437 WILMSLOW ROAD WITHINGTON

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

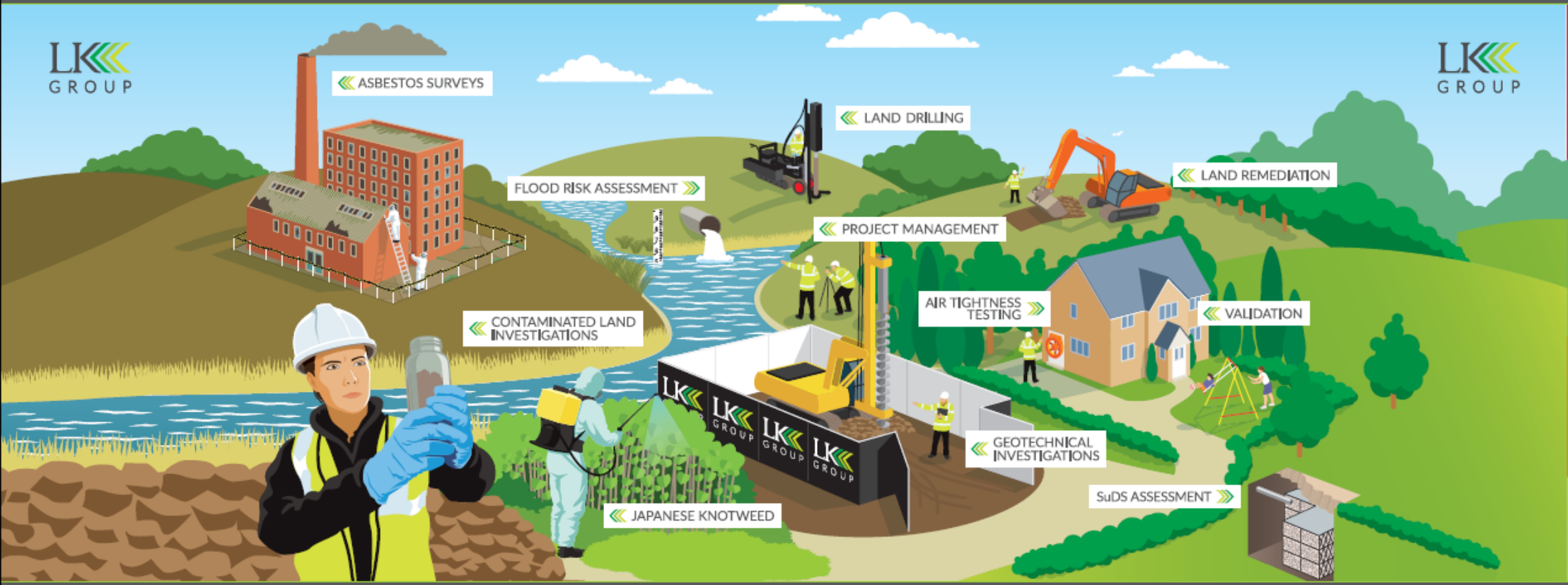
Job Number: LKC 19 1129
Date: June 2019
Client: First-Step Group Ltd



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Document Verification

Site Address	437 Wilmslow Road, Withington, Manchester, M20 4AF		
Report Title	Final Phase 2 Geo-Environmental Investigation, Risk Assessment and Remediation Strategy		
Job Number	LKC 19 1129	**Document Ref.**	CL-602-LKC 19 1129-01
Date Issued	7th June 2019	**Report Version**	R0
Prepared By	Beth Ryder	**Signature**	
Reviewed By	Peter Dunn	**Signature**	

Revision Record			
Revision No.	**Date**	**Nature of Revision**	**Approved By**

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EXECUTIVE SUMMARY

Site Details

Site Location:	437, Wilmslow Road. Northwest of Swinbourne Grove, to the southeast of Wilmslow Road, Withington, Manchester. Centred at approximate National Grid Reference 385000E, 393130N.
Site Area:	1,300m^2.
Current Land Use:	Rough ground in the east and tarmacadam / concrete car park in the west.
Proposed Development:	Conversion and 4 storey extension of current building to include 16no. residential apartments with car parking and limited soft landscaping.
Purpose of Report:	Contamination and Geotechnical Assessment.

Preliminary Risk Assessment

PRA Details:	Undertaken by LKC in April 2019. Ref: LKC 19 1129
History:	Bank building on site 1893- present, remainder of site undeveloped on historical mappings. Currently hard stood car park area.
Geology / Hydrogeology:	No superficial recorded on site. Wilmslow Sandstone Formation (Principal Aquifer).
Mining:	Not within coal reporting area.
Relevant Environmental Setting:	264m S, Shaw Brook Pollution incident, 172m E: 14th June 1995, Category 3 (Minor Incident). Principal Aquifer (bedrock). No surface water abstractions within the Envirocheck search area of 1km. No groundwater abstractions within the Envirocheck search area of 1km. Not within Source Protection Zone.
Preliminary Conceptual Model: PL=Pollutant Linkage	PL1 Direct Contact (Human Health): Low Risk (ACM, metals, PAHs, hydrocarbons) PL2 Inhalation of Vapours: Low Risk (volatile contaminants). PL3 Gas: Moderate/**Low** (hazardous and ground gas). PL4 Controlled waters: Low (mobile contaminants). PL5 Sulphate Attack: **Moderate**/Low (sulphate). PL6 Water Pipelines: Low Risk (organic contaminants). PL7 Phytotoxic: Very low Risk (metals).
Recommendations:	Site Investigation was recommended to further assess all the above pollutant linkages.

Ground Investigation Work Undertaken

Date of Investigation:	17th May 2019.
Intrusive Investigation Work Undertaken:	3no. window sample boreholes (WS101-WS103). 2no. hand excavated trial pits (HD101-102).
Monitoring Wells:	Installed in all boreholes.
Soil Sampling:	5no. samples tested for metals, speciated PAHs, pH, sulphate, asbestos and SOM.
Monitoring:	Additional site visit to monitor groundwater levels.
Insitu and Laboratory Geotechnical Testing:	SPTs, shear vanes, PSDs, plasticity.

Geotechnical Assessment

Proposed Development	- Three storey extension to the existing bank building.
General Ground conditions / Geotechnical Testing	- Based on WS101-WS103 (location of extension). - Maximum investigation depth 3.3mbgl. - Made Ground to 0.6-0.8mbgl. - Stiff consistency, high strength gravelly sandy Clay from 0.6-1.9mbgl. SPTs N = 10-12 at 1mbgl. - Dense gravelly, silty Sand (probable weathered bedrock) to >3.3mbgl. SPTs N = 20 at 1.20m, N=28-35 at 2mbgl. - SPT N>50 at 2.8-3.0mbgl. - No groundwater encountered.
Allowable Bearing Pressure	100kN/m^2 at 1.00mbgl in the stiff clay. 250kN/m^2 at 2.00mbgl in the medium dense sand. >500kN/m^2 at 3.00m in the weathered sandstone.
Anticipated Foundation Type	- Ground conditions below the proposed extension are variable with varying depths of made ground (0.6->1.0mbgl), stiff clay to 1.2-1.90mbgl and medium dense becoming very dense sand (weathered sandstone) to the completion depths of the window sample boreholes. - Traditional shallow foundations are not expected to be suitable for the proposed development given the loadings anticipated. Settlement of the proposed building could affect the stability of the adjoining existing building. It is recommended that the proposed extension is supported on deep strip/trench foundations at circa 2.00mbgl upon the weathered sandstone.
Concrete Requirements	- Based on BRE Digest 2005[1] – DS-1 AC-1 recommended.
Services	- Services – consideration to the presence of services running through the site. Services may need to re-routed.
Plasticity	- Consideration will need to be given to the shrink / swell of the clay strata if it is to be used as founding strata, particularly where trees/hedges are present. Foundations may need to be deepened.

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

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, fibres and vegetables).	**Moderate /** Low (metals, PAHs)	- Although elevated metals and PAHs identified only limited soft landscaping associated with existing mature trees is proposed. - Moderate risk considered appropriate. - **Recommendation**: Limited remediation in areas of soft landscaping recommended.
		Low (ACM, hydrocarbons)	- No ACM and no evidence of hydrocarbons noted during site investigation. - **Recommendation:** No remediation required.
2	Volatile contaminants posing a risk to site users via the inhalation of vapours.	**Low**	- No evidence identified. TVOCs <LOD. - **Recommendation**: 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 identified. - **Recommendation**: No remediation required.
4	Mobile contamination posing a risk to controlled waters via the migration through permeable strata.	**Low**	- No significant mobile contamination identified. - **Recommendation**: No remediation required.
5	Sulphate posing a risk to building via direct contact (sulphate attack).	**Low**	- No elevated SO_4 or pH. - **Recommendation**: DS1 AC1 considered suitable, subject to structural engineer's recommendations.
6	Organic contaminants posing a risk to water pipes.	Moderate/ **Low**	- Elevated TVOCs identified in made ground across the site. - Low risk assumed as pipelines likely to be laid in natural strata at pipeline depth (0.75-1.35m). - **Recommendation**: UURA required for new connections, barrier pipe may be required.
7	Phytotoxic metals posing a risk to flora via root uptake.	**Very Low**	- No elevated concentrations identified. - **Recommendation**: No remediation required.

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.

Phase	PL	Remediation Requirements	Validation Requirements
Build-Phase Construction	**1 and 7**	In areas of soft landscaping, as the made ground is relatively shallow the following options are given: <u>Option 1</u> Removal of all reworked topsoil / made ground from soft landscaping and raise levels (as required) with suitably chemically validated subsoil and topsoil. <u>Option 2</u> If all or some of the made ground remains in place in soft landscaping areas, an environmental cover system will be required. The environmental cover system should be as follows: **300mm thick environmental cover system comprising:** **<u>Either</u>** 100mm physical break layer (MOT type 1 material, 20-30mm, minimal fines) and at least 200mm comprising clean inert fill and sufficient topsoil for a growing medium. **<u>Or</u>** geotextile membrane and at least 300mm comprising clean inert fill and sufficient topsoil for a growing medium. The subsoil layer can be replaced by additional topsoil. A diagram of a typical environmental cover system is shown in Appendix E No remediation required in areas of hardstanding. **Areas of TPO's** Please note where there are TPO's in influencing distance of the gardens it is likely the arboriculture officer may only allow a 100-150mm clean cover system.	<u>Option 1</u> Consignment notes confirming the removal of made ground. Photographic evidence of natural strata. Chemical validation of imported soils: See Table 9-2. <u>Option 2</u> Measuring depth of environmental cover system using a staff and providing photographic evidence. Photographic evidence of the granular physical break or geotextile layer will also be collected. Chemical validation of imported soils: See Table 9-2.
	6	<u>Potable Water Pipes</u> If a new connection is required, it is recommended that a Water Pipeline Assessment is undertaken once the location and depth of potable water pipes are known.	Delivery Notes of Pipe Material. Photographs of the Installed Pipe.
2, 3, 4, 5, 7		No remediation anticipated with respect to PL2 (inhalation of vapours), PL3 (gas), PL4 (controlled waters), PL5 (concrete) and PL7 (phytotoxicity).	

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1 Introduction

1.1 Background

LK Consult Ltd (LKC) has been commissioned by First-Step Group Ltd to carry out a Phase 2 Geo-Environmental Investigation, Risk Assessment and Remediation Strategy for 437 Wilmslow Road, Withington. The investigation was undertaken in support of a future planning application to develop the site for residential purposes.

The following work has previously been undertaken:

- Preliminary Risk Assessment (PRA) report, undertaken by LKC (Ref: LKC 19 1129, dated 29th April 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.

The aims of this report are also to establish the feasibility of developing this site, to demonstrate to the Local Planning Authority that in accordance with the National Planning Policy Framework (NPPF)[2] the site may be developed for a residential end use and that appropriate site investigation and risk assessment works are in place to allow conditional approval of any future planning application.

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	Northwest of Swinbourne Grove, to the southeast of Wilmslow Road, Withington, Manchester. Centred at approximate National Grid Reference 385000E, 393130N.
Area	1,300m^2.
Topography	37 metres Above Ordnance Datum (AOD). Site is approximately level.
Land Use	Site A former bank building is present in the northern area of site, with a red brick building to the rear (specific use of the building unknown). A car park is present in the south of the site. Surrounding Area North: Wilmslow Road. East: Swinbourne Grove and residential properties. South: Care Home and residential properties. West: Withington Methodist Church.
Proposed Development	Conversion and 4 storey extension of current building to include 16no. residential apartments with car parking and limited soft landscaping.

Table 1-1. Summary of site details.

[2] DCL (2018). "National Planning Policy Framework." Department of Communities and Local Government.

2 Previous Work

2.1 Summary of Existing Information

A PRA report (Ref: CL-602-LKC 19 1129-01, dated 29th April 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 Buildings	N	1893-present	- Building annotated from 1934 mapping. Noted to be 'Number 2 Swinbourne Grove'.
Bank	N	1893-present	- Bank building extended to W by 1923 mapping.
Surrounding Area Features	**Distance / Location**	**Map Dates Present**	**Comments**
2no. Pumps	25m S & 20m W	1893 only	- No longer annotated by 1894 mapping, potentially infilled.
Smithy	55m NW	1893 only	- Footprint of building present after 1893, but only annotated as 'Smithy' on 1893 mapping.
Methodist Chapel	Adj to SW	1893-present	
Tramway	10m NW	1893-1934	- Replaced by 'Wilmslow Road' by 1938 mapping.
Bakery	65m NW	1958 only	- No longer annotated by 1966 mapping. - Replaced by 'Works' by 1982 mapping.
Garage	50m NW	1982-present	
Works	60m NW	1982-present	- The nature of the works is not indicated on historical 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		- None recorded on site.
	Bedrock		- Wilmslow Sandstone Formation (Sandstone) recorded on site.
	BGS Logs		- None in close proximity to site.
Hydro-geology	Aquifer Designation	- Superficial	- N/A.
		- Bedrock	- Principal Aquifer.
	Source Protection Zone (SPZ)		- Site is not within SPZ.
	Groundwater Abstractions		- None within the Envirocheck search area of 1km.
Minerals & Mining	Coal Report		- Not within a coal reporting area.
	Mining Instability / Non-Coal Mining Area		- No hazard from non-coal mining activities.
Ground Stability (onsite)	Collapsible Ground		- Very low hazard.
	Compressible Ground		- No hazard.
	Ground Dissolution		- No hazard.
	Landslide		- Very low hazard.
	Running Sand		- No hazard.
	Shrinking / Swelling Clay		- No hazard.
Landfill Sites	Known / Registered		- None recorded within 1km of site.
	Potential		- 2 within 250m: - 2no. pumps 20-25m, potentially infilled by 1894 mapping.
Radon			- Probability of <1% of homes above Action Level. No further action required.
Designated Sites			- None recorded within 1km of site.
Contemporary Trade Directory			- 8 within 100m. - Nearest 34m S: 'Johnson Cleaners (UK) Ltd'. Classification: dry cleaners. Currently inactive.
Fuel Station Entries			- None within 100m. - Nearest 541m NE: 'Fallowfield Service Station'. Currently obsolete.
Fuel Station Entries			- None within 100m.
Unexploded Bomb Risk (UXO)			- Whilst a detailed desk study is always prudent, it is not essential in this case.
Hydrology	Nearest Surface Water		- 264m S, Shaw Brook.
	Water Quality Data		- 241m N, Cringle Brook – River Quality B.
	Surface Water Abstractions		- None within the Envirocheck search area of 1km.
	Discharge Consents		- None recorded within 250m.
	Pollution Incidents		- 1 within 250m.

Table 2-2: Summary of the environmental setting.

2.4 Contamination Sources / Pathways and Receptors

Potential contamination sources are detailed in Table 2-3.

