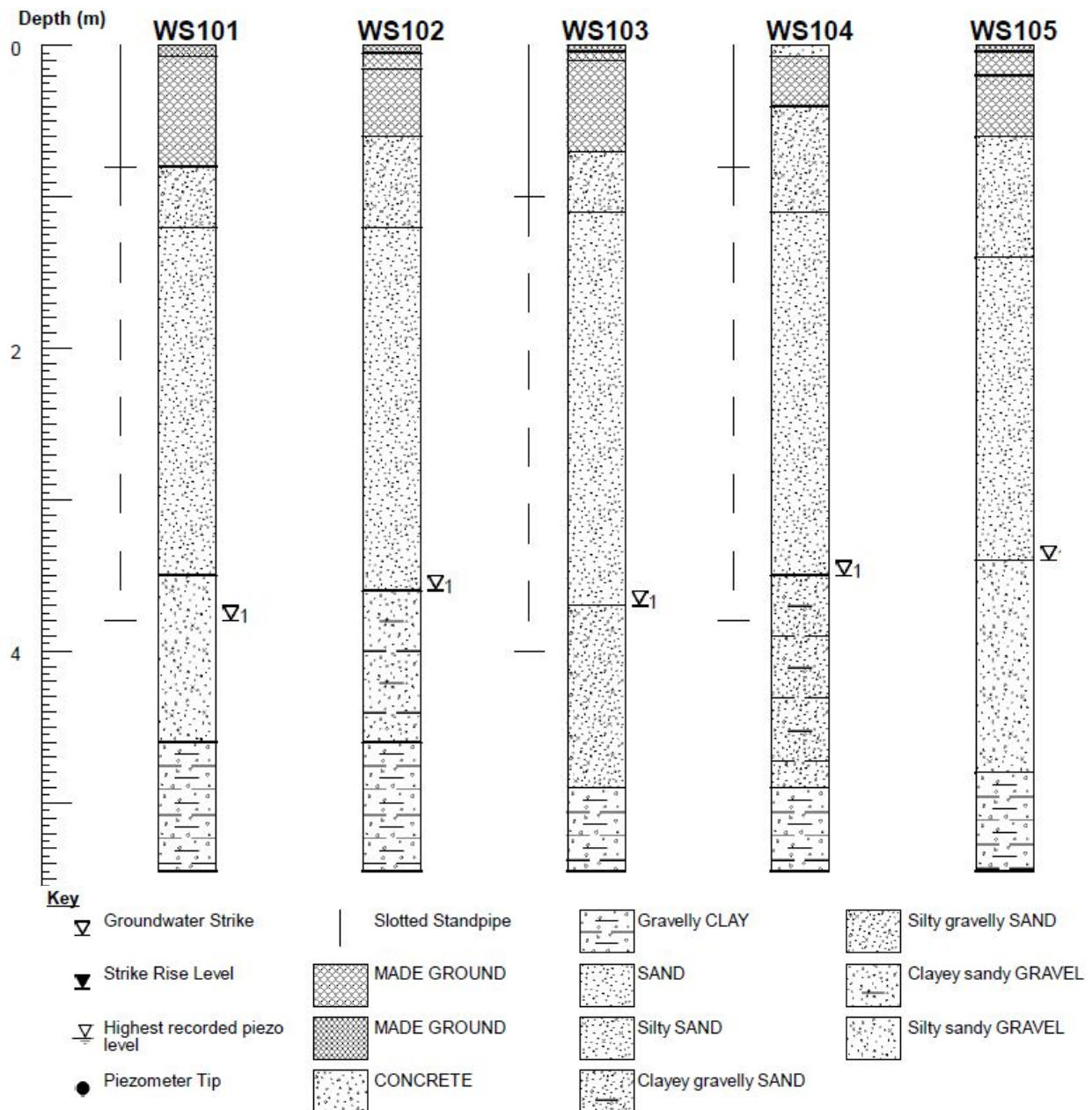


Plate 4-1: Summary of ground conditions.

Additional information on ground conditions:

- Made ground was recorded from depths of 0.4 to 0.8mbgl and generally consisted of tarmacadam and sub-base or concrete over gravelly silty sand with brick and ash. Exceptions to this were:
 - WS105 0.2-0.6mbgl – occasional tarmacadam fragments noted.

- Possible faint hydrocarbon odour was identified in WS103 at 0.04-0.1mbgl within the sub-base underlying the tarmacadam surfacing.

Several of the boreholes were noted to be collapsing from 3.8mbgl when inserting the monitoring installations, and is generally around the level groundwater strikes were noted.

4.2 Groundwater

4.2.1 Groundwater Levels

Groundwater strikes were recorded during the investigation in boreholes. In addition, groundwater monitoring within the 3no. borehole wells has been undertaken on one occasion. An oil-water interface probe (approximately 1cm detection limit) was used to detect the presence of free phase hydrocarbons within each borehole.

It should be noted no water encountered showed any evidence of hydrocarbon impact.

Results are summarised in Table 4-1.

BH Ref.	Water Strike Depths (mbgl)	Well Response Zone (mbgl)	No. of Monitoring Visits	Monitoring Depths (mbgl)		Sample Taken?	Evidence of Contamination?
				Level	Base		
WS101	3.8	0.8-3.8 (S)	1	3.50	3.65	No	No
WS102	3.6	Not installed					
WS103	3.7	1.0-4.0 (S)	1	3.43	3.87	Yes	No
WS104	3.5	0.8-3.8 (S)	1	3.33	3.75	Yes	No
WS105	3.4	Not installed					

Table 4-1: Summary of water strike depths within boreholes.

Response Zones: S=Sands.

4.3 In-Situ Geotechnical Testing

4.3.1 Standard Penetration Tests

In-situ standard penetration tests (SPTs) were undertaken, predominantly in the natural ground. The results are summarised in Table 4-2 and provided within the profile logs in Appendix B.

Approximate Depth (mbgl)	SPT 'N' Values				
	WS101	WS102	WS103	WS104	WS105
1-2	16 (gsiS/S)	15 (gsiS/S)	14 (gsiS/S)	7 (gsiS/S)	14 (siS/S)
2-3	27(S)	26 (S)	21 (S)	22 (S)	30 (S)
3-4	16 (S)	17 (S)	24 (S)	16 (S)	14 (S/S&G)
4-5	19 (S&G)	14 (S&G)	12 (gsiS)	11 (gcS)	12 (S&G)
5-6	12 (gC)	8 (gC)	8 (gC)	11 (gC)	12 (gC)
GW Level	3.8	3.6	3.7	3.5	3.4

Table 4-2: Summary of SPT (N) values.

Notes:

gsiS=gravelly silty SAND; gcS=gravelly clayey SAND; siS=silty SAND; S=SAND; S&G=SAND and GRAVEL; gC=gravelly CLAY.

Groundwater level based on strikes during investigation.

4.4 Geotechnical Laboratory Testing

4.4.1 Particle Size Distribution

Particle size distribution (PSDs) tests were carried out on granular strata to confirm the material type. Full results are presented in Appendix E and summarised below in Table 4-3.

Location	Depth (mbgl)	Material	Percent passing through sieve		
			63mm	2mm	0.063mm
WS101	0.8-1.2	Brown silty SAND	100	100	7
WS102	0.6-1.2	Brown silty SAND with rare gravel	100	96	8
WS103	1.2-2.0	Brown slightly silty SAND	100	100	2
WS104	1.5-2.0	Brown slightly silty SAND with rare gravel	100	99	3
WS105	1.5-2.0	Brown slightly silty SAND with rare gravel	100	99	1

Table 4-3: Summary of particle size distribution results.

Notes:

% passing: 63mm = cobble / gravel boundary; 2mm = gravel / sand boundary; 0.063mm = sand / silt boundary

4.4.2 Sulphate and pH

Water soluble sulphate and pH tests were carried out on soil and groundwater samples. Full results are presented in Appendix C (soils) and Appendix D (groundwater) and summarised in Table 4-4.

Strata	pH		Sulphate	
	Soil	Groundwater	Soil (g/l)	Groundwater (mg/l)
Made Ground	7.9-8.5	8.2-8.3	<0.01-0.35	130-160
Natural	8.3		0.27	

Table 4-4: Summary of pH and sulphate results.

5 Geotechnical Assessment

It is understood that the proposed development will comprise a 2-storey building to form offices (Class A2 and Class B1) with associated car parking. Details of the proposed loadings for the proposed development are not known at this stage and therefore the preliminary geotechnical assessment will be based on the allowable bearing capacity of granular strata.

The finished ground levels have not been provided and it is therefore anticipated that they will not vary significantly from current levels. However, should the development proposals or finished levels be altered then the comments/recommendations in this section may require revising.

The depths of any underground engineering works (sewers etc.) are unknown and therefore have not been taken into account in the following assessment. It is considered that any such works will be designed so as not to have an effect on, or compromise, proposed or existing foundations or ground stability.

- » Made ground (MG) was recorded to a maximum depth of 0.8mbgl and generally consisted of silty sand or sandy gravel (subbase) overlying by tarmacadam; and
- » A thin layer of Tarmacadam is present across most of the site.

Given the nature of the proposed development it is considered that the structure meets the criteria of Geotechnical Category 1 of Euro Code 7¹⁶.

Given the nature of the development it is considered that acceptable risk from settlement is a total settlement value of 25mm for a masonry structure.

5.1 Summary of Ground Conditions

Ground conditions identified at the site are detailed in Section 4 and summarised in Table 5-1 below.

Strata	Typical Description	Min Depth to top of Strata (mbgl)	Max Depth to top of Strata (mbgl)	Max Thickness (m)
Made Ground	Gravelly silty sand with occasional brick fragments and ash OR Tarmacadam underlaid by sandy gravel.	0.00	0.8	0.8
Granular (Glaciofluvial Deposits)	Medium dense slightly gravelly slightly silty SAND, becoming locally loose below groundwater level.	0.4 – 0.8	4.6 – 4.9	3.8 – 4.5
Cohesive (Glacial Till)	Firm to stiff consistency medium strength slightly gravelly CLAY.	4.6 – 4.9	>5.5	>0.6 – >0.9

Table 5-1: Summary of ground conditions.

¹⁶ Eurocode 7: Geotechnical design - Part 1: General rules. EN 1997-1:2004.

5.2 Site Preparation

The site should be cleared and any vegetation below areas of proposed development stripped in accordance with Series 200 of the Specification for Highway Works¹⁷. This should include:

- Roots present below the footprint of proposed structures and infrastructure should be grubbed out and the resulting void infilled with suitable compacted engineered fill;
- Redundant services should be sealed off and grubbed out and replaced with suitable compacted engineered fill; and,
- Buried structures and old foundations of past structures could be encountered during construction works, as the area is a former car repair garage. These should be excavated from below the proposed development footprint with the resulting void backfilled.

Hardstanding is present on site as Tarmacadam in the yard area of the garage. Where hardstanding is broken out the near surface soils may potentially be disturbed by weathering and site traffic. Precautions should be taken to avoid this, as excessive disturbance may result in more onerous floor slab design and increased amount of site disposal etc.

5.3 Foundation Conditions and Bearing Capacity

5.3.1 General

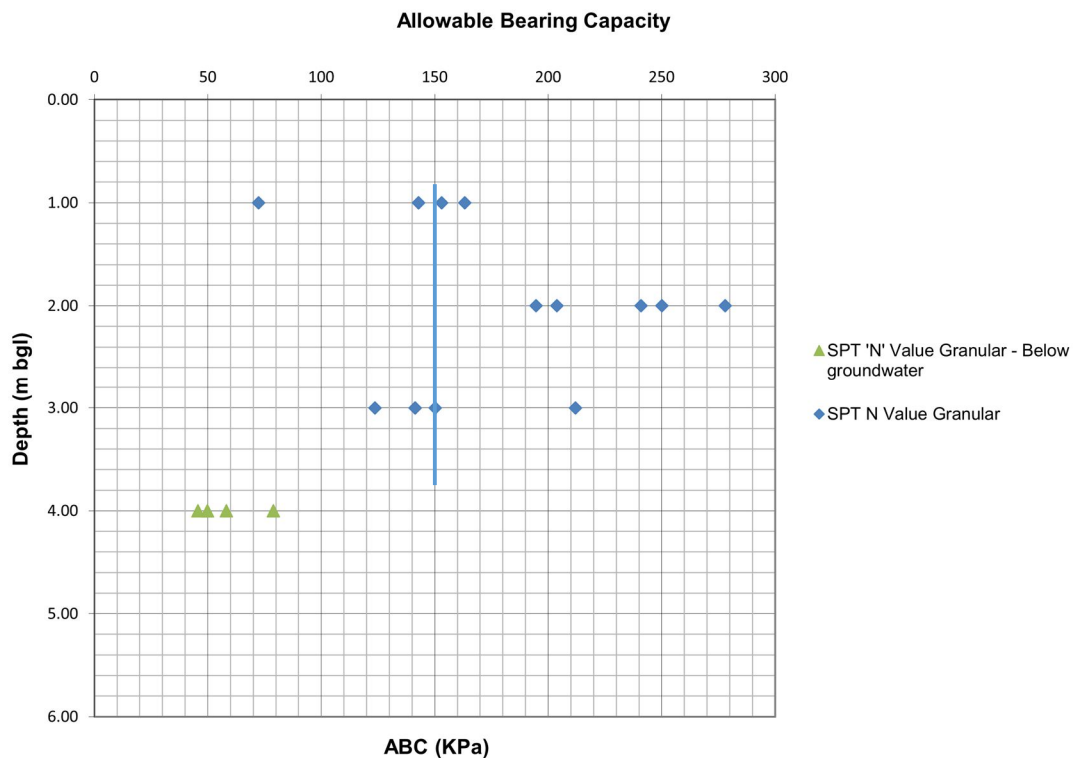
It is considered that the Made Ground and any granular material of loose density are not suitable for a founding material due to the inherent variability of the material. The loading should be transferred to medium dense SAND of the natural strata.

Foundation options will be dependent upon the location and types of structures which are proposed but are considered likely to comprise:

- Conventional strip foundations on the underlying natural granular supporting walls; and,
- Pad footings supporting column loads.

For granular soils of the Glaciofluvial Deposits, an assessment of the ABC has been undertaken using data obtained from in-situ geotechnical tests, including SPT. This data is shown in Graph 5-1.

¹⁷ Manuals of Contract Documents for Highway Works. Volume 1 – Specification for Highway Works. Series 200 Site Clearance. February 2016.



Graph 5-1: Summary of ABC vs depth from in-situ SPT in the granular soils of the natural strata.

Graph 5-1 shows a constant ABC value with depth. A conservative value of ABC of 150kN/m² can be used from a depth of approx. 1.0mbgl in the granular soils of the natural strata, above the groundwater level. The granular soils above the groundwater level have a medium density, with the exception of WS104 at 1.00mbgl. At this location, the slightly silty SAND is loose, returning an ABC value of 72kN/m². Car parking is currently proposed at WS104 location; however if the proposed development is altered then consideration may need to be given to a ground improvement solution.

Groundwater level was encountered at all borehole locations at depth of 3.3-3.9mbgl within the granular soils of the natural strata. Where groundwater is encountered within the granular soils, the ABC value should be halved.

The ABC values shown in Graph 5-1 are already halved to account for groundwater. ABC of granular soils below groundwater level ranged between 46 and 79kN/m² at a depth of approx. 4.0mbgl. The layer of granular soils within the groundwater has a loose density.

The SPT N uncorrected values ranged between 14 and 30 in the medium dense SAND, which gives an angle of shearing resistance of 31-35°. An average value of 33° is considered representative.

Soft spots or loose granular soils should be removed by a minimum of 300mm and backfilled with suitable granular material compacted in engineering manner.

The foundation options are discussed in the following Sections.

5.3.2 Pad Foundations

An assessment has been made on a pad foundation supporting column loads for the granular soils of the made ground. For preliminary assessment purposes, two sizes of pad (1m^2 and 2m^2) have been considered at depths of 1.0m and 1.5mbgl for medium dense and loose SAND.

The ABC incorporates a Factor of Safety (FoS) of 3 for conservancy, results are shown in Table 5-2 for the medium dense SAND.

Pad Size	Pad Depth (mbgl)	Net Ultimate Bearing Capacity (Q_{nf}) kN/m^2	Allowable Bearing Capacity (kN)	Φ (°)
1m^2 (1.00m x 1.00m)	1.0	690	236	33
	1.5	954	326	
2m^2 (1.42m x 1.42m)	1.0	759	259	
	1.5	1022	349	

Table 5-2: Summary of pad ABC in medium dense granular soils of the natural strata.

For the medium dense SAND, the pad analysis shows an ABC of 236kN for a 1m^2 increasing to 259kN for a 2m^2 pad foundation placed at a depth of 1.0mbgl. For a pad foundation level at a depth of 1.5mbgl, the pad analysis shows an ABC value of 326kN for a 1m^2 to 349kN for 2m^2 . The increasing of level foundation to a depth of 1.5mbgl has a marginal benefit to ABC for the considered pad size.

The above is for assessment purposes only, foundation design should be undertaken by the Structural Engineer, once the loads are known.

5.4 Ground Floor Slabs

Due to the presence of varying thickness for the Made ground up to 0.8m across the site it is considered that suitable preparation of the sub-grade, by a combination of excavation and re-compaction, a ground bearing floor slab should prove suitable for the proposed building.

Floor slabs should be designed by a suitably experienced structural engineer.

5.5 Pavement Construction

No assessment of the California Bearing Ratio (CBR) for the Made Ground and natural strata was undertaken on site at the location of the proposed car park.

At borehole locations WS103 and WS105, a sub-base of gravel is already present underlying the layer of tarmac. At borehole location WS104, the MG is made of a top layer of concrete overlying silty sand.

Due to potential variability of the Made ground across the proposed car park, it is considered that the topsoil is not suitable for use as a sub-grade. Untreated Made Ground is considered unsuitable as a sub-grade due to its potential variability and potentially low strength/high compressibility. It should be removed to a depth of 0.5m below formation level and sorted to remove any unsuitable or deleterious materials. The sub formation should be rolled and suitable excavated material can then be replaced, up to formation level, in fully compacted thin layers. Any deficit should be made up with suitable imported fill compacted as above. Following this treatment an overall design CBR of 2-5% should be available, although this will require confirmation at a later date through in-situ CBR tests.

5.6 Drainage

The granular soils of the natural strata may prove suitable for the application of soakaway drainage.

The presence of Made Ground all over the site may result in settlement. It is therefore recommended that drain runs are designed using steeper gradients and flexible joints to allow for some differential settlement.

5.7 Concrete Durability

Based upon the results of the chemical analyses summarised in Table 4-4 it is considered that subsurface concrete can be designed in accordance with Design Sulphate Class DS-1, Aggressive Chemical Environment for Concrete Classification (ACEC) AC-1 in accordance with the recommendations provided in BRE Special Digest 1 (2005). It has been assumed that there is the groundwater level is mobile within the granular soils.

5.8 Excavations

Site observations indicated that excavations should be feasible in the near surface with normal plant. The exploratory holes were observed to be generally stable during drilling however given the granular nature of the natural the short- and long-term stability of near vertically sided excavations cannot be guaranteed and random and sudden instability within these soils should be anticipated, in particular at groundwater level.

Due to the variability of the Made Ground it is considered that all excavations are supported or battered back in accordance with guidance contained in CIRIA R97¹⁸.

Groundwater levels were recorded at depths of between 3.3mbgl and 3.9mbgl at borehole locations across the site. It is considered that conventional sump pumping should be adequate to dewater any excavations.

5.9 Construction Activity and Inspection

The following activities and inspections should be incorporated into the site works:

- It is recommended that sufficient allowance is made for the inspection of formation and sub formations to foundations and pavement construction;
- Excavations where access is required should be subject to a risk assessment from a competent person and where appropriate mitigation measures such as benching back the sides or use of support systems in accordance with CIRIA R97 utilised;
- It is considered that de-watering will be required, especially following periods of heavy rainfall or where groundwater was encountered within the granular soils. Removal of surface water and water within trenches should be possible with conventional sump pumping. Discharge of any water should be agreed with the relevant regulatory body and be undertaken under a trade effluent discharge, where required. Measures to remove silt and suspended solids may be required and consideration should be given to provision of space for settling tanks or an attenuation pond;
- Where access to confined spaces is required appropriate mitigation measures should be addressed within the Construction Stage Health and Safety Plan. Particular account should be taken of the gas results.

¹⁸ CIRIA Report 97 – Trenching Practice – Second Edition (2001 revision)

- » The presence of potential contamination and mitigation measures should be addressed as part of the Construction Stage Health and Safety Plan and should include measures to design out the risks, reduce their impact and finally the use of Personnel Protective Equipment (PPE).

6 Generic Risk Assessment

6.1 Introduction

Current good practice requires that the findings from a site investigation should be evaluated on a site-specific basis, using a risk-based approach. Risk assessment involves identification and evaluation of the hazards presented by the concentrations of contaminants measured followed by an evaluation of the risks which are associated with these hazards (LCRM¹⁹). Information gathered from the risk assessment has been collated in the revised contamination conceptual model in Section 6.6.

6.2 Soil Risk Assessment

6.2.1 Methodology

With regards to the soil risk assessment LKC will use the following hierarchy:

- Category 4 Screening Levels (C4SLs).
- LQM Suitable 4 Use Levels (S4ULs).
- ATRISK Soil Screening Values (SSVs) and CL:AIRE Generic Assessment Criteria (GACs).

C4SLs were published in 2013^{20,21}. The change to the contaminated land guidance has changed the evaluation of risk from 'minimal' (referred to as Health Criteria values (HCVs))²² used to generate Soil Guideline Values (SGVs) to 'low' (referred to as Lowest Level of Toxicological Concern (LLTCs)). The policy companion document and supporting letter by Defra, dated 3rd September 2014, states that C4SLs '*could be used under the planning regime, as well as within Part 2A*'. Based on these comments LKC considers the justifications and assumptions used to generate 'low' risk are suitable for the planning regime.

Where no C4SLs have been generated LKC will use the LQM S4ULs²³. Similar assumptions and land uses to C4SLs have been used. However, toxicological information has been based on 'minimal risk' as per previous guidelines and assumptions^{24,25,26,27}.

If contaminants are not present as C4SLs and S4ULs then LKC will use ATRISK SSVs or CL:AIRE GACs²⁸. These follow the 'minimal' risk principle and more stringent exposure parameters and will be conservative.

LKC consider the main risk drivers for PAHs are benzo(a)pyrene (B(a)P) and naphthalene. This is due to B(a)P possibly being a carcinogen and most toxic of the

¹⁹ Land Contamination Risk Management (LCRM) <https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm>

²⁰ Defra (2014). "SP1010: Development of Category 4 Screening Levels and Assessment of Land Affected by Contamination – Policy Companion Document."

²¹ CL:AIRE (2013). "SP1010: Development of Category 4 Screening Levels and Assessment of Land Affected by Contamination – Final project Report."

²² EA (2008). "Human Health Toxicological Assessment of Contaminants in Soils." Science Report – SC050021/SR2.

²³ LQM (2014). "The LQM/CIEH S4ULs for Human Health Risk Assessment."

²⁴ EA (2008). "Updated Technical Background to the CLEA Model." Science Report – SC050021/SR3.

²⁵ EA (2008). "Human Health Toxicological Assessment of Contaminants in Soils." Science Report – SC050021/SR2.

²⁶ EA (2008). "A Review of Body Weight and Height Data used within the Contaminated Land Exposure Assessment Model (CLEA)." Project SC050021/Technical Review 1.

²⁷ EA (2009). "Compilation of Data for Priority Organic Pollutants for Derivation of Soil Guideline Values." Science report SC050021/SR7.

²⁸ CL:AIRE (2009). "The Soil Generic Assessment Criteria for Human Health Risk Assessment."

PAHs^{29,30} and naphthalene the most volatile and soluble³¹. The new C4SLs indicate B(a)P as a surrogate marker for carcinogenic PAHs, if it falls within appropriate limits, since the risk from other non-carcinogenic PAHs are considered negligible³². For B(a)P to be used as a surrogate marker it should follow the profile described by the HPA (2008)³³ and CL:AIRE (2013). Naphthalene will be treated separately using the LQM S4ULs.

