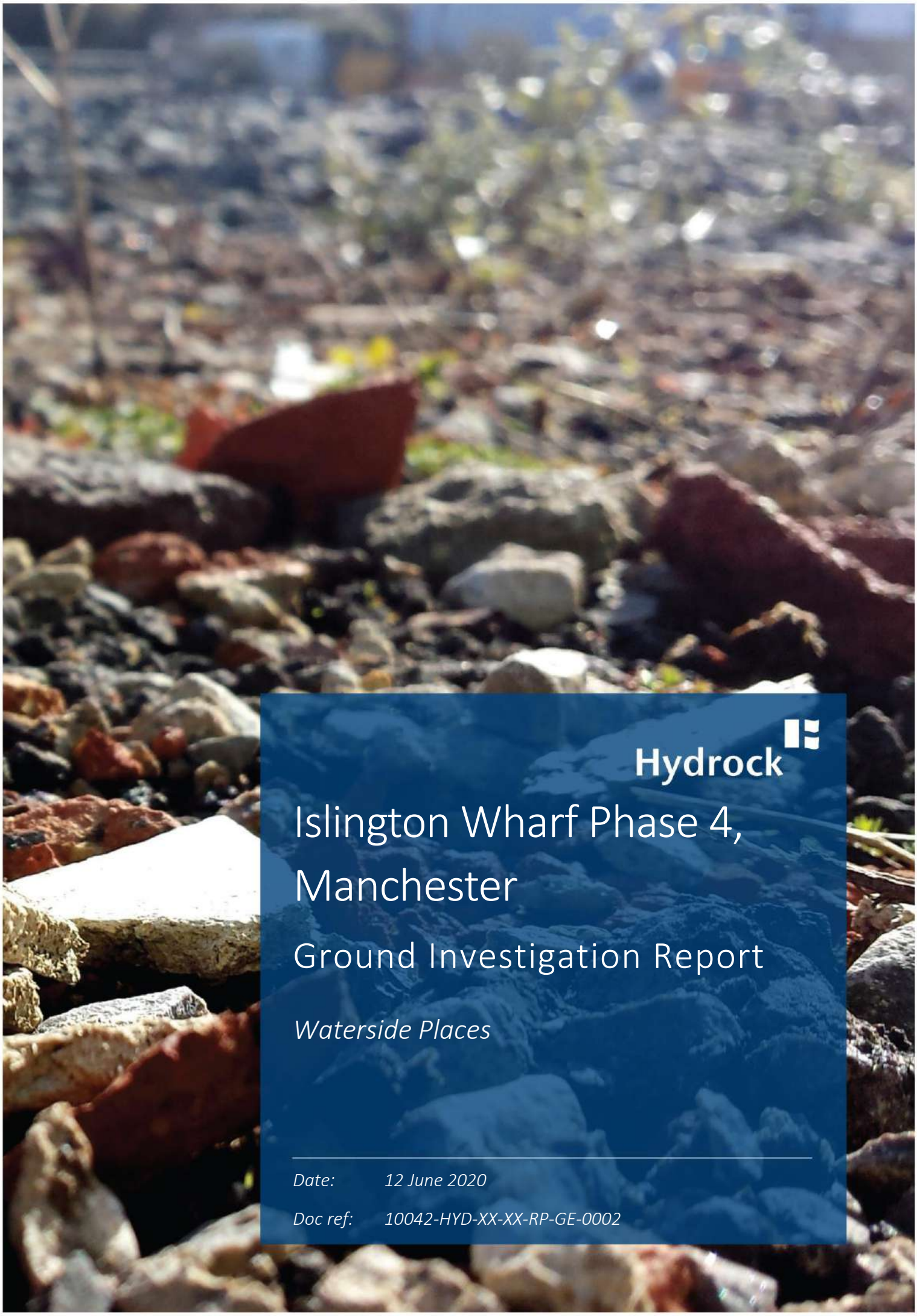


Hydrock

Islington Wharf Phase 4, Manchester

Ground Investigation Report

Waterside Places

Date: *12 June 2020*

Doc ref: *10042-HYD-XX-XX-RP-GE-0002*

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Prepared by		Jason Bradley BSc MSc FGS
Checked by		Daniel Fry BSc MSc CGeol FGS
Approved by		Danny Hope BSc (Hons) MSc MCIWEM CEnv C.WEM SiLC