Source	Contaminants
Onsite made ground (general made ground)	- Ash and clinker (e.g. from hearths and boilers, often historically used for site raising / levelling): Heavy metals, sulphates and PAHs. - Other unknown inorganic / organic contaminants (dependant on fill material source). - If significant depth of organic / putrescible material: Hazardous gas (principally carbon dioxide and methane).
Onsite former bank building and unreferenced buildings (still present)	- Potential ACM given age of properties on site; none identified externally.
Onsite car park	- Spillages / leakages: petroleum hydrocarbons, oils (source expected to be minimal and localised). - No evidence of hydrocarbon staining noted.
Offsite former tramway (including railway line)[3].	- Fuels, oils, PAHs, ethylene glycol (antifreeze), creosote, solvents, herbicides (including atrazine and simazine), heavy metals (such as vanadium), sulphate, phenols and asbestos. - Not considered a significant source due to distance and time since use.
Offsite potentially infilled ground within 250m (pumps)	- Hazardous gas (principally carbon dioxide and methane). - Given age, size and location of potentially infilled features, not considered to be a significant source.
Surrounding industries (former smithy, former bakery, former glass houses, Methodist church, works and garage)	- Metals, inorganic compounds and organic compounds. - Not expected to be a significant source due to distance from site and age of features.

Table 2-3: Potential contamination sources

Potential receptors are detailed in Table 2-4.

Receptors	
Human Health	- Future site users (including residents, visitors and site workers). - Offsite land users.
Controlled Waters	- Principal Aquifer. - Cringle Brook 241m north is not considered to be a significant receptor given the distance from the site.
Buildings and structures.	
Potable water pipes.	
Flora within future landscaping.	

Table 2-4: Potential receptors

Potential pathways are detailed in Table 2-5.

[3] Department of the Environment Industry Profile – Railway Land (1995).

Pathways		
Soil	Human Health[4] (residential land use: apartments with shared 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 as no private gardens: 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).	
	- Root uptake.	
Water	- Surface run-off over impermeable surface.	
	- Site is predominantly hardstood; therefore, infiltration is likely to be limited.	
	- Migration through potentially permeable strata and preferential pathways. - Bedrock (sandstone) likely to be relatively permeable. - Preferential pathways: services.	
Gas	- Migration through potentially permeable strata and preferential pathways. - 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

2.5 LKC Preliminary Contamination Conceptual Model

The preliminary contamination conceptual model using contaminant-pathway-receptor linkages based on guidance in CLR11[5] 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 C552[6].

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] EA (2004). "Model Procedures for the Management of Land Contamination." R&D Publication CLR 11.
[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.

It should be noted that there may be risk from short term exposure from contaminated soil to site workers during development work. The Preliminary Contamination Conceptual Model deals with long term exposure to key receptors associated with the future use of the site. Acute risks can be easily mitigated by good environmental management of the site during site works. Standard health and safety precautions (as per HSE guidance[7]) should be adopted by all workers involved with site enabling and construction works. Therefore, this receptor is not considered in the contamination conceptual model.

2.6 Recommendations

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

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

Pollutant Linkage	Pathway	Receptor	Contaminant (source)	Probability	Consequence	Risk	Assessment & Recommendations
PL1	- Dermal contact. - Inhalation of soil, fibres and dust. - Ingestion of soils, dust, vegetables, soil attached to vegetables. - Windblown dust.	- Future site users. - Offsite receptors.	- ACM, Heavy metals, PAHs, hydrocarbons (made ground, onsite car park, former landscaping).	Unlikely	Medium	**Low**	- Unlikely as no significant sources of contamination identified and as limited soft landscaping proposed. - **Recommendation**: Limited confirmatory testing recommended.
PL2	- Inhalation of vapours. - Migration through permeable strata and preferential pathways.	- Future site users. - Offsite receptors.	- Volatile contaminants such as hydrocarbons (made ground, onsite car park).	Unlikely	Medium	**Low**	- Unlikely as no significant source of volatile contamination identified. - **Recommendation**: No testing required unless evidence of volatile contaminants identified.
PL3	- Inhalation of gas. - Migration through permeable strata and preferential pathways. - Explosion in confined spaces.	- Future site users. - Buildings. - Offsite land users.	- Hazardous Gas: - Methane, carbon dioxide (potentially infilled features 250m of the site).	Unlikely	Severe	Moderate / **Low**	- Unlikely as no significant viable source of hazardous gas anticipated. - Low risk assumed due to limited historical development on site. - **Recommendation**: Gas monitoring not required unless significant thickness of made ground and / or putrescible material 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, onsite car park).	Unlikely	Medium	**Low**	- Unlikely as no significant sources of mobile contaminants expected. Hardstanding ground covering site noted to be in good condition which will limit downward migration of mobile contaminants. - **Recommendation**: No testing required unless evidence of significant potentially mobile contamination is identified in the soil.
PL5	- Sulphate attack on concrete.	- Building structure.	- Sulphate (ash potentially in made ground).	Likely	Mild	**Moderate /** Low	- Likely as ash potentially in made ground, which may be in contact with concrete used in future buildings. - Moderate risk assumed due to unknown ground conditions. - **Recommendation**: Confirmatory testing required.
PL6	- Ingestion of tainted water supply.	- Future site users. - Water pipes.	- Organic contaminants such as hydrocarbons, solvents (made ground, garage).	Unlikely	Medium	**Low**	- Unlikely as significant contamination not anticipated at pipeline depth (0.75-1.35m). - **Recommendation**: Sampling required if made ground present at pipeline installation depths.
PL7	- Direct contact (plant uptake).	- Flora.	- Phytotoxic contaminants (made ground).	Unlikely	Minor	**Very Low**	- Unlikely as no significant sources of contamination identified and as very limited soft landscaping proposed **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 17th May 2019 and comprised the following:

- 3no. window sample boreholes drilled to 3.17-3.30 metres below ground level (mbgl) (ref. WS101 to WS103).
- 2no. hand pits (using hand auger / spade) excavated to 0.9-1.0mbgl (ref. HD101 and HD102).

The locations were chosen to allow an adequate assessment of ground conditions across the site. WS101-WS103 were located in the footprint of the proposed building to obtain geotechnical information for the building foundations. Contamination samples were also obtained from these locations.

HD101-102 were located in the areas of limited soft landscaping to allow contamination testing.

All site investigation locations are shown in Figure 4.

The number of site investigation points corresponds to approximately one location per 15 m square centres. This is in line with a detailed investigation as detailed in BS10175 (recommends a sampling density of 1 sample per 10-25m square centres).

3.2 Well Installations

All (WS101-WS103) of the boreholes were installed with monitoring wells for groundwater monitoring. Monitoring wells were installed in accordance with BS10175 and CIRIA C665[8] and generally comprised approximately 1m plain pipe over a length of slotted pipe surrounded by pea gravel and sealed at the top with bentonite and concrete.

Well installation details are provided in Profile Logs in Appendix B.

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 investigation[9].

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 C665[10] to aid in screening samples for volatile analysis.

[8] CIRIA (2007). "Assessing Risks Posed by Hazardous Ground Gases to Buildings." CIRIA C665.
[9] EA (2000). "Technical Aspects of Site Investigation. Volumes 1 & 2 Text Supplements Research and Development Technical Report." P5-065/Tr.
[10] CIRIA (2007). "Assessing Risks Posed by Hazardous Ground Gases to Buildings." CIRIA C665.

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 3-1 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.	5	WS101 0.1-0.5 WS102 0.6-1.0 WS103 0.1-0.5 HD101 0.15-0.6 HD102 0.1-0.6	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 and brick) and no TVOCs identified from the PID tests.

Table 3-1. 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; PAH=polycyclic aromatic hydrocarbons, SOM=Soil Organic Matter.

3.3.2 Water Sampling

Groundwater sampling was not carried out as part of this investigation.

A low risk was identified in the preliminary contamination conceptual model for controlled waters (pollutant linkage 4) and further action was only recommended if significant soil contamination was identified on site. Based on the ground conditions encountered, LKC did not consider testing to be required. This is discussed further in Section 6.

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.

3.5 Site Investigation Scope

The scope of the contaminated land investigation was agreed with Lisa Jones of MCC via email. The site investigation was undertaken in line with the provided scope.

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 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 for geotechnical testing.

Many of the tests are UKAS accredited and further details are given in the laboratory report presented in Appendix D. Table 3-2 shows the geotechnical testing undertaken.

Suites and Contaminants	No. Samples	Location
Atterberg Limits (plasticity testing)	3	WS101 (2.5-3m) WS102 (2.5-2.8m) WS103 (2.5-3m)
Particle Size Distribution (PSD)	1	WS102 (2.5-2.8m)

Table 3-2. 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 slightly gravelly sand. A summary section of the logs is provided in Plate 4-1, with additional comments below.

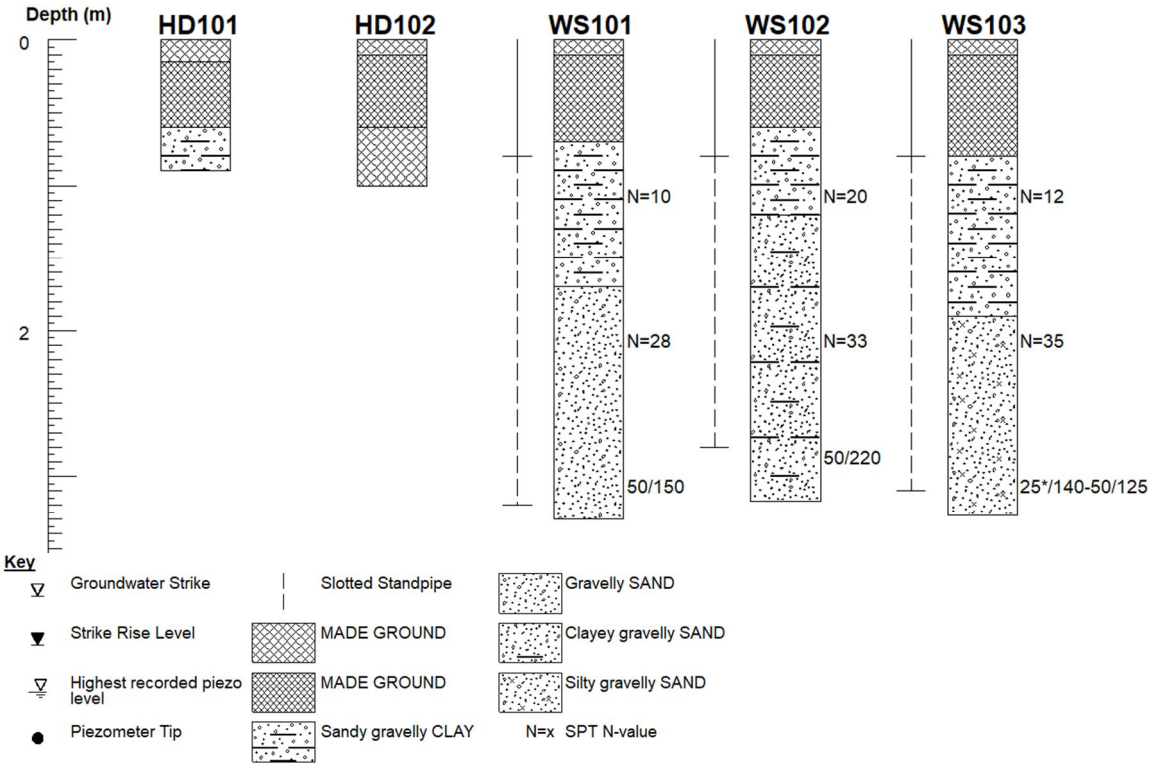


Plate 4-1: Summary of ground conditions.

Additional information on ground conditions:

- Tarmac was underlain by Made Ground comprising clay sand and gravel with variable amounts of ash, clinker and brick from up to 0.6-0.8mbgl.
- Made ground was underlain by natural strata comprising stiff consistency, high strength gravelly, sandy Clay from 0.6-1.9mbgl. This in turn was underlain by dense gravelly silty Sand (probable weathered bedrock) to >3.3mbgl.
- No groundwater strikes were encountered during the drilling.
- No visual / olfactory evidence of hydrocarbons or volatile contaminants in any locations.

4.2 Groundwater

4.2.1 Groundwater Levels

No groundwater was present in the hand excavated trial pits or boreholes. Groundwater level monitoring was undertaken on one occasion. Results of the groundwater level monitoring within the boreholes is summarised in Table 4-1.

BH/TP	Water Strike Depths (mbgl)	Well Response Zone (mbgl)	No. of Monitoring Visits	Monitoring Depths (mbgl)			Sample Taken?	Evidence of Contam?
				Min	Max	Base		
WS101	Dry	0.8-2.8 (C/SG)	1	Dry	Dry	3.22	N	N
WS102	Dry	0.8-2.8 (C/SG)	1	Dry	Dry	2.78	N	N
WS103	Dry	0.8-2.8 (C/SG)	1	Dry	Dry	3.16	N	N
HD101	Dry	-	-	-	-	-	N	N
HD102	Dry	-	-	-	-	-	N	N

Table 4-1: Summary of water strike depths within boreholes and trial pits.
Response Zones:
SG=Sand and Gravel; C=Clay.

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
1-2	10 (C)	20 (C)	12 (C)
2-3	28 (SG)	33 (SG)	35 (SG)
3-4	50 (S/S)	50 (S/S)	50 (S/S)
GW Level	Dry	Dry	Dry

Table 4-2: Summary of SPT (N) values.
Notes:
S/S = Sandstone; SG=Sands and Gravel; C=Clay.
Groundwater level based on strikes during investigation and monitoring data.

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 D and summarised below in Table 4-3.

Location	Depth (mbgl)	Material	Percent passing through sieve		
			63mm	2mm	0.063mm
WS102	2.5-2.8	Red brown silty fine to coarse SAND with occasional gravel.	100%	82%	14%

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 Atterberg Limits

Representative samples of natural strata with cohesive elements were subjected to Atterberg Limits (plasticity) and Moisture Content testing. Results are presented in Appendix D and summarised in Table 4-4.

Location	Depth (mbgl)	Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Class	Passing 425 micron (%)
WS101	2.5-3	14	N/A	Non Plastic	N/A	S	57
WS102	2.5-2.8	12	N/A	Non Plastic	N/A	S	62
WS103	2.5-3	11	N/A	Non Plastic	N/A	S	51

Table 4-4: Summary of plasticity index testing.

5 Geotechnical Assessment

Final foundation design will need to be confirmed once loadings of proposed buildings are known and details of ground works (i.e. potential cut and fill exercises) are known.

5.1 Proposed Development

It is understood that the proposed development will comprise a 4-storey residential extension to the rear of the existing building as shown on Figure 3.

Given the nature of the proposed development it is considered that the structure meets the criteria of Geotechnical Category 1 of Euro Code 7[11].

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.

5.2 Summary of Ground Conditions

Ground conditions identified at the site are detailed in Section 4.1 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	Tarmac over very gravelly clayey sand/sandy clay, containing ash and brick cobbles.	0.00	0.00	0.80
Cohesive	Stiff brown variably sandy gravelly CLAY.	0.60	0.80	1.10
Granular	Medium dense becoming very dense silty gravelly SAND (weathered sandstone of the Wilmslow Sandstone Formation).	1.20	1.90	Not proven

Table 5-1: Summary of ground conditions.

5.3 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 Works. 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 from previous structures can be anticipated on site. These should be excavated from below the proposed development footprint with the resulting void backfilled.

5.4 Foundation Conditions and Bearing Capacity

It is considered that the Made Ground is not suitable for a founding material due to the inherent variability of the material. Foundation options are therefore:

[11] EN 1997-1: Section 2: basics of Geotechnical Design.

- Shallow spread footings into the underlying stiff clay.
- Deeper strip/trench fill footings founding upon the medium dense sand.
- Piled foundations socketed into the underlying sandstone.

These options are discussed below:

5.4.1 Strip Foundations

Strip foundations should be constructed at least 150mm into the underlying stiff clay at around 1.00mbgl. At this depth an undrained shear strength (c_u) of 50kPa has been assessed from in-situ tests and logging observations. An Allowable Bearing Capacity (ABC) of 100kN/m^2 has been calculated using a Factor of safety of 3 and a c_u of 50kN/m².

5.4.2 Deep Strip/Trench Foundations

Deeper strip/trench foundations bearing upon the medium dense sands encountered at a depth of circa 2.00mbgl are considered. At this depth an ABC of 250kN/m^2 is considered achievable.

The presence of groundwater can reduce the bearing capacity of a granular material by as much as 50%. During the investigation groundwater was not encountered and during a subsequent monitoring visit to site all wells were recorded as dry.