The proposed development is for rection of a 2-storey building to form offices with associated car parking and landscaping, therefore the assessment criteria for commercial has been used.

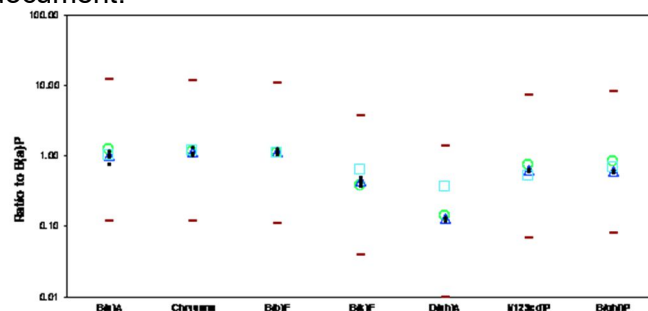
All criteria have been generated using the CLEA V1.06 model³⁴ based either on 1%, 2.5% and 6% Soil Organic matter (SOM). Results will be compared to the nearest appropriate SOM.

A summary of the generic assessment criteria is provided in Appendix F. ATRISK SSVs and CL:AIRE GACs were not required for this dataset and have not been included.

B(a)P as Surrogate Marker

Based on the above assumption for PAHs, LKC undertook an assessment of the data for the site with regards to using B(a)P as a surrogate marker for carcinogenic PAHs as per HPA and CL:AIRE guidelines. The primary toxicological study related to Culp *et al.*³⁵, which was based on coal tar mixtures (>80,000mg/kg of total PAHs) fed in food to mice over a two-year carcinogenicity study.

Graph 6-1 summarises the study site data with respect to how the ratios of carcinogenic PAHs relate to B(a)P, within the confidence limits provided in the HPA document.



Graph 6-1: The ratio of PAH to B(a)P in soil for all available data at the site based on 5 samples (where values were >LOD to allow the calculation of a ratio).

Notes: B(a)P = Benzo(a)pyrene; D(ah)A = Dibenzo(ah)anthracene; B(a)A = Benzo(a)anthracene; B(b)F = Benzo(b)fluoranthene; B(k)F = benzo(k)fluoranthene; I(123cd)P = Indeno(123cd)pyrene; B(ghi)P = Benzo(ghi)perylene

● = Ratio to B(a)P for all data ○ = Mean ratio to B(a)P for Culp data ▲ = Mean ratio to B(a)P from all data at the site
□ = Mean ratio to B(a)P for UK data presented by HPA ■ = Upper and Lower limits (order of magnitude from Culp data)

²⁹ EA (2002). "Contaminants in Soils: Collation of Toxicological Data and Intake Values for Humans. Benzo[a]pyrene." R&D Publication TOX2.

³⁰ USEPA (1984). "Health Effects Assessment of Polycyclic Aromatic Hydrocarbons (PAHs). EPA 540/1-86-013."

³¹ EA (2003). "Review of the Fate and Transport of Selected Contaminants in the Soil Environment." Draft technical report P5- 079/TR1.

³² CL:AIRE (2013). "SP1010: Development of Category 4 Screening Levels and Assessment of Land Affected by Contamination – Final project Report."

³³ HPA (2010). "HPA Contaminated Land Information Sheet: Risk Assessment Approaches for Polycyclic Aromatic Hydrocarbons (PAHs)." Version 3.

³⁴ EA (2008). "CLEA Software (Version 1.05) Handbook." Science Report – SC050021/SR4.

³⁵ Culp, S; Gaylor, D; Sheldon, W; Goldstein, L and Beland, F (1998). "A Comparison of Tumours Induced by Coal Tar and Benzo-a-pyrene in a 2-Year Bioassay." Carcinogenesis. Vol 19, no. 1, pp. 117-124.

All the data points that could be used to calculate ratios fall inside the upper or lower limits.

Based on this distribution of data LKC considers B(a)P can be used as a surrogate marker for carcinogenic PAHs and the C4SL criteria is suitable for this dataset.

6.2.2 *Soil Results Comparison against Assessment Criteria*

All analysis sheets are presented in Appendix C. Elevated and pertinent results are presented in Table 6-1.

Results have been compared to the relevant assessment criteria and no elevated contaminants were identified.

6.2.3 *Hazard Quotient*

To examine the potential additivity of toxicological effects between the petroleum hydrocarbon fractions, a Hazard Index (HI) as described by the Environment Agency³⁶ technical report was calculated for the samples. This should be undertaken when there are no elevated petroleum hydrocarbons, when compared to assessment criteria of individual fractions. A HI of 0.02 was calculated for WS103 0.1-0.7m (See Appendix G). A HI was not calculated for the remaining samples as no petroleum hydrocarbons fractions were present.

6.2.4 *Direct Contact Risk – Pollutant Linkage 1*

No elevated levels of PAHs, metals or petroleum hydrocarbons were identified when compared to a 'commercial' land use assessment criteria. Therefore, the probability of these contaminants posing a risk to site users is considered unlikely. With a medium consequence, the risk is considered to be moderate and no remediation is recommended.

No asbestos was identified in any of the samples; therefore the probability of asbestos affected site users is considered to be unlikely. With a medium consequence, the risk is low and remediation is not required. However, as a precaution, construction workers should be and vigilant for any suspected ACM during groundworks (discussed further in Section 9.2).

6.2.5 *Risk from Inhalation of Vapours – Pollutant Linkage 2*

A possible faint hydrocarbon odour was noted in WS103 within the thin layer of sub-base underlying the tarmac. No visual / olfactory evidence of volatile contaminants was identified across the remainder of the site during the investigation. The PID did not detect any TVOCs in any of the soils tested. Confirmatory soil analysis did not detect any petroleum hydrocarbons, glycol or naphthalene above detection limits.

LKC therefore consider the probability of volatile contaminants affecting site users as unlikely. The consequence is expected to be medium, giving a low risk and no remediation is required with respect to pollutant linkage 2.

³⁶ EA (2005). "The UK Approach for Evaluating Human Health Risks from Petroleum Hydrocarbons in Soils." Science report P5-080/TR3.

6.3 Gas Risk Assessment

Gas monitoring was not carried out as part of this assessment. The PRA identified a moderate/low risk and recommended gas monitoring if a significant depth of organic / putrescible material was identified.

No organic / putrescible material was encountered on site. Made ground was encountered to a maximum depth of 0.8m and generally comprised of a dark brown gravelly silty sand with ash and brick fragments.

Given the ground conditions encountered, LKC considers the probability of gas posing a risk to site users as unlikely. The consequence is severe, which gives a moderate / low risk. Given the known ground conditions, LKC considers there to be a low risk and no further action is required with respect to pollutant linkage 3.

6.4 Controlled Water Assessment

LKC considers the Principal Aquifer as the primary receptor.

LKC have compared results above Limits of Detection (LOD). Where relevant the review of priority substances takes precedence considering threshold values for groundwater cannot be used '*as part of site-specific investigations*'. The hierarchy is as follows:

- » River Basin District Standards³⁷ and updated Water Framework Directive³⁸ for Annual Average / Maximum Allowable Concentration Environmental Quality Standards (AA-MAC-EQS) for priority substances (surface water risk).
- » 2016 private water supply standards (UKDWS potable)³⁹.
- » 2001 Environment Agency Values for Environmental Quality Standards (EQS) and UK Drinking Water Standard (UKDWS)⁴⁰.
- » With regards to hydrocarbon mixtures (TPHCWG and PAHs) for UKDWS, LKC will use the CL:AIRE guidance on petroleum hydrocarbons in groundwater⁴¹ based on WHO guidelines.

No elevated contaminants above detection limits were identified in any water sample.

No free product was noted in any water samples

Based on the above, LKC considers the probability of contaminants on site affecting the Principal Aquifer as unlikely. Given the medium consequence, a low risk is anticipated (Pollutant Linkage 4) and no remediation is required.

6.5 Additional Risk Assessments

6.5.1 Concrete (Pollutant Linkage 5)

The concentrations of soluble sulphate in the soil when contrasted to BRE Digest 2005⁴² categorise the concrete requirement as DS-1 AC-1.

³⁷ Defra (2010). "The River Basin Districts Typology, Standards and Groundwater Threshold Values". Water Framework Directive (England and Wales) Directions 2010.

³⁸ Defra (2015). "Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015".

³⁹ Statutory Instruments (2016). "The Private Water Supplies Regulation 2016." No. 614

⁴⁰ EA (2002). "Environment Agency technical advice to third parties on Pollution of Controlled Waters for Part IIA of the Environment Protection Act 1990."

⁴¹ CL:AIRE (2017). "Petroleum Hydrocarbons in Groundwater: Guidance on Assessing Petroleum Hydrocarbons Using Existing Hydrological Risk Assessment Methodologies."

⁴² BRE (2005). "Concrete in Aggressive Ground." Special Digest 1.

Based on the above, the probability of sulphate concentrations affecting buildings is unlikely. Given the consequence is considered to be mild, the risk (pollutant linkage 5) is anticipated to be low and no remediation is required. This should be confirmed with the structural engineer.

6.5.2 Potable Water Supply (Pollutant Linkage 6)

Soil results were compared to United Utilities (UU) guidelines for the selection of potable water pipes in land potentially affected by contamination⁴³. Only contaminants of concern, based on the preliminary conceptual model and ground conditions encountered, were analysed. The following contaminants were not considered to be a risk and therefore not included in the analysis suites: chlorinated compounds, cresols, ethers, nitrobenzene, ketones, aldehydes and amines.

The following elevated contaminants were identified:

» Elevated TVOCs (inc. naphthalene) in made ground in WS101 and WS103.

It is likely that barrier pipe will be required across the site subject to the depth and location of the water pipes and in consultation with UU. It should be noted typical pipework depths are 0.75mbgl to 1.35mbgl. Once details of the pipeline location and depths are known a UU Risk Assessment should be undertaken.

At this stage, the probability of organic contaminants affecting potable water pipes is likely. Given the consequence is considered to be medium, the risk (pollutant linkage 6) is anticipated to be moderate risk and remediation (i.e. barrier pipe) is likely to be required (subject to further risk assessment).

6.5.3 Phytotoxicity (Pollutant Linkage 7)

Soil results were compared to phytotoxic guideline values as outlined in BS3882⁴⁴.

Elevated zinc was identified in one location (330mg/kg in WS103 at 0.1-0.7mbgl). The probability of phytotoxic contaminants affecting vegetation is considered to be likely around WS103. With a minor consequence, the risk (pollutant linkage 7) is anticipated to be low and considering the site end use and limited landscaping no specific remediation is required.

6.6 Revised Contamination Conceptual Model

The preliminary contamination conceptual model (Table 2-6) has been revised following the risk assessments undertaken in Sections 6.1-6.5. The revised contamination conceptual model follows the same methodology and guidance used in the preliminary contamination conceptual model. The risk matrix is provided in Appendix A.

The revised contamination conceptual model is presented in Table 6-1.

Where a very low risk is identified no specific remediation is required.

⁴³ UU(2011). "United Utilities Water Supplementary Guidance for the Selection of Water Pipes in Land Potentially Affected by Contamination."

⁴⁴ BS (2015). "Specifications for Topsoil and Requirements for Use." BS3882:2015.

Where a low risk is identified, some form of remediation may be required depending on the pollutant linkage, the type and concentration of contaminants present and the proposed development.

Where there is a moderate/low risk is identified, an assessment will be undertaken to establish what category the pollutant linkage will fall into.

Where LKC identifies a moderate or higher risk, remediation or further investigation work is recommended.

Further details of the remedial proposals and a remedial option appraisal are given in Section 9.

Barlow Moor Road Business Centre, Chorlton
Phase 2 Geo-Environmental Investigation, Risk Assessment and Remediation Strategy

Pollutant Linkage	Pathway	Receptor	Contaminant	Probability	Consequence	Risk	Assessment
PL1	- Dermal contact. - Inhalation of soil, fibres and dust. - Ingestion of soils, dust. - Windblown dust.	- Future site users. - Offsite receptors.	- Heavy metals, PAHs, hydrocarbons, ACMs, other inorganic and organic contaminants.	Unlikely	Medium	Low	- Unlikely probability as no elevated metals, PAHs, hydrocarbons and no ACM identified in the made ground across the site which could come into contact with site users in any areas of soft landscaping areas. - Recommendation *1 *2: No remediation required.
PL2	- Inhalation of vapours. - Migration through permeable strata and preferential pathways.	- Future site users. - Offsite receptors.	- Volatile contaminants such as hydrocarbons, solvents, antifreeze.	Unlikely	Medium	Low	- No elevated volatile contaminants identified across the site. - Recommendation : No remediation required.
PL3	- Inhalation of gas. - Migration through permeable strata and preferential pathways. - Explosion in confined spaces (methane only).	- Future site users. - Buildings. - Offsite land users.	- Hazardous gas: methane and carbon dioxide.	Unlikely	Severe	Moderate / Low	- Unlikely probability as no viable source of gas identified close to the site. - Made ground across the site was identified to a maximum depth of 0.8mbgl and did not contain any putrescible or degradable material, therefore unlikely probability and low risk of hazardous gas. - Recommendation : No remediation required.
PL4	- Surface Run-off. - Migration through permeable strata and preferential pathways - Perched waters migration.	- Groundwater (Principal Aquifer).	- Mobile contaminants such as metals, PAHs, hydrocarbons.	Unlikely	Medium	Low	- No elevated levels of contaminants when compared to the relevant assessment criteria. - Recommendation : No remediation required.
PL5	- Sulphate attack on concrete.	- Building structure.	- Sulphate.	Unlikely	Mild	Very Low	- No elevated sulphate identified in soils or groundwater. - Recommendation : No remediation required.
PL6	- Ingestion of tainted water supply.	- Future site users (via potable water).	Organic Contaminants: - Naphthalene.	Likely	Medium	Moderate	- Likely probability as elevated naphthalene encountered (based on very conservative UU criteria), which could permeate water pipes and contaminate water supply. - Recommendation : UU risk assessment to be undertaken. Barrier piping likely to be required if installed in the made ground.
PL7	- Direct Contact (plant uptake).	- Flora.	Phytotoxic Contaminants: - Zinc.	Likely	Minor	Low	- Elevated zinc identified in one location, which may be taken up by flora in soft landscaping. - Recommendation : No remediation required as not considered a significant risk for any small areas of landscaping.

Table 6-1: Revised Contamination Conceptual Model.

Notes

*1 Although no ACM identified, contractors should be vigilant during earthworks of any potential ACM. This is discussed further in Section 9.

*2 The characteristics of the made ground should also be taken into account if it is to be used as a topsoil / growing medium for flora. The material should be assessed against the parameters outlined in Table 1 of BS3882 (not included within this assessment).

7 Waste Disposal Assessment

The soil contamination results as presented in Appendix C have been used to help determine the waste classification of material for off-site disposal.

As an initial screen the soil results were inputted into HazWaste Online™. This is a web-based facility that allows an assessment waste as either hazardous or non-hazardous waste based on relevant guidance and legislation^{45, 46, 47, 48, 49, 50, 51, 52, 53}.

HazWaste Online™ has been designed to cover, amongst other waste types, the European Waste List of Waste (LoW) code number 17 "Construction and Demolition Waste (Including Excavated Soil from Contaminated Sites)".

Where less than limits of detection (LOD) were recorded, the value of the LOD was inputted.

Where applicable, appropriate metal species based on hazard statements/ molecular weight, site history, ground conditions and likely species present in soils were used (e.g. metal oxides relating to an ash-based source).

The results show that all the samples tested are classified as NON-HAZARDOUS WASTE and LoW code "17-05-04 - soil and stones other than those mentioned in 17 05 03" is suitable. The HazWaste Online™ output sheets are provided in Appendix H.

⁴⁵ EA (2018). "Guidance on the Classification and Assessment of Waste (1st Edition v1.1)". Technical Guidance WM3.

⁴⁶ CLP Regulation - Regulation 1272/2008/EC of 16 December 2008.

⁴⁷ 1st ATP - Regulation 790/2009/EC of 10 August 2009.

⁴⁸ Correction to 1st ATP - Regulation 758/2013/EU of 7 August 2013.

⁴⁹ WFD Annex III replacement - Regulation 1357/2014/EU of 18 December 2014.

⁵⁰ Revised List of Wastes 2014 - Decision 2014/955/EU of 18 December 2014.

⁵¹ 13th ATP - Regulation (EU) 2018/1480 of 4 October 2018.

⁵² POPs Regulation 2004 - Regulation 850/2004/EC of 29 April 2004.

⁵³ 2nd ATP to POPs Regulation - Regulation 757/2010/EU of 24 August 2010.

8 Conclusions

8.1 Geotechnical

It is considered that the Made Ground and loose SAND of the natural strata are not suitable for a founding material due to the inherent variability of the material. The loading should be transferred to the medium dense SAND to a minimum depth of 0.6-0.8mbgl at the proposed 2-storey location.

Foundation options will be dependent upon the location and types of structures which are proposed but are considered likely to comprise conventional strip foundations for supporting walls and pad footings for supporting column loads.

A conservative value of ABC of 150kN/m² can be used at approx. 1.0mbgl in the medium dense granular soils of the natural strata, for a standard strip foundation.

The pads show an ABC of 236kN for a 1m² increasing to 259kN for a 2m² pad foundation placed at a depth of 1.0mbgl within the target stratum of medium SAND.

Groundwater strikes were recorded at depth of 3.3-3.9mbgl within the granular soils of the natural strata and it is considered that conventional sump pumping should be adequate to dewater any excavations.

The concrete classification in accordance with BRE Special Digest 1 (2005) is DS-1 AC-1 for the made ground and natural strata (if made ground removed), where groundwater may also be present and the water table is mobile.

No CBR testing was undertaken at the proposed car park area. Some areas have already a gravel subbase present and covered in tarmacadam. Other areas are covered with MG and due to potential variability of the MG across the proposed car park, it is recommended to us a CBR values of 1-5%.

The above is for assessment purposes only, foundation design should be undertaken by a specialist contractor.

8.2 Contamination Assessment

A revised contamination conceptual model has been produced by LKC which is summarised in Table 8-1 below (more detailed model provided in Section 6).

Pollutant Linkage		Risk	Recommendations
1	Contaminants posing a risk to site users via dermal contact, ingestion and inhalation (of soil, dust and fibres).	Low	No elevated metals, PAHs, petroleum hydrocarbons identified and no ACMs detected in any of the soil samples tested. Recommendations: No remediation required.
2	Volatile contaminants posing a risk to site users via the inhalation of vapours.	Low	No elevated levels of volatile contamination identified across the site. Recommendations: No remediation required.
3	Gas posing a risk to buildings and site users via the migration of gas into building causing explosion and asphyxiation.	Moderate / Low	No significant source of hazardous gas identified nearby or within the shallow made ground (<0.8m thick). Recommendations: No remediation required.
4	Mobile contamination posing a risk to controlled waters via the migration through permeable strata.	Low	No elevated contaminants identified in groundwater. Recommendations: No remediation required.
5	Sulphate posing a risk to building via direct contact (sulphate attack).	Low	No elevated levels of sulphate identified. Recommendations: No remediation required.
6	Organic contaminants posing a risk to water pipes.	Moderate	Organic contamination (naphthalene) identified at potable pipe depth of 0.75-1.35mbgl. Recommendations: UU risk assessment to be completed. The site will likely require barrier piping if installed in made ground.
7	Phytotoxic metals posing a risk to flora via root uptake.	Low	Elevated zinc identified in one location. Recommendations: No remediation required as not considered a significant risk for any small areas of landscaping.

Table 8-1: Summary Risk Table.

The results show that all the samples tested are classified as NON-HAZARDOUS WASTE.

Remedial recommendations are presented in Section 9.

9 Recommendations and Remedial Strategy

The recommendations provided below are considered appropriate for the site based on the site investigation work undertaken. LKC should stress that no remediation, enabling works or designing works should take place until Regulatory approval has been obtained.

9.1 Remediation and Validation Recommendations

Table 9-1 details the further works and remedial recommendations / requirements.

PL	Remediation Requirements	Validation Requirements
ALL	<u>Earthworks Inspections / Unexpected Contamination</u> The relevant contractors should be briefed that during development works at the site, should any unusual ground conditions and / or visual or olfactory evidence of contamination (including asbestos containing material) be encountered at the site, LKC and the Local Authority should be informed, and further assessment of the material may be required. Should asbestos be identified during groundworks, precautions should be taken to ensure the safety of the construction workers and nearby land users. It would be advisable to introduce an asbestos management strategy in line with CIRIA C733⁵⁴.	Log of work undertaken including photographs. Details of any sampling undertaken and validation of any potential additional remedial work.
6	<u>Potable Water Pipes</u> It is recommended that a Water Pipeline Assessment is undertaken once the location and depth of potable water pipes are known. It is likely that barrier pipe will be required if installed in the made ground.	Delivery Notes of Pipe Material. Photographs of the Installed Pipe.
<u>Grubbing Out of In-Ground Structures</u> It is recommended that in-ground structures are grubbed out as part of the groundworks. In-ground structures expected in south and west of the site associated with the former buildings.		

Table 9-1: Remediation and validation requirements.

Notes: See Table 6-1 for pollutant linkage (PL) details.

⁵⁴ CIRIA (2014). "Asbestos in Soil and Made Ground: A Guide to Understanding and Managing Risks". C733.

Remediation/ Validation Requirements
<u>Re-use of site won material</u> To ensure material is compliant with appropriate waste regulations, any site won material re-used onsite should be in recourse to appropriate exemptions. A U1 and T5 exemption should be registered. This will allow the following to be used onsite or brought in for use onsite (refer to guidance for types of waste that can be used ⁵⁵): 5,000 tonnes (c. 2,500m³) <u>treatment</u> of crushed concrete / stone. 1,000 tonnes (c. 500m³) <u>use of</u> non-hazardous soil. 5,000 tonnes (c. 2,500m³) <u>use of</u> clays, sand, gravel, brick, concrete, stone etc. 50,000 tonnes (c. 25,000m³) <u>use of</u> bituminous material to be used in roadways. A Materials Management Plan (MMP) with recourse to the CL:AIRE Code of Practice may be required if volumes exceed exemption limits. This must be registered before material movement starts onsite. If an MMP is required, this needs to be registered by a Qualified Person (QP) and there must be 'certainty of use' for any material re-used onsite or exported to site to ensure there is no 'sham recovery'. For all the above material will need to be tested at the rate and analytical suites presented in Table 9-2. <u>Health and Safety Considerations</u> In working with, removing or treating any contaminating material it is important that any potential risks associated with the actual site works are mitigated by good environmental management of the site during the remedial phases. Standard health and safety precautions (as per HSE guidance⁵⁶) should be adopted by all workers involved with site enabling and construction works.

Table 9-1 (continued): Remediation and validation requirements.

Notes: See Table 6-1 for pollutant linkage (PL) details.

9.2 Validation of Subsoil / Topsoil (if required)

If required, chemical validation of any imported soils to be used on site in soft landscaping areas should be undertaken. Imported soils should be accompanied by a certificate of analysis and source details.

A summary of the required imported material sampling requirements is presented in Table 9-2. Ideally, the material should be sampled at source to prevent double handling if soil fails, with confirmatory sampling undertaken on importation to site. However, where this is not possible then material imported should be segregated based on source and soil type. Validation samples should be taken prior to placement in landscaped areas to ensure suitability for use.

⁵⁵ <https://www.gov.uk/guidance/waste-exemptions-using-waste>

⁵⁶ HSE (1991). "Protection of Workers and the General Public During Development of Contaminated Land" London HMSO.