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Hydrock Consultants Limited (Hydrock) has prepared this report in accordance with the instructions of the above-named Client, under the terms of appointment for Hydrock, for the sole and specific use of the Client and parties commissioned by them to undertake work where reliance is placed on this report. Any third parties who use the information contained herein do so at their own risk. Hydrock shall not be responsible for any use of the report or its contents for any purpose other than that for which it was prepared or for use of the report by any parties not defined in Hydrock's appointment.

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EXECUTIVE SUMMARY

SITE INFORMATION AND SETTING	
Objectives	The objectives of this report are to detail the findings of the ground investigation and provide a geo-environmental and geotechnical assessment of any risks relating to ground conditions, and provide initial recommendations.
Client	Waterside Places
Site name and location	Islington Wharf Phase 4, located immediately to the southeast of the Junction of Old Mill Street and Great Ancoats Street, Manchester, M4 6DN. The National Grid Reference of the approximate centre of the site is 385246,398249.
Proposed development	The proposed development, as shown on Ryder Architecture drawing (ref. IW4-RYD-00-XX-VS-A-3610), is to comprise a new development with mixed commercial and residential end use with associated car parking in the south and soft landscaping. The apartment block will be stepped 16 storeys and 11 storeys high.
GROUND MODEL	
Desk study summary	At the time of investigation, the site was vacant, recently used as a construction compound for the adjacent Islington Wharf Phases. The majority of the site is surfaced with asphalt hardstanding with some areas of exposed sub base material and relic concrete base/floors. There is currently no vegetation in any area of the site or close to the site boundaries. Local ground levels across the site vary slightly, largely depending on the presence of hardstanding areas or whether such hardstanding has locally been broken out. Overall, the site falls towards the west, from a high point of 51.11m OD in the east to a low point of 46.10m OD in the west. A review of historical maps indicates that as early as 1851 the site was completely covered by buildings and associated yards, with a road, Back Mill Street, running northwest-southeast close to the approximate centre of the site. Land uses to the west of Back Mill Street included a public house, a timber yard, a smithy and a number of houses. The area to the east of Back Mill Street was occupied by a building and yard associated with Moore's cotton mill, which extended off-site towards the north and east, with houses in the southeast of the site. By 1889 the timber yard and smithy in the west had gone, and Moore's mill had been demolished and replaced with a school, with buildings and playgrounds forming the eastern part of the site. Some of the buildings present in 1938 in the north western part of the site had disappeared in the 1948 maps, indicating possible damage from German bombing. The school in the east of the site had been demolished by 1985, with the area to the east of Back Mill Street being left as open ground. The remaining buildings occupying the site had been completely cleared by 1987, although Back Mill Street remained in situ until it was removed sometime between 2002 and 2010. A UXO desk study indicates the site to be a medium risk from UXO with a requirement for mitigation measures during any earthworks. Details of mitigation measures are provided in the UXO report in Appendix B. The natural geology of the site consists of Glacial Till overlying strata of the Chester Formation, predominantly sandstones with subordinate siltstones and mudstones. A variable thickness of Made Ground will underlie the entire site associated with the site's historical use. There are no faults shown to run beneath, or within influencing distance of, the site. The site is at very low risk from historical mining activities. The Glacial Till is classified as being a Secondary (undifferentiated) aquifer, and the Chester Formation is a Principal aquifer. The site is not within a groundwater Source Protection Zone (SPZ) and there are no active, licensed groundwater abstractions within 1km of the site. The nearest surface water bodies are canals, located 50m and 70m away, and an unnamed river located 240m away. The River Medlock is located 465m to the southwest of the site.