5.4.3 Piled Foundations

As an alternative, consideration may be given to the use of piled foundations. Weathered sandstone was encountered from 1.20mbgl to 1.90mbgl with refusals recorded at depths of between 3.17mbgl and 3.30mbgl. Should higher loadings be anticipated then piled foundations socketed into the sandstone bedrock would allow higher loadings to be supported.

Pile design should be undertaken by a specialist contractor to allow them to reduce the factor of safety based on their extensive pile testing data.

5.4.4 Recommendation

Shallow strip footings are unlikely to support the loadings exerted by a 4 storey structure and whilst a piling solution is viable it is considered that deeper strip/trench footings founding on the medium dense sands (weathered sandstone) will provide the most reliable and cost effective option for the site.

5.5 Ground Floor Slabs

Made Ground was encountered within all exploratory holes and within HD102 Made Ground was encountered in excess of 1.00m thickness. Where Made Ground is encountered in excess of 600mm the NHBC require suspended floor slabs. As the proposed development comprises a 4-storey residential extension, due to the presence of Made Ground across the site it is considered that ground bearing floor slabs, whilst viable, will require detailed design to accommodate variability of the formation and account for differential settlement. It is recommended that the upper 1.00m is re-engineered to provide a suitable platform for the development and an engineered base for a ground bearing floor slab.

5.6 Pavement Construction

An assessment of the likely California Bearing Ratio (CBR) for the Made Ground has been assessed from the following sources:

- Description of the materials encountered in the exploratory holes.

Based on this it is considered that a CBR of less than 2% may be required to account for variability of the Made Ground. It is, however, recommended that this be re-assessed using on site plate tests of the formation. It is possible that a higher design CBR may then be achievable.

5.7 Drainage

The presence of Made Ground across 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.

5.8 Concrete Durability

Based upon the results of the chemical analyses contained in Appendix C 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)[12].

5.9 Excavations

Site observations indicated that excavations should be feasible in the near surface with normal plant. It is anticipated that any obstructions will be grubbed out during the reduced level dig for the sub structure works.

Groundwater seepage was not encountered within any of the exploratory holes.

Given the granular nature of deposits encountered at depths of below 1.20m and the inherent instability of the material, it is considered that all excavations are supported or battered back in accordance with guidance contained in CIRIA RR97.

5.10 Construction Activity and Inspection

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

- Due to the variability of the soils at the site 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[13] utilised. Appropriate mitigation measures should be addressed within the Construction Stage Health and Safety Plan.
- It is considered that de-watering may be required, especially following periods of heavy rainfall. 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

[12] BRE (2005)."Concrete in Aggressive Ground." Special Digest 1.
[13] CIRIA (1992) "CIRIA Report 97 – Trenching practice – Second Edition". November 1993.

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;
- 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 (CLR11[14]). 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).

C4SLs were published in 2013[15,16]. The change to the contaminated land guidance has changed the evaluation of risk from 'minimal' (referred to as Health Criteria values (HCVs))[17] 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 S4ULs[18]. 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[19,20,21,22].

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 PAHs[23,24] and naphthalene the most volatile and soluble[25]. 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 negligible[26]. For

[14] EA (2004). "Model Procedures for the Management of Land Contamination." R&D Publication CLR 11.
[15] Defra (2014). "SP1010: Development of Category 4 Screening Levels and Assessment of Land Affected by Contamination – Policy Companion Document."
[16] CL:AIRE (2013). "SP1010: Development of Category 4 Screening Levels and Assessment of Land Affected by Contamination – Final project Report."
[17] EA (2008). "Human Health Toxicological Assessment of Contaminants in Soils." Science Report – SC050021/SR2.
[18] LQM (2014). "The LQM/CIEH S4ULs for Human Health Risk Assessment."
[19] EA (2008). "Updated Technical Background to the CLEA Model." Science Report – SC050021/SR3.
[20] EA (2008). "Human Health Toxicological Assessment of Contaminants in Soils." Science Report – SC050021/SR2.
[21] EA (2008). "A Review of Body Weight and Height Data used within the Contaminated Land Exposure Assessment Model (CLEA)." Project SC050021/Technical Review 1.
[22] EA (2009). "Compilation of Data for Priority Organic Pollutants for Derivation of Soil Guideline Values." Science report SC050021/SR7.
[23] EA (2002). "Contaminants in Soils: Collation of Toxicological Data and Intake Values for Humans. Benzo[a]pyrene." R&D Publication TOX2.
[24] USEPA (1984). "Health Effects Assessment of Polycyclic Aromatic Hydrocarbons (PAHs). EPA 540/1-86-013."
[25] EA (2003). "Review of the Fate and Transport of Selected Contaminants in the Soil Environment." Draft technical report P5- 079/TR1.
[26] CL:AIRE (2013). "SP1010: Development of Category 4 Screening Levels and Assessment of Land Affected by Contamination – Final project Report."

B(a)P to be used as a surrogate marker it should follow the profile described by the HPA (2008)[27] and CL:AIRE (2013). Naphthalene will be treated separately using the LQM S4ULs.

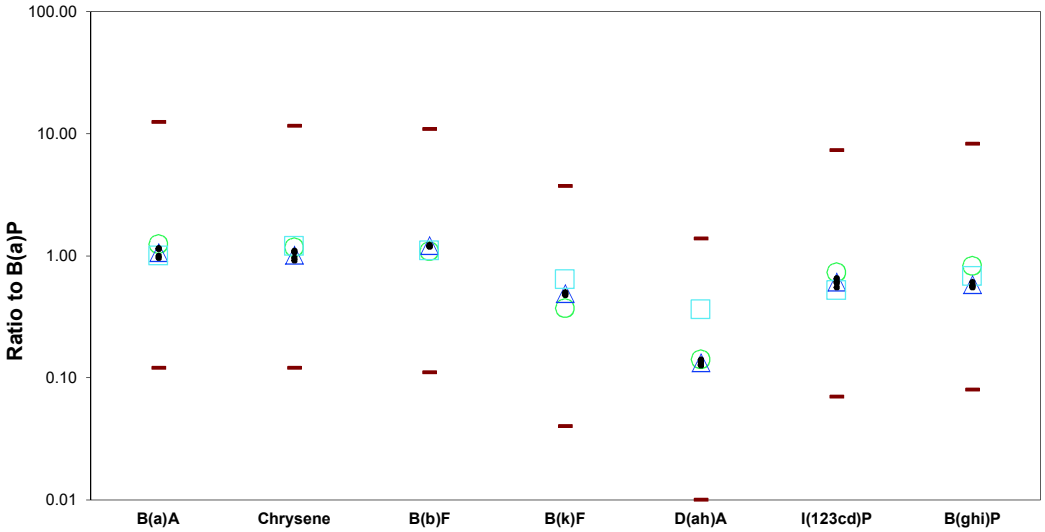
The proposed development is for residential apartments. The majority of the site is hardstood, with only small areas of soft landscaping associated with the existing mature trees to be included. Therefore, adopting a conservative approach, the assessment criteria for residential without plant uptake has been used.

All criteria have been generated using the CLEA V1.06 model[28] based either on 1%, 2.5% and 6% Soil Organic matter (SOM). Results will be compared to the nearest appropriate SOM.

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*[29], 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)

[27] HPA (2010). "HPA Contaminated Land Information Sheet: Risk Assessment Approaches for Polycyclic Aromatic Hydrocarbons (PAHs)." Version 3.
[28] EA (2008). "CLEA Software (Version 1.05) Handbook." Science Report – SC050021/SR4.
[29] 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.

Contaminant	Units	No. of samples	Elevated Results	Sample Location	Criteria (1%/2.5%/6%)	Source of Criteria
Metals						
Arsenic	mg/kg	5	110	WS101/0.1-0.5m	37	C4SL
			98	WS103/ 0.1-0.5m		
			41	HD102/ 0.1-0.6m		
PAHs						
Benzo(a)pyrene	mg/kg	5	47	WS101/0.1-0.5m	5	C4SL
			23	WS103/ 0.1-0.5m		
			20	HS101/0.15-0.6m		
			30	HD102/ 0.1-0.6m		
GENERAL						
pH	pH	5	Range 7.6 to 8.9			
SOM	%	5	Range 1.0 to 15			
Asbestos	N/A	5	None detected.			

Table 6-1: Summary of elevated and pertinent analytical results.

Notes:
Only results that exceeded assessment criteria have been shown and results from **all depths** are noted.
Results have been compared to the nearest appropriate SOM.

No asbestos was identified in any soil samples analysed.

6.2.3 Direct Contact Risk – Pollutant Linkage 1

Elevated PAHs and metals (arsenic) have been identified on site, given the number and location of elevated samples, the contamination is considered to be site wide. The source of the contamination is expected to the ash, clinker noted in the made ground.

At the concentrations identified, the contaminants are considered to pose a potential risk to future site users (residents) in soft landscaped areas, where made ground may be exposed. The principal pathways are the ingestion pathways (soil, dust) and dermal contact.

Given only a small soft landscaping area is included, the probability of PAH and metal contamination affecting site users is low. With a medium consequence, the risk is considered to be moderate/low and limited remediation is required in areas of soft landscaping.

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 no remediation is required. However, as a precaution, construction workers should be and vigilant for any suspected ACM during groundworks (discussed further in Section 9).

No evidence of hydrocarbons were identified, therefore the probability of these contaminants posing a risk to site users in considered unlikely. With a medium consequence, the risk is considered to be low and no remediation is recommended.

6.2.4 Risk from Inhalation of Vapours – Pollutant Linkage 2

No visual / olfactory evidence of volatile contaminants was identified during the investigation. The PID did not detect any TVOCs.

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.

6.3 Gas Risk Assessment

Gas monitoring was not carried out as part of this assessment. The PRA identified a low/ moderate 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 comprised approximately <1m made ground with ash and brick.

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

The PRA identified a low risk with respect to controlled waters as no significant source of mobile contamination was anticipated. Furthermore, although a Principal Aquifer is present below the site, no abstractions have been identified within influencing distance. The surface water is not considered to be a significant receptor.

No evidence of significant mobile contamination was identified on the site. Although elevated metals and PAHs were identified within the soils, the source is anticipated to be ash and clinker noted within the made ground. Contamination associated with ash and clinker is not anticipated to be mobile due to the residual crystalline nature of the matrix. Furthermore, the clay present on the site should significantly reduce any sub-surface migration and processes include dilution, attenuation and biodegradation will reduce the concentration of contamination.

The site investigation did not identify any significant sources of likely mobile contamination within the soils. This confirms an unlikely probability of onsite contamination affecting controlled waters. With a medium consequence the risk is anticipated to be low and no remediation is required.
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 2005. As described in Section 5, the data categorises the concrete requirement as DS-1 AC-1.

Based on the above, the probability of sulphate concentrations affecting buildings is low. 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 contamination[30]. 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: speciated petroleum hydrocarbons, chlorinated compounds, BTEX compounds, phenols, cresols, ethers, nitrobenzene, ketones, aldehydes and amines.

The following elevated contaminants were identified:

- Elevated TVOCs (inc. naphthalene) in made ground across the site.

Typical pipework depths are 0.75mbgl to 1.35mbgl. Pipework will likely be laid into the underlying natural strata after levels have been reduced.

If a new pipeline connection is proposed, then once details of the pipeline location and depths are known a UU Risk Assessment should be undertaken. Barrier pipe may be required.

At this stage, the probability of organic contaminants affecting potable water pipes is a low likelihood. Given the consequence is considered to be medium, the risk (pollutant linkage 6) is anticipated to be low / moderate risk and remediation (i.e. barrier pipe) may 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 BS3882[31].

No elevated contaminants were identified therefore the probability of phytotoxic contaminants affecting vegetation is considered to be unlikely. With a minor consequence, the risk (pollutant linkage 7) is anticipated to be very low.

In addition to the above, 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). Made ground with undesirable material (e.g. brick) was noted at shallow depth. Irrespective of the contamination risk, this material should not be used as topsoil and it is recommended that a suitable topsoil of at least 150mm is placed over this undesirable made ground.

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

[30] UU(2011). "United Utilities Water Supplementary Guidance for the Selection of Water Pipes in Land Potentially Affected by Contamination."
[31] BS (2015). "Specifications for Topsoil and Requirements for Use." BS3882:2015.

the preliminary contamination conceptual model. The risk matrix is provided in Appendix A.

The revised contamination conceptual model is presented in Table 6-2.

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 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 7.

Pollutant Linkage	Pathway	Receptor	Contaminant	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.	Low Likelihood	Medium	**Moderate / Low**	- Low likelihood as, although elevated metals and PAHs identified only limited soft landscaping associated with existing mature trees is proposed. - Moderate risk considered appropriate - **Recommendation**: Limited remediation in areas of soft landscaping recommended.
			- ACM, hydrocarbons, other inorganic and organic contaminants	Unlikely	Medium	**Low**	- No ACM and no evidence of hydrocarbons contaminants noted during site investigation. - **Recommendation:** No remediation required.*[1]
PL2	- Inhalation of vapours. - Migration through permeable strata and preferential pathways.	- Future site users. - Offsite receptors.	- Volatile contaminants such as hydrocarbons.	Unlikely	Medium	**Low**	- No evidence identified. TVOCs <LOD. - **Recommendation**: No remediation required.
PL3	- Inhalation of gas. - Migration through permeable strata and preferential pathways. - Explosion in confined spaces.	- Future site users. - Buildings. - Offsite land users.	- Hazardous Gas: - Methane, carbon dioxide.	Unlikely	Severe	Moderate **/ Low**	- No significant source identified. - Made ground <1m thick, no organic or putrescible material identified and no infilled features close to site. - **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 significant mobile contamination identified. - **Recommendation**: No remediation required.
PL5	- Sulphate attack on concrete.	- Building structure.	- Sulphate.	Low Likelihood	Mild	**Low**	- No elevated SO_4 or pH. - **Recommendation**: DS1 AC1 considered suitable, subject to structural engineer's recommendations.
PL6	- Ingestion of tainted water supply.	- Future site users. - Water pipes.	- Organic contaminants such as hydrocarbons.	Low Likelihood	Medium	Moderate/ **Low**	- Elevated TVOCs identified in made ground across the site. - Low risk assumed as pipelines likely to be laid in natural strata at pipeline depth (0.75-1.35m). - **Recommendation**: UURA required for new connections, barrier pipe may be required.
PL7	- Direct contact (plant uptake).	- Flora.	- Phytotoxic contaminants.	Unlikely	Minor	**Very Low**	- No elevated concentrations of phytotoxic contaminants identified. - **Recommendation**: No remediation required[+]

Table 6-2: Revised Contamination Conceptual Model.

Notes

*[1] Although no ACM identified, contractors should be vigilant during earthworks of any potential ACM.

[+] Although no phytotoxic contaminants identified in soils, 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 disposal route should any material be earmarked 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 of contaminant soils and classifies the soils as either hazardous or non-hazardous waste.

It is understood that Hazwaste Online™ has been designed to cover the European Waste Catalogue code number 17 05 03 "soil and stones containing dangerous substances" and follows current guidance[32,33,34,35,36].

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

The results show that all the samples tested are classified as NON-HAZARDOUS WASTE. The output sheets are provided in Appendix E.

[32] EA (2018). "Guidance on the Classification and Assessment of Waste (1st Edition v1.1)". Technical Guidance WM3.
[33] The Hazardous Waste Directive, (HWD, Council Directive 91/689/EC).
[34] European Waste Catalogue, 2002 (EWC 2002, Commission Decision 2000/532/EC) as amended by Commission Decision 2001/118/EC, 2001/119/EC and Council Decision 2001/573/E.
[35] List of Wastes (England) Regulations 2005.
[36] Approved Supply List (Eighth Edition), 2002. ISBN: 0 7176 2368 8.

8 Conclusions

8.1 Geotechnical

A preliminary foundation assessment is summarised in Table 8-1.