Material Type	Source	Suite of Analysis	Sampling Rate
Topsoil	Greenfield	Suite A	1 sample per 50m³ or a minimum 3 samples per source
	Brownfield / Unknown	Suite B	
Subsoil	Brownfield / Unknown	Suite B	1 sample per 150m³ or a minimum 3 samples per source
	Site won natural material / greenfield	Suite A	
	Physical Stone Break Layer	First Generation i.e. quarried sand (subsoil) or stone (break layer)	No testing is required. Certification of material provenance is required.
Recycled Stone (6F2 / screened)		Suite B	1 sample per 500m³ or a minimum 3 samples per source

Table 9-2: Sampling requirements for imported soils.

Notes:

Suite A - Heavy metals, pH, water soluble sulphate, speciated PAH, soil organic matter and asbestos screen.

Suite B - Heavy metals, pH, water soluble sulphate, speciated PAH, phenol, total and free cyanide, soil organic matter, asbestos screen, banded petroleum hydrocarbons (TPH CWG), BTEX, MTBE.

Any soil with visual or olfactory evidence of hydrocarbons should be rejected.

In addition, it should be ensured that the matrix of the topsoil is suitable as a growing medium and no undesirable material is present (in line with BS3882⁵⁷). LKC advise this information is provided by the supplier before material is imported onto site.

Imported material to be used in gardens will be compared against commercial end use criteria (as used in the contamination risk assessment (Section 6-1)). Appropriate remedial target criteria are presented in Appendix F.

9.3 Site Completion Report

It is recommended that any remediation carried out on the site is validated by a third party and suitable documentary evidence provided in a Site Completion Report, such as photographs, consignment documents and analytical results. This should include as a minimum:

- » If required, provision of any waste transfer documents.
- » If required, verification testing of any imported soil for soft landscaping areas.
- » If required, information on the installation of protective pipes and / or sterile trenches.
- » Details of any unexpected contamination identified onsite, suitably risk assessed and / or validated.

The Site Completion Report will assist the Local Authority in the discharge of any future relevant planning condition and will also be of use to solicitors acting on behalf of any prospective conveyancer who may have concerns over the former use of the site.

⁵⁷ BS (2015). "Specifications for Topsoil and Requirements for use." BS3882:2015.

Figures

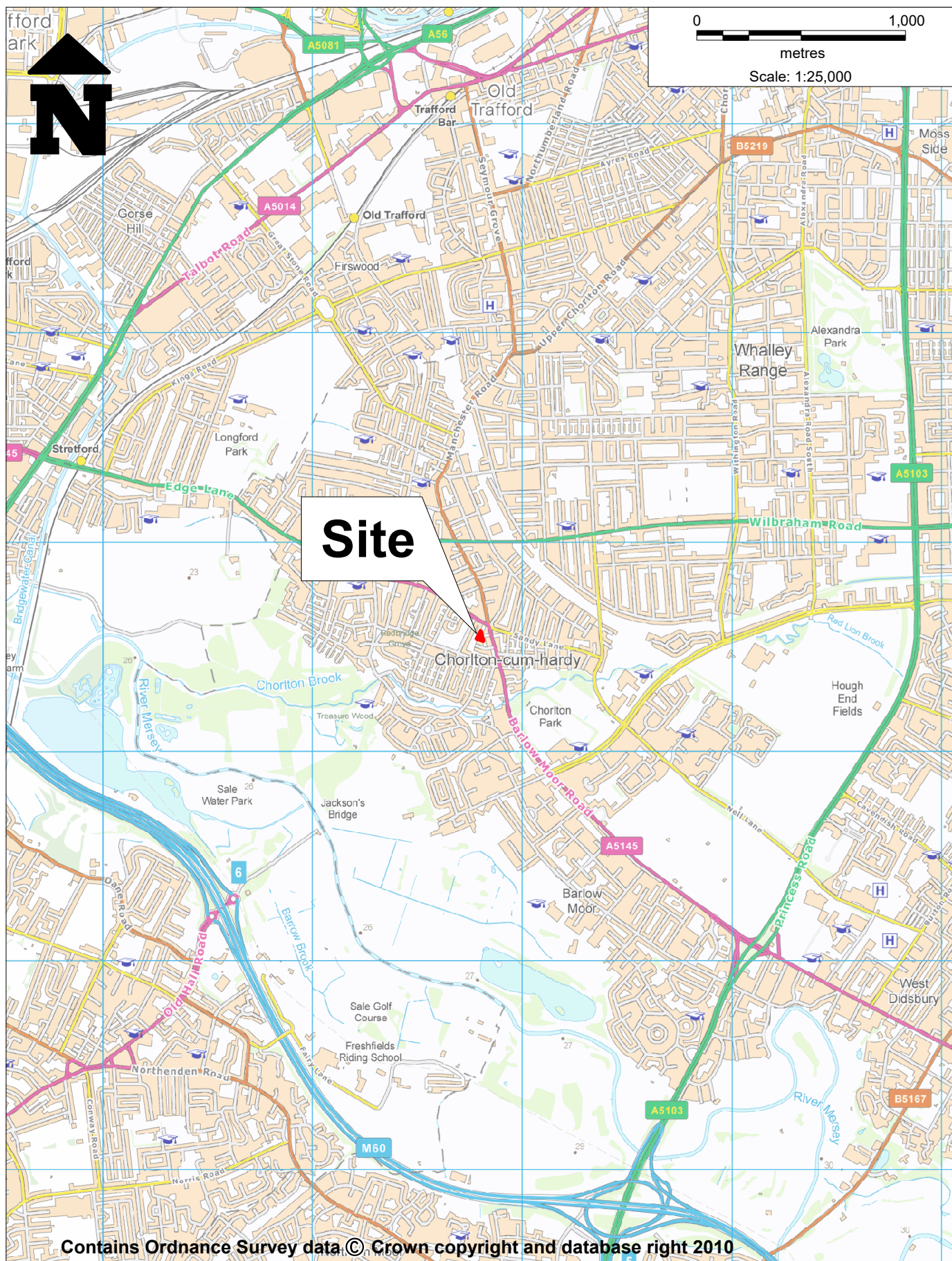
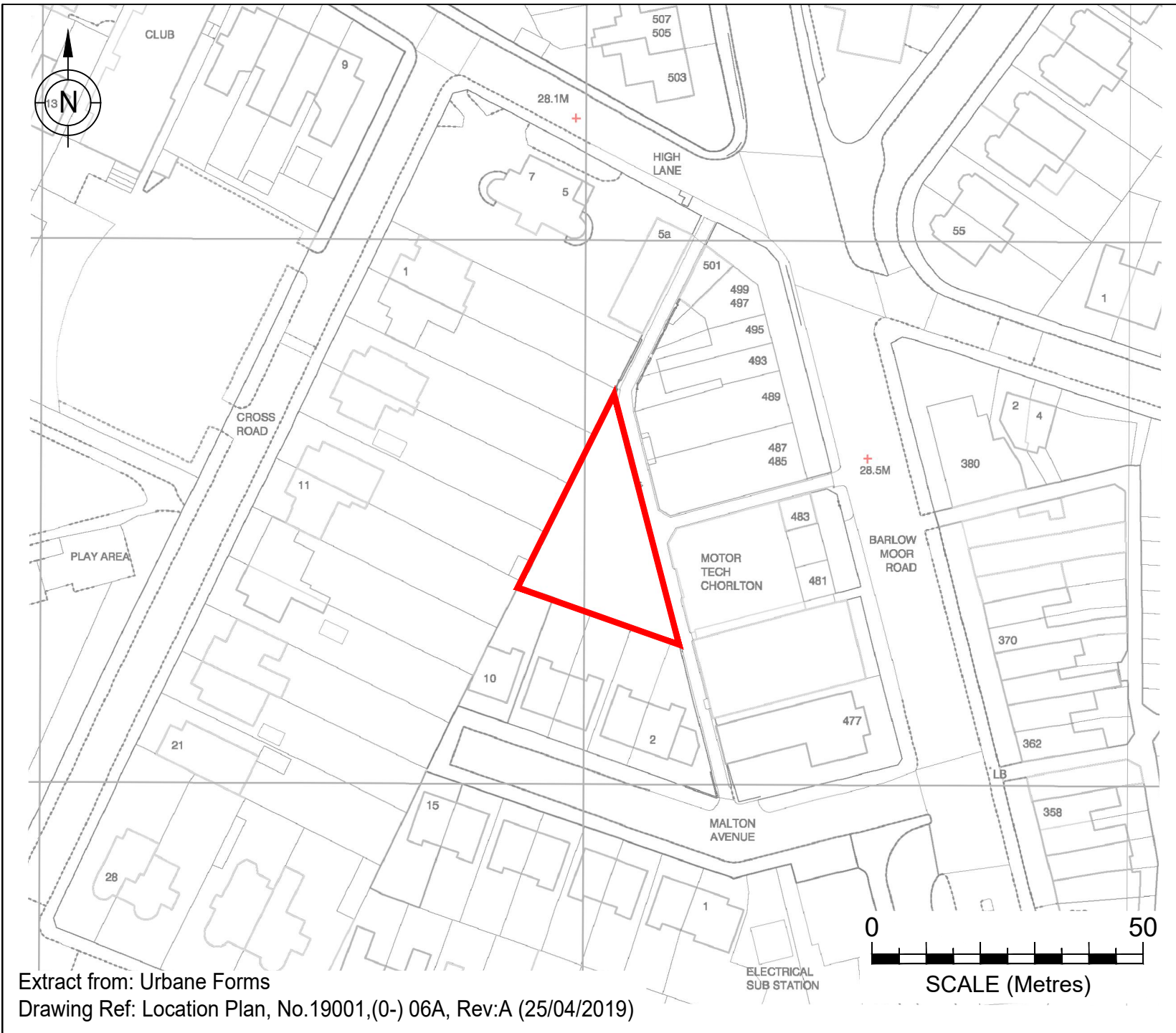


Figure 1: Site Location Plan, Barlow Moor Business Centre, Chorlton

Drawn: January 2021 Scale: 1:25,000 @ A4 (see scale bar)



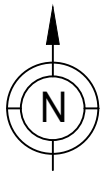
KEY

 Site Boundary

Sampling Locations and features annotated by LK Consult Ltd are approximate and are based upon observed measurements unless otherwise stated. Do not scale from this drawing and work from marked dimensions only. All dimensions and features should be confirmed on site by the Contractor. Where this drawing includes information provided to LK Consult Ltd by others, LK Consult Ltd gives no warranty, representation or assurance as to the accuracy of such information.



Client: BOS2 Manchester Limited			
Site: Barlow Moor Business Centre, Chorlton			
Title: Site Boundary Plan			
Job No.: LKC 20 1970	Scale (See Scale Bar): 1:1000 @ A4	Figure: 2	Revision:
Drawn By: AC	Checked By: RP	Drawn: Jan 2021	



KEY

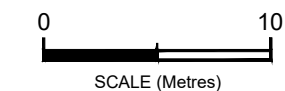


Sampling Locations and features annotated by LK Consult Ltd are approximate and are based upon observed measurements unless otherwise stated. Do not scale from this drawing and work from marked dimensions only. All dimensions and features should be confirmed on site by the Contractor. Where this drawing includes information provided to LK Consult Ltd by others, LK Consult Ltd gives no warranty, representation or assurance as to the accuracy of such information.

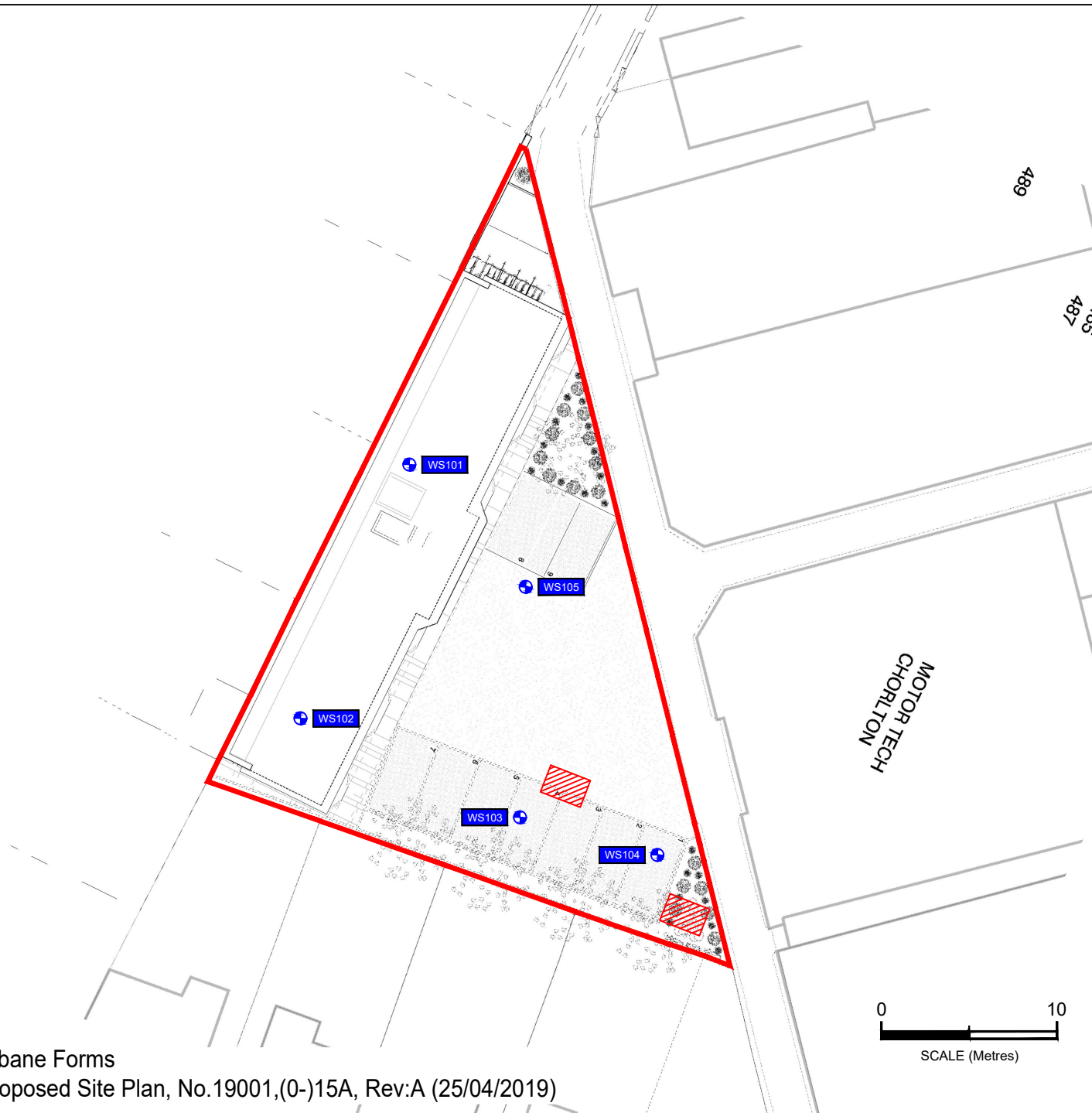
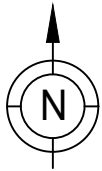


Client: BOS2 Manchester Limited			
Site: Barlow Moor Business Centre, Chorlton			
Title: Proposed Site Use			
Job No.: LKC 20 1970	Scale (See Scale Bar): See Scale Bar	Figure: 3	Revision:
Drawn By: AC	Checked By: RP	Drawn: Jan 2021	

Extract from: Urbane Forms
Drawing Ref: Proposed Site Plan, No.19001,(0-)15A, Rev:A (25/04/2019)



SCALE (Metres)



KEY

-  Site Boundary
-  Window Sample Borehole (WS)
-  Above Ground Tanks Noted During Site Reconnaissance

Sampling Locations and features annotated by LK Consult Ltd are approximate and are based upon observed measurements unless otherwise stated. Do not scale from this drawing and work from marked dimensions only. All dimensions and features should be confirmed on site by the Contractor. Where this drawing includes information provided to LK Consult Ltd by others, LK Consult Ltd gives no warranty, representation or assurance as to the accuracy of such information.



Client: BOS2 Manchester Limited			
Site: Barlow Moor Business Centre, Chorlton			
Title: Sampling Location Plan			
Job No.: LKC 20 1970	Scale (See Scale Bar): See Scale Bar	Figure: 4	Revision:
Drawn By: AC	Checked By: RP	Drawn: Mar 2021	

Extract from: Urbane Forms
Drawing Ref: Proposed Site Plan, No.19001,(0-)15A, Rev:A (25/04/2019)

Appendix A

Risk Matrix

Risk Evaluation

The method for risk evaluation is a qualitative method of interpreting the output from the risk estimation stage of the assessment, based on CIRIA 552⁵⁸. It involves the classification of the:

- » Magnitude of the potential consequence (severity) of the risk occurring (Table A).
- » Magnitude of the probability (likelihood) of the risk occurring (Table B).

Consequence (Severity)		
Classification	Definition	Example
Severe	- Short term (acute) risk to human health likely to results in 'significant harm' as defined by the Environment Protection Act 1990, Part IIA. - Short term risk of pollution (note: water Resources Act contains no scope for considering significance of pollution) of sensitive water resource. - Catastrophic damage to buildings/properties. - A short-term risk to a particular ecosystem, or organism forming part of such ecosystem (note: the definition of ecological systems within the Draft Circular on Contaminated Land, DETR, 2000).	- High Concentrations of cyanide on the surface of an informal recreation area. - Major spillage of contaminants from site into controlled waters. - Explosion, causing building collapse (can also equate to short term human health risk if buildings are occupied).
Medium	- Chronic damage to Human Health ('significant harm' as defined in DETR, 2000). - Pollution of sensitive water resources (note Water Resources Act contains no scope for considering significance of pollution). - A significant change in a particular ecosystem, or organism forming part of such ecosystem.	- Concentrations of a contaminant from site exceed generic, or site-specific assessment criteria. - Leaching of contaminants from a site to a major or minor aquifer (Principal and Secondary). - Death of a species within a designated nature reserve.
Mild	- Pollution of non-sensitive water resources. - Significant damage to crops, buildings, structures and services ('significant harm' as defined in DETR, 2000). - Damage to sensitive buildings/structures/services or the environment.	- Pollution of non-classified groundwater. - Damage to building rendering it unsafe to occupy (e.g. foundation damage resulting in instability).
Minor	- Harm, although not necessarily significant harm, which may result in a financial loss, or expenditure to resolve. - Non-permanent health effects to human health (easily prevented by means such as personal protective clothing etc). - Easily repairable damage to buildings, structures and services.	- The presence of contaminants at such concentrations that protective equipment is required during site works. - The loss of plants in a landscaping scheme. - Discoloration of concrete.

Table A: Classification of Consequence.

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

Table B: Classification of Probability.

⁵⁸ CIRIA C552 (2001) Contaminated Land Risk Assessment - A Guide to Good Practice.

These classifications are then compared to indicate the risk presented by each pollutant linkage (Table C). It is important that this classification is only applied where there is a possibility (which can range from high likelihood to unlikely) of a pollutant linkage existing.

		Consequence			
		Severe	Medium	Mild	Minor
Probability	High Likelihood	Very High Risk	High Risk	Moderate Risk	Moderate / Low Risk
	Likely	High Risk	Moderate Risk	Moderate / Low Risk	Low Risk
	Low Likelihood	Moderate Risk	Moderate / Low Risk	Low Risk	Very Low Risk
	Unlikely	Moderate / Low Risk	Low Risk	Very Low Risk	Very Low Risk

Table C: Comparison of Consequence against Probability.

Once the risk has been determined the corresponding action can be assessed (Table D).

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

Table D: Description of the Classification and Likely Action Required.

Where a very low risk is identified no specific remediation is required.

Where a low risk is identified, some form of remediation may be required depending on the pollutant linkage, the type and concentration of contaminants present and the proposed development.

Where there is a moderate/low risk identified, an assessment will be undertaken to establish what category the pollutant linkage will fall into.

Where LKC identifies a moderate or higher risk, remediation or further investigation work is recommended.

Appendix B

Profile Logs

Excavation Method

Drive-in Windowless Sampler

Dimensions
Ground Level (mOD)
Client

BOS2 Manchester Limited

Job Number
LKC 20 1970

Location
Dates

24/02/2021

Project Contractor

D&I Drilling

Sheet

1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.10-0.80	ES1 1.7ppm				0.07	MADE GROUND: Tarmacadam.			
					(0.73)	MADE GROUND: Dark brown gravelly silty sand with occasional brick fragments and ash. Sand is fine to coarse. Gravel is fine to coarse subangular to subrounded. Possible faint hydrocarbon odour.			
0.80-1.20	B3				0.80				
0.80-1.20	ES2 0.2ppm				(0.40)	Brown slightly gravelly slightly silty SAND. Sand is fine to coarse. Gravel is fine subrounded.			
1.00-1.45	SPT N=16		1,2/2,4,5,5		1.20	Medium dense orange becoming light grey SAND. Sand is fine to coarse.			
2.00-2.45	SPT N=27		4,5/6,7,7,7		(2.30)				
3.00-3.45	SPT N=16		4,4/4,4,4,4		3.50				
						Medium dense grey slightly silty SAND and GRAVEL. Sand is fine to coarse. Gravel is subangular to subrounded.			
4.00-4.45	SPT N=19		Water strike(1) at 3.80m. 2,3/4,5,5,5		(1.10)				
					4.60	Firm to stiff consistency medium strength brown slightly gravelly CLAY. Gravel is fine subangular to subrounded.			
5.00-5.45	SPT N=12		2,2/2,3,3,4		(0.85)				
					5.45	Complete at 5.45m			

Remarks

Strata collapsing in at 3.8mbgl.

Scale (approx)

1:40

Logged By

RP

Figure No.

LKC 20 1970.WS101

Excavation Method

Drive-in Windowless Sampler

Dimensions
Ground Level (mOD)
Client

BOS2 Manchester Limited

Job
Number
LKC 20 1970

Location
Dates

24/02/2021

Project Contractor

D&I Drilling

Sheet
1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.15-0.60	ES1 0.4ppm				0.05 (0.15)	MADE GROUND: Tarmacadam.		
0.60-1.20	B3				(0.45)	MADE GROUND: Dark grey sandy gravel (sub-base). Sand is fine to coarse. Gravel is fine to coarse subangular to angular.		
0.60-1.20	ES2 0.2ppm				0.60	MADE GROUND: Dark brown slightly gravelly slightly silty sand with occasional ash and brick fragments. Sand is fine to coarse. Gravel is fine to coarse subangular to subrounded.		
1.00-1.45	SPT N=15		2,2/3,4,4,4		(0.60)	Dark brown slightly gravelly slightly silty SAND. Sand is fine to coarse. Gravel is fine subrounded to rounded.		
					1.20	Medium dense orange becoming light grey SAND. Sand is fine to coarse.		
2.00-2.45	SPT N=26		3,4/5,6,7,8		(2.40)			
2.00-2.45	X4							
3.00-3.45	SPT N=17		4,4/4,5,4,4					
3.00-3.45	X5							
			Water strike(1) at 3.60m.		3.60	Medium dense greyish brown clayey SAND and GRAVEL. Sand is fine to coarse. Gravel is fine to coarse subangular to rounded.		
4.00-4.45	SPT N=14		3,4/5,3,3,3		(1.00)			
4.00-4.45	X6				4.60	Firm consistency low to medium strength brown slightly gravelly CLAY. Gravel is fine subangular to subrounded.		
5.00-5.45	SPT N=8		2,2/2,2,2,2		(0.85)			
5.00-5.45	X7				5.45	Complete at 5.45m		

V1

Remarks
Scale
(approx)

1:40

Logged
By

RP

Figure No.