	There are no active licensed surface water abstractions within 1km of the site, and no discharge consents within 250m of the site. There are no recorded landfills within 250m of the site.
Ground and groundwater conditions encountered by investigation	The ground conditions as proven by the investigation(s) undertaken at the site comprise: • Made Ground – between 1.2 and 4.0m below ground level (bgl), comprising clayey gravel and cobbles and sandy gravel and cobbles with brick, concrete, metal and plastic fragments. • Upper cohesive Glacial Till – underlying the Made Ground proven to depths between 15.0m and 17.0m bgl. Comprising firm becoming stiff brown slightly silty gravelly clay. • Lower granular Glacial Till – underlying the cohesive Glacial Till and proven to 21.6 and 26.0m bgl. The base of this strata is unproven. Comprising very dense sand and gravels with low to medium cobble content. Groundwater was encountered at depths between 3.1m bgl and 11.5m bgl during the investigation. Water levels recorded post-fieldwork ranged from 1.23m bgl to 21.55m. There is shallow groundwater in the Made Ground and cohesive Glacial Till. A deeper groundwater unit is present at approximately 21m below ground level (bgl) within lower granular Glacial Till. During fieldworks a slight odour of petroleum hydrocarbons was noted on soils at BH04 and TP04. One asbestos cement fragment was also identified at TP05.
GEOTECHNICAL CONCLUSIONS	
Conclusions of geotechnical assessment	Obstructions associated with former/current development, including foundations, floor slabs and services, should be anticipated. Excavations generally should be readily achievable with standard excavation plant. Excavations during investigation were unstable, and collapse of excavation sides as a result of loose Made Ground and potential for shallow groundwater. Water seepages into excavations are unlikely to be adequately controlled by sump pumping and alternative methods of dewatering are likely to be required. Foundations are recommended to comprise piled foundations. A design CBR of no greater than 2.5% is recommended. Design Sulphate Class - DS-1 and ACEC Class AC-1. Equivalent to Design Chemical Class DC-1 for a 50 year design life.
GEO-ENVIRONMENTAL CONCLUSIONS	
Conclusions of contamination Generic risk assessment	Human health: • Significantly elevated concentrations of PAH in the Made Ground at BH04, TP03, TP04 and TP02. • Significantly elevated concentrations of Lead in the Made Ground at TP02, and one significantly elevated concentration of Arsenic at TP02. • Asbestos fibres (<0.001%v/v of chrysotile) detected in the Made Ground at three locations (BH02, TP03 and TP01) and one asbestos cement fragment identified in TP05. • Elevated concentrations of petroleum hydrocarbons Aliphatic 12-16 and Aromatics >EC21-EC35 at BH02. Plant growth: • Pervasive arsenic, copper, nickel and zinc. Controlled Waters: • Elevated concentrations of metals, inorganics, PAH and petroleum hydrocarbons in the perched groundwater at BH02. Ground gases or vapours: • Low risk from ground gases and CS1 conditions apply. Radon:

	• The site is not in a Radon Affected Area. Water supply pipes: • The site is Brownfield with a range of contaminants present and barrier pipe is considered suitable for this site. However, confirmation should be sought from the water supply company at the earliest opportunity.
Proposed mitigation measures	The mitigation measures proposed to remove unacceptable risks include: • hotspot delineation through trial pitting and additional sampling to determine a volume of material impacted by PAH contamination; • Possible hotspot removal and replacement (to be verified after delineation) at the area impacted by PAH contamination; • Introduction of a simple cover system (450mm thick) in areas of soft landscaping comprising 300mm of subsoil and 150mm topsoil; • A piling works risk assessment to establish the risk to controlled waters from contaminated Made Ground and shallow groundwater; The methodology for the remediation should be presented in a Remediation Strategy, which will need to be submitted to the warranty provider and the regulatory authorities for approval. In addition, the production of a Materials Management Plan and its approval by a Qualified Person will be required to allow reuse of suitable material at the site. Verification reports by a competent independent geo-environmental specialist will be required following completion of any remedial works.
Waste management	Excavated Made Ground in the vicinity of BH02, BH04 and TP02 are likely to classed as hazardous waste (should it require off-site disposal). The remainder of the Made Ground is likely to be classed as non-hazardous. Excavated natural soils to be disposed of as waste, are likely to be classed as non-hazardous.
FUTURE CONSIDERATIONS	
Further work	Following the ground investigation works undertaken to date, the following further works will be required: • Delineation and additional sampling of deeper Made Ground in the north east portion of the site to determine the volume of material impacted by metals and PAH; • Should any suspected contamination be identified during the enablement works, Hydrock should be informed and the requirement for remedial measures will be re-visited; • discussion and agreement with service providers regarding the materials suitable for pipework; • discussions with regulatory bodies regarding the conclusions of this report; • production of a piling works risk assessment to establish the risk to underlying aquifers; • discussions with piling Contractors regarding conclusions of this report and design of the piles; • provision of geotechnical design for the Category 2 structures (floor slabs, foundations etc.); • a remediation strategy is required to mitigate the risk of asbestos identified in soils and reuse of any site won soils; • writing of a Materials Management Plan relating to reuse of soils at the site and import of soils to the site, unless it may be captured via a waste exemption; • remediation and mitigation works; and • verification of the earthworks, remediation and mitigation works.