Proposed Development	- Three storey extension to the existing bank building.
General Ground conditions / Geotechnical Testing	- Based on WS101-WS103 (location of extension). - Maximum investigation depth 3.3mbgl. - Made Ground to 0.6-0.8mbgl. - Stiff consistency, high strength gravelly sandy Clay from 0.6-1.9mbgl. SPTs N = 10-12 at 1mbgl. - Dense gravelly, silty Sand (probable weathered bedrock) to >3.3mbgl. SPTs N = 20 at 1.20m, N=28-35 at 2mbgl. - SPT N>50 at 2.8-3.0mbgl. - No groundwater encountered.
Allowable Bearing Pressure	- 100kN/m^2 at 1.00mbgl in the stiff clay. - 250kN/m^2 at 2.00mbgl in the medium dense sand. - >500kN/m^2 at 3.00m in the weathered sandstone.
Anticipated Foundation Type	- Ground conditions below the proposed extension are variable with varying depths of made ground (0.6->1.0mbgl), stiff clay to 1.2-1.90mbgl and medium dense becoming very dense sand (weathered sandstone) to the completion depths of the window sample boreholes. - Traditional shallow foundations are not expected to be suitable for the proposed development given the loadings anticipated. Settlement of the proposed building could affect the stability of the adjoining existing building. It is recommended that the proposed extension is supported on deep strip/trench foundations at circa 2.00mbgl upon the weathered sandstone.
Concrete Requirements	- Based on BRE Digest 2005[37] – DS-1 AC-1 recommended.
Services	- Services – consideration to the presence of services running through the site. Services may need to re-routed.
Plasticity	- Consideration will need to be given to the shrink / swell of the clay strata if it is to be used as founding strata, particularly where trees/hedges are present. Foundations may need to be deepened.

Table 8-1: Summary Geotechnical Assessment.

[37] BRE (2005)."Concrete in Aggressive Ground." Special Digest 1.

8.2 Contamination Assessment

A revised contamination conceptual model has been produced by LKC which is summarised in Table 8-2 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, fibres and vegetables).	**Moderate /** Low (metals, PAHs)	- Although elevated metals and PAHs identified only limited soft landscaping associated with existing mature trees is proposed. - Moderate risk considered appropriate. - **Recommendation**: Limited remediation in areas of soft landscaping recommended.
		Low (ACM, hydrocarbons)	- No ACM and no evidence of hydrocarbons noted during site investigation. - **Recommendation:** No remediation required.
2	Volatile contaminants posing a risk to site users via the inhalation of vapours.	**Low**	- No evidence identified. TVOCs <LOD. - **Recommendation**: 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 identified. - **Recommendation**: No remediation required.
4	Mobile contamination posing a risk to controlled waters via the migration through permeable strata.	**Low**	- No significant mobile contamination identified. - **Recommendation**: No remediation required.
5	Sulphate posing a risk to building via direct contact (sulphate attack).	**Low**	- No elevated SO_4 or pH. - **Recommendation**: DS1 AC1 considered suitable, subject to structural engineer's recommendations.
6	Organic contaminants posing a risk to water pipes.	Moderate/ **Low**	- Elevated TVOCs identified in made ground across the site. - Low risk assumed as pipelines likely to be laid in natural strata at pipeline depth (0.75-1.35m). - **Recommendation**: UURA required for new connections, barrier pipe may be required.
7	Phytotoxic metals posing a risk to flora via root uptake.	**Very Low**	- No elevated concentrations identified. - **Recommendation**: No remediation required.

Table 8-2: Summary Risk Table.

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. The table shows work required pre-construction (i.e. during earthworks) and during / post construction.

9.1.1 Earthworks Inspection/ Unexpected Contamination

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 C733[38].

Validation requirements include a log od works undertaken (including photographs) and details of any sampling and validation of remediation works.

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

Phase	PL	Remediation Requirements	Validation Requirements
Build-Phase Construction	**1 and 7**	In areas of soft landscaping, as the made ground is relatively shallow the following options are given: Option 1 Removal of all reworked topsoil / made ground from soft landscaping and raise levels (as required) with suitably chemically validated subsoil and topsoil. Option 2 If all or some of the made ground remains in place in soft landscaping areas, an environmental cover system will be required. The environmental cover system should be as follows: **300mm thick environmental cover system comprising:** **Either** 100mm physical break layer (MOT type 1 material, 20-30mm, minimal fines) and at least 200mm comprising clean inert fill and sufficient topsoil for a growing medium. **Or** geotextile membrane and at least 300mm comprising clean inert fill and sufficient topsoil for a growing medium. The subsoil layer can be replaced by additional topsoil. A diagram of a typical environmental cover system is shown in Appendix E No remediation required in areas of hardstanding. **Areas of TPO's** Please note where there are TPO's in influencing distance of the gardens it is likely the arboriculture officer may only allow a 100-150mm clean cover system.	Option 1 Consignment notes confirming the removal of made ground. Photographic evidence of natural strata. Chemical validation of imported soils: See Table 9-2. Option 2 Measuring depth of environmental cover system using a staff and providing photographic evidence. Photographic evidence of the granular physical break or geotextile layer will also be collected. Chemical validation of imported soils: See Table 9-2.
	6	Potable Water Pipes If a new connection is required, it is recommended that a Water Pipeline Assessment is undertaken once the location and depth of potable water pipes are known.	Delivery Notes of Pipe Material. Photographs of the Installed Pipe.
2, 3, 4, 5, 7		No remediation anticipated with respect to PL2 (inhalation of vapours), PL3 (gas), PL4 (controlled waters), PL5 (concrete) and PL7 (phytotoxicity).	

Table 9-1: Further work, remediation and validation requirements
Notes: See Table 6-2 for pollutant linkage (PL) details.

9.2 Other Considerations

9.2.1 Grubbing Out in-ground Structures

It is recommended that in-ground structures are grubbed out as part of the groundworks.

9.2.2 Re-use of site won material

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):

- 5,000 tonnes (c. 2,500m^3) treatment of crushed concrete / stone.
- 1,000 tonnes (c. 500m^3) use of non-hazardous soil
- 5,000 tonnes (c. 2,500m^3) use of clays, sand, gravel, brick, concrete, stone etc.
- 50,000 tonnes (c. 25,000m^3) use of 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.

9.2.3 Health & Safety Considerations

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 guidance[39]) should be adopted by all workers involved with site enabling and construction works.

9.3 Validation of Subsoil / Topsoil

Chemical validation of all imported soils to be used on site in gardens and 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 gardens to ensure suitability for use.

[39] 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 50m^3
	Brownfield / Unknown	Suite B	
Subsoil	Brownfield / Unknown	Suite B	1 sample per 150m^3
	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 500m^3

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.

*Minimum sampling rate of 3 samples per source.

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 BS3882[40]). LKC advise this information is provided by the supplier before material is imported onto site.

Imported material to be used in soft landscaping will be compared against residential without plant uptake criteria (as used in the contamination risk assessment (Section 6-1)).

9.4 Site Completion Report

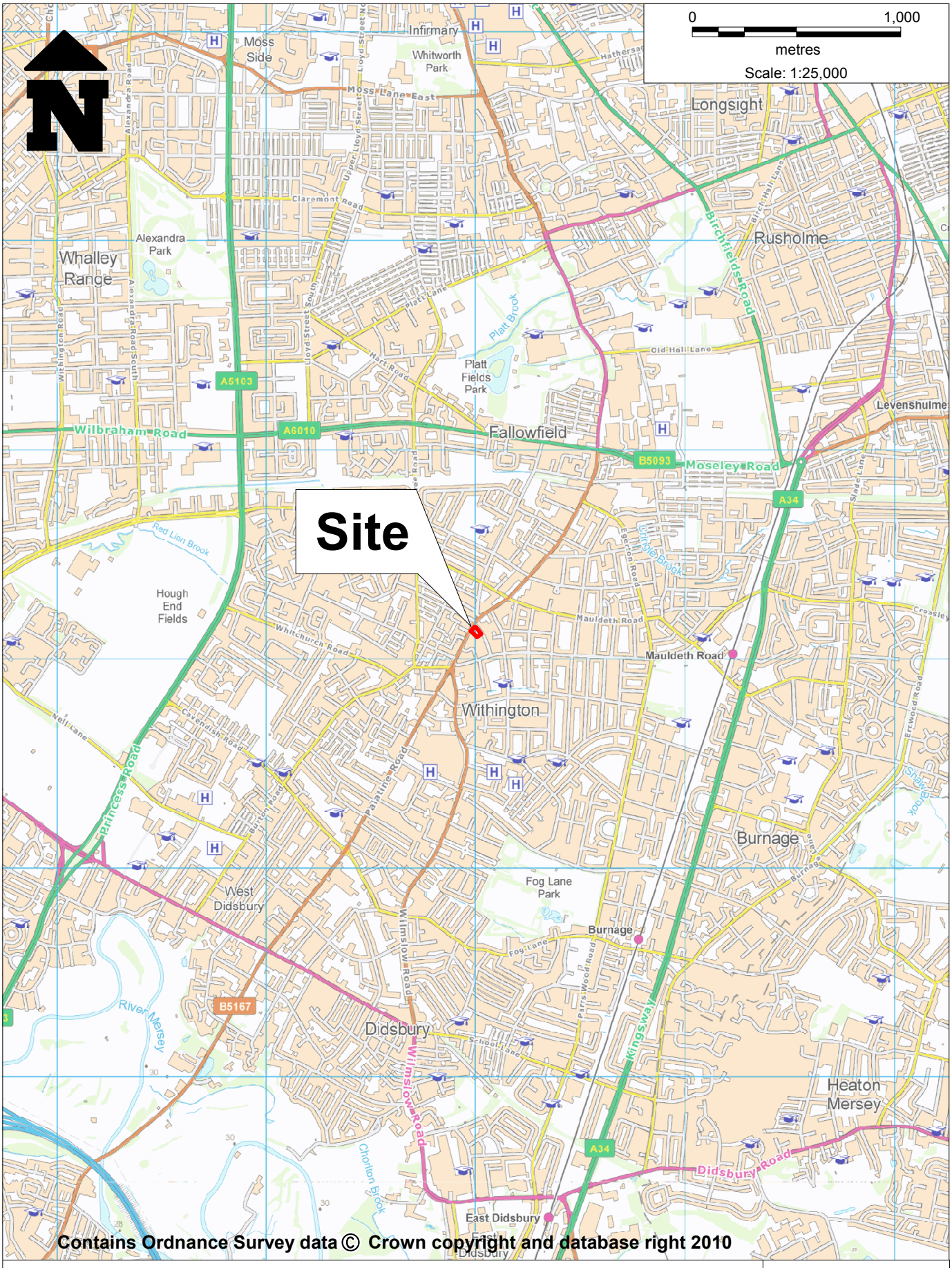
It is recommended that any remediation carried out on the site is validated by a third party and suitable documentary evidence provided in a Site Completion Report, such as photographs, consignment documents and analytical results. This should include as a minimum:

- If option 1 (source removal)): Validation of any made ground removal (photographic evidence that natural strata was reached).
- If option 2 (environmental capping layer): Validation of environmental cover system.
- Verification testing of all imported soil for soft landscaping areas.
- 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.

[40] BS (2015). "Specifications for Topsoil and Requirements for use." BS3882:2015.

Figures



Contains Ordnance Survey data © Crown copyright and database right 2010

Figure 1: Site Location Plan, 437 Wilmslow Road, Withington

Drawn: April 2019 Scale: 1:25,000 @ A4 (see scale bar)

LK CONSULT LIMITED



Extract from: Plan Supplied by Client
Drawing Ref: Red Line Plan

KEY

Site Boundary

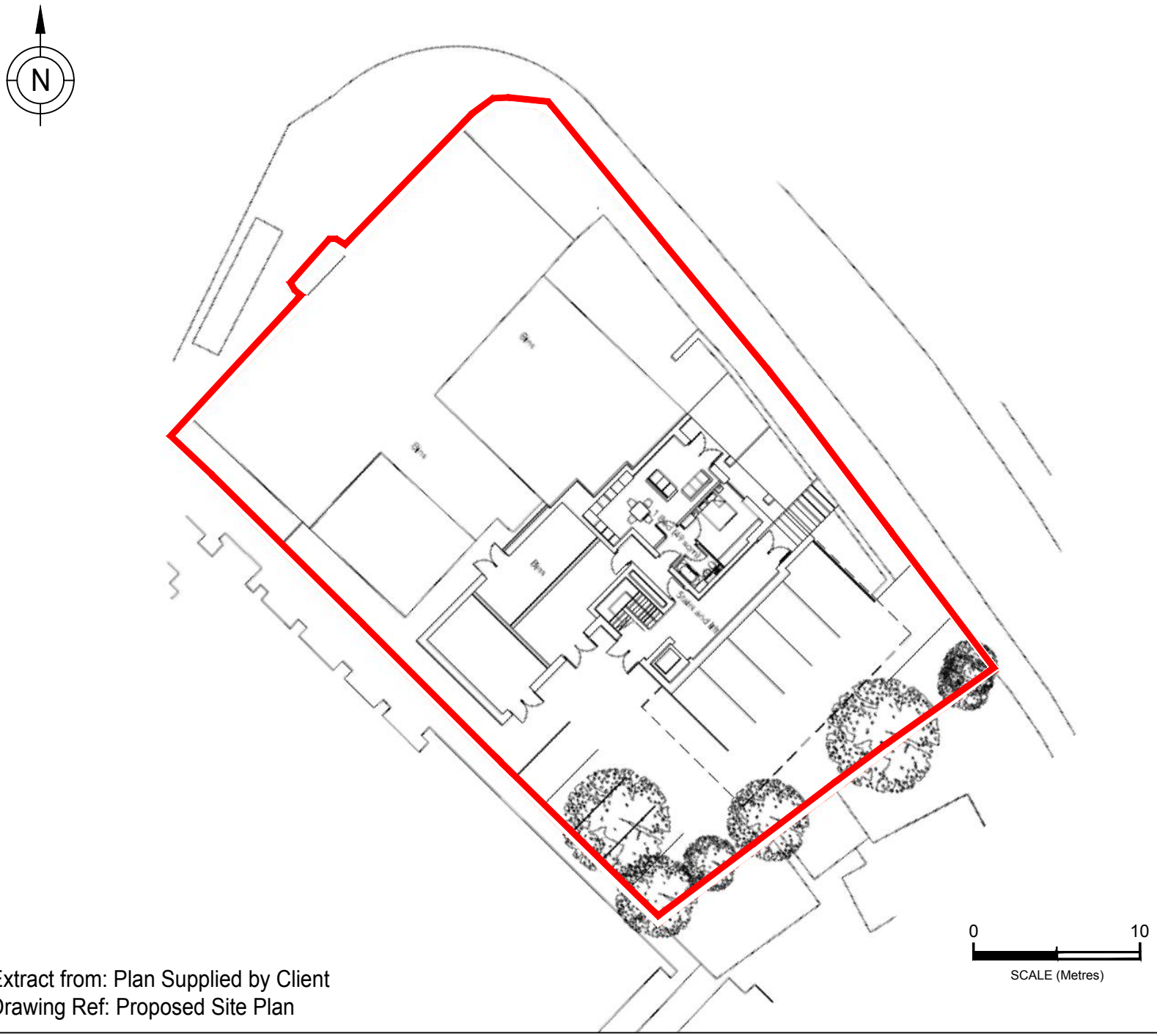
Sampling Locations and features annotated by LK Consult Ltd are approximate and are based upon observed measurements unless otherwise stated. Do not scale from this drawing and work from marked dimensions only. All dimensions and features should be confirmed on site by the Contractor. Where this drawing 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.