LKC 20 1970.WS102

Excavation Method

Drive-in Windowless Sampler

Dimensions
Ground Level (mOD)
Client

BOS2 Manchester Limited

Job
Number
LKC 20 1970

Location
Dates

24/02/2021

Project Contractor

D&I Drilling

Sheet

1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.04-0.10 0.10-0.70	ES1 0.2ppm ES2 0.5ppm				0.04 0.10	MADE GROUND: Tarmacadam.			
					(0.60)	MADE GROUND: Dark grey sandy gravel (sub-base). Sand is fine to coarse. Gravel is fine to coarse subangular to angular. Possible faint hydrocarbon odour.			
0.70-1.10 0.70-1.10	B4 ES3 0.6ppm				0.70 (0.40)	MADE GROUND: Dark brown gravelly slightly silty sand with frequent brick fragments and ash. Sand is fine to coarse. Gravel is fine to coarse subangular to subrounded.			
1.00-1.45 1.00-1.45 1.20-2.00	SPT N=14 X5 B6 0.6ppm		1,2/3,3,4,4		1.10	Dark brown slightly gravelly slightly silty SAND. Sand is fine to coarse. Gravel is fine to medium subangular to rounded.			
						Medium dense orange becoming light grey SAND. Sand is fine to coarse.			
2.00-2.45 2.00-2.45	SPT N=21 X7		4,5/5,5,5,6		(2.60)				
3.00-3.45 3.00-3.45	SPT N=24 X8		5,6/6,6,6,6						
			Water strike(1) at 3.70m.		3.70				
4.00-4.45 4.00-4.45	SPT N=12 X9		4,2/3,3,3,3		(1.20)	Loose to medium dense brownish grey gravelly slightly silty SAND. Sand is fine to coarse. Gravel is fine to coarse subangular to subrounded.			
5.00-5.45 5.00-5.45	SPT N=8 X10		1,1/2,2,2,2		4.90 (0.55)	Firm consistency low to medium strength brown slightly gravelly CLAY. Gravel is fine subangular to subrounded.			
					5.45	Complete at 5.45m			

Remarks
Scale
(approx)

1:40

Logged
By

RP

Figure No.

LKC 20 1970.WS103

Excavation Method

Drive-in Windowless Sampler

Dimensions
Ground Level (mOD)
Client

BOS2 Manchester Limited

Job
Number
LKC 20 1970

Location
Dates

24/02/2021

Project Contractor

D&I Drilling

Sheet
1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.10-0.40	ES1 1.0ppm				0.07	CONCRETE.			
0.40-1.10	B3				(0.33)	MADE GROUND: Dark brown slightly gravelly silty sand with rare ash and brick fragments. Sand is fine to coarse. Gravel is fine to coarse subangular to subrounded.			
0.40-1.10	ES2 1.5ppm				0.40				
					(0.70)	Dark brown slightly gravelly silty SAND. Sand is fine to coarse. Gravel is fine to medium subangular to subrounded.			
1.00-1.45	SPT N=7		1,1/1,2,2,2		1.10	Medium dense light grey SAND. Sand is fine to coarse.			
1.00-1.45	X4								
1.50-2.00	B5 0.9ppm								
2.00-2.45	SPT N=22		3,4/5,5,6,6		(2.40)				
2.00-2.45	X6								
3.00-3.45	SPT N=16		3,3/4,4,4,4						
3.00-3.45	X7								
			Water strike(1) at 3.50m.		3.50	Loose to medium dense orange slightly gravelly slightly clayey SAND. Sand is fine to coarse. Gravel is fine to coarse subangular to subrounded.			
4.00-4.45	SPT N=11		4,3/3,2,2,4		(1.40)				
4.00-4.45	X8								
					4.90	Firm to stiff consistency medium strength brown slightly gravelly CLAY. Gravel is fine subangular to subrounded.			
5.00-5.45	SPT N=11		1,2/2,3,3,3		(0.55)				
5.00-5.45	X9				5.45	Complete at 5.45m			

Remarks
Scale
(approx)

1:40

Logged
By

RP

Figure No.

LKC 20 1970.WS104

Excavation Method

Drive-in Windowless Sampler

Dimensions
Ground Level (mOD)
Client

BOS2 Manchester Limited

Job
Number
LKC 20 1970

Location
Dates

24/02/2021

Project Contractor

D&I Drilling

Sheet
1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.20-0.60	ES 0.7ppm				0.04 (0.16) 0.20	MADE GROUND: Tarmacadam.		
0.60-1.40 0.60-1.40	B ES 0.4ppm				(0.40) 0.60	MADE GROUND: Dark grey sandy slightly silty gravel (sub-base). Sand is fine to coarse. Gravel is fine to coarse subangular to angular.		
1.00-1.45 1.00-1.45	SPT N=14 X		2,3/3,3,4,4		(0.80)	MADE GROUND: Dark brown gravelly slightly silty sand with occasional tarmacadam fragments, red brick fragments and ash. Sand is fine to coarse. Gravel is fine to coarse subangular to subrounded.		
1.50-2.00	B 0.6ppm				1.40	Dark brown slightly silty SAND. Sand is fine to coarse.		
2.00-2.45 2.00-2.45	SPT N=30 X		4,5/7,7,8,8		(2.00)	Medium dense light grey SAND. Sand is fine to coarse.		
3.00-3.45 3.00-3.45	SPT N=14 X		4,4/3,3,4,4					
3.50-4.00	B 0.8ppm		Water strike(1) at 3.40m.		3.40	Medium dense grey silty SAND and GRAVEL. Sand is fine to coarse. Gravel is fine to coarse subangular to subrounded.		▽1
4.00-4.45 4.00-4.45	SPT N=12 X		2,3/3,3,3,3		(1.40) 4.80			
5.00-5.45 5.00-5.45	SPT N=12 X		1,2/2,3,3,4		(0.65) 5.45	Stiff consistency medium strength brown slightly gravelly CLAY. Gravel is fine subangular to subrounded.		
						Complete at 5.45m		

Remarks
Scale
(approx)

1:40

Logged
By

RP

Figure No.

LKC 20 1970.WS105

Appendix C

Certificates of Analysis – Soil



Final Report

Report No.: 21-05812-1
Initial Date of Issue: 09-Mar-2021
Client LK Consult
Client Address: Unit 29 Eton Business Park
Eton Hill Road
Radcliffe
Manchester
Lancashire
M26 2ZS
Contact(s): Contaminated Land
Rachel Peart
Project LKC 20 1970 Barlow Moor Road,
Chorlton

Quotation No.:		Date Received:	25-Feb-2021
Order No.:	738392	Date Instructed:	02-Mar-2021
No. of Samples:	6		
Turnaround (Wkdays):	5	Results Due:	08-Mar-2021
Date Approved:	09-Mar-2021		

Approved By:

Details: Glynn Harvey, Technical Manager

Results - Soil

Project: LKC 20 1970 Barlow Moor Road, Chorlton

Client: LK Consult	Chemtest Job No.:				21-05812	21-05812	21-05812	21-05812	21-05812	21-05812
Quotation No.:	Chemtest Sample ID.:				1148580	1148581	1148582	1148585	1148587	1148589
Order No.: 738392	Client Sample Ref.:				WS101	WS101	WS102	WS103	WS104	WS105
	Sample Type:				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	Top Depth (m):				0.1	0.8	0.15	0.1	0.1	0.2
	Bottom Depth (m):				0.8	1.2	0.6	0.7	0.4	0.6
	Date Sampled:				24-Feb-2021	24-Feb-2021	24-Feb-2021	24-Feb-2021	24-Feb-2021	24-Feb-2021
	Asbestos Lab:				COVENTRY		COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	Accred.	SOP	Units	LOD						
ACM Type	U	2192		N/A	-		-	-	-	-
Asbestos Identification	U	2192		N/A	No Asbestos Detected		No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
ACM Detection Stage	U	2192		N/A	-		-	-	-	-
Moisture	N	2030	%	0.020	13	11	13	19	25	17
Soil Colour	N	2040		N/A	Brown	Brown	Brown	Brown	Brown	Black
Glycols	N	2780	mg/kg	1.0	< 1.0			< 1.0		
Other Material	N	2040		N/A	Stones	Stones	None	Stones	Stones	None
Soil Texture	N	2040		N/A	Clay	Clay	Clay	Sand	Sand	Clay
Chromatogram (TPH)	N			N/A	See Attached			See Attached	See Attached	
pH	M	2010		4.0	8.5	8.3	8.2	8.3	7.9	8.4
Boron (Hot Water Soluble)	M	2120	mg/kg	0.40	1.5			3.9	2.3	
Magnesium (Water Soluble)	N	2120	g/l	0.010	< 0.010	< 0.010	< 0.010			
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010	0.19	0.27	0.068	0.35	0.35	< 0.010
Chloride (Water Soluble)	M	2220	g/l	0.010	< 0.010	< 0.010	< 0.010			
Nitrate (Water Soluble)	N	2220	g/l	0.010	0.050	0.039	0.061			
Cyanide (Free)	M	2300	mg/kg	0.50	< 0.50			< 0.50	< 0.50	
Cyanide (Total)	M	2300	mg/kg	0.50	0.80			< 0.50	< 0.50	
Arsenic	M	2450	mg/kg	1.0	34		5.9	14	20	17
Cadmium	M	2450	mg/kg	0.10	0.19		0.10	1.2	0.31	0.13
Chromium	M	2450	mg/kg	1.0	15		6.8	16	12	9.7
Copper	M	2450	mg/kg	0.50	130		19	58	50	31
Mercury	M	2450	mg/kg	0.10	0.52		0.11	0.25	0.55	0.41
Nickel	M	2450	mg/kg	0.50	29		7.3	21	17	13
Lead	M	2450	mg/kg	0.50	550		270	1100	380	150
Selenium	M	2450	mg/kg	0.20	0.48		0.25	0.23	0.40	0.39
Vanadium	U	2450	mg/kg	5.0	47		9.7	24	23	17
Zinc	M	2450	mg/kg	0.50	95		29	330	98	42
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50		< 0.50	< 0.50	< 0.50	< 0.50
Organic Matter	M	2625	%	0.40	6.9		1.7	6.4	6.7	3.3
Diesel Present	N	2670		N/A	False			False	False	
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	< 1.0			< 1.0	< 1.0	
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	< 1.0			< 1.0	< 1.0	
Aliphatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0			< 1.0	< 1.0	
Aliphatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0			< 1.0	< 1.0	
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0			< 1.0	< 1.0	
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0	< 1.0			< 1.0	< 1.0	
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0	< 1.0			< 1.0	< 1.0	

Results - Soil

Project: LKC 20 1970 Barlow Moor Road, Chorlton

Client: LK Consult	Chemtest Job No.:				21-05812	21-05812	21-05812	21-05812	21-05812	21-05812
Quotation No.:	Chemtest Sample ID.:				1148580	1148581	1148582	1148585	1148587	1148589
Order No.: 738392	Client Sample Ref.:				WS101	WS101	WS102	WS103	WS104	WS105
	Sample Type:				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	Top Depth (m):				0.1	0.8	0.15	0.1	0.1	0.2
	Bottom Depth (m):				0.8	1.2	0.6	0.7	0.4	0.6
	Date Sampled:				24-Feb-2021	24-Feb-2021	24-Feb-2021	24-Feb-2021	24-Feb-2021	24-Feb-2021
	Asbestos Lab:				COVENTRY		COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	Accred.	SOP	Units	LOD						
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0			< 1.0	< 1.0	
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0			< 5.0	< 5.0	
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0			< 1.0	< 1.0	
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	< 1.0			< 1.0	< 1.0	
Aromatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0			< 1.0	< 1.0	
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0			13	< 1.0	
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0			48	< 1.0	
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0			79	< 1.0	
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0	< 1.0			450	< 1.0	
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0			< 1.0	< 1.0	
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0			590	< 5.0	
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	< 10			590	< 10	
Benzene	M	2760	µg/kg	1.0	< 1.0			< 1.0	< 1.0	
Toluene	M	2760	µg/kg	1.0	< 1.0			< 1.0	< 1.0	
Ethylbenzene	M	2760	µg/kg	1.0	< 1.0			< 1.0	< 1.0	
m & p-Xylene	M	2760	µg/kg	1.0	< 1.0			< 1.0	< 1.0	
o-Xylene	M	2760	µg/kg	1.0	< 1.0			< 1.0	< 1.0	
Methyl Tert-Butyl Ether	M	2760	µg/kg	1.0	< 1.0			< 1.0	< 1.0	
Naphthalene	M	2800	mg/kg	0.10	3.1		0.28	11	< 0.10	< 0.10
Acenaphthylene	N	2800	mg/kg	0.10	0.57		0.20	1.6	< 0.10	< 0.10
Acenaphthene	M	2800	mg/kg	0.10	4.4		1.6	3.8	< 0.10	< 0.10
Fluorene	M	2800	mg/kg	0.10	3.3		1.2	3.4	< 0.10	< 0.10
Phenanthrene	M	2800	mg/kg	0.10	31		11	19	0.77	0.53
Anthracene	M	2800	mg/kg	0.10	7.4		3.3	3.8	0.18	0.13
Fluoranthene	M	2800	mg/kg	0.10	44		12	17	1.2	0.88
Pyrene	M	2800	mg/kg	0.10	39		9.8	16	1.1	0.82
Benzo[a]anthracene	M	2800	mg/kg	0.10	18		4.2	6.8	0.60	0.36
Chrysene	M	2800	mg/kg	0.10	19		4.9	7.0	0.64	0.47
Benzo[b]fluoranthene	M	2800	mg/kg	0.10	19		4.7	6.8	0.71	0.55
Benzo[k]fluoranthene	M	2800	mg/kg	0.10	7.8		1.8	2.8	0.27	0.18
Benzo[a]pyrene	M	2800	mg/kg	0.10	17		3.6	6.5	0.61	0.47
Indeno(1,2,3-c,d)Pyrene	M	2800	mg/kg	0.10	11		2.3	3.9	< 0.10	< 0.10
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10	2.0		0.49	0.84	< 0.10	< 0.10
Benzo[g,h,i]perylene	M	2800	mg/kg	0.10	9.9		2.2	4.1	< 0.10	< 0.10
Total Of 16 PAH's	N	2800	mg/kg	2.0	240		64	110	6.1	4.4
Total Phenols	M	2920	mg/kg	0.30	< 0.30			< 0.30	< 0.30	

TPH Chromatogram on Soil Sample: 1148580

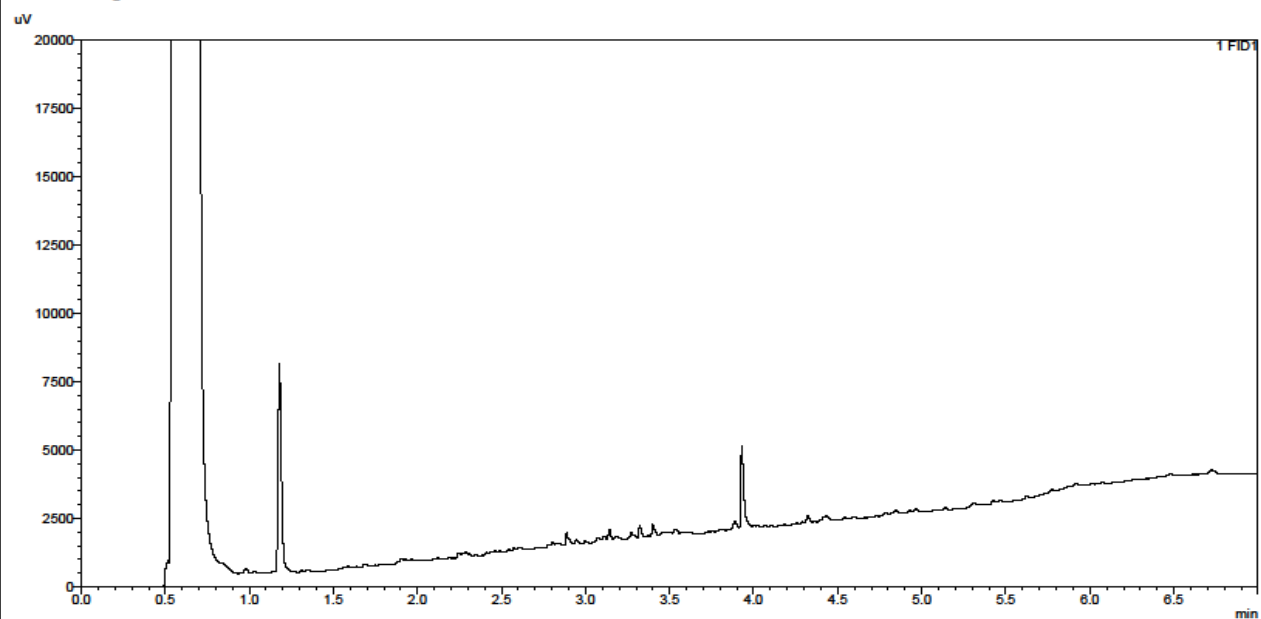
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Sample Name : 1148580 21-05812
Data Filename : 02 March 2021_02032021_1148580 21-05812_009.gcd
Method Filename : TPH 12m Fast OSv2.gcm
Sample # : 35
Date Acquired : 02/03/2021 23:13:16
Date Processed : 02/03/2021



Chemtest

<Chromatogram>



TPH Chromatogram on Soil Sample: 1148585

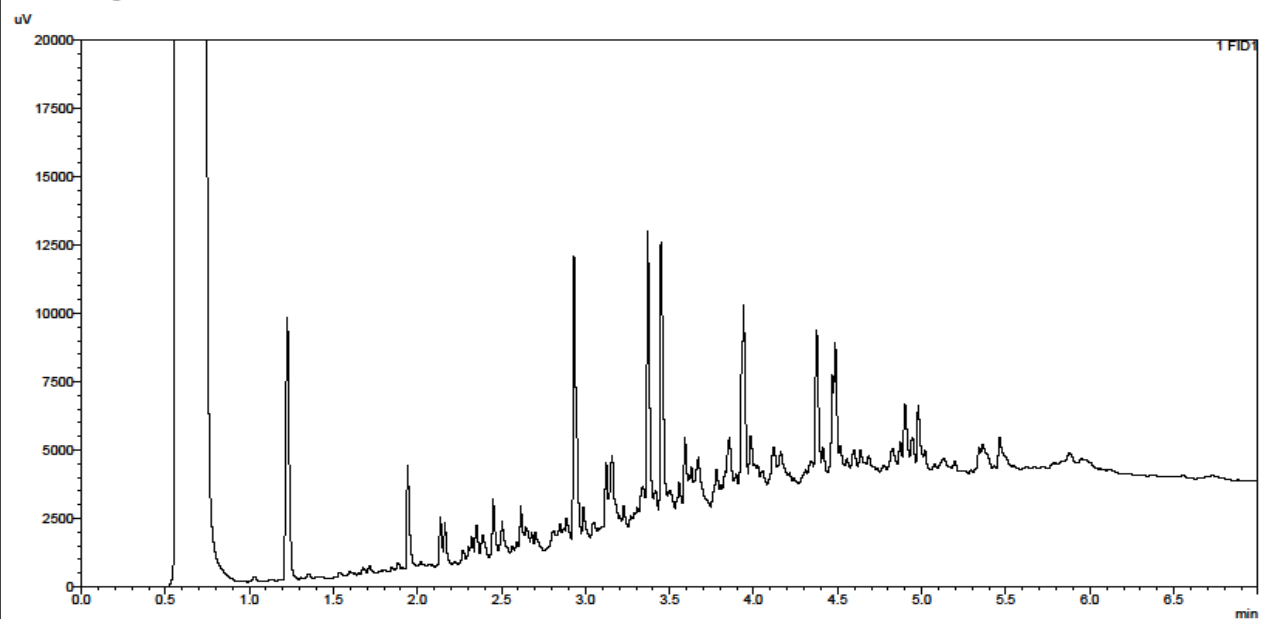
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Sample Name : 1148585 21-05812
Data Filename : 03 March 2021_03032021_1148585 21-05812_013.gcd
Method Filename : TPH 12m Fast OSv2.gcm
Sample # : 7
Date Acquired : 03/03/2021 15:46:42
Date Processed : 03/03/2021



Chemtest

<Chromatogram>



TPH Chromatogram on Soil Sample: 1148587

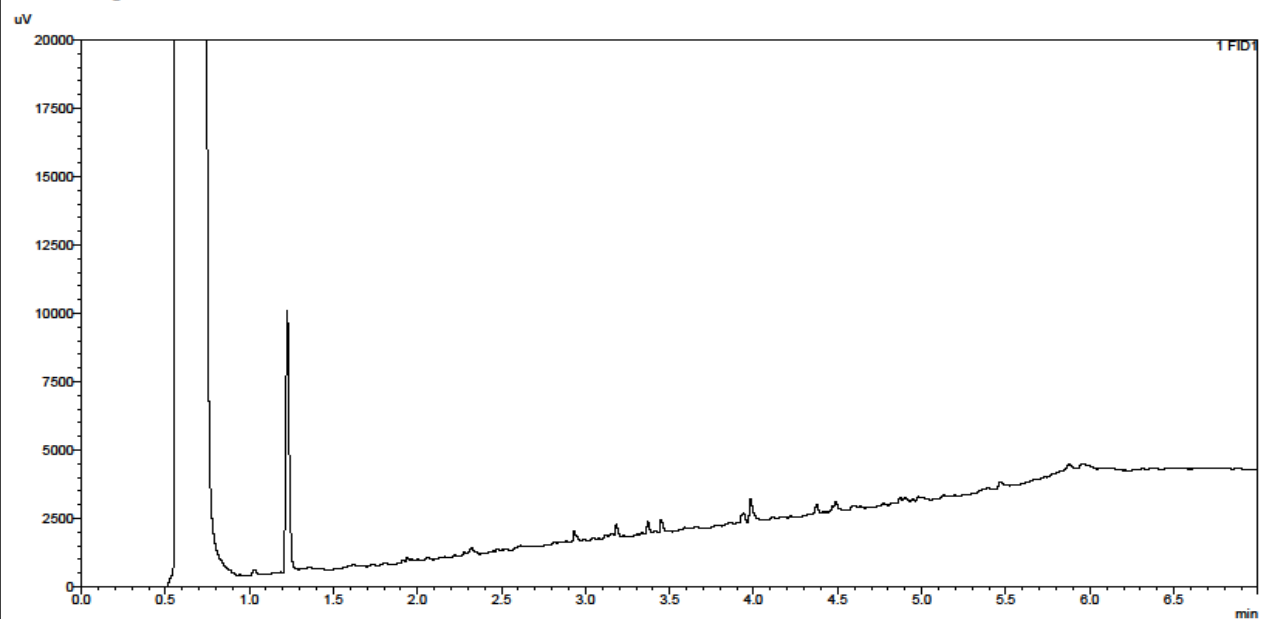
<Sample Information>

Sample Name : 1148587 21-05812
Data Filename : 03 March 2021_03032021_1148587 21-05812_015.gcd
Method Filename : TPH 12m Fast OSv2.gcm
Sample # : 8
Date Acquired : 03/03/2021 15:59:20
Date Processed : 03/03/2021



Chemtest

<Chromatogram>



TPH Interpretation

Job	Sample	Matrix	Location	Sample Ref	Sample ID	Sample Depth (m)	Gasoline / Diesel Present	TPH Interpretation
21-05812	1148580	S		WS101		0.1	No	N/A
21-05812	1148585	S		WS103		0.1	No	PAH
21-05812	1148587	S		WS104		0.1	No	N/A

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
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2220	Water soluble Chloride in Soils	Chloride	Aqueous extraction and measurement by 'Aquakem 600' Discrete Analyser using ferric nitrate / mercuric thiocyanate.
2300	Cyanides & Thiocyanate in Soils	Free (or easily liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Alkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2670	Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID	TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8–C40	Dichloromethane extraction / GC-FID
2680	TPH A/A Split	Aliphatics: >C5–C6, >C6–C8, >C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35–C44 Aromatics: >C5–C7, >C7–C8, >C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35–C44	Dichloromethane extraction / GCxGC FID detection
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.
2780	Glycols, Aldehydes, Amines, Ethers and Ketones	Glycols, Aldehydes, Amines, Ethers and Ketones	GCMS detection
2800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-MS	Acenaphthene*; Acenaphthylene; Anthracene*; Benzo[a]Anthracene*; Benzo[a]Pyrene*; Benzo[b]Fluoranthene*; Benzo[ghi]Perylene*; Benzo[k]Fluoranthene; Chrysene*; Dibenzo[ah]Anthracene; Fluoranthene*; Fluorene*; Indeno[123cd]Pyrene*; Naphthalene*; Phenanthrene*; Pyrene*	Dichloromethane extraction / GC-MS
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.