LK CONSULT LIMITED

Client:	First-Group Ltd
Site:	437 Wilmslow Road, Withington
Title:	Site Boundary Plan

Job No.:	Scale (See Scale Bar):	Figure:	Revision:
LKC 19 1129	See Scale Bar	2	

Drawn By:	Checked By:	Drawn:
AC	HM	Apr 2019



Extract from: Plan Supplied by Client
Drawing Ref: Proposed Site Plan

KEY

Site Boundary

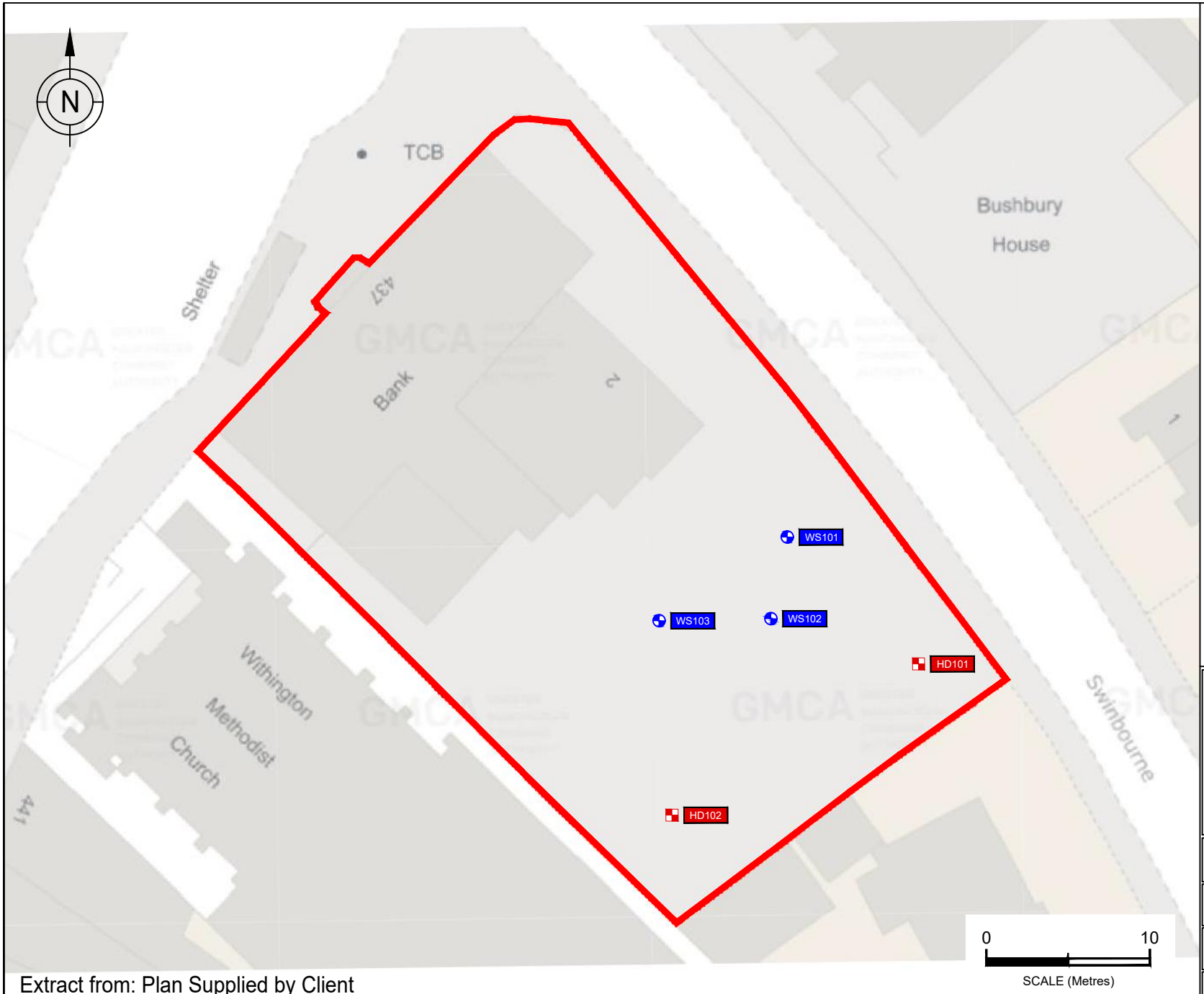
Sampling Locations and features annotated by LK Consult Ltd are approximate and are based upon observed measurements unless otherwise stated. Do not scale from this drawing and work from marked dimensions only. All dimensions and features should be confirmed on site by the Contractor. Where this drawing 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.

LK CONSULT LIMITED

Client:	First-Group Ltd
Site:	437 Wilmslow Road, Withington
Title:	Proposed Site Use

Job No.:	Scale (See Scale Bar):	Figure:	Revision:
LKC 19 1129	See Scale Bar	3	

Drawn By:	Checked By:	Drawn:
AC	HM	Apr 2019



Extract from: Plan Supplied by Client
Drawing Ref: Red Line Plan

KEY

- Site Boundary
- Window Sample Borehole (WS)
- Hand Dug Trial Pit (HD)

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.

LK CONSULT LIMITED

Client:	First-Group Ltd
Site:	437 Wilmslow Road, Withington
Title:	Site Investigation Location Plan

Job No.:	Scale (See Scale Bar):	Figure:	Revision:
LKC 19 1129	See Scale Bar	4	

Drawn By:	Checked By:	Drawn:
AC	BR	May 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 552[41]. It involves the classification of the:

- Magnitude of the potential consequence (severity) of the risk occurring (Table A).
- Magnitude if 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.

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

Table B. Classification of Probability.

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 sever harm to a designated receptor is currently happening. - This risk, if realised, is likely to results 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 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.

Appendix B

Profile Logs

LK CONSULT LTD
Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS
Tel: 0161 763 7200 web: www.thelkgroup.com

Site	Number
437 Wilmslow Road, Withington	**WS101**

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Drive-in Windowless Sampler to 3.23mbgl.		37.00	First-Step Group Ltd	lkc 19 1129
	Location (Handheld GPS) 385016 E 393126 N	**Dates** 17/05/2019	**Engineer** LKC	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
				36.90	(0.10) 0.10	MADE GROUND: Tarmacadam			
0.10-0.50	D1 PID < 0.1ppm				(0.60)	MADE GROUND: Blackish brown very gravelly clayey SAND with frequent brick and occasional ash. Sand is fine to coarse. Gravel is fine to coarse and angular to subangular comprising sandstone. Sandstone cobble at 0.3mbgl.			
0.70-1.00	D2 PID < 0.1ppm			36.30	0.70				
0.80-1.00	B3 PID < 0.1ppm					Stiff consistency medium strength brownish black sandy gravelly CLAY with frequent lenses of sand. Sand is fine to coarse. Gravel is fine to coarse and angular to subangular comprising sandstone.			
1.00-1.45	SPT N=10		1,2/2,2,3,3		(1.00)				
1.00-1.45	X1								
1.70-2.00	B4 PID < 0.1ppm			35.30	1.70	Dense to very dense orange slightly gravelly SAND. Sand is fine to medium. Gravel is fine to medium and angular to subangular comprising sandstone and mudstone. Probable weathered bedrock.			
2.00-2.45	SPT N=28		4,5/6,7,7,8						
2.00-2.45	X2								
2.50-2.80	B5 PID < 0.1ppm				(1.60)				
3.00-3.30	SPT 50/150		9,16/18,32						
3.00-3.23	X3								
				33.70	3.30	Complete at 3.30m			

Remarks
Elevation estimated from https://www.freemaptools.com/elevation-finder.htm
Location accurate to 3.00-5.00m.
Borehole was dry.
SPT refusal at 3.23mbgl on sandstone, probable rockhead.

Scale (approx)	Logged By
1:40	BR

Figure No. LKC 19 1129.WS101

Produced by the GEOtechnical DAtabase SYstem (GEODASY) © all rights reserved

LK GROUP	**LK CONSULT LTD** Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS Tel: 0161 763 7200 web: www.thelkgroup.com	**Site** 437 Wilmslow Road, Withington	**Number** **WS102**

Excavation Method	**Dimensions**	**Ground Level (mOD)**	**Client**	**Job Number**
Drive-in Windowless Sampler to 3.17mbgl.		37.00	First-Step Group Ltd	lkc 19 1129
	Location (Handheld GPS) 385015 E 393121 N	**Dates** 17/05/2019	**Engineer** LKC	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
				36.90	(0.10) 0.10	MADE GROUND: Tarmacadam			
0.10-0.50	D1 PID < 0.1ppm				(0.50)	MADE GROUND: Black slightly sandy clayey GRAVEL with abundant ash, clinker and occasional brick. Sand is fine to coarse. Gravel is fine to coarse and angular to subangular comprising mudstone and sandstone.			
				36.40	0.60				
0.80-1.00	B2 PID < 0.1ppm				(0.60)	Stiff consistency high strength orangey brown mottled grey slightly gravelly sandy CLAY. Sand is fine to medium. Gravel is fine to medium and angular to subangular comprising mudstone and sandstone.			
0.80-1.00	D2 PID < 0.1ppm								
1.00-1.45	SPT N=20		2,3/4,6,5,5						
1.00-1.45	X1			35.80	1.20				
1.50-2.00	B3 PID < 0.1ppm					Dense to very dense orange silty SAND with occasional sandstone cobble. Sand is fine to medium. Probable weathered bedrock.			
2.00-2.45	SPT N=33		5,6/7,8,8,10						
2.00-2.45	X2				(1.97)				
2.50-2.80	B4 PID < 0.1ppm								
2.80-3.17	SPT 50/220		10,15/16,16,18						
2.80-3.17	X3			33.83	3.17				
						Complete at 3.17m			

Remarks
Elevation estimated from https://www.freemaptools.com/elevation-finder.htm
Location accurate to 3.00-5.00m.
Borehole dry.
SPT refusal at 3.17mbgl on sandstone. Probable rockhead.

Scale (approx)	**Logged By**
1:40	BR

Figure No.
LKC 19 1129.WS102

Produced by the GEOtechnical DAtabase SYstem (GEODASY) © all rights reserved

LK GROUP	**LK CONSULT LTD** Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS Tel: 0161 763 7200 web: www.thelkgroup.com	**Site** 437 Wilmslow Road, Withington	**Number** **WS103**

Excavation Method	**Dimensions**	**Ground Level (mOD)**	**Client**	**Job Number**
Drive-in Windowless Sampler to 3.27mbgl.		37.00	First-Step Group Ltd	lkc 19 1129
	Location (Handheld GPS) 385011 E 393123 N	**Dates** 17/05/2019	**Engineer** LKC	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
				36.90	(0.10) 0.10	MADE GROUND: Tarmacadam.			
0.10-0.80	D1 PID < 0.1ppm					MADE GROUND: Blackish brown sandy clayey GRAVEL with abundant brick, frequent ash and occasional rootlets. Sand is fine to coarse. Gravel is fine to coarse and angular comprising mudstone and sandstone. Brick less frequent below 0.4mbgl.			
0.50-0.80	B1 PID < 0.1ppm				(0.70)				
0.80-0.90	D2 PID < 0.1ppm			36.20	0.80				
1.00-1.45 1.00-1.45	SPT N=12 X1		2,2/3,3,3,3			Stiff consistency high strength brownish orange slightly gravelly sandy CLAY with occasional brick and rare cobble. Sand is fine to coarse. Gravel is fine to medium and angular to subangular comprising mudstone.			
					(1.10)				
1.90-2.00 2.00-2.45 2.00-2.45	B3 PID < 0.1ppm SPT N=35 X2		3,4/7,8,10,10	35.10	1.90	Dense to very dense orange slightly gravellly silty SAND with occasional sandstone cobble. Sand is fine to medium. Gravel is fine to medium and angular to subangular comprising sandstone. Probable weathered bedrock.			
2.50-3.00	B4 PID < 0.1ppm				(1.37)				
3.00-3.27 3.00-3.27	SPT 25*/140 50/125 X3		11,14/25,25	33.73	3.27	Complete at 3.27m			

Remarks
Elevation estimated from https://www.freemaptools.com/elevation-finder.htm
Location accurate to 3.00-5.00m.
Borehole dry.
SPT refusal at 3.27mbgl on sandstone. Probable rockhead.

Scale (approx)	**Logged By**
1:40	BR

Figure No.
LKC 19 1129.WS103

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LK GROUP	**LK CONSULT LTD** Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS Tel: 0161 763 7200 web: www.thelkgroup.com	**Site** 437 Wilmslow Road, Withington	**Trial Pit Number** **HD101**

Excavation Method	**Dimensions**	**Ground Level (mOD)**	**Client**	**Job Number**
Hand Excavated Trial Pit to 0.9mbgl.		37.00	First-Step Group Ltd	lkc 19 1129
	Location (Handheld GPS) 385021 E 393120 N	**Dates** 17/05/2019	**Engineer** LKC	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				36.85	(0.15) 0.15	MADE GROUND: Tarmacadam.		
0.15-0.60	D1 PID < 0.1ppm				(0.45)	MADE GROUND: Brownish grey clayey sandy GRAVEL with abundant brick, occasional ash and clinker. Sand is fine to coarse. Gravel is fine to coarse and angular to subangular comprising mudstone and sandstone. Brick less frequent below 0.3mbgl.		
0.60-0.90	D2 PID < 0.1ppm			36.40	0.60 (0.30)			
				36.10	0.90	Orangey brown slightly gravelly sandy CLAY with occasional rootlets. Sand is fine to medium. Gravel is fine to medium and angular to subangular comprising sandstone.		
						Complete at 0.90m		



Remarks

Elevation estimated from https://www.freemaptools.com/elevation-finder.htm
Location accurate to 3.00-5.00m.
Hand excavated pit dry.
Refusal on very stiff strata.

Scale (approx)	**Logged By**	**Figure No.**
1:40	BR	LKC 19 1129.HD101

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LK CONSULT LTD Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS Tel: 0161 763 7200 web: www.thelkgroup.com		**Site** 437 Wilmslow Road, Withington	**Trial Pit Number** **HD102**
Excavation Method Hand Excavated Trial Pit to 1.00mbgl.	**Dimensions**	**Ground Level (mOD)** 37.00	**Client** First-Step Group Ltd	**Job Number** lkc 19 1129
	Location (Handheld GPS) 385014 E 393116 N	**Dates** 17/05/2019	**Engineer** LKC	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10-0.60	D1 PID < 0.1ppm			36.90	0.10	MADE GROUND: Tarmacadam.		
					(0.50)	MADE GROUND: Grey sandy GRAVEL with occasional brick and rootlets. Sand is fine to coarse. Gravel is fine to coarse and angular to subangular comprising mudstone and sandstone. Sand more frequent with depth.		
0.60-1.00	D2 PID < 0.1ppm			36.40	0.60			
					(0.40)	MADE GROUND: Brownish orange gravelly clayey SAND with occasional brick, ash and rare rootlets. Sand is fine to coarse. Gravel is fine to coarse and angular to subangular comprising sandstone.		
				36.00	1.00	Complete at 1.00m		



Remarks

Hand excavated pit dry.
Refusal on very stiff strata.
Elevation estimated from https://www.freemaptools.com/elevation-finder.htm
Location accurate to 3.00-5.00m.