Report Information

Key

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

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

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

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

All Asbestos testing is performed at the indicated laboratory

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

Sample Deviation Codes

- A - Date of sampling not supplied
- B - Sample age exceeds stability time (sampling to extraction)
- C - Sample not received in appropriate containers
- D - Broken Container
- E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 45 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 D

Certificates of Analysis – Groundwater



2183

Final Report

Report No.: 21-07813-1
Initial Date of Issue: 18-Mar-2021
Client LK Consult
Client Address: Unit 29 Eton Business Park
Eton Hill Road
Radcliffe
Manchester
Lancashire
M26 2ZS
Contact(s): Contaminated Land
Rachel Peart
Project LKC 20 1970 Barlow Moor Business
Centre, Chorlton

Quotation No.:		Date Received:	12-Mar-2021
Order No.:	738457	Date Instructed:	12-Mar-2021
No. of Samples:	2		
Turnaround (Wkdays):	5	Results Due:	18-Mar-2021
Date Approved:	18-Mar-2021		

Approved By:



Details: Glynn Harvey, Technical Manager

Results - Water

Project: LKC 20 1970 Barlow Moor Business Centre, Chorlton

Client: LK Consult	Chemtest Job No.:				21-07813	21-07813
Quotation No.:	Chemtest Sample ID.:				1158515	1158516
Order No.: 738457	Client Sample Ref.:				WS103	WS104
	Sample Type:				WATER	WATER
	Date Sampled:				08-Mar-2021	08-Mar-2021
Determinand	Accred.	SOP	Units	LOD		
Diesel Present	N	1670		N/A	False	False
Glycols	N		mg/l	0.10	< 0.10	
pH	U	1010		N/A	8.2	8.3
Sulphate	U	1220	mg/l	1.0	130	160
Cyanide (Total)	U	1300	mg/l	0.050	< 0.050	< 0.050
Cyanide (Free)	U	1300	mg/l	0.050	< 0.050	< 0.050
Calcium	U	1455	mg/l	2.00	150	160
Total Hardness as CaCO3	U	1270	mg/l	15	430	450
Arsenic (Dissolved)	U	1455	µg/l	0.20	1.0	0.89
Boron (Dissolved)	U	1455	µg/l	10.0	100	170
Cadmium (Dissolved)	U	1455	µg/l	0.12	< 0.12	0.14
Chromium (Dissolved)	U	1455	µg/l	0.50	1.3	1.2
Copper (Dissolved)	U	1455	µg/l	0.50	6.8	3.7
Manganese (Dissolved)	U	1455	µg/l	0.50	87	84
Nickel (Dissolved)	U	1455	µg/l	0.50	3.3	4.9
Lead (Dissolved)	U	1455	µg/l	0.50	0.86	1.0
Selenium (Dissolved)	U	1455	µg/l	0.50	3.3	6.8
Vanadium (Dissolved)	U	1455	µg/l	0.50	6.6	3.0
Zinc (Dissolved)	U	1455	µg/l	3.0	3.0	3.6
Mercury Low Level	U	1460	µg/l	0.010	< 0.010	< 0.010
Chromium (Hexavalent)	U	1490	µg/l	20	[B] < 20	[B] < 20
Dissolved Organic Carbon	U	1610	mg/l	2.0	14	10
Aliphatic TPH >C5-C6	N	1675	µg/l	0.10	< 0.10	< 0.10
Aliphatic TPH >C6-C8	N	1675	µg/l	0.10	< 0.10	< 0.10
Aliphatic TPH >C8-C10	N	1675	µg/l	0.10	< 0.10	< 0.10
Aliphatic TPH >C10-C12	N	1675	µg/l	0.10	< 0.10	< 0.10
Aliphatic TPH >C12-C16	N	1675	µg/l	0.10	< 0.10	< 0.10
Aliphatic TPH >C16-C21	N	1675	µg/l	0.10	< 0.10	< 0.10
Aliphatic TPH >C21-C35	N	1675	µg/l	0.10	< 0.10	< 0.10
Aliphatic TPH >C35-C44	N	1675	µg/l	0.10	< 0.10	< 0.10
Total Aliphatic Hydrocarbons	N	1675	µg/l	5.0	< 5.0	< 5.0
Aromatic TPH >C5-C7	N	1675	µg/l	0.10	< 0.10	< 0.10
Aromatic TPH >C7-C8	N	1675	µg/l	0.10	< 0.10	< 0.10
Aromatic TPH >C8-C10	N	1675	µg/l	0.10	< 0.10	< 0.10
Aromatic TPH >C10-C12	N	1675	µg/l	0.10	< 0.10	< 0.10
Aromatic TPH >C12-C16	N	1675	µg/l	0.10	< 0.10	< 0.10
Aromatic TPH >C16-C21	N	1675	µg/l	0.10	< 0.10	< 0.10
Aromatic TPH >C21-C35	N	1675	µg/l	0.10	< 0.10	< 0.10
Aromatic TPH >C35-C44	N	1675	µg/l	0.10	< 0.10	< 0.10
Total Aromatic Hydrocarbons	N	1675	µg/l	5.0	< 5.0	< 5.0

Results - Water

Project: LKC 20 1970 Barlow Moor Business Centre, Chorlton

Client: LK Consult	Chemtest Job No.:				21-07813	21-07813
Quotation No.:	Chemtest Sample ID.:				1158515	1158516
Order No.: 738457	Client Sample Ref.:				WS103	WS104
	Sample Type:				WATER	WATER
	Date Sampled:				08-Mar-2021	08-Mar-2021
Determinand	Accred.	SOP	Units	LOD		
Total Petroleum Hydrocarbons	N	1675	µg/l	10	< 10	< 10
Benzene	U	1760	µg/l	1.0	< 1.0	< 1.0
Toluene	U	1760	µg/l	1.0	< 1.0	< 1.0
Ethylbenzene	U	1760	µg/l	1.0	< 1.0	< 1.0
m & p-Xylene	U	1760	µg/l	1.0	< 1.0	< 1.0
o-Xylene	U	1760	µg/l	1.0	< 1.0	< 1.0
Methyl Tert-Butyl Ether	N	1760	µg/l	1.0	< 1.0	< 1.0
Naphthalene	N	1800	µg/l	0.010	0.13	< 0.010
Acenaphthylene	N	1800	µg/l	0.010	0.020	< 0.010
Acenaphthene	N	1800	µg/l	0.010	0.020	< 0.010
Fluorene	N	1800	µg/l	0.010	< 0.010	< 0.010
Phenanthrene	N	1800	µg/l	0.010	0.040	< 0.010
Anthracene	N	1800	µg/l	0.010	0.040	< 0.010
Fluoranthene	N	1800	µg/l	0.010	0.040	< 0.010
Pyrene	N	1800	µg/l	0.010	0.020	< 0.010
Benzo[a]anthracene	N	1800	µg/l	0.010	< 0.010	< 0.010
Chrysene	N	1800	µg/l	0.010	< 0.010	< 0.010
Benzo[b]fluoranthene	N	1800	µg/l	0.010	< 0.010	< 0.010
Benzo[k]fluoranthene	N	1800	µg/l	0.010	< 0.010	< 0.010
Benzo[a]pyrene	N	1800	µg/l	0.010	< 0.010	< 0.010
Indeno(1,2,3-c,d)Pyrene	N	1800	µg/l	0.010	< 0.010	< 0.010
Dibenz(a,h)Anthracene	N	1800	µg/l	0.010	< 0.010	< 0.010
Benzo[g,h,i]perylene	N	1800	µg/l	0.010	< 0.010	< 0.010
Total Of 16 PAH's	N	1800	µg/l	0.20	0.31	< 0.20
Total Phenols	U	1920	mg/l	0.030	< 0.030	< 0.030

TPH Interpretation

Job	Sample	Matrix	Location	Sample Ref	Sample ID	Sample Depth (m)	Gasoline / Diesel Present	TPH Interpretation
21-07813	1158515	W		WS103			No	N/A
21-07813	1158516	W		WS104			No	N/A

Deviations

In accordance with UKAS Policy on Deviating Samples TPS 63. Chemtest have a procedure to ensure 'upon receipt of each sample a competent laboratory shall assess whether the sample is suitable with regard to the requested test(s)'. This policy and the respective holding times applied, can be supplied upon request. The reason a sample is declared as deviating is detailed below. Where applicable the analysis remains UKAS/MCERTs accredited but the results may be compromised.

Sample:	Sample Ref:	Sample ID:	Sample Location:	Sampled Date:	Deviation Code(s):	Containers Received:
1158515	WS103			08-Mar-2021	B	Coloured Winchester 1000ml
1158515	WS103			08-Mar-2021	B	EPA Vial 40ml
1158515	WS103			08-Mar-2021	B	Plastic Bottle 1000ml
1158516	WS104			08-Mar-2021	B	Coloured Winchester 1000ml
1158516	WS104			08-Mar-2021	B	EPA Vial 40ml
1158516	WS104			08-Mar-2021	B	Plastic Bottle 1000ml

Test Methods

SOP	Title	Parameters included	Method summary
1010	pH Value of Waters	pH	pH Meter
1220	Anions, Alkalinity & Ammonium in Waters	Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium	Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser.
1270	Total Hardness of Waters	Total hardness	Calculation applied to calcium and magnesium results, expressed as mg l-1 CaCO3 equivalent.
1300	Cyanides & Thiocyanate in Waters	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Continuous Flow Analysis.
1455	Metals in Waters by ICP-MS	Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc	Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS).
1460	Mercury low-level in Waters by AFS	Mercury	Atomic Fluorescence Spectrometry, with collimated UV source, wavelength 253.7 nm.
1490	Hexavalent Chromium in Waters	Chromium [VI]	Automated colorimetric analysis by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazine.
1610	Total/Dissolved Organic Carbon in Waters	Organic Carbon	TOC Analyser using Catalytic Oxidation
1670	Total Petroleum Hydrocarbons (TPH) in Waters by GC-FID	TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO	Pentane extraction / GC FID detection
1675	TPH Aliphatic/Aromatic split in Waters by GC-FID(cf. Texas Method 1006 / TPH CWG)	Aliphatics: >C5–C6, >C6–C8, >C8– C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44 Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44	Pentane extraction / GCxGC FID detection
1760	Volatile Organic Compounds (VOCs) in Waters by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics. (cf. USEPA Method 8260)	Automated headspace gas chromatographic (GC) analysis of water samples with mass spectrometric (MS) detection of volatile organic compounds.
1780	Alcohols	Alcohols	GCMS detection
1800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Waters by GC-MS	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenzo[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Pentane extraction / GCMS detection
1920	Phenols in Waters by HPLC	Phenolic compounds including: Phenol, Cresols, Xylenols, Trimethylphenols Note: Chlorophenols are excluded.	Determination by High Performance Liquid Chromatography (HPLC) using electrochemical detection.

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
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I/S	Insufficient Sample
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LOD	Limit of detection

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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 45 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 E

Certificate of Analysis – Geotechnical



TEST REPORT

Client LK Consult Ltd

Address Unit 29 Eton Business Park
Eton Hill Road
Radcliffe
Greater Manchester
M26 2ZS

Contract LKC 20 1970 -
Barlow Moor Road, Chorlton

Job Number MRN 4066/44
Date of Issue 23 March 2021
Page 1 of 6

Approved Signatories

S J Hutchings, O P Davies

Notes

- 1 All remaining samples and remnants from this contract will be disposed 28 days from the date of this report unless you notify us to the contrary.
- 2 Result certificates, in this report, not bearing a UKAS mark, are not included in our UKAS accreditation schedule.
- 3 Opinions and interpretations expressed herein are outside the scope of our UKAS accreditation
- 4 Certified that the samples have been examined and tested in accordance with the terms of the contract/order and unless otherwise stated conform to the standards/specifications quoted. This does not, however, guarantee the balance of the materials from which the tested samples have been taken to be of equal quality.



Andrew House, Hadfield Street, Dukinfield, Cheshire SK16 4QX Tel: 0161 475 0870
Email: enquiries@murrayrix.com Website: www.murrayrix.com

Also at: London: 020 8523 1999

Murray Rix is the trading name of Murray Rix (Northern) Limited. Registered in England 2878361

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870



TEST CERTIFICATE

PARTICLE SIZE DISTRIBUTION

BS 1377: PART 2: Clause 9.2: 1990

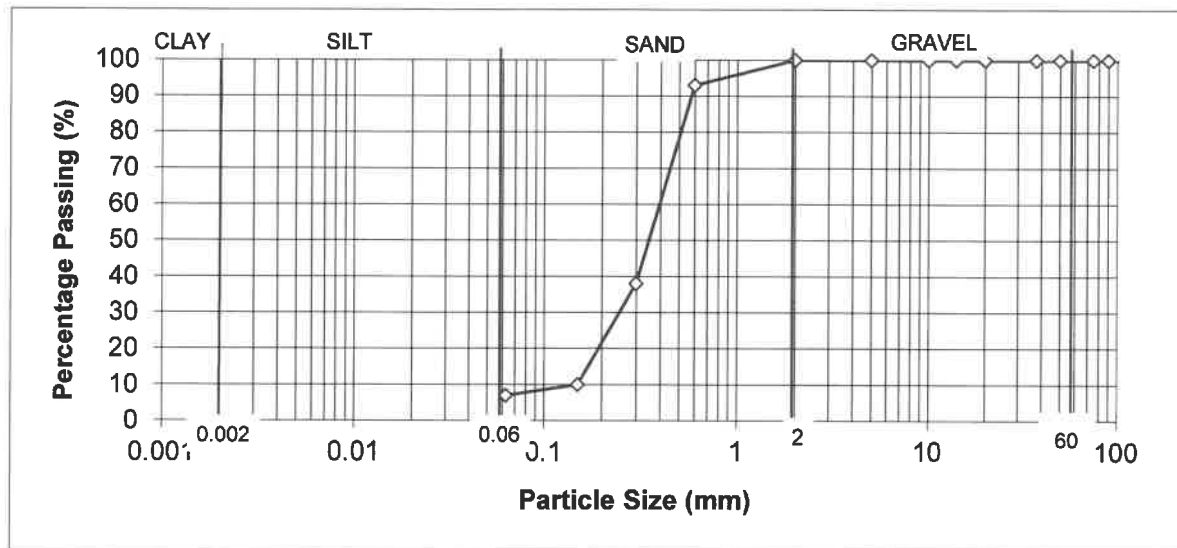
Determination of Moisture Content in accordance with BS 1377: PART 2: Clause 3: 1990 (Oven Dry)

CLIENT	LK Consult Ltd
SITE	LKC 20 1970 - Barlow Moor Road, Chorlton
JOB NUMBER	MRN 4066/44

SAMPLE LABEL	WS101 / 0.8-1.2m	DATE SAMPLED	Not advised
LAB SAMPLE No	96809	DATE RECEIVED	04-Mar-21
DATE TESTED	12-Mar-21	SAMPLED BY	Client

MATERIAL	Brown silty SAND
ADVISED SOURCE	Site Investigation Sample

Sieve Size (mm)	% Passing (%)	Specification (%)	Sieve Size (mm)	% Passing (%)	Specification (%)
125	100		10	100	
90	100		5	100	
75	100		2	100	
50	100		0.6	93	
37.5	100		0.3	38	
20	100		0.15	10	
14	100		0.063	7	



REMARKS

As received moisture content = 9.7%

SIGNED

NAME O.P. Davies BA (Hons)
(Laboratory Manager)

DATE 23-Mar-21

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870



TEST CERTIFICATE

PARTICLE SIZE DISTRIBUTION

BS 1377: PART 2: Clause 9.2: 1990

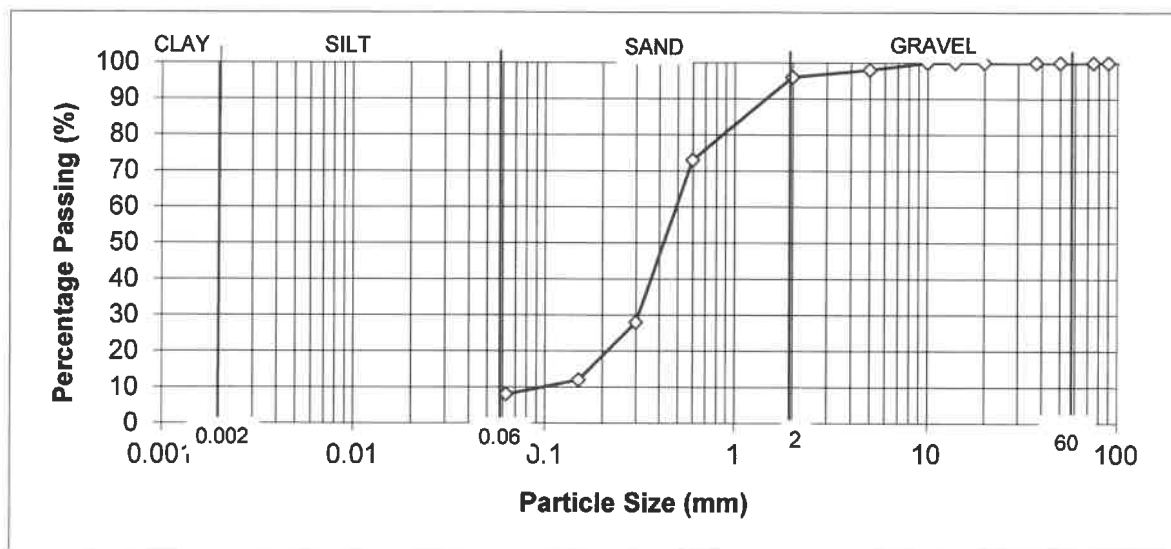
Determination of Moisture Content in accordance with BS 1377: PART 2: Clause 3: 1990 (Oven Dry)

CLIENT	LK Consult Ltd
SITE	LKC 20 1970 - Barlow Moor Road, Chorlton
JOB NUMBER	MRN 4066/44

SAMPLE LABEL	WS102 / 0.6-1.2m	DATE SAMPLED	Not advised
LAB SAMPLE No	96810	DATE RECEIVED	04-Mar-21
DATE TESTED	12-Mar-21	SAMPLED BY	Client

MATERIAL	Brown silty SAND with rare gravel
ADVISED SOURCE	Site Investigation Sample

Sieve Size (mm)	% Passing (%)	Specification (%)	Sieve Size (mm)	% Passing (%)	Specification (%)
125	100		10	100	
90	100		5	98	
75	100		2	96	
50	100		0.6	73	
37.5	100		0.3	28	
20	100		0.15	12	
14	100		0.063	8	



REMARKS

As received moisture content = 20%

SIGNED

NAME O.P. Davies BA (Hons)
(Laboratory Manager)

DATE 23-Mar-21

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870



TEST CERTIFICATE

PARTICLE SIZE DISTRIBUTION

BS 1377: PART 2: Clause 9.2: 1990

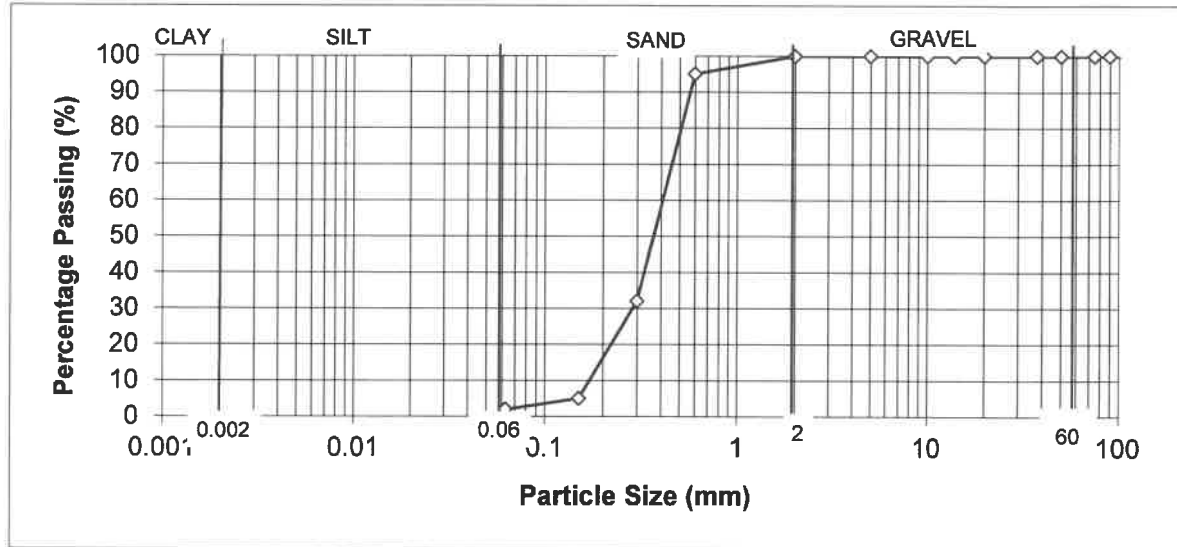
Determination of Moisture Content in accordance with BS 1377: PART 2: Clause 3: 1990 (Oven Dry)

CLIENT	LK Consult Ltd
SITE	LKC 20 1970 - Barlow Moor Road, Chorlton
JOB NUMBER	MRN 4066/44

SAMPLE LABEL	WS103 / 1.2-2.0m	DATE SAMPLED	Not advised
LAB SAMPLE No	96811	DATE RECEIVED	04-Mar-21
DATE TESTED	12-Mar-21	SAMPLED BY	Client

MATERIAL	Brown slightly silty SAND
ADVISED SOURCE	Site Investigation Sample

Sieve Size (mm)	% Passing (%)	Specification (%)	Sieve Size (mm)	% Passing (%)	Specification (%)
125	100		10	100	
90	100		5	100	
75	100		2	100	
50	100		0.6	95	
37.5	100		0.3	32	
20	100		0.15	5	
14	100		0.063	2	



REMARKS

As received moisture content = 5.8%

SIGNED

NAME

O.P. Davies BA (Hons)
(Laboratory Manager)

DATE

23-Mar-21

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870



TEST CERTIFICATE

PARTICLE SIZE DISTRIBUTION

BS 1377: PART 2: Clause 9.2: 1990

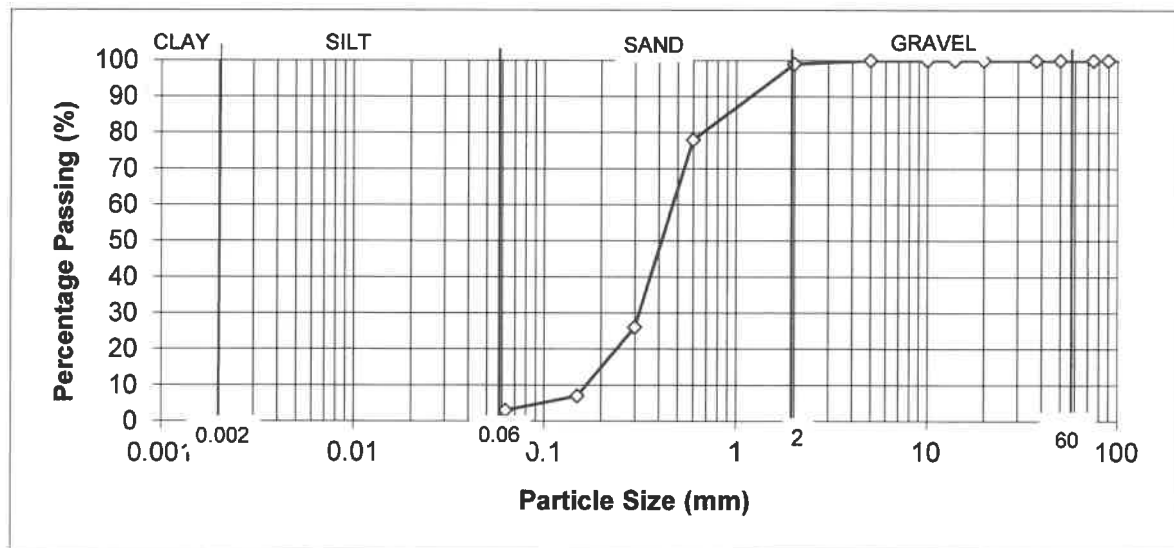
Determination of Moisture Content in accordance with BS 1377: PART 2: Clause 3: 1990 (Oven Dry)