Scale (approx)	Logged By	Figure No.
1:40	BR	LKC 19 1129.HD102

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Appendix C

Certificates of Analysis – Soil

Chemtest
The right chemistry to deliver results
Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

Final Report

Report No.:	19-17114-1
Initial Date of Issue:	29-May-2019
Client	LK Consult
Client Address:	Unit 29 Eton Business Park Eton Hill Road Radcliffe Manchester Lancashire M26 2ZS
Contact(s):	Contaminated Land Peter Dunn
Project	LK 19 1129 437 Wilmslow Road, Withington

Quotation No.:		**Date Received:**	21-May-2019
Order No.:	736948	**Date Instructed:**	21-May-2019
No. of Samples:	10		
Turnaround (Wkdays):	5	**Results Due:**	28-May-2019
Date Approved:	29-May-2019		

Approved By:



Details: Martin Dyer, Laboratory Manager

Chemtest
The right chemistry to deliver results

Results - Soil

Project: LK 19 1129 437 Wilmslow Road, Withington

Client: LK Consult				**Chemtest Job No.:**	19-17114	19-17114	19-17114	19-17114	19-17114	19-17114	19-17114	19-17114
Quotation No.:				**Chemtest Sample ID.:**	829651	829652	829653	829654	829655	829656	829657	829658
				Client Sample ID.:	WS101 D1	WS101 D2	WS102 D1	WS102 D2	WS103 D1	WS103 D2	HS101 D1	HD101 D2
				Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):	0.10	0.70	0.10	0.80	0.10	0.80	0.15	0.60
				Bottom Depth (m):	0.50	1.00	0.50	1.00	0.50	1.00	0.60	0.90
				Date Sampled:	17-May-2019	17-May-2019	17-May-2019	17-May-2019	17-May-2019	17-May-2019	17-May-2019	17-May-2019
				Asbestos Lab:	COVENTRY			COVENTRY	COVENTRY		COVENTRY	
Determinand	**Accred.**	**SOP**	**Units**	**LOD**								
ACM Type	U	2192		N/A	-			-	-		-	
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected			No Asbestos Detected	No Asbestos Detected		No Asbestos Detected	
ACM Detection Stage	U	2192		N/A	-			-	-		-	
Moisture	N	2030	%	0.020	12	19	7.9	15	14	12	13	15
Soil Colour	N	2040		N/A	Black	Brown	Brown	Brown	Brown	Brown	Brown	Brown
Other Material	N	2040		N/A	Stones	Stones	Stones	Stones	Stones	Stones	Stones, Brick	Stones
Soil Texture	N	2040		N/A	Sand	Clay	Sand	Loam	Sand	Sand	Sand	Loam
pH	M	2010		N/A	8.4			7.6	8.2		8.9	
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010	0.051			0.046	0.048		0.15	
Arsenic	M	2450	mg/kg	1.0	110			9.5	98		26	
Cadmium	M	2450	mg/kg	0.10	0.73	0.13	0.82	< 0.10	0.86	< 0.10	0.20	< 0.10
Chromium	M	2450	mg/kg	1.0	16			31	22		16	
Copper	M	2450	mg/kg	0.50	43			24	79		32	
Mercury	M	2450	mg/kg	0.10	0.23			0.10	0.25		0.19	
Nickel	M	2450	mg/kg	0.50	27			27	44		17	
Lead	M	2450	mg/kg	0.50	110			13	120		79	
Selenium	M	2450	mg/kg	0.20	0.35			< 0.20	0.76		< 0.20	
Vanadium	U	2450	mg/kg	5.0	39			37	67		33	
Zinc	M	2450	mg/kg	0.50	90			57	210		48	
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50			< 0.50	< 0.50		< 0.50	
Organic Matter	M	2625	%	0.40	15			0.72	15		5.3	
Naphthalene	M	2800	mg/kg	0.10	4.1			< 0.10	2.4		1.8	
Acenaphthylene	N	2800	mg/kg	0.10	2.9			< 0.10	1.2		1.1	
Acenaphthene	M	2800	mg/kg	0.10	3.1			< 0.10	0.98		4.2	
Fluorene	M	2800	mg/kg	0.10	4.1			< 0.10	1.1		4.6	
Phenanthrene	M	2800	mg/kg	0.10	49			0.36	14		40	
Anthracene	M	2800	mg/kg	0.10	13			0.11	5.9		11	
Fluoranthene	M	2800	mg/kg	0.10	100			1.4	40		53	
Pyrene	M	2800	mg/kg	0.10	95			1.3	38		49	
Benzo[a]anthracene	M	2800	mg/kg	0.10	47			0.31	22		23	
Chrysene	M	2800	mg/kg	0.10	45			0.29	21		22	
Benzo[b]fluoranthene	M	2800	mg/kg	0.10	56			< 0.10	28		24	
Benzo[k]fluoranthene	M	2800	mg/kg	0.10	23			< 0.10	11		9.9	
Benzo[a]pyrene	M	2800	mg/kg	0.10	47			< 0.10	23		20	
Indeno(1,2,3-c,d)Pyrene	M	2800	mg/kg	0.10	29			< 0.10	15		11	
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10	6.6			< 0.10	3.1		2.6	
Benzo[g,h,i]perylene	M	2800	mg/kg	0.10	27			< 0.10	14		11	

Chemtest
The right chemistry to deliver results

Results - Soil

Project: LK 19 1129 437 Wilmslow Road, Withington

Client: LK Consult			**Chemtest Job No.:**		19-17114	19-17114	19-17114	19-17114	19-17114	19-17114	19-17114	19-17114
Quotation No.:			**Chemtest Sample ID.:**		829651	829652	829653	829654	829655	829656	829657	829658
			Client Sample ID.:		WS101 D1	WS101 D2	WS102 D1	WS102 D2	WS103 D1	WS103 D2	HS101 D1	HD101 D2
			Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Top Depth (m):		0.10	0.70	0.10	0.80	0.10	0.80	0.15	0.60
			Bottom Depth (m):		0.50	1.00	0.50	1.00	0.50	1.00	0.60	0.90
			Date Sampled:		17-May-2019	17-May-2019	17-May-2019	17-May-2019	17-May-2019	17-May-2019	17-May-2019	17-May-2019
			Asbestos Lab:		COVENTRY			COVENTRY	COVENTRY		COVENTRY	
Determinand	**Accred.**	**SOP**	**Units**	**LOD**								
Total Of 16 PAH's	N	2800	mg/kg	2.0	550			3.8	240		290	

Chemtest
The right chemistry to deliver results

Results - Soil

Project: LK 19 1129 437 Wilmslow Road, Withington

Client: LK Consult			**Chemtest Job No.:**		19-17114	19-17114
Quotation No.:			**Chemtest Sample ID.:**		829659	829660
			Client Sample ID.:		HD102 D1	HD102 D2
			Sample Type:		SOIL	SOIL
			Top Depth (m):		0.10	0.60
			Bottom Depth (m):		0.60	1.00
			Date Sampled:		17-May-2019	17-May-2019
			Asbestos Lab:		COVENTRY	
Determinand	**Accred.**	**SOP**	**Units**	**LOD**		
ACM Type	U	2192		N/A	-	
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected	
ACM Detection Stage	U	2192		N/A	-	
Moisture	N	2030	%	0.020	9.6	13
Soil Colour	N	2040		N/A	Brown	Brown
Other Material	N	2040		N/A	Stones	Stones
Soil Texture	N	2040		N/A	Sand	Sand
pH	M	2010		N/A	8.0	
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010	< 0.010	
Arsenic	M	2450	mg/kg	1.0	41	
Cadmium	M	2450	mg/kg	0.10	0.50	0.11
Chromium	M	2450	mg/kg	1.0	19	
Copper	M	2450	mg/kg	0.50	77	
Mercury	M	2450	mg/kg	0.10	0.70	
Nickel	M	2450	mg/kg	0.50	28	
Lead	M	2450	mg/kg	0.50	310	
Selenium	M	2450	mg/kg	0.20	< 0.20	
Vanadium	U	2450	mg/kg	5.0	45	
Zinc	M	2450	mg/kg	0.50	160	
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	
Organic Matter	M	2625	%	0.40	14	
Naphthalene	M	2800	mg/kg	0.10	0.83	
Acenaphthylene	N	2800	mg/kg	0.10	1.7	
Acenaphthene	M	2800	mg/kg	0.10	4.6	
Fluorene	M	2800	mg/kg	0.10	5.5	
Phenanthrene	M	2800	mg/kg	0.10	61	
Anthracene	M	2800	mg/kg	0.10	20	
Fluoranthene	M	2800	mg/kg	0.10	84	
Pyrene	M	2800	mg/kg	0.10	71	
Benzo[a]anthracene	M	2800	mg/kg	0.10	34	
Chrysene	M	2800	mg/kg	0.10	32	
Benzo[b]fluoranthene	M	2800	mg/kg	0.10	36	
Benzo[k]fluoranthene	M	2800	mg/kg	0.10	15	
Benzo[a]pyrene	M	2800	mg/kg	0.10	30	
Indeno(1,2,3-c,d)Pyrene	M	2800	mg/kg	0.10	18	
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10	3.8	
Benzo[g,h,i]perylene	M	2800	mg/kg	0.10	17	

Results - Soil

Project: LK 19 1129 437 Wilmslow Road, Withington

Client: LK Consult			**Chemtest Job No.:**		19-17114	19-17114
Quotation No.:			**Chemtest Sample ID.:**		829659	829660
			Client Sample ID.:		HD102 D1	HD102 D2
			Sample Type:		SOIL	SOIL
			Top Depth (m):		0.10	0.60
			Bottom Depth (m):		0.60	1.00
			Date Sampled:		17-May-2019	17-May-2019
			Asbestos Lab:		COVENTRY	
Determinand	**Accred.**	**SOP**	**Units**	**LOD**		
Total Of 16 PAH's	N	2800	mg/kg	2.0	430	

Chemtest
The right chemistry to deliver results

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
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.
2800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-MS	Acenaphthene*; Acenaphthylene; Anthracene*; Benzo[a]Anthracene*; Benzo[a]Pyrene*; Benzo[b]Fluoranthene*; Benzo[ghi]Perylene*; Benzo[k]Fluoranthene; Chrysene*; Dibenz[ah]Anthracene; Fluoranthene*; Fluorene*; Indeno[123cd]Pyrene*; Naphthalene*; Phenanthrene*; Pyrene*	Dichloromethane extraction / GC-MS

Chemtest
The right chemistry to deliver results

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"

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 - Geotechnical

MURRAY RIX
CONSULTANCY, SITE INVESTIGATION
CONSTRUCTION MATERIALS TESTING

TEST REPORT

Client LK Consult Ltd

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

Contract LKC 19 1129 -
437 Wilmslow Road, Withington

Job Number MRN 3524/75
Date of Issue 28 May 2019

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.

UKAS TESTING 1580
33C, Vauxhall Industrial Estate, Greg Street, Reddish, Stockport SK5 7BR Tel: 0161 475 0870 Fax: 0161 475 0871
Email: steve@mtt-uk.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

33C Vauxhall Ind. Estate, Greg Street
Reddish, Stockport SK5 7BR
TEL 0161 475 0870 FAX 0161 475 0871

UKAS TESTING 1580

TEST CERTIFICATE

LIQUID AND PLASTIC LIMIT

BS 1377: PART 2: 1990 Clause 4.4 ONE POINT METHOD & Clause 5.3

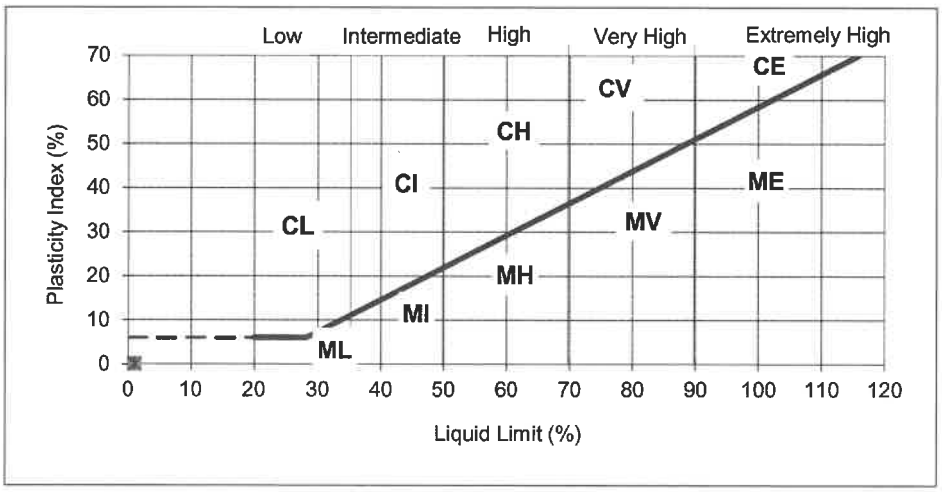
MOISTURE CONTENT METHOD BS 1377: PART 2: 1990 Clause 3.2

CLIENT	LK Consult Ltd
SITE	LKC 19 1129 - 437 Wilmslow Road, Withington
JOB NUMBER	MRN 3524/75

SAMPLE LABEL	WS101 B5 (2.5-3)	DATE SAMPLED	Not advised
SAMPLE No.	83323	DATE RECEIVED	20-May-19
DATE TESTED	21-May-19	SAMPLED BY	Client

MATERIAL	Reddish brown very silty SAND
ADVISED SOURCE	Site Investigation Sample

Moisture Content (Natural) (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
14	N/A	Non Plastic	N/A	57



REMARKS
Sample tested after wet sieving

SIGNED

NAME O.P. Davies BA (Hons) DATE 28-May-19
(Laboratory Manager)

MURRAY RIX
33C Vauxhall Ind. Estate, Greg Street
Reddish, Stockport SK5 7BR
TEL 0161 475 0870 FAX 0161 475 0871

UKAS TESTING
1580

TEST CERTIFICATE

PARTICLE SIZE DISTRIBUTION

BS 1377: PART 2: Clause 9.2: 1990

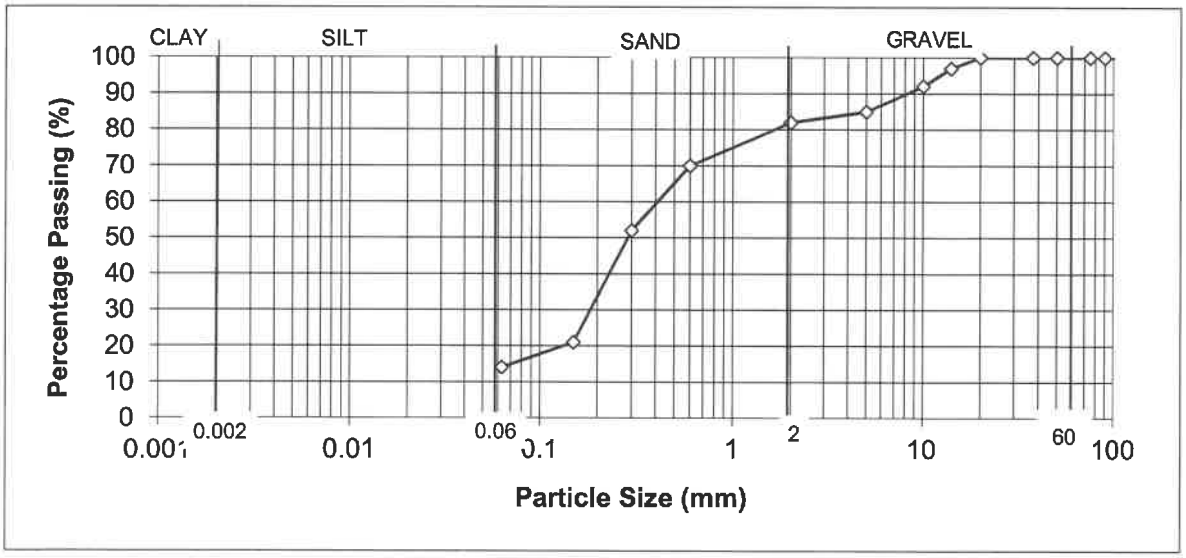
Determination of Moisture Content in accordance with BS 1377: PART 2: Clause 3: 1990 (Oven Dry)

CLIENT	LK Consult Ltd
SITE	LKC 19 1129 - 437 Wilmslow Road, Withington
JOB NUMBER	MRN 3524/75

SAMPLE LABEL	WS102 B4 (2.5-2.8)	DATE SAMPLED	18-May-19
LAB SAMPLE No	83324	DATE RECEIVED	20-May-19
DATE TESTED	21-May-19	SAMPLED BY	Client

MATERIAL	Red brown silty fine to coarse SAND with occasional gravel
ADVISED SOURCE	Site Investigation Sample

Sieve Size (mm)	% Passing (%)	Specification (%)	Sieve Size (mm)	% Passing (%)	Specification (%)
125	100		10	92	
90	100		5	85	
75	100		2	82	
50	100		0.6	70	
37.5	100		0.3	52	
20	100		0.15	21	
14	97		0.063	14	



REMARKS
As received moisture content = 12%

SIGNED

NAME O.P. Davies BA (Hons) (Laboratory Manager) DATE 28-May-19

MURRAY RIX

33C Vauxhall Ind. Estate, Greg Street
Reddish, Stockport SK5 7BR
TEL 0161 475 0870 FAX 0161 475 0871

UKAS TESTING 1580

TEST CERTIFICATE

LIQUID AND PLASTIC LIMIT

BS 1377: PART 2: 1990 Clause 4.4 ONE POINT METHOD & Clause 5.3

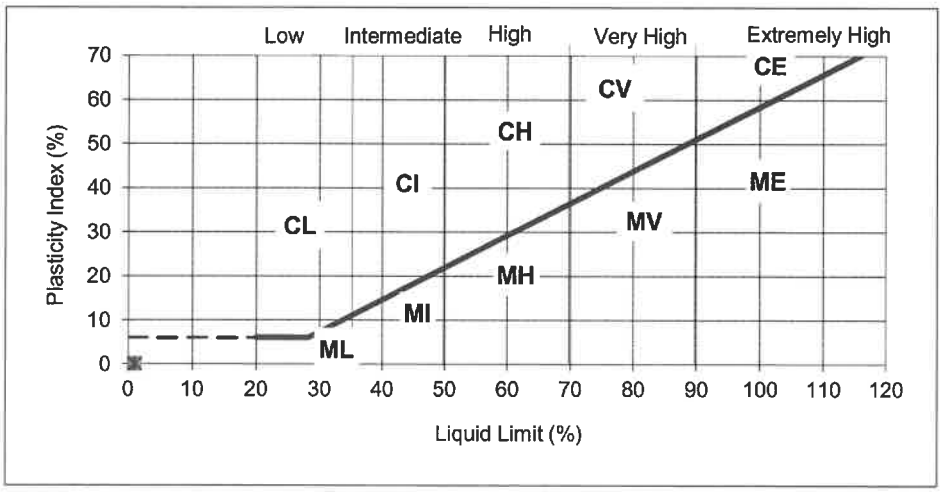
MOISTURE CONTENT METHOD BS 1377: PART 2: 1990 Clause 3.2