CLIENT	LK Consult Ltd
SITE	LKC 20 1970 - Barlow Moor Road, Chorlton
JOB NUMBER	MRN 4066/44

SAMPLE LABEL	WS104 / 1.5-2.0m	DATE SAMPLED	Not advised
LAB SAMPLE No	96812	DATE RECEIVED	04-Mar-21
DATE TESTED	12-Mar-21	SAMPLED BY	Client

MATERIAL	Brown slightly silty SAND with rare gravel
ADVISED SOURCE	Site Investigation Sample

Sieve Size (mm)	% Passing (%)	Specification (%)	Sieve Size (mm)	% Passing (%)	Specification (%)
125	100		10	100	
90	100		5	100	
75	100		2	99	
50	100		0.6	78	
37.5	100		0.3	26	
20	100		0.15	7	
14	100		0.063	3	



REMARKS

As received moisture content = 5.5%

SIGNED

NAME

O.P. Davies BA (Hons)
(Laboratory Manager)

DATE

23-Mar-21

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870



TEST CERTIFICATE

PARTICLE SIZE DISTRIBUTION

BS 1377: PART 2: Clause 9.2: 1990

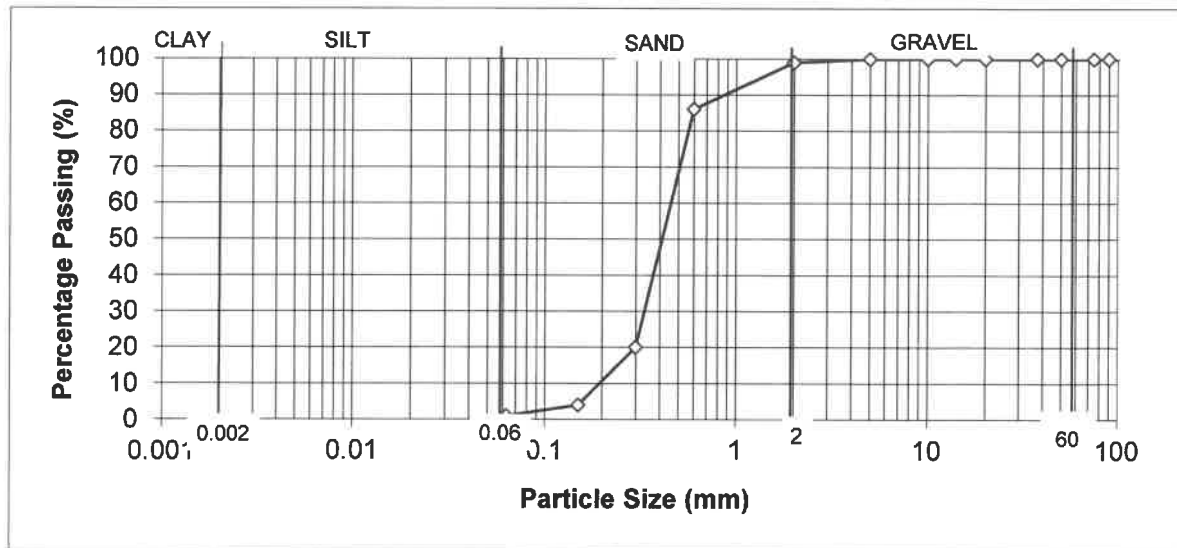
Determination of Moisture Content in accordance with BS 1377: PART 2: Clause 3: 1990 (Oven Dry)

CLIENT	LK Consult Ltd
SITE	LKC 20 1970 - Barlow Moor Road, Chorlton
JOB NUMBER	MRN 4066/44

SAMPLE LABEL	WS105 / 1.5-2.0m	DATE SAMPLED	Not advised
LAB SAMPLE No	96813	DATE RECEIVED	04-Mar-21
DATE TESTED	12-Mar-21	SAMPLED BY	Client

MATERIAL	Brown slightly silty SAND with rare gravel
ADVISED SOURCE	Site Investigation Sample

Sieve Size (mm)	% Passing (%)	Specification (%)	Sieve Size (mm)	% Passing (%)	Specification (%)
125	100		10	100	
90	100		5	100	
75	100		2	99	
50	100		0.6	86	
37.5	100		0.3	20	
20	100		0.15	4	
14	100		0.063	1	



REMARKS

As received moisture content = 5.3%

SIGNED

NAME

O.P. Davies BA (Hons)
(Laboratory Manager)

DATE

23-Mar-21

Appendix F

Generic Assessment Criteria Values

Summary of Category 4 Screening Levels: 2015

Substance	Residential (with home- grown produce)	Residential (without home- grown produce)	Allotments	Commercial	Public Open Space 1	Public Open Space 2
Arsenic	37 mg/kg	40 mg/kg	49 mg/kg	640 mg/kg	79 mg/kg	170 mg/kg
Benzene	0.87 mg/kg	3.3 mg/kg	0.18 mg/kg	98 mg/kg	140 mg/kg	230 mg/kg
Benzo(a)pyrene	5.0 mg/kg	5.3 mg/kg	5.7 mg/kg	77 mg/kg	10 mg/kg	21 mg/kg
Cadmium	22 mg/kg	150 mg/kg	3.9 mg/kg	410 mg/kg	220 mg/kg	880 mg/kg
Chromium VI	21 mg/kg	21 mg/kg	170 mg/kg	49 mg/kg	21 mg/kg	250 mg/kg
Lead	200 mg/kg	310 mg/kg	80 mg/kg	2300 mg/kg	630 mg/kg	1300 mg/kg

Summary Table for the Generic Assessment Criteria for Human Health Risk Assessment Land Quality Management (LQM) S4ULs.

All GAC are based on sandy loam soils with a pH 7.

		LQM Generic Assessment Criteria (mg/kg) Dry weight soil						
Contaminant		SOM	Res +	Res -	Allot.	Comm.	POS _{resi}	POS _{park}
Metals	Inorganic Arsenic	6%	37	40	43	640	79	170
	Beryllium	6%	1.7	1.7	35	12	2.2	63
	Boron	6%	290	11,000	45	240,000	21,000	46,000
	Cadmium	6%	11	85	1.9	190	120	532
	Chromium (III)	6%	910	910	18,000	8,600	1,500	33,000
	Chromium (VI)	6%	6.0	6.0	1.8	33	7.7	220
	Copper	6%	2,400	7,100	520	68,000	12,000	44,000
	Elemental Mercury	6%	1.2	1.2	21	58 (25.8) ^{vap}	16	30 (25.8) ^{vap}
	Inorganic Mercury	6%	40	56	19	1,100	120	240
	Methylmercury	6%	11	15	6.0	320	40	68
	Nickel	6%	180	180	230	980	230	3,400
	Selenium	6%	250	430	88	12,000	1,100	1,800
	Vanadium	6%	410	1,200	91	9,000	2,000	5,000
	Zinc	6%	3,700	40,000	620	730,000	81,000	170,000
BTEX Compounds	Benzene	1%	0.087	0.38	0.017	27	72	90
		2.5%	0.17	0.70	0.034	47	72	100
		6%	0.37	1.4	0.075	90	73	110
	Toluene	1%	130	880 (869) ^{vap}	22	56,000 (869) ^{vap}	56,000	87,000 (869) ^{vap}
		2.5%	290	1,900	51	110,000 (1,920) ^{vap}	56,000	95,000 (1,920) ^{vap}
		6%	660	3,900	120	180,000 (4,360) ^{vap}	56,000	100,000 (4,360) ^{vap}
	Ethylbenzene	1%	47	83	16	5,700 (518) ^{vap}	24,000	17,000 (518) ^{vap}
		2.5%	110	190	39	13,000 (1,220) ^{vap}	24,000	22,000 (1,220) ^{vap}
		6%	260	440	91	27,000 (2,840) ^{vap}	25,000	27,000 (2,840) ^{vap}
	o-xylene	1%	60	88	28	6,600 (478) ^{sol}	41,000	17,000 (478) ^{sol}
		2.5%	140	210	67	15,000 (1,120) ^{sol}	42,000	24,000 (1,120) ^{sol}
		6%	330	480	160	33,000 (2,620) ^{sol}	43,000	33,000 (2,620) ^{sol}
	m-xylene	1%	59	82	31	6,200 (625) ^{vap}	41,000	17,000 (625) ^{vap}
		2.5%	140	190	74	14,000 (1,470) ^{vap}	42,000	24,000 (1,470) ^{vap}
		6%	320	450	170	31,000 (3,460) ^{vap}	43,000	32,000 (3,460) ^{vap}
	p-xylene	1%	56	79	29	5,900 (576) ^{sol}	41,000	17,000 (576) ^{sol}
		2.5%	130	180	69	14,000 (1,350) ^{sol}	42,000	23,000 (1,350) ^{sol}
		6%	310	430	160	30,000 (3,170) ^{sol}	43,000	31,000 (3,170) ^{sol}

NOTES

^{sol/vap} = solubility / vapour limit (potentially use if free product identified, although highly conservative).

f = oral, dermal and inhalation exposures compared to oral HCV.

All GAC are based on sandy loam soils with a pH 7.

All GAC are based on sandy loam soils with a pH 7.			LQM Generic Assessment Criteria (mg/kg) Dry weight soil					
Contaminant		SOM	Res +	Res -	Allot.	Comm.	POS _{resi}	POS _{park}
Polycyclic Aromatic Hydrocarbons (PAHs)	Acenaphthene	1%	210	3,000 (57.1) ^{sol}	34	84,000 (57.0) ^{sol}	15,000	29,000
		2.5%	510	4,700 (141) ^{sol}	85	97,000 (141) ^{sol}	15,000	30,000
		6%	1,100	6,000 (336) ^{sol}	200	100,000	15,000	30,000
	Acenaphthylene	1%	170	2,900 (86.1) ^{sol}	28	83,000 (86.1) ^{sol}	15,000	29,000
		2.5%	420	4,600 (212) ^{sol}	69	97,000 (212) ^{sol}	15,000	30,000
		6%	920	6,000 (506) ^{sol}	160	100,000	15,000	30,000
	Anthracene	1%	2,400	31,000 (1.17) ^{vap}	380	520,000	74,000	150,000
		2.5%	5,400	35,000	950	540,000	74,000	150,000
		6%	11,000	37,000	2,200	540,000	74,000	150,000
	Benz(a)anthracene	1%	7.2	11	2.9	170	29	49
		2.5%	11	14	6.5	170	29	56
		6%	13	15	13	180	29	62
	Benzo(a)pyrene (only)	1%	2.2	3.2	0.97	35	5.7	11
		2.5%	2.7	3.2	2.0	35	5.7	12
		6%	3.0	3.2	3.5	36	5.7	13
	Benzo(b)fluoranthene	1%	2.6	3.9	0.99	44	7.1	13
		2.5%	3.3	4.0	2.1	44	7.2	15
		6%	3.7	4.0	3.9	45	7.2	16
	Benzo(ghi)perylene	1%	320	360	290	3,900	640	1,400
		2.5%	340	360	470	4,000	640	1,500
		6%	350	360	640	4,000	640	1,600
	Benzo(k)fluoranthene	1%	77	110	37	1,200	190	370
		2.5%	93	110	75	1,200	190	410
		6%	100	110	130	1,200	190	440
	Chrysene	1%	15	30	4.1	350	57	93
		2.5%	22	31	9.4	350	57	110
		6%	27	32	19	350	57	120
	Dibenzo(ah)anthracene	1%	0.24	0.31	0.14	3.5	0.57	1.1
		2.5%	0.28	0.32	0.27	3.6	0.58	1.3
		6%	0.3	0.32	0.43	3.6	0.58	1.4
	Fluoranthene	1%	280	1,500	52	23,000	3,100	6,300
		2.5%	560	1,600	130	23,000	3,100	6,300
		6%	890	1,600	290	23,000	3,100	6,400
	Fluorene	1%	170	2,800 (36.0) ^{sol}	27	63,000 (30.9) ^{sol}	9,900	20,000
		2.5%	400	3,800 (76.5) ^{sol}	67	68,000	9,900	20,000
		6%	860	4,500 (183) ^{sol}	160	71,000	9,900	20,000
	Indeno(123-cd)pyrene	1%	27	45	9.5	500	82	150
		2.5%	36	46	21	510	82	170
		6%	41	46	39	510	82	180
	Naphthalene	1%	2.3 ^f	2.3 ^f	4.1 ^f	190 ^f (76.4) ^{sol}	4,900 ^f	1,200 ^f (76.4) ^{sol}
		2.5%	5.6 ^f	5.6 ^f	10 ^f	460 ^f (183) ^{sol}	4,900 ^f	1,900 ^f (183) ^{sol}
		6%	13 ^f	13 ^f	24 ^f	1,100 ^f (432) ^{sol}	4,900 ^f	3,000
	Phenanthrene	1%	95	1,300 (36.0) ^{sol}	15	22,000	3,100	6,200
		2.5%	220	1,500	38	22,000	3,100	6,200
		6%	440	1,500	90	22,000	3,100	6,300
	Pyrene	1%	620	3,700	110	54,000	7,400	15,000
		2.5%	1,200	3,800	270	54,000	7,400	15,000
		6%	2,000	3,800	620	54,000	7,400	15,000
Coal Tar (B(a)P as surrogate marker)	1%	0.79	1.2	0.32	15	2.2	4.4	
	2.5%	0.98	1.2	0.67	15	2.2	4.7	
	6%	1.1	1.2	1.2	15	2.2	4.8	

NOTES

^{sol} / ^{vap} = solubility / vapour limit (potentially use if free product identified, although highly conservative).

^f = naphthalene is based on comparison of inhalation exposure with TDI_{inhal} for localised effect.

All GAC are based on sandy loam soils with a pH 7.

LQM Generic Assessment Criteria (mg/kg) Dry weight soil

Contaminant	SOM	Res +	Res -	Allot.	Comm.	POS _{resi}	POS _{park}
Aliphatic							
EC 5-6	1%	42	42	730	3,200 (304) ^{sol}	570,000(304) ^{sol}	95,000 (304) ^{sol}
EC>6-8	1%	100	100	2,300	7,800 (144) ^{sol}	600,000	150,000 (144) ^{sol}
EC>8-10	1%	27	27	320	2,000 (78) ^{sol}	13,000	14,000 (78) ^{vap}
EC>10-12	1%	130 (48) ^{vap}	130 (48) ^{vap}	2,200	9,700 (48) ^{sol}	13,000	21,000 (48) ^{vap}
EC>12-16	1%	1,100 (24) ^{sol}	1,100 (24) ^{sol}	11,000	59,000 (24) ^{sol}	13,000	25,000 (24) ^{sol}
EC>16-35	1%	65,000 (8.48) ^{f, sol}	65,000 (8.48) ^{f, sol}	260,000 ^f	160,000 ^f	250,000 ^f	450,000 ^f
EC>35-44	1%	65,000 (8.48) ^{f, sol}	65,000 (8.48) ^{f, sol}	260,000 ^f	160,000 ^f	250,000 ^f	450,000 ^f
Aliphatic							
EC 5-6	2.5%	78	78	1,700	5,900 (558) ^{sol}	590,000	130,000 (558) ^{sol}
EC>6-8	2.5%	230	230	5,600	17,000 (322) ^{sol}	610,000	220,000 (322) ^{sol}
EC>8-10	2.5%	65	65	770	4,800 (190) ^{vap}	13,000	18,000 (190) ^{vap}
EC>10-12	2.5%	330 (118) ^{vap}	330 (118) ^{vap}	4,400	23,000 (118) ^{vap}	13,000	23,000 (118) ^{vap}
EC>12-16	2.5%	2,400 (59) ^{sol}	2,400 (59) ^{sol}	13,000	82,000 (59) ^{sol}	13,000	25,000 (59) ^{sol}
EC>16-35	2.5%	92,000 (21) ^{f, sol}	92,000 (21) ^{f, sol}	270,000 ^f	1,700,000 ^f	250,000 ^f	480,000 ^f
EC>35-44	2.5%	92,000 (21) ^{f, sol}	92,000 (21) ^{f, sol}	270,000 ^f	1,700,000 ^f	250,000 ^f	480,000 ^f
Aliphatic							
EC 5-6	6%	160	160	3,900	12,000 (1,150) ^{sol}	600,000	180,000 (1,150) ^{sol}
EC>6-8	6%	530	530	13,000	40,000 (736) ^{sol}	620,000	320,000 (736) ^{sol}
EC>8-10	6%	150	150	1,700	11,000 (451) ^{vap}	13,000	21,000 (451) ^{vap}
EC>10-12	6%	760 (283) ^{vap}	760 (283) ^{vap}	7,300	47,000 (283) ^{vap}	13,000	24,000 (283) ^{vap}
EC>12-16	6%	4,300 (142) ^{sol}	4,400 (142) ^{sol}	13,000	90,000 (142) ^{sol}	13,000	26,000 (142) ^{sol}
EC>16-35	6%	110,000 ^f	110,000 ^f	270,000 ^f	1,800,000 ^f	250,000 ^f	490,000 ^f
EC>35-44	6%	110,000 ^f	110,000 ^f	270,000 ^f	1,800,000 ^f	250,000 ^f	490,000 ^f
Aromatic							
EC5-7(benzene as non-threshold)	1%	70	370	13	26,000 (1,220) ^{sol}	56,000	76,000 (1,220) ^{sol}
EC>7-8(toluene)	1%	130	860	22	56,000 (869) ^{vap}	56,000	87,000 (869) ^{vap}
EC>8-10	1%	34	47	8.6	3,500 (613) ^{vap}	5,000	7,200 (613) ^{vap}
EC>10-12	1%	74	250	13	16,000 (364) ^{sol}	5,000	9,200 (364) ^{sol}
EC>12-16	1%	140	1,800	23	36,000 (169) ^{sol}	5,100	10,000
EC>16-21	1%	260 ^f	1,900 ^f	46 ^f	28,000 ^f	3,800 ^f	7,600 ^f
EC>21-35	1%	1,100 ^f	1,900 ^f	370 ^f	28,000 ^f	3,800 ^f	7,800 ^f
EC>35-44	1%	1,100 ^f	1,900 ^f	370 ^f	28,000 ^f	3,800 ^f	7,800 ^f
Aromatic							
EC5-7(benzene as non-threshold)	2.5%	140	690	27	46,000 (2,260) ^{sol}	56,000	84,000 (2,260) ^{sol}
EC>7-8(toluene)	2.5%	290	1,800	51	110,000 (1,920) ^{sol}	56,000	95,000 (1,920) ^{sol}
EC>8-10	2.5%	83	110	21	8,100 (1,500) ^{vap}	5,000	8,500 (1,500) ^{vap}
EC>10-12	2.5%	180	590	31	28,000 (899) ^{sol}	5,000	9,700 (899) ^{sol}
EC>12-16	2.5%	330	2,300 (419) ^{sol}	57	37,000	5,100	10,000
EC>16-21	2.5%	540 ^f	1,900 ^f	110 ^f	28,000 ^f	3,800 ^f	7,700 ^f
EC>21-35	2.5%	1,500 ^f	1,900 ^f	820 ^f	28,000 ^f	3,800 ^f	7,800 ^f
EC>35-44	2.5%	1,500 ^f	1,900 ^f	820 ^f	28,000 ^f	3,800 ^f	7,800 ^f
Aromatic							
EC5-7(benzene as non-threshold)	6%	300	1,400	57	86,000 (4,710) ^{sol}	56,000	92,000 (4,710) ^{sol}
EC>7-8(toluene)	6%	660	3,900	120	180,000 (4,360) ^{vap}	56,000	100,000 (4,360) ^{vap}
EC>8-10	6%	190	270	51	17,000 (3,580) ^{vap}	5,000	9,300 (3,580) ^{vap}
EC>10-12	6%	380	1,200	74	34,000(2,150) ^{sol}	5,000	10,000
EC>12-16	6%	660	2,500	130	38,000	5,100	10,000
EC>16-21	6%	930 ^f	1,900 ^f	260 ^f	28,000 ^f	3,800 ^f	7,800 ^f
EC>21-35	6%	1,700 ^f	1,900 ^f	1,600 ^f	28,000 ^f	3,800 ^f	7,900 ^f
EC>35-44	6%	1,700 ^f	1,900 ^f	1,600 ^f	28,000 ^f	3,800 ^f	7,900 ^f
Aliphatic	1%	1,600 ^f	1,900 ^f	1,200 ^f	28,000 ^f	3,800 ^f	7,800 ^f
+Aromatic	2.5%	1,800 ^f	1,900 ^f	2,100 ^f	28,000 ^f	3,800 ^f	7,800 ^f
>EC44	6%	1,900 ^f	1,900 ^f	3,000 ^f	28,000 ^f	3,800 ^f	7,900 ^f

NOTES

^{sol}/^{vap} = solubility / vapour limit (potentially use if free product identified, although highly conservative).

^f = oral, dermal and inhalation exposures compared to oral HCV.

All GAC are based on sandy loam soils with a pH 7.

		LQM Generic Assessment Criteria (mg/kg) Dry weight soil						
Contaminant		SOM	Res +	Res -	Allot.	Comm.	POS _{resi}	POS _{park}
Chloalkanes and Alkenes & Explosives	1,2 Dichloroethane (DCA)	1%	7.1E-03	9.2E-03	4.6E-03	0.67	29	21
		2.5%	1.1E-02	1.3E-02	8.3E-03	0.97	29	24
		6%	1.9E-02	2.3E-02	1.6E-02	1.7	29	28
	1,1,1 Trichloroethane (TCA)	1%	8.8	9.0	48	660	140,000	57,000 (1,425) ^{vap}
		2.5%	18	18	110	1,300	140,000	76,000 (2,915) ^{vap}
		6%	39	40	240	3,000	140,000	100,000 (6,392) ^{vap}
	1,1,2,2-Tetrachloroethanes (PCA)	1%	1.6	3.9	0.41	270	1,400	1,800
		2.5%	3.4	8.0	0.89	550	1,400	2,100
		6%	7.5	17	2.0	1,100	1,400	2,300
	1,1,1,2-Tetrachloroethanes (PCA)	1%	1.2	1.5	0.79	110	1,400	1,500
		2.5%	2.8	3.5	1.9	250	1,400	1,800
		6%	6.4	8.2	4.4	560	1,400	2,100
	Tetrachloroethene (PCE)	1%	0.18	0.18	0.65	19	1,400	810 (424) ^{sol}
		2.5%	0.39	0.40	1.5	42	1,400	1,100 (951) ^{sol}
		6%	0.90	0.92	3.6	95	1,400	1,500
	Tetrachloromethane (carbon tetrachloride)	1%	2.6E-02	2.6E-02	0.45	2.9	890	190
		2.5%	5.6E-02	5.6E-02	1.0	6.3	920	270
		6%	0.13	0.13	2.4	14	950	400
	Trichloroethene (TCE)	1%	1.6E-02	1.7E-02	4.1E-02	1.2	120	70
		2.5%	3.4E-02	3.6E-02	9.1E-02	2.6	120	91
		6%	7.5E-02	8.0E-02	0.21	5.7	120	120
	Trichloromethane (chloroform)	1%	0.91	1.2	0.42	99	2,500	2,600
		2.5%	1.7	2.1	0.83	170	2,500	2,800
		6%	3.4	4.2	1.7	350	2,500	3,100
	Chloroethene (vinyl chloride)	1%	6.4E-04	7.7E-04	5.5E-04	5.9E-02	3.5	4.8
		2.5%	8.7E-04	1.0E-03	1.0E-03	7.7E-02	3.5	5.0
		6%	1.4E-03	1.5E-03	1.8E-03	0.12	3.5	5.4
	2,4,6-Trinitrotoluene (TNT)	1%	1.6	65	0.24	1,000	130	260
		2.5%	3.7	66	0.58	1,000	130	270
		6%	8.1	66	1.4	1,000	130	270
	RDX	1%	120	13,000	17	210,000	26,000	49,000 (18.7) ^{sol}
		2.5%	250	13,000	38	210,000	26,000	51,000
		6%	540	13,000	85	210,000	27,000	53,000
	HMX	1%	5.7	6,700	0.86	110,000	13,000	23,000 (0.35) ^{vap}
		2.5%	13	6,700	1.9	110,000	13,000	23,000 (0.39) ^{vap}
		6%	26	6,700	3.9	110,000	13,000	24,000 (0.48) ^{vap}
Pesticides	Aldrin	1%	5.7	7.3	3.2	170	18	30
		2.5%	6.6	7.4	6.1	170	18	31
		6%	7.1	7.5	9.8	170	18	31
	Dieldrin	1%	0.97	7.0	0.17	170	18	30
		2.5%	2.0	7.3	0.41	170	18	30
		6%	3.5	7.4	0.96	170	18	31
	Atrazine	1%	3.3	610	0.5	9,300	1,200	2,300
		2.5%	7.8	620	1.2	9,400	1,200	2,400
		6%	17.4	620	2.7	9,400	1,200	2,400
	Dichlorvos	1%	3.2E-02	6.4	4.9E-03	140	16	26
		2.5%	6.6E-02	6.5	1.0E-02	140	16	26
		6%	0.14	6.6	2.2E-02	140	16	27
	Endosulfans (2 isomers)	1%	7.4	160 (3.0E-03) ^{vap}	1.2	5,600 (3.0E-03) ^{vap}	1,200	2,300
		2.5%	18	280 (7.0E-03) ^{vap}	2.9	7,400 (7.0E-03) ^{vap}	1,200	2,400
		6%	41	410 (1.6E-02) ^{vap}	6.8	8,400 (1.6E-02) ^{vap}	1,200	2,500
	Hexachlorocyclohexane (3 isomers), inc Lindane	1%	8.5E-02	3.7	1.3E-02	65	8.1	15
		2.5%	0.2	3.8	3.2E-02	65	8.1	15
		6%	0.46	3.8	7.7E-02	65	8.1	16

NOTES

^{sol} / ^{vap} = solubility / vapour limit (potentially use if free product identified, although highly conservative).

All GAC are based on
sandy loam soils with a pH
7.

All GAC are based on sandy loam soils with a pH 7.			LQM Generic Assessment Criteria (mg/kg) Dry weight soil					
Contaminant		SOM	Res +	Res -	Allot.	Comm.	POS _{resi}	POS _{park}
Chlorobenzenes	Chlorobenzene	1%	0.46	0.46	5.9	56	11,000	1,300 (675) ^{sol}
		2.5%	1.0	1.0	14	130	13,000	2,000 (1,520) ^{sol}
		6%	2.4	2.4	32	290	14,000	2,900
	Dichlorobenzenes (3 isomers)	1%	23	24	94	2,000 (571) ^{sol}	90,000	24,000 (571) ^{sol}
		2.5%	55	57	230	4,800 (1,370) ^{sol}	95,000	36,000 (1,370) ^{sol}
		6%	130	130	540	11,000 (3,240) ^{sol}	98,000	51,000 (3,270) ^{sol}
	Trichlorobenzenes (3 isomers)	1%	2.6	2.6	55	220	15,000	1,700 (318) ^{vap}
		2.5%	6.4	6.4	140	530	17,000	2,600 (786) ^{vap}
		6%	15	15	320	1,300	19,000	4,000 (1,880) ^{vap}
	Tetrachlorobenzenes (3 isomers)	1%	0.66	0.75	0.38	49 (39.4) ^{vap}	78	110 (39) ^{vap}
		2.5%	1.6	1.9	0.90	120 (98.1) ^{vap}	79	120
		6%	3.7	4.3	2.2	240 (235) ^{vap}	79	130
	Pentachlorobenzene	1%	5.8	19	1.2	640 (43.0) ^{sol}	100	190
		2.5%	12	30	3.1	770 (107) ^{sol}	100	190
		6%	22	38	7.0	830	100	190
	Hexachlorobenzene	1%	1.8 (0.20) ^{vap}	4.1 (0.20) ^{vap}	0.47	110 (0.20) ^{vap}	16	30
		2.5%	3.3 (0.50) ^{vap}	5.7 (0.50) ^{vap}	1.1	120	16	30
		6%	4.9	6.7 (1.2) ^{vap}	2.5	120	16	30
Chlorophenol	Chlorophenols (4 congeners)	1%	0.87 ^g	94	0.13 ^g	3,500	620	1,100
		2.5%	2.0	150	0.30	4,000	620	1,100
		6%	4.5	210	0.70	4,300	620	1,100
	Pentachlorophenol	1%	0.22	27 (16.4) ^{vap}	3.0E-02	400	60	110
		2.5%	0.52	29	8.0E-02	400	60	120
		6%	1.2	31	0.19	400	60	120
Others	Carbon Disulphide	1%	0.14	0.14	4.8	11	11,000	1,300
		2.5%	0.29	0.29	10	22	11,000	1,900
		6%	0.62	0.62	23	47	11,000	2,700
	Hexachlorobutadiene	1%	0.29	0.32	0.25	31	25	48
		2.5%	0.7	0.78	0.61	66	25	50
		6%	1.6	1.8	1.4	120	25	51
	Phenol	1%	280	750	66	760 ^{dir} (31,000)	760 ^{dir} (11,000)	760 ^{dir} (8,600)
		2.5%	550	1,300	140	1,500 ^{dir} (35,000)	1,500 ^{dir} (11,000)	1,500 ^{dir} (9,700)
		6%	1,100	2,300	280	3,200 ^{dir} (37,000)	3,200 ^{dir} (11,000)	3,200 ^{dir} (11,000)

NOTES

^{sol / vap} = solubility / vapour limit (potentially use if free product identified, although highly conservative).

^{dir} = S4uls based on threshold protective of direct skin contact with phenol (brackets long term exposure for illustration purposes).

^g = derived based on 2,3,4,6-tetrachlorophenol.

Appendix G

Hazard Index Spreadsheets

$$HI = \sum_{Fi=1}^{16} HQ_{Fi} = \frac{\text{Measured concentration } Fi \text{ (mg/kg)}}{S4UL \text{ } Fi \text{ (mg/kg)}}$$

where: HI = Hazard Index
 HQ = Hazard Quotient
 Fi = Fraction I
 S4UL = LQM Sutable 4 Use Levels (S4ULs)

Job Barlow Moor Road Business Centre, Chorlton
Job No. LKC 20 1970
SOM 6%
Comment Based upon the highest concentrations (WS103 0.1-0.7m) as a conservative measure.

Commercial

	1% S4UL	2.50% S4UL	6% S4UL	Max Soil concn.	HQ (1%SOM)	HQ (2.5%SOM)	HQ (6% SOM)
Aliphatic							
EC5-EC6	3200	5900	12000	1			8.333E-05
EC6-EC8	7800	17000	40000	1			0.000025
EC8-EC10	2000	4800	11000	1			9.091E-05
EC10-EC12	9700	23000	47000	1			2.128E-05
EC12-EC16	59000	82000	90000	1			1.111E-05
EC16-EC21	160000	1700000	1800000	1			5.556E-07
EC21-EC35							
EC35-EC44	160000	1700000	1800000	1			5.556E-07
Aromatic							
EC5-EC7 (benzene)	26000	46000	86000	0.001			1.163E-08
EC7-EC8 (tolulene)	56000	110000	180000	0.001			5.556E-09
EC8-EC10	3500	8100	17000	1			5.882E-05
EC10-EC12	16000	28000	34000	13			0.0003824
EC12-EC16	36000	37000	38000	48			0.0012632
EC16-EC21	28000	28000	28000	79			0.0028214
EC21-EC35	28000	28000	28000	450			0.0160714
EC35-EC44	28000	28000	28000	1			3.571E-05

HI			0.02
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Appendix H

HazWaste Online Output Sheets

Waste Classification Report



TGY6Y-QSPRG-BCJJ6

Job name

LKC 20 1970

Description/Comments

Project

LKC 20 1970

Site

Barlow Moor Road Business Centre

Related Documents

#	Name	Description
1	HWOL_21-05812-20210309 164122.hwol	.hwol file used to create the Job

Waste Stream Template

Example waste stream template for contaminated soils

Classified by

Name: Peter Dunn	Company: LK Group	HazWasteOnline™ Training Record:	
Date: 23 Mar 2021 10:55 GMT	Unit 29, Eton Business Park	Course	Date
Telephone: 0161 763 7200	Eton Hill Rd, Radcliffe	Hazardous Waste Classification	17 Sep 2019
	Manchester	Advanced Hazardous Waste Classification	18 Sep 2019
	M26 2ZS		

Report

Created by: Peter Dunn
Created date: 23 Mar 2021 10:55 GMT

Job summary

#	Sample Name	Depth [m]	Classification Result	Hazard properties	Page
1	-WS101-24/02/2021-0.1	0.1-0.8	Non Hazardous		2
2	-WS101-24/02/2021-0.8	0.8-1.2	Non Hazardous		5
3	-WS102-24/02/2021-0.15	0.15-0.6	Non Hazardous		6
4	-WS103-24/02/2021-0.1	0.1-0.7	Non Hazardous		8
5	-WS104-24/02/2021-0.1	0.1-0.4	Non Hazardous		11
6	-WS105-24/02/2021-0.2	0.2-0.6	Non Hazardous		14

Appendices	Page
Appendix A: Classifier defined and non CLP determinands	16
Appendix B: Rationale for selection of metal species	17
Appendix C: Version	18

Classification of sample: -WS101-24/02/2021-0.1

 **Non Hazardous Waste**
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:	LoW Code:
-WS101-24/02/2021-0.1	Chapter:
Sample Depth:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
0.1-0.8 m	Entry:
Moisture content:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
13%	
(wet weight correction)	

Hazard properties

None identified

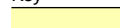
Determinands

Moisture content: 13% Wet Weight Moisture Correction applied (MC)

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
1		arsenic { arsenic trioxide }				34	mg/kg	1.32	39.055	mg/kg	0.00391 %	✓	
		033-003-00-0	215-481-4	1327-53-3									
2		boron { diboron trioxide; boric oxide }				1.5	mg/kg	3.22	4.202	mg/kg	0.00042 %	✓	
		005-008-00-8	215-125-8	1303-86-2									
3		cadmium { cadmium oxide }				0.19	mg/kg	1.142	0.189	mg/kg	0.0000189 %	✓	
		048-002-00-0	215-146-2	1306-19-0									
4		chromium in chromium(III) compounds { chromium(III) oxide (worst case) }				15	mg/kg	1.462	19.073	mg/kg	0.00191 %	✓	
			215-160-9	1308-38-9									
5		chromium in chromium(VI) compounds { chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }				<0.5	mg/kg	2.27	<1.135	mg/kg	<0.000113 %		<LOD
		024-017-00-8											
6		copper { dicopper oxide; copper (I) oxide }				130	mg/kg	1.126	127.338	mg/kg	0.0127 %	✓	
		029-002-00-X	215-270-7	1317-39-1									
7		lead { lead chromate }			1	550	mg/kg	1.56	746.372	mg/kg	0.0478 %	✓	
		082-004-00-2	231-846-0	7758-97-6									
8		mercury { mercury dichloride }				0.52	mg/kg	1.353	0.612	mg/kg	0.0000612 %	✓	
		080-010-00-X	231-299-8	7487-94-7									
9		nickel { nickel chromate }				29	mg/kg	2.976	75.091	mg/kg	0.00751 %	✓	
		028-035-00-7	238-766-5	14721-18-7									
10		selenium { nickel selenate }				0.48	mg/kg	2.554	1.066	mg/kg	0.000107 %	✓	
		028-031-00-5	239-125-2	15060-62-5									
11		zinc { zinc chromate }				95	mg/kg	2.774	229.283	mg/kg	0.0229 %	✓	
		024-007-00-3	236-878-9	13530-65-9									
12		TPH (C6 to C40) petroleum group				<10	mg/kg		<10	mg/kg	<0.001 %		<LOD
				TPH									
13		tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane				<0.001	mg/kg		<0.001	mg/kg	<0.0000001 %		<LOD
		603-181-00-X	216-653-1	1634-04-4									
14		benzene				<0.001	mg/kg		<0.001	mg/kg	<0.0000001 %		<LOD
		601-020-00-8	200-753-7	71-43-2									

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	CLP index number	EC Number	CAS Number							
15	toluene				<0.001 mg/kg		<0.001 mg/kg	<0.0000001 %		<LOD
	601-021-00-3	203-625-9	108-88-3							
16	ethylbenzene				<0.001 mg/kg		<0.001 mg/kg	<0.0000001 %		<LOD
	601-023-00-4	202-849-4	100-41-4							
17	xylene				<0.002 mg/kg		<0.002 mg/kg	<0.0000002 %		<LOD
	601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]							
18	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }				0.8 mg/kg	1.884	1.311 mg/kg	0.000131 %	✓	
	006-007-00-5									
19	pH				8.5 pH		8.5 pH	8.5 pH		
20	naphthalene				3.1 mg/kg		2.697 mg/kg	0.00027 %	✓	
	601-052-00-2	202-049-5	91-20-3							
21	acenaphthylene				0.57 mg/kg		0.496 mg/kg	0.0000496 %	✓	
		205-917-1	208-96-8							
22	acenaphthene				4.4 mg/kg		3.828 mg/kg	0.000383 %	✓	
		201-469-6	83-32-9							
23	fluorene				3.3 mg/kg		2.871 mg/kg	0.000287 %	✓	
		201-695-5	86-73-7							
24	phenanthrene				31 mg/kg		26.97 mg/kg	0.0027 %	✓	
		201-581-5	85-01-8							
25	anthracene				7.4 mg/kg		6.438 mg/kg	0.000644 %	✓	
		204-371-1	120-12-7							
26	fluoranthene				44 mg/kg		38.28 mg/kg	0.00383 %	✓	
		205-912-4	206-44-0							
27	pyrene				39 mg/kg		33.93 mg/kg	0.00339 %	✓	
		204-927-3	129-00-0							
28	benzo[a]anthracene				18 mg/kg		15.66 mg/kg	0.00157 %	✓	
	601-033-00-9	200-280-6	56-55-3							
29	chrysene				19 mg/kg		16.53 mg/kg	0.00165 %	✓	
	601-048-00-0	205-923-4	218-01-9							
30	benzo[b]fluoranthene				19 mg/kg		16.53 mg/kg	0.00165 %	✓	
	601-034-00-4	205-911-9	205-99-2							
31	benzo[k]fluoranthene				7.8 mg/kg		6.786 mg/kg	0.000679 %	✓	
	601-036-00-5	205-916-6	207-08-9							
32	benzo[a]pyrene; benzo[def]chrysene				17 mg/kg		14.79 mg/kg	0.00148 %	✓	
	601-032-00-3	200-028-5	50-32-8							
33	indeno[123-cd]pyrene				11 mg/kg		9.57 mg/kg	0.000957 %	✓	
		205-893-2	193-39-5							
34	dibenz[a,h]anthracene				2 mg/kg		1.74 mg/kg	0.000174 %	✓	
	601-041-00-2	200-181-8	53-70-3							
35	benzo[ghi]perylene				9.9 mg/kg		8.613 mg/kg	0.000861 %	✓	
		205-883-8	191-24-2							
36	vanadium { divanadium pentaoxide; vanadium pentoxide }				47 mg/kg	1.785	72.996 mg/kg	0.0073 %	✓	
	023-001-00-8	215-239-8	1314-62-1							
37	monohydric phenols				<0.3 mg/kg		<0.3 mg/kg	<0.00003 %		<LOD
			P1186							
Total:								0.127 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Determinand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: -WS101-24/02/2021-0.8

✔ **Non Hazardous Waste**
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:	LoW Code:	
-WS101-24/02/2021-0.8	Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:	Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
0.8-1.2 m		
Moisture content:		
11%		
(wet weight correction)		

Hazard properties

None identified

Determinands

Moisture content: 11% Wet Weight Moisture Correction applied (MC)

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	CLP index number	EC Number	CAS Number							
1	• pH				8.3 pH		8.3 pH	8.3 pH		
			PH							
Total:								0%		

Key

- User supplied data
- Determinand defined or amended by HazWasteOnline (see Appendix A)

Classification of sample: -WS102-24/02/2021-0.15

 **Non Hazardous Waste**
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:	LoW Code:
-WS102-24/02/2021-0.15	Chapter:
Sample Depth:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
0.15-0.6 m	Entry:
Moisture content:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
13%	
(wet weight correction)	

Hazard properties

None identified

Determinands

Moisture content: 13% Wet Weight Moisture Correction applied (MC)

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
1		arsenic { arsenic trioxide }				5.9	mg/kg	1.32	6.777	mg/kg	0.000678 %	✓	
	033-003-00-0	215-481-4	1327-53-3										
2		cadmium { cadmium oxide }				0.1	mg/kg	1.142	0.0994	mg/kg	0.00000994 %	✓	
	048-002-00-0	215-146-2	1306-19-0										
3		chromium in chromium(III) compounds { chromium(III) oxide (worst case) }				6.8	mg/kg	1.462	8.647	mg/kg	0.000865 %	✓	
		215-160-9	1308-38-9										
4		chromium in chromium(VI) compounds { chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }				<0.5	mg/kg	2.27	<1.135	mg/kg	<0.000113 %		<LOD
	024-017-00-8												
5		copper { dicopper oxide; copper (I) oxide }				19	mg/kg	1.126	18.611	mg/kg	0.00186 %	✓	
	029-002-00-X	215-270-7	1317-39-1										
6		lead { lead chromate }			1	270	mg/kg	1.56	366.401	mg/kg	0.0235 %	✓	
		082-004-00-2	231-846-0	7758-97-6									
7		mercury { mercury dichloride }				0.11	mg/kg	1.353	0.13	mg/kg	0.000013 %	✓	
		080-010-00-X	231-299-8	7487-94-7									
8		nickel { nickel chromate }				7.3	mg/kg	2.976	18.902	mg/kg	0.00189 %	✓	
		028-035-00-7	238-766-5	14721-18-7									
9		selenium { nickel selenate }				0.25	mg/kg	2.554	0.555	mg/kg	0.0000555 %	✓	
		028-031-00-5	239-125-2	15060-62-5									
10		zinc { zinc chromate }				29	mg/kg	2.774	69.992	mg/kg	0.007 %	✓	
		024-007-00-3	236-878-9	13530-65-9									
11		pH				8.2	pH		8.2	pH	8.2 pH		
				PH									
12		naphthalene				0.28	mg/kg		0.244	mg/kg	0.0000244 %	✓	
		601-052-00-2	202-049-5	91-20-3									
13		acenaphthylene				0.2	mg/kg		0.174	mg/kg	0.0000174 %	✓	
			205-917-1	208-96-8									
14		acenaphthene				1.6	mg/kg		1.392	mg/kg	0.000139 %	✓	
			201-469-6	83-32-9									

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	CLP index number	EC Number	CAS Number							
15	fluorene	201-695-5	86-73-7		1.2 mg/kg		1.044 mg/kg	0.000104 %	✓	
16	phenanthrene	201-581-5	85-01-8		11 mg/kg		9.57 mg/kg	0.000957 %	✓	
17	anthracene	204-371-1	120-12-7		3.3 mg/kg		2.871 mg/kg	0.000287 %	✓	
18	fluoranthene	205-912-4	206-44-0		12 mg/kg		10.44 mg/kg	0.00104 %	✓	
19	pyrene	204-927-3	129-00-0		9.8 mg/kg		8.526 mg/kg	0.000853 %	✓	
20	benzo[a]anthracene	601-033-00-9	200-280-6		4.2 mg/kg		3.654 mg/kg	0.000365 %	✓	
21	chrysene	601-048-00-0	205-923-4		4.9 mg/kg		4.263 mg/kg	0.000426 %	✓	
22	benzo[b]fluoranthene	601-034-00-4	205-911-9		4.7 mg/kg		4.089 mg/kg	0.000409 %	✓	
23	benzo[k]fluoranthene	601-036-00-5	205-916-6		1.8 mg/kg		1.566 mg/kg	0.000157 %	✓	
24	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5		3.6 mg/kg		3.132 mg/kg	0.000313 %	✓	
25	indeno[123-cd]pyrene	205-893-2	193-39-5		2.3 mg/kg		2.001 mg/kg	0.0002 %	✓	
26	dibenz[a,h]anthracene	601-041-00-2	200-181-8		0.49 mg/kg		0.426 mg/kg	0.0000426 %	✓	
27	benzo[ghi]perylene	205-883-8	191-24-2		2.2 mg/kg		1.914 mg/kg	0.000191 %	✓	
28	vanadium { divanadium pentaoxide; vanadium pentoxide }	023-001-00-8	215-239-8		9.7 mg/kg	1.785	15.065 mg/kg	0.00151 %	✓	
Total:								0.043 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
•	Determinand defined or amended by HazWasteOnline (see Appendix A)
•	Speciated Determinand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: -WS103-24/02/2021-0.1

 **Non Hazardous Waste**
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:	LoW Code:
-WS103-24/02/2021-0.1	Chapter:
Sample Depth:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
0.1-0.7 m	Entry:
Moisture content:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
19%	
(wet weight correction)	

Hazard properties

None identified

Determinands

Moisture content: 19% Wet Weight Moisture Correction applied (MC)

#	Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
	CLP index number	EC Number	CAS Number									
1	arsenic { arsenic trioxide }				14	mg/kg	1.32	14.972	mg/kg	0.0015 %	✓	
	033-003-00-0	215-481-4	1327-53-3									
2	boron { diboron trioxide; boric oxide }				3.9	mg/kg	3.22	10.172	mg/kg	0.00102 %	✓	
	005-008-00-8	215-125-8	1303-86-2									
3	cadmium { cadmium oxide }				1.2	mg/kg	1.142	1.11	mg/kg	0.000111 %	✓	
	048-002-00-0	215-146-2	1306-19-0									
4	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }				16	mg/kg	1.462	18.942	mg/kg	0.00189 %	✓	
		215-160-9	1308-38-9									
5	chromium in chromium(VI) compounds { chromium(VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }				<0.5	mg/kg	2.27	<1.135	mg/kg	<0.000113 %		<LOD
	024-017-00-8											
6	copper { dicopper oxide; copper (I) oxide }				58	mg/kg	1.126	52.894	mg/kg	0.00529 %	✓	
	029-002-00-X	215-270-7	1317-39-1									
7	lead { lead chromate }			1	1100	mg/kg	1.56	1389.795	mg/kg	0.0891 %	✓	
	082-004-00-2	231-846-0	7758-97-6									
8	mercury { mercury dichloride }				0.25	mg/kg	1.353	0.274	mg/kg	0.0000274 %	✓	
	080-010-00-X	231-299-8	7487-94-7									
9	nickel { nickel chromate }				21	mg/kg	2.976	50.626	mg/kg	0.00506 %	✓	
	028-035-00-7	238-766-5	14721-18-7									
10	selenium { nickel selenate }				0.23	mg/kg	2.554	0.476	mg/kg	0.0000476 %	✓	
	028-031-00-5	239-125-2	15060-62-5									
11	zinc { zinc chromate }				330	mg/kg	2.774	741.529	mg/kg	0.0742 %	✓	
	024-007-00-3	236-878-9	13530-65-9									
12	TPH (C6 to C40) petroleum group		TPH		590	mg/kg		477.9	mg/kg	0.0478 %	✓	
13	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane				<0.001	mg/kg		<0.001	mg/kg	<0.0000001 %		<LOD
	603-181-00-X	216-653-1	1634-04-4									
14	benzene				<0.001	mg/kg		<0.001	mg/kg	<0.0000001 %		<LOD
	601-020-00-8	200-753-7	71-43-2									

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	CLP index number	EC Number	CAS Number							
15	toluene				<0.001 mg/kg		<0.001 mg/kg	<0.0000001 %		<LOD
	601-021-00-3	203-625-9	108-88-3							
16	ethylbenzene				<0.001 mg/kg		<0.001 mg/kg	<0.0000001 %		<LOD
	601-023-00-4	202-849-4	100-41-4							
17	xylene				<0.002 mg/kg		<0.002 mg/kg	<0.0000002 %		<LOD
	601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]							
18	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }				<0.5 mg/kg	1.884	<0.942 mg/kg	<0.0000942 %		<LOD
	006-007-00-5									
19	pH				8.3 pH		8.3 pH	8.3 pH		
			PH							
20	naphthalene				11 mg/kg		8.91 mg/kg	0.000891 %	✓	
	601-052-00-2	202-049-5	91-20-3							
21	acenaphthylene				1.6 mg/kg		1.296 mg/kg	0.00013 %	✓	
		205-917-1	208-96-8							
22	acenaphthene				3.8 mg/kg		3.078 mg/kg	0.000308 %	✓	
		201-469-6	83-32-9							
23	fluorene				3.4 mg/kg		2.754 mg/kg	0.000275 %	✓	
		201-695-5	86-73-7							
24	phenanthrene				19 mg/kg		15.39 mg/kg	0.00154 %	✓	
		201-581-5	85-01-8							
25	anthracene				3.8 mg/kg		3.078 mg/kg	0.000308 %	✓	
		204-371-1	120-12-7							
26	fluoranthene				17 mg/kg		13.77 mg/kg	0.00138 %	✓	
		205-912-4	206-44-0							
27	pyrene				16 mg/kg		12.96 mg/kg	0.0013 %	✓	
		204-927-3	129-00-0							
28	benzo[a]anthracene				6.8 mg/kg		5.508 mg/kg	0.000551 %	✓	
	601-033-00-9	200-280-6	56-55-3							
29	chrysene				7 mg/kg		5.67 mg/kg	0.000567 %	✓	
	601-048-00-0	205-923-4	218-01-9							
30	benzo[b]fluoranthene				6.8 mg/kg		5.508 mg/kg	0.000551 %	✓	
	601-034-00-4	205-911-9	205-99-2							
31	benzo[k]fluoranthene				2.8 mg/kg		2.268 mg/kg	0.000227 %	✓	
	601-036-00-5	205-916-6	207-08-9							
32	benzo[a]pyrene; benzo[def]chrysene				6.5 mg/kg		5.265 mg/kg	0.000527 %	✓	
	601-032-00-3	200-028-5	50-32-8							
33	indeno[123-cd]pyrene				3.9 mg/kg		3.159 mg/kg	0.000316 %	✓	
		205-893-2	193-39-5							
34	dibenz[a,h]anthracene				0.84 mg/kg		0.68 mg/kg	0.000068 %	✓	
	601-041-00-2	200-181-8	53-70-3							
35	benzo[ghi]perylene				4.1 mg/kg		3.321 mg/kg	0.000332 %	✓	
		205-883-8	191-24-2							
36	vanadium { divanadium pentoxide; vanadium pentoxide }				24 mg/kg	1.785	34.704 mg/kg	0.00347 %	✓	
	023-001-00-8	215-239-8	1314-62-1							
37	monohydric phenols				<0.3 mg/kg		<0.3 mg/kg	<0.00003 %		<LOD
			P1186							
Total:								0.239 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
●	Speciated Determinand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and ≤ 75°C"

Force this Hazardous property to non hazardous because Concentrations at less than 1.0% are "unlikely to be flammable". Flammability of soils is unlikely to result in a hazardous classification in soils (AGS Waste Classification – A Practitioner's Guide).