CLIENT	LK Consult Ltd
SITE	LKC 19 1129 - 437 Wilmslow Road, Withington
JOB NUMBER	MRN 3524/75

SAMPLE LABEL	See Remarks	DATE SAMPLED	Not advised
SAMPLE No.	83324	DATE RECEIVED	20-May-19
DATE TESTED	21-May-19	SAMPLED BY	Client

MATERIAL	Reddish brown silty fine to coarse SAND with occasional gravel
ADVISED SOURCE	Site Investigation Sample

Moisture Content (Natural) (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
12	N/A	Non Plastic	N/A	62



REMARKS

Sample tested after wet sieving, Sample label WS102 B4 (2.5-2.8)

SIGNED

NAME O.P. Davies BA (Hons) DATE 28-May-19

(Laboratory Manager)

MURRAY RIX

33C Vauxhall Ind. Estate, Greg Street
Reddish, Stockport SK5 7BR
TEL 0161 475 0870 FAX 0161 475 0871

UKAS TESTING 1580

TEST CERTIFICATE

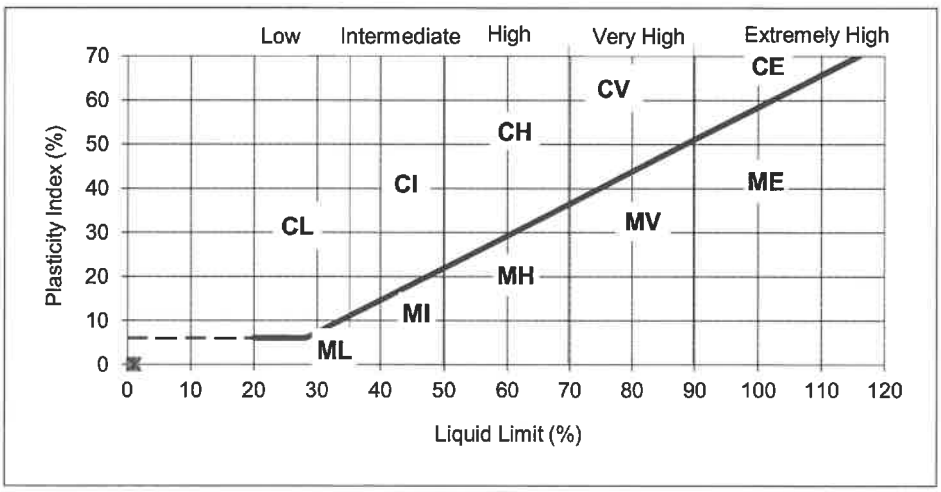
LIQUID AND PLASTIC LIMIT
BS 1377: PART 2: 1990 Clause 4.4 ONE POINT METHOD & Clause 5.3
MOISTURE CONTENT METHOD BS 1377: PART 2: 1990 Clause 3.2

CLIENT	LK Consult Ltd
SITE	LKC 19 1129 - 437 Wilmslow Road, Withington
JOB NUMBER	MRN 3524/75

SAMPLE LABEL	WS103 B4 (2.5-3)	DATE SAMPLED	Not advised
SAMPLE No.	83325	DATE RECEIVED	20-May-19
DATE TESTED	21-May-19	SAMPLED BY	Client

MATERIAL	Reddish brown very silty SAND
ADVISED SOURCE	Site Investigation Sample

Moisture Content (Natural) (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
11	N/A	Non Plastic	N/A	51



REMARKS
Sample tested after wet sieving,

SIGNED

NAME O.P. Davies BA (Hons) DATE 28-May-19
(Laboratory Manager)

Appendix E

Hazwaste Online Certificates

HazWasteOnline™

Waste Classification Report

MA5JH-3DMPK-BUUUM

Job name

LKC 19 1129

Description/Comments

Project

LKC 19 1129

Site

437 Wilmslow Road, Withington

Related Documents

#	Name	Description
1	HWOL-19-17114-20190529 162328.hwol	.hwol file used to create the Job

Waste Stream Template

Example waste stream template for contaminated soils

Classified by

Name:
Peter Dunn
Date:
06 Jun 2019 15:37 GMT
Telephone:
0161 763 7200

Company:
LK Group
Unit 29, Eton Business Park
Eton Hill Rd, Radcliffe
Manchester
M26 2ZS

Report

Created by: Peter Dunn
Created date: 06 Jun 2019 15:37 GMT

Job summary

#	Sample Name	Depth [m]	Classification Result	Hazard properties	Page
1	WS101 D1-829651-17/05/2019-0.10	0.10-0.50	Non Hazardous		3
2	WS101 D2-829652-17/05/2019-0.70	0.70-1.00	Non Hazardous		5
3	WS102 D1-829653-17/05/2019-0.10	0.10-0.50	Non Hazardous		6
4	WS102 D2-829654-17/05/2019-0.80	0.80-1.00	Non Hazardous		7
5	WS103 D1-829655-17/05/2019-0.10	0.10-0.50	Non Hazardous		9
6	WS103 D2-829656-17/05/2019-0.80	0.80-1.00	Non Hazardous		11

#	Sample Name	Depth [m]	Classification Result	Hazard properties	Page
7	HS101 D1-829657-17/05/2019-0.15	0.15-0.60	Non Hazardous		12
8	HD101 D2-829658-17/05/2019-0.60	0.60-0.90	Non Hazardous		14
9	HD102 D1-829659-17/05/2019-0.10	0.10-0.60	Non Hazardous		15
10	HD102 D2-829660-17/05/2019-0.60	0.60-1.00	Non Hazardous		17

Appendices	Page
Appendix A: Classifier defined and non CLP determinands	18
Appendix B: Rationale for selection of metal species	19
Appendix C: Version	19

Classification of sample: WS101 D1-829651-17/05/2019-0.10

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

Sample details

Sample Name:
WS101 D1-829651-17/05/2019-0.10
Sample Depth:
0.10-0.50 m
Moisture content:
12%
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 12% Wet Weight Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		110	mg/kg	1.32	127.807	mg/kg	0.0128 %	✓	
2	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.73	mg/kg	1.142	0.734	mg/kg	0.0000734 %	✓	
3	chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		16	mg/kg	1.462	20.579	mg/kg	0.00206 %	✓	
4	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<0.5	mg/kg	1.923	<0.962	mg/kg	<0.0000962 %		**<LOD**
5	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		43	mg/kg	1.126	42.604	mg/kg	0.00426 %	✓	
6	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	110	mg/kg	1.56	150.99	mg/kg	0.00968 %	✓	
7	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.23	mg/kg	1.353	0.274	mg/kg	0.0000274 %	✓	
8	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		27	mg/kg	2.976	70.716	mg/kg	0.00707 %	✓	
9	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				0.35	mg/kg	2.554	0.787	mg/kg	0.0000787 %	✓	
10	zinc { zinc chromate }	024-007-00-3				90	mg/kg	2.774	219.712	mg/kg	0.022 %	✓	
11	pH			PH		8.4	pH		8.4	pH	8.4 pH		
12	naphthalene	601-052-00-2	202-049-5	91-20-3		4.1	mg/kg		3.608	mg/kg	0.000361 %	✓	
13	acenaphthylene		205-917-1	208-96-8		2.9	mg/kg		2.552	mg/kg	0.000255 %	✓	
14	acenaphthene		201-469-6	83-32-9		3.1	mg/kg		2.728	mg/kg	0.000273 %	✓	

#		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				4.1	mg/kg		3.608	mg/kg	0.000361 %	✓	
			201-695-5	86-73-7									
16		phenanthrene				49	mg/kg		43.12	mg/kg	0.00431 %	✓	
			201-581-5	85-01-8									
17		anthracene				13	mg/kg		11.44	mg/kg	0.00114 %	✓	
			204-371-1	120-12-7									
18		fluoranthene				100	mg/kg		88	mg/kg	0.0088 %	✓	
			205-912-4	206-44-0									
19		pyrene				95	mg/kg		83.6	mg/kg	0.00836 %	✓	
			204-927-3	129-00-0									
20		benzo[a]anthracene				47	mg/kg		41.36	mg/kg	0.00414 %	✓	
		601-033-00-9	200-280-6	56-55-3									
21		chrysene				45	mg/kg		39.6	mg/kg	0.00396 %	✓	
		601-048-00-0	205-923-4	218-01-9									
22		benzo[b]fluoranthene				56	mg/kg		49.28	mg/kg	0.00493 %	✓	
		601-034-00-4	205-911-9	205-99-2									
23		benzo[k]fluoranthene				23	mg/kg		20.24	mg/kg	0.00202 %	✓	
		601-036-00-5	205-916-6	207-08-9									
24		benzo[a]pyrene; benzo[def]chrysene				47	mg/kg		41.36	mg/kg	0.00414 %	✓	
		601-032-00-3	200-028-5	50-32-8									
25		indeno[123-cd]pyrene				29	mg/kg		25.52	mg/kg	0.00255 %	✓	
			205-893-2	193-39-5									
26		dibenz[a,h]anthracene				6.6	mg/kg		5.808	mg/kg	0.000581 %	✓	
		601-041-00-2	200-181-8	53-70-3									
27		benzo[ghi]perylene				27	mg/kg		23.76	mg/kg	0.00238 %	✓	
			205-883-8	191-24-2									
28		vanadium { divanadium pentaoxide; vanadium pentoxide }				39	mg/kg	1.785	61.268	mg/kg	0.00613 %	✓	
		023-001-00-8	215-239-8	1314-62-1									
29		asbestos				<10	mg/kg		<10	mg/kg	<0.001 %		<**LOD**
		650-013-00-6	- - - - - - -	12001-28-4 132207-32-0 12172-73-5 77536-66-4 77536-68-6 77536-67-5 12001-29-5									
										Total:	0.114 %		

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 Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: WS101 D2-829652-17/05/2019-0.70

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

Sample details

Sample Name:
WS101 D2-829652-17/05/2019-0.70
Sample Depth:
0.70-1.00 m
Moisture content:
19%
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

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		cadmium { cadmium oxide }				0.13 mg/kg	1.142	0.12 mg/kg	0.000012 %	✓	
		048-002-00-0	215-146-2	1306-19-0							
								Total:	0.00001 %		

Key

	User supplied data
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration

Classification of sample: WS102 D1-829653-17/05/2019-0.10

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

Sample details

Sample Name:
WS102 D1-829653-17/05/2019-0.10
Sample Depth:
0.10-0.50 m
Moisture content:
7.9%
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 7.9% 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		cadmium { cadmium oxide }				0.82 mg/kg	1.142	0.863 mg/kg	0.0000863 %	✓	
		048-002-00-0	215-146-2	1306-19-0							
								Total:	0.00008 %		

Key

	User supplied data
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration

Classification of sample: WS102 D2-829654-17/05/2019-0.80

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

Sample details

Sample Name:
WS102 D2-829654-17/05/2019-0.80
Sample Depth:
0.80-1.00 m
Moisture content:
15%
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 15% 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 }		9.5 mg/kg	1.32	10.662 mg/kg	0.00107 %	✓	
		033-003-00-0 / 215-481-4 / 1327-53-3							
2		cadmium { cadmium oxide }		<0.1 mg/kg	1.142	<0.114 mg/kg	<0.0000114 %		<LOD
		048-002-00-0 / 215-146-2 / 1306-19-0							
3		chromium in chromium(III) compounds { chromium(III) oxide }		31 mg/kg	1.462	38.512 mg/kg	0.00385 %	✓	
		/ 215-160-9 / 1308-38-9							
4		chromium in chromium(VI) compounds { chromium(VI) oxide }		<0.5 mg/kg	1.923	<0.962 mg/kg	<0.0000962 %		<LOD
		024-001-00-0 / 215-607-8 / 1333-82-0							
5		copper { dicopper oxide; copper (I) oxide }		24 mg/kg	1.126	22.968 mg/kg	0.0023 %	✓	
		029-002-00-X / 215-270-7 / 1317-39-1							
6		lead { lead chromate }	1	13 mg/kg	1.56	17.236 mg/kg	0.00111 %	✓	
		082-004-00-2 / 231-846-0 / 7758-97-6							
7		mercury { mercury dichloride }		<0.1 mg/kg	1.353	<0.135 mg/kg	<0.0000135 %		<LOD
		080-010-00-X / 231-299-8 / 7487-94-7							
8		nickel { nickel chromate }		27 mg/kg	2.976	68.305 mg/kg	0.00683 %	✓	
		028-035-00-7 / 238-766-5 / 14721-18-7							
9		selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }		<0.2 mg/kg	2.554	<0.511 mg/kg	<0.0000511 %		<LOD
		034-002-00-8 / /							
10		zinc { zinc chromate }		57 mg/kg	2.774	134.407 mg/kg	0.0134 %	✓	
		024-007-00-3 / /							
11		pH		7.6 pH		7.6 pH	7.6 pH		
		/ / 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				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			201-695-5	86-73-7									
16		phenanthrene				0.36	mg/kg		0.306	mg/kg	0.0000306 %	✓	
			201-581-5	85-01-8									
17		anthracene				0.11	mg/kg		0.0935	mg/kg	0.00000935 %	✓	
			204-371-1	120-12-7									
18		fluoranthene				1.4	mg/kg		1.19	mg/kg	0.000119 %	✓	
			205-912-4	206-44-0									
19		pyrene				1.3	mg/kg		1.105	mg/kg	0.000111 %	✓	
			204-927-3	129-00-0									
20		benzo[a]anthracene				0.31	mg/kg		0.264	mg/kg	0.0000264 %	✓	
		601-033-00-9	200-280-6	56-55-3									
21		chrysene				0.29	mg/kg		0.247	mg/kg	0.0000246 %	✓	
		601-048-00-0	205-923-4	218-01-9									
22		benzo[b]fluoranthene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
		601-034-00-4	205-911-9	205-99-2									
23		benzo[k]fluoranthene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
		601-036-00-5	205-916-6	207-08-9									
24		benzo[a]pyrene; benzo[def]chrysene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
		601-032-00-3	200-028-5	50-32-8									
25		indeno[123-cd]pyrene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			205-893-2	193-39-5									
26		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									
27		benzo[ghi]perylene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			205-883-8	191-24-2									
28		vanadium { divanadium pentaoxide; vanadium pentoxide }				37	mg/kg	1.785	56.144	mg/kg	0.00561 %	✓	
		023-001-00-8	215-239-8	1314-62-1									
29		asbestos				<10	mg/kg		<10	mg/kg	<0.001 %		<LOD
		650-013-00-6	- - - - - - -	12001-28-4 132207-32-0 12172-73-5 77536-66-4 77536-68-6 77536-67-5 12001-29-5									
										Total:	0.0358 %		

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 Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: WS103 D1-829655-17/05/2019-0.10

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

Sample details

Sample Name:
WS103 D1-829655-17/05/2019-0.10
Sample Depth:
0.10-0.50 m
Moisture content:
14%
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 14% Wet Weight Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		98	mg/kg	1.32	111.277	mg/kg	0.0111 %	✓	
2	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.86	mg/kg	1.142	0.845	mg/kg	0.0000845 %	✓	
3	chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		22	mg/kg	1.462	27.653	mg/kg	0.00277 %	✓	
4	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<0.5	mg/kg	1.923	<0.962	mg/kg	<0.0000962 %		**<LOD**
5	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		79	mg/kg	1.126	76.493	mg/kg	0.00765 %	✓	
6	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	120	mg/kg	1.56	160.973	mg/kg	0.0103 %	✓	
7	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.25	mg/kg	1.353	0.291	mg/kg	0.0000291 %	✓	
8	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		44	mg/kg	2.976	112.622	mg/kg	0.0113 %	✓	
9	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				0.76	mg/kg	2.554	1.669	mg/kg	0.000167 %	✓	
10	zinc { zinc chromate }	024-007-00-3				210	mg/kg	2.774	501.011	mg/kg	0.0501 %	✓	
11	pH			PH		8.2	pH		8.2	pH	8.2 pH		
12	naphthalene	601-052-00-2	202-049-5	91-20-3		2.4	mg/kg		2.064	mg/kg	0.000206 %	✓	
13	acenaphthylene		205-917-1	208-96-8		1.2	mg/kg		1.032	mg/kg	0.000103 %	✓	
14	acenaphthene		201-469-6	83-32-9		0.98	mg/kg		0.843	mg/kg	0.0000843 %	✓	