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.0478%)

Classification of sample: -WS104-24/02/2021-0.1

✔ **Non Hazardous Waste**
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:	LoW Code:	
-WS104-24/02/2021-0.1	Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:	Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
0.1-0.4 m		
Moisture content:		
25%		
(wet weight correction)		

Hazard properties

None identified

Determinands

Moisture content: 25% Wet Weight Moisture Correction applied (MC)

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	CLP index number	EC Number	CAS Number							
1	arsenic { arsenic trioxide }				20 mg/kg	1.32	19.805 mg/kg	0.00198 %	✓	
	033-003-00-0	215-481-4	1327-53-3							
2	boron { diboron trioxide; boric oxide }				2.3 mg/kg	3.22	5.554 mg/kg	0.000555 %	✓	
	005-008-00-8	215-125-8	1303-86-2							
3	cadmium { cadmium oxide }				0.31 mg/kg	1.142	0.266 mg/kg	0.0000266 %	✓	
	048-002-00-0	215-146-2	1306-19-0							
4	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }				12 mg/kg	1.462	13.154 mg/kg	0.00132 %	✓	
		215-160-9	1308-38-9							
5	chromium in chromium(VI) compounds { chromium(VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }				<0.5 mg/kg	2.27	<1.135 mg/kg	<0.000113 %		<LOD
	024-017-00-8									
6	copper { dicopper oxide; copper (I) oxide }				50 mg/kg	1.126	42.221 mg/kg	0.00422 %	✓	
	029-002-00-X	215-270-7	1317-39-1							
7	lead { lead chromate }			1	380 mg/kg	1.56	444.547 mg/kg	0.0285 %	✓	
	082-004-00-2	231-846-0	7758-97-6							
8	mercury { mercury dichloride }				0.55 mg/kg	1.353	0.558 mg/kg	0.0000558 %	✓	
	080-010-00-X	231-299-8	7487-94-7							
9	nickel { nickel chromate }				17 mg/kg	2.976	37.947 mg/kg	0.00379 %	✓	
	028-035-00-7	238-766-5	14721-18-7							
10	selenium { nickel selenate }				0.4 mg/kg	2.554	0.766 mg/kg	0.0000766 %	✓	
	028-031-00-5	239-125-2	15060-62-5							
11	zinc { zinc chromate }				98 mg/kg	2.774	203.9 mg/kg	0.0204 %	✓	
	024-007-00-3	236-878-9	13530-65-9							
12	TPH (C6 to C40) petroleum group		TPH		<10 mg/kg		<10 mg/kg	<0.001 %		<LOD
13	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane				<0.001 mg/kg		<0.001 mg/kg	<0.0000001 %		<LOD
	603-181-00-X	216-653-1	1634-04-4							
14	benzene				<0.001 mg/kg		<0.001 mg/kg	<0.0000001 %		<LOD
	601-020-00-8	200-753-7	71-43-2							

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
	CLP index number	EC Number	CAS Number								
15	toluene				<0.001 mg/kg		<0.001 mg/kg	<0.0000001 %			<LOD
	601-021-00-3	203-625-9	108-88-3								
16	ethylbenzene				<0.001 mg/kg		<0.001 mg/kg	<0.0000001 %			<LOD
	601-023-00-4	202-849-4	100-41-4								
17	xylene				<0.002 mg/kg		<0.002 mg/kg	<0.0000002 %			<LOD
	601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]								
18	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }				<0.5 mg/kg	1.884	<0.942 mg/kg	<0.0000942 %			<LOD
	006-007-00-5										
19	pH				7.9 pH		7.9 pH	7.9 pH			
			PH								
20	naphthalene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %			<LOD
	601-052-00-2	202-049-5	91-20-3								
21	acenaphthylene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %			<LOD
		205-917-1	208-96-8								
22	acenaphthene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %			<LOD
		201-469-6	83-32-9								
23	fluorene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %			<LOD
		201-695-5	86-73-7								
24	phenanthrene				0.77 mg/kg		0.578 mg/kg	0.0000578 %		✓	
		201-581-5	85-01-8								
25	anthracene				0.18 mg/kg		0.135 mg/kg	0.0000135 %		✓	
		204-371-1	120-12-7								
26	fluoranthene				1.2 mg/kg		0.9 mg/kg	0.00009 %		✓	
		205-912-4	206-44-0								
27	pyrene				1.1 mg/kg		0.825 mg/kg	0.0000825 %		✓	
		204-927-3	129-00-0								
28	benzo[a]anthracene				0.6 mg/kg		0.45 mg/kg	0.000045 %		✓	
	601-033-00-9	200-280-6	56-55-3								
29	chrysene				0.64 mg/kg		0.48 mg/kg	0.000048 %		✓	
	601-048-00-0	205-923-4	218-01-9								
30	benzo[b]fluoranthene				0.71 mg/kg		0.533 mg/kg	0.0000533 %		✓	
	601-034-00-4	205-911-9	205-99-2								
31	benzo[k]fluoranthene				0.27 mg/kg		0.203 mg/kg	0.0000203 %		✓	
	601-036-00-5	205-916-6	207-08-9								
32	benzo[a]pyrene; benzo[def]chrysene				0.61 mg/kg		0.458 mg/kg	0.0000457 %		✓	
	601-032-00-3	200-028-5	50-32-8								
33	indeno[123-cd]pyrene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %			<LOD
		205-893-2	193-39-5								
34	dibenz[a,h]anthracene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %			<LOD
	601-041-00-2	200-181-8	53-70-3								
35	benzo[ghi]perylene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %			<LOD
		205-883-8	191-24-2								
36	vanadium { divanadium pentaoxide; vanadium pentoxide }				23 mg/kg	1.785	30.794 mg/kg	0.00308 %		✓	
	023-001-00-8	215-239-8	1314-62-1								
37	monohydric phenols				<0.3 mg/kg		<0.3 mg/kg	<0.00003 %			<LOD
			P1186								
Total:									0.0658 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Determinand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1 Only the metal concentration has been used for classification	

Classification of sample: -WS105-24/02/2021-0.2

 **Non Hazardous Waste**
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:	LoW Code:
-WS105-24/02/2021-0.2	Chapter:
Sample Depth:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
0.2-0.6 m	Entry:
Moisture content:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
17%	
(wet weight correction)	

Hazard properties

None identified

Determinands

Moisture content: 17% Wet Weight Moisture Correction applied (MC)

#	Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
	CLP index number	EC Number	CAS Number									
1	arsenic { arsenic trioxide }				17	mg/kg	1.32	18.63	mg/kg	0.00186 %	✓	
	033-003-00-0	215-481-4	1327-53-3									
2	cadmium { cadmium oxide }				0.13	mg/kg	1.142	0.123	mg/kg	0.0000123 %	✓	
	048-002-00-0	215-146-2	1306-19-0									
3	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }				9.7	mg/kg	1.462	11.767	mg/kg	0.00118 %	✓	
		215-160-9	1308-38-9									
4	chromium in chromium(VI) compounds { chromium(VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }				<0.5	mg/kg	2.27	<1.135	mg/kg	<0.000113 %		<LOD
	024-017-00-8											
5	copper { dicopper oxide; copper (I) oxide }				31	mg/kg	1.126	28.969	mg/kg	0.0029 %	✓	
	029-002-00-X	215-270-7	1317-39-1									
6	lead { lead chromate }			1	150	mg/kg	1.56	194.197	mg/kg	0.0124 %	✓	
	082-004-00-2	231-846-0	7758-97-6									
7	mercury { mercury dichloride }				0.41	mg/kg	1.353	0.461	mg/kg	0.0000461 %	✓	
	080-010-00-X	231-299-8	7487-94-7									
8	nickel { nickel chromate }				13	mg/kg	2.976	32.114	mg/kg	0.00321 %	✓	
	028-035-00-7	238-766-5	14721-18-7									
9	selenium { nickel selenate }				0.39	mg/kg	2.554	0.827	mg/kg	0.0000827 %	✓	
	028-031-00-5	239-125-2	15060-62-5									
10	zinc { zinc chromate }				42	mg/kg	2.774	96.707	mg/kg	0.00967 %	✓	
	024-007-00-3	236-878-9	13530-65-9									
11	pH		PH		8.4	pH		8.4	pH	8.4 pH		
12	naphthalene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
	601-052-00-2	202-049-5	91-20-3									
13	acenaphthylene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
		205-917-1	208-96-8									
14	acenaphthene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
		201-469-6	83-32-9									

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	CLP index number	EC Number	CAS Number							
15	fluorene	201-695-5	86-73-7		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
16	phenanthrene	201-581-5	85-01-8		0.53 mg/kg		0.44 mg/kg	0.000044 %	✓	
17	anthracene	204-371-1	120-12-7		0.13 mg/kg		0.108 mg/kg	0.0000108 %	✓	
18	fluoranthene	205-912-4	206-44-0		0.88 mg/kg		0.73 mg/kg	0.000073 %	✓	
19	pyrene	204-927-3	129-00-0		0.82 mg/kg		0.681 mg/kg	0.0000681 %	✓	
20	benzo[a]anthracene	601-033-00-9	200-280-6		0.36 mg/kg		0.299 mg/kg	0.0000299 %	✓	
21	chrysene	601-048-00-0	205-923-4		0.47 mg/kg		0.39 mg/kg	0.000039 %	✓	
22	benzo[b]fluoranthene	601-034-00-4	205-911-9		0.55 mg/kg		0.457 mg/kg	0.0000457 %	✓	
23	benzo[k]fluoranthene	601-036-00-5	205-916-6		0.18 mg/kg		0.149 mg/kg	0.0000149 %	✓	
24	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5		0.47 mg/kg		0.39 mg/kg	0.000039 %	✓	
25	indeno[123-cd]pyrene	205-893-2	193-39-5		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
26	dibenz[a,h]anthracene	601-041-00-2	200-181-8		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
27	benzo[ghi]perylene	205-883-8	191-24-2		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
28	vanadium { divanadium pentaoxide; vanadium pentoxide }	023-001-00-8	215-239-8		17 mg/kg	1.785	25.189 mg/kg	0.00252 %	✓	
Total:								0.0345 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
•	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Determinand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Appendix A: Classifier defined and non CLP determinands

■ **chromium(III) oxide (worst case)** (EC Number: 215-160-9, CAS Number: 1308-38-9)

Description/Comments: Data from C&L Inventory Database

Data source: <https://echa.europa.eu/information-on-chemicals/cl-inventory-database/-/discli/details/33806>

Data source date: 17 Jul 2015

Hazard Statements: Acute Tox. 4 H332 , Acute Tox. 4 H302 , Eye Irrit. 2 H319 , STOT SE 3 H335 , Skin Irrit. 2 H315 , Resp. Sens. 1 H334 , Skin Sens. 1 H317 , Repr. 1B H360FD , Aquatic Acute 1 H400 , Aquatic Chronic 1 H410

■ **pH** (CAS Number: PH)

Description/Comments: Appendix C4

Data source: WM3 1st Edition 2015

Data source date: 25 May 2015

Hazard Statements: None.

■ **acenaphthylene** (EC Number: 205-917-1, CAS Number: 208-96-8)

Description/Comments: Data from C&L Inventory Database

Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>

Data source date: 17 Jul 2015

Hazard Statements: Acute Tox. 4 H302 , Acute Tox. 1 H330 , Acute Tox. 1 H310 , Eye Irrit. 2 H319 , STOT SE 3 H335 , Skin Irrit. 2 H315

■ **acenaphthene** (EC Number: 201-469-6, CAS Number: 83-32-9)

Description/Comments: Data from C&L Inventory Database

Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>

Data source date: 17 Jul 2015

Hazard Statements: Eye Irrit. 2 H319 , STOT SE 3 H335 , Skin Irrit. 2 H315 , Aquatic Acute 1 H400 , Aquatic Chronic 1 H410 , Aquatic Chronic 2 H411

■ **fluorene** (EC Number: 201-695-5, CAS Number: 86-73-7)

Description/Comments: Data from C&L Inventory Database

Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>

Data source date: 06 Aug 2015

Hazard Statements: Aquatic Acute 1 H400 , Aquatic Chronic 1 H410

■ **phenanthrene** (EC Number: 201-581-5, CAS Number: 85-01-8)

Description/Comments: Data from C&L Inventory Database

Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>

Data source date: 06 Aug 2015

Hazard Statements: Acute Tox. 4 H302 , Eye Irrit. 2 H319 , STOT SE 3 H335 , Carc. 2 H351 , Skin Sens. 1 H317 , Aquatic Acute 1 H400 , Aquatic Chronic 1 H410 , Skin Irrit. 2 H315

■ **anthracene** (EC Number: 204-371-1, CAS Number: 120-12-7)

Description/Comments: Data from C&L Inventory Database

Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>

Data source date: 17 Jul 2015

Hazard Statements: Eye Irrit. 2 H319 , STOT SE 3 H335 , Skin Irrit. 2 H315 , Skin Sens. 1 H317 , Aquatic Acute 1 H400 , Aquatic Chronic 1 H410

■ **fluoranthene** (EC Number: 205-912-4, CAS Number: 206-44-0)

Description/Comments: Data from C&L Inventory Database

Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>

Data source date: 21 Aug 2015

Hazard Statements: Acute Tox. 4 H302 , Aquatic Acute 1 H400 , Aquatic Chronic 1 H410

■ **pyrene** (EC Number: 204-927-3, CAS Number: 129-00-0)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 2014

Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>

Data source date: 21 Aug 2015

Hazard Statements: Skin Irrit. 2 H315 , Eye Irrit. 2 H319 , STOT SE 3 H335 , Aquatic Acute 1 H400 , Aquatic Chronic 1 H410

■ **indeno[123-cd]pyrene** (EC Number: 205-893-2, CAS Number: 193-39-5)

Description/Comments: Data from C&L Inventory Database

Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>

Data source date: 06 Aug 2015

Hazard Statements: Carc. 2 H351

▪ **benzo[ghi]perylene** (EC Number: 205-883-8, CAS Number: 191-24-2)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 28/02/2015
Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>
Data source date: 23 Jul 2015
Hazard Statements: Aquatic Acute 1 H400 , Aquatic Chronic 1 H410

▪ **TPH (C6 to C40) petroleum group** (CAS Number: TPH)

Description/Comments: Hazard statements taken from WM3 1st Edition 2015; Risk phrases: WM2 3rd Edition 2013
Data source: WM3 1st Edition 2015
Data source date: 25 May 2015
Hazard Statements: Flam. Liq. 3 H226 , Asp. Tox. 1 H304 , STOT RE 2 H373 , Muta. 1B H340 , Carc. 1B H350 , Repr. 2 H361d , Aquatic Chronic 2 H411

▪ **ethylbenzene** (EC Number: 202-849-4, CAS Number: 100-41-4)

CLP index number: 601-023-00-4
Description/Comments:
Data source: Commission Regulation (EU) No 605/2014 – 6th Adaptation to Technical Progress for Regulation (EC) No 1272/2008. (ATP6)
Additional Hazard Statement(s): Carc. 2 H351
Reason for additional Hazards Statement(s):
03 Jun 2015 - Carc. 2 H351 hazard statement sourced from: IARC Group 2B (77) 2000

▪ **salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex**

CLP index number: 006-007-00-5
Description/Comments: Conversion factor based on a worst case compound: sodium cyanide
Data source: Commission Regulation (EC) No 790/2009 - 1st Adaptation to Technical Progress for Regulation (EC) No 1272/2008. (ATP1)
Additional Hazard Statement(s): EUH032 >= 0.2 %
Reason for additional Hazards Statement(s):
14 Dec 2015 - EUH032 >= 0.2 % hazard statement sourced from: WM3, Table C12.2

▪ **monohydric phenols** (CAS Number: P1186)

Description/Comments: Combined hazards statements from harmonised entries in CLP for phenol, cresols and xylenols (604-001-00-2, 604-004-00-9, 604-006-00-X)
Data source: CLP combined data
Data source date: 26 Mar 2019
Hazard Statements: Acute Tox. 3 H301 , Acute Tox. 3 H311 , Acute Tox. 3 H331 , Skin Corr. 1B H314 , Skin Corr. 1B H314 >= 3 % , Skin Irrit. 2 H315 1 £ conc. < 3 % , Eye Irrit. 2 H319 1 £ conc. < 3 % , Muta. 2 H341 , STOT RE 2 H373 , Aquatic Chronic 2 H411

Appendix B: Rationale for selection of metal species

arsenic {arsenic trioxide}

Reasonable case CLP species based on hazard statements/molecular weight and most common (stable) oxide of arsenic. Industrial sources include: smelting; main precursor to other arsenic compounds (edit as required)

cadmium {cadmium oxide}

Reasonable case CLP species based on hazard statements/molecular weight, very low solubility in water. Industrial sources include: electroplating baths, electrodes for storage batteries, catalysts, ceramic glazes, phosphors, pigments and nematocides. (edit as required) Worst case compounds in CLP: cadmium sulphate, chloride, fluoride & iodide not expected as either very soluble and/or compound's industrial usage not related to site history (edit as required)

chromium in chromium(III) compounds {chromium(III) oxide (worst case)}

Reasonable case species based on hazard statements/molecular weight. Industrial sources include: tanning, pigment in paint, inks and glass (edit as required)

chromium in chromium(VI) compounds {chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex}

Worst case species based on hazard statements/molecular weight (edit as required)

copper {dicopper oxide; copper (I) oxide}

Reasonable case CLP species based on hazard statements/molecular weight and insolubility in water. Industrial sources include: oxidised copper metal, brake pads, pigments, antifouling paints, fungicide. (edit as required) Worst case copper sulphate is very soluble and likely to have been leached away if ever present and/or not enough soluble sulphate detected. (edit as required)

lead {lead chromate}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

mercury {mercury dichloride}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

nickel {nickel chromate}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

selenium {nickel selenate}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

zinc {zinc chromate}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

vanadium {divanadium pentaoxide; vanadium pentoxide}

worst case/most likely scenario

boron {diboron trioxide; boric oxide}

Reasonable case CLP species based on hazard statements/ molecular weight, physical form and low solubility. Industrial sources include: fluxing agent for glass/enamels; additive for fibre optics, borosilicate glass (edit as required)

cyanides {salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex}

Harmonised group entry used as most reasonable case as complex cyanides and those specified elsewhere in the annex are not likely to be present in this soil: [Note conversion factor based on a worst case compound: sodium cyanide] (edit as required)

Appendix C: Version

HazWasteOnline Classification Engine: **WM3 1st Edition v1.1, May 2018**

HazWasteOnline Classification Engine Version: 2021.77.4714.9046 (18 Mar 2021)

HazWasteOnline Database: 2021.77.4714.9046 (18 Mar 2021)

This classification utilises the following guidance and legislation:

WM3 v1.1 - Waste Classification - 1st Edition v1.1 - May 2018

CLP Regulation - Regulation 1272/2008/EC of 16 December 2008

1st ATP - Regulation 790/2009/EC of 10 August 2009

2nd ATP - Regulation 286/2011/EC of 10 March 2011

3rd ATP - Regulation 618/2012/EU of 10 July 2012

4th ATP - Regulation 487/2013/EU of 8 May 2013

Correction to 1st ATP - Regulation 758/2013/EU of 7 August 2013

5th ATP - Regulation 944/2013/EU of 2 October 2013

6th ATP - Regulation 605/2014/EU of 5 June 2014

WFD Annex III replacement - Regulation 1357/2014/EU of 18 December 2014

Revised List of Waste 2014 - Decision 2014/955/EU of 18 December 2014

7th ATP - Regulation 2015/1221/EU of 24 July 2015

8th ATP - Regulation (EU) 2016/918 of 19 May 2016

9th ATP - Regulation (EU) 2016/1179 of 19 July 2016

10th ATP - Regulation (EU) 2017/776 of 4 May 2017

HP14 amendment - Regulation (EU) 2017/997 of 8 June 2017

13th ATP - Regulation (EU) 2018/1480 of 4 October 2018

14th ATP - Regulation (EU) 2020/217 of 4 October 2019

15th ATP - Regulation (EU) 2020/1182 of 19 May 2020

The Chemicals (Health and Safety) and Genetically Modified Organisms (Contained Use)(Amendment etc.) (EU Exit)

Regulations 2019 - UK: 2019 No. 720 of 27th March 2019

The Chemicals (Health and Safety) and Genetically Modified Organisms (Contained Use)(Amendment etc.) (EU Exit)

Regulations 2020 - UK: 2020 No. 1567 of 16th December 2020

The Waste and Environmental Permitting etc. (Legislative Functions and Amendment etc.) (EU Exit) Regulations 2020 - UK: 2020 No. 1540 of 16th December 2020

POPs Regulation 2019 - Regulation (EU) 2019/1021 of 20 June 2019

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