#		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				1.1	mg/kg		0.946	mg/kg	0.0000946 %	✓	
			201-695-5	86-73-7									
16		phenanthrene				14	mg/kg		12.04	mg/kg	0.0012 %	✓	
			201-581-5	85-01-8									
17		anthracene				5.9	mg/kg		5.074	mg/kg	0.000507 %	✓	
			204-371-1	120-12-7									
18		fluoranthene				40	mg/kg		34.4	mg/kg	0.00344 %	✓	
			205-912-4	206-44-0									
19		pyrene				38	mg/kg		32.68	mg/kg	0.00327 %	✓	
			204-927-3	129-00-0									
20		benzo[a]anthracene				22	mg/kg		18.92	mg/kg	0.00189 %	✓	
		601-033-00-9	200-280-6	56-55-3									
21		chrysene				21	mg/kg		18.06	mg/kg	0.00181 %	✓	
		601-048-00-0	205-923-4	218-01-9									
22		benzo[b]fluoranthene				28	mg/kg		24.08	mg/kg	0.00241 %	✓	
		601-034-00-4	205-911-9	205-99-2									
23		benzo[k]fluoranthene				11	mg/kg		9.46	mg/kg	0.000946 %	✓	
		601-036-00-5	205-916-6	207-08-9									
24		benzo[a]pyrene; benzo[def]chrysene				23	mg/kg		19.78	mg/kg	0.00198 %	✓	
		601-032-00-3	200-028-5	50-32-8									
25		indeno[123-cd]pyrene				15	mg/kg		12.9	mg/kg	0.00129 %	✓	
			205-893-2	193-39-5									
26		dibenz[a,h]anthracene				3.1	mg/kg		2.666	mg/kg	0.000267 %	✓	
		601-041-00-2	200-181-8	53-70-3									
27		benzo[ghi]perylene				14	mg/kg		12.04	mg/kg	0.0012 %	✓	
			205-883-8	191-24-2									
28		vanadium { divanadium pentaoxide; vanadium pentoxide }				67	mg/kg	1.785	102.862	mg/kg	0.0103 %	✓	
		023-001-00-8	215-239-8	1314-62-1									
29		asbestos				<10	mg/kg		<10	mg/kg	<0.001 %		<**LOD**
		650-013-00-6	- - - - - - -	12001-28-4 132207-32-0 12172-73-5 77536-66-4 77536-68-6 77536-67-5 12001-29-5									
										Total:	0.126 %		

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 Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: WS103 D2-829656-17/05/2019-0.80

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

Sample details

Sample Name:
WS103 D2-829656-17/05/2019-0.80
Sample Depth:
0.80-1.00 m
Moisture content:
12%
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 12% 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		cadmium { cadmium oxide }				<0.1 mg/kg	1.142	<0.114 mg/kg	<0.0000114 %		<**LOD**
		048-002-00-0	215-146-2	1306-19-0							
								Total:	0.00001 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection

Classification of sample: HS101 D1-829657-17/05/2019-0.15

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

Sample details

Sample Name:
HS101 D1-829657-17/05/2019-0.15
Sample Depth:
0.15-0.60 m
Moisture content:
13%
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

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

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		26	mg/kg	1.32	29.866	mg/kg	0.00299 %	✓	
2	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.2	mg/kg	1.142	0.199	mg/kg	0.0000199 %	✓	
3	chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		16	mg/kg	1.462	20.345	mg/kg	0.00203 %	✓	
4	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<0.5	mg/kg	1.923	<0.962	mg/kg	<0.0000962 %		<**LOD**
5	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		32	mg/kg	1.126	31.345	mg/kg	0.00313 %	✓	
6	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	79	mg/kg	1.56	107.206	mg/kg	0.00687 %	✓	
7	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.19	mg/kg	1.353	0.224	mg/kg	0.0000224 %	✓	
8	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		17	mg/kg	2.976	44.019	mg/kg	0.0044 %	✓	
9	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				<0.2	mg/kg	2.554	<0.511	mg/kg	<0.0000511 %		<**LOD**
10	zinc { zinc chromate }	024-007-00-3				48	mg/kg	2.774	115.848	mg/kg	0.0116 %	✓	
11	pH			PH		8.9	pH		8.9	pH	8.9 pH		
12	naphthalene	601-052-00-2	202-049-5	91-20-3		1.8	mg/kg		1.566	mg/kg	0.000157 %	✓	
13	acenaphthylene		205-917-1	208-96-8		1.1	mg/kg		0.957	mg/kg	0.0000957 %	✓	
14	acenaphthene		201-469-6	83-32-9		4.2	mg/kg		3.654	mg/kg	0.000365 %	✓	

#		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				4.6	mg/kg		4.002	mg/kg	0.0004 %	✓	
			201-695-5	86-73-7									
16		phenanthrene				40	mg/kg		34.8	mg/kg	0.00348 %	✓	
			201-581-5	85-01-8									
17		anthracene				11	mg/kg		9.57	mg/kg	0.000957 %	✓	
			204-371-1	120-12-7									
18		fluoranthene				53	mg/kg		46.11	mg/kg	0.00461 %	✓	
			205-912-4	206-44-0									
19		pyrene				49	mg/kg		42.63	mg/kg	0.00426 %	✓	
			204-927-3	129-00-0									
20		benzo[a]anthracene				23	mg/kg		20.01	mg/kg	0.002 %	✓	
		601-033-00-9	200-280-6	56-55-3									
21		chrysene				22	mg/kg		19.14	mg/kg	0.00191 %	✓	
		601-048-00-0	205-923-4	218-01-9									
22		benzo[b]fluoranthene				24	mg/kg		20.88	mg/kg	0.00209 %	✓	
		601-034-00-4	205-911-9	205-99-2									
23		benzo[k]fluoranthene				9.9	mg/kg		8.613	mg/kg	0.000861 %	✓	
		601-036-00-5	205-916-6	207-08-9									
24		benzo[a]pyrene; benzo[def]chrysene				20	mg/kg		17.4	mg/kg	0.00174 %	✓	
		601-032-00-3	200-028-5	50-32-8									
25		indeno[123-cd]pyrene				11	mg/kg		9.57	mg/kg	0.000957 %	✓	
			205-893-2	193-39-5									
26		dibenz[a,h]anthracene				2.6	mg/kg		2.262	mg/kg	0.000226 %	✓	
		601-041-00-2	200-181-8	53-70-3									
27		benzo[ghi]perylene				11	mg/kg		9.57	mg/kg	0.000957 %	✓	
			205-883-8	191-24-2									
28		vanadium { divanadium pentaoxide; vanadium pentoxide }				33	mg/kg	1.785	51.253	mg/kg	0.00513 %	✓	
		023-001-00-8	215-239-8	1314-62-1									
29		asbestos				<10	mg/kg		<10	mg/kg	<0.001 %		<**LOD**
		650-013-00-6	- - - - - - -	12001-28-4 132207-32-0 12172-73-5 77536-66-4 77536-68-6 77536-67-5 12001-29-5									
										Total:	0.0624 %		

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 Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: HD101 D2-829658-17/05/2019-0.60

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

Sample details

Sample Name:
HD101 D2-829658-17/05/2019-0.60
Sample Depth:
0.60-0.90 m
Moisture content:
15%
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 15% 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		cadmium { cadmium oxide }				<0.1 mg/kg	1.142	<0.114 mg/kg	<0.0000114 %		<**LOD**
		048-002-00-0	215-146-2	1306-19-0							
								Total:	0.00001 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection

Classification of sample: HD102 D1-829659-17/05/2019-0.10

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

Sample details

Sample Name:
HD102 D1-829659-17/05/2019-0.10
Sample Depth:
0.10-0.60 m
Moisture content:
9.6%
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 9.6% Wet Weight Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		41	mg/kg	1.32	48.937	mg/kg	0.00489 %	✓	
2	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.5	mg/kg	1.142	0.516	mg/kg	0.0000516 %	✓	
3	chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		19	mg/kg	1.462	25.104	mg/kg	0.00251 %	✓	
4	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<0.5	mg/kg	1.923	<0.962	mg/kg	<0.0000962 %		<**LOD**
5	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		77	mg/kg	1.126	78.371	mg/kg	0.00784 %	✓	
6	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	310	mg/kg	1.56	437.123	mg/kg	0.028 %	✓	
7	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.7	mg/kg	1.353	0.856	mg/kg	0.0000856 %	✓	
8	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		28	mg/kg	2.976	75.335	mg/kg	0.00753 %	✓	
9	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				<0.2	mg/kg	2.554	<0.511	mg/kg	<0.0000511 %		<**LOD**
10	zinc { zinc chromate }	024-007-00-3				160	mg/kg	2.774	401.253	mg/kg	0.0401 %	✓	
11	pH			PH		8	pH		8	pH	8pH		
12	naphthalene	601-052-00-2	202-049-5	91-20-3		0.83	mg/kg		0.75	mg/kg	0.000075 %	✓	
13	acenaphthylene		205-917-1	208-96-8		1.7	mg/kg		1.537	mg/kg	0.000154 %	✓	
14	acenaphthene		201-469-6	83-32-9		4.6	mg/kg		4.158	mg/kg	0.000416 %	✓	

#		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				5.5	mg/kg		4.972	mg/kg	0.000497 %	✓	
			201-695-5	86-73-7									
16		phenanthrene				61	mg/kg		55.144	mg/kg	0.00551 %	✓	
			201-581-5	85-01-8									
17		anthracene				20	mg/kg		18.08	mg/kg	0.00181 %	✓	
			204-371-1	120-12-7									
18		fluoranthene				84	mg/kg		75.936	mg/kg	0.00759 %	✓	
			205-912-4	206-44-0									
19		pyrene				71	mg/kg		64.184	mg/kg	0.00642 %	✓	
			204-927-3	129-00-0									
20		benzo[a]anthracene				34	mg/kg		30.736	mg/kg	0.00307 %	✓	
		601-033-00-9	200-280-6	56-55-3									
21		chrysene				32	mg/kg		28.928	mg/kg	0.00289 %	✓	
		601-048-00-0	205-923-4	218-01-9									
22		benzo[b]fluoranthene				36	mg/kg		32.544	mg/kg	0.00325 %	✓	
		601-034-00-4	205-911-9	205-99-2									
23		benzo[k]fluoranthene				15	mg/kg		13.56	mg/kg	0.00136 %	✓	
		601-036-00-5	205-916-6	207-08-9									
24		benzo[a]pyrene; benzo[def]chrysene				30	mg/kg		27.12	mg/kg	0.00271 %	✓	
		601-032-00-3	200-028-5	50-32-8									
25		indeno[123-cd]pyrene				18	mg/kg		16.272	mg/kg	0.00163 %	✓	
			205-893-2	193-39-5									
26		dibenz[a,h]anthracene				3.8	mg/kg		3.435	mg/kg	0.000344 %	✓	
		601-041-00-2	200-181-8	53-70-3									
27		benzo[ghi]perylene				17	mg/kg		15.368	mg/kg	0.00154 %	✓	
			205-883-8	191-24-2									
28		vanadium { divanadium pentaoxide; vanadium pentoxide }				45	mg/kg	1.785	72.621	mg/kg	0.00726 %	✓	
		023-001-00-8	215-239-8	1314-62-1									
29		asbestos				<10	mg/kg		<10	mg/kg	<0.001 %		<**LOD**
		650-013-00-6	- - - - - - -	12001-28-4 132207-32-0 12172-73-5 77536-66-4 77536-68-6 77536-67-5 12001-29-5									
										Total:	0.139 %		

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 Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: HD102 D2-829660-17/05/2019-0.60

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

Sample details

Sample Name:
HD102 D2-829660-17/05/2019-0.60
Sample Depth:
0.60-1.00 m
Moisture content:
13%
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

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		cadmium { cadmium oxide }				0.11 mg/kg	1.142	0.109 mg/kg	0.0000109 %	✓	
		048-002-00-0	215-146-2	1306-19-0							
								Total:	0.00001 %		

Key

	User supplied data
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration

Appendix A: Classifier defined and non CLP determinands

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

Conversion factor: 1.462
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: Aquatic Chronic 1 H410 , Aquatic Acute 1 H400 , Repr. 1B H360FD , Skin Sens. 1 H317 , Resp. Sens. 1 H334 , Skin Irrit. 2 H315 , STOT SE 3 H335 , Eye Irrit. 2 H319 , Acute Tox. 4 H302 , Acute Tox. 4 H332

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

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

- **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 Chronic 1 H410 , Aquatic Acute 1 H400

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

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

- **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: Aquatic Chronic 1 H410 , Aquatic Acute 1 H400 , Acute Tox. 4 H302

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

- **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 Chronic 1 H410 , Aquatic Acute 1 H400

Appendix B: Rationale for selection of metal species

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)

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)

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

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) oxide}

Worst case CLP species based on hazard statements/molecular weight. Industrial sources include: production stainless steel, electroplating, wood preservation, anti-corrosion agents or coatings, pigments (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) Worse 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 {selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex}

Harmonised group entry used as most reasonable case. Pigment cadmium sulphoselenide not likely to be present in this soil. No evidence for the other CLP entries: sodium selenite, nickel II selenite and nickel selenide, to be present in this soil. (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

Appendix C: Version

HazWasteOnline Classification Engine: WM3 1st Edition v1.1, May 2018
HazWasteOnline Classification Engine Version: 2019.152.3882.7895 (01 Jun 2019)
HazWasteOnline Database: 2019.152.3882.7895 (01 Jun 2019)

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 Wastes 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
POPs Regulation 2004 - Regulation 850/2004/EC of 29 April 2004
1st ATP to POPs Regulation - Regulation 756/2010/EU of 24 August 2010
2nd ATP to POPs Regulation - Regulation 757/2010/EU of 24 August 2010

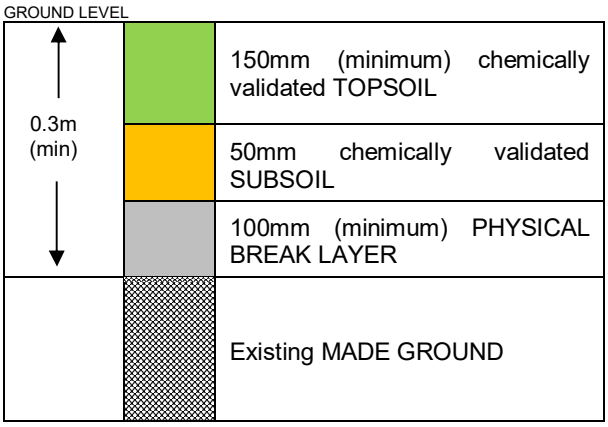
Appendix F

Environmental Cover System Construction

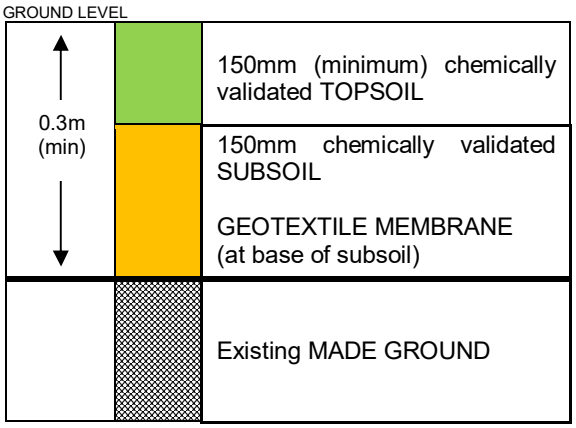
Shared Landscaping

SHARED LANDSCAPING:

Either (physical break layer)



Or (geotextile membrane)



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- Project Management
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