This Executive Summary forms part of Hydrock Consultants Limited report number 10042-HYD-XX-XX-RP-GE-0002 and should not be used as a separate document.

1. INTRODUCTION

1.1 Terms of reference

In January 2020, Hydrock Consultants Limited (Hydrock) was commissioned by Waterside Places (the Client) to undertake a Phase 2 ground investigation for Phase 4 of the Islington Wharf development, located to the east of Old Mill Street and Great Ancoats Street, Manchester, M4 6ND.

The site extends to approximately 0.18 ha and currently comprises an area of relatively flat brownfield land. The site was recently used by Eric Wright Construction as a materials storage yard, including two mortar silos, and site offices as part of the construction activities associated with the wider Islington Wharf development. At the time of investigation, the site was vacant.

The proposed development, as shown on Ryder Architecture drawing (ref. IW4-RYD-00-XX-VS-A-3610), is to comprise a new development with mixed commercial and residential end use with associated car parking in the south west and soft landscaping at the north and east perimeter. The apartment blocks will vary in height between 16 storeys and 11 storeys high.

The proposed development layout provided by Waterside Places is presented in Appendix A

The works have been undertaken in accordance with Hydrock's proposal referenced C-10042-E-FP-GE-001 and the Client's instructions to proceed via email.

1.2 Objectives

The works have been commissioned to assist in clearing planning conditions and to assist with the design of the development.

The objective of the Phase 2 Ground Investigation is:

- to resolve uncertainties identified in the previous Phase 1 Desk Study undertaken by Hydrock by refining and updating the preliminary Ground Model, determining geo-environmental and geotechnical site conditions and identifying key contamination risks by updating and finalising the Conceptual Model in accordance with the principles of LCRM;
- to identify geo-environmental mitigation requirements where required to enable development; and
- to provide preliminary geotechnical recommendations for design.

1.3 Scope

The scope of the Phase 2 Ground Investigation comprises:

- a ground investigation including trial pitting and cable percussive boring to:
  - obtain data on the ground and groundwater conditions of the site;
  - allow collection of samples for geotechnical and chemical laboratory analysis;
  - allow geotechnical field tests to be undertaken;
  - install gas and groundwater wells;
- gas concentration and groundwater level monitoring;
- gas and groundwater sampling;
- geotechnical and chemical laboratory analysis;

- updating of the preliminary Ground Model;
- preparation of a geotechnical risk register;
- presentation of an initial geotechnical design recommendations;
- formulation of an updated Conceptual Site Model (CM), including identification of plausible pollution linkages;
- completion of a generic quantitative risk assessment of potential chemical contaminants to establish 'suitability for use' under the current planning regime;
- discussion of potential environmental liabilities associated with land contamination (soil, water and gas); and
- identification of outline mitigation requirements to ensure the site is 'suitable for use'.

1.4 Available information

The following documents and reports have been provided to Hydrock by the Client for use in the preparation of this report:

- Greenhatch Group, Topographical Survey, Islington Wharf Phase 4, January 2014, ref. 21267_OGL.
- Hydrock, Ground Conditions Desk Study, Islington Wharf Phase, October 2018, ref. IW4-HYD-XX-XX-RP-GE-0001_Desk_Study.
- EOD Contracts Ltd, UXO desk study report, Islington Wharf, January 2020, ref. 20124.
- Ryder Architecture, Islington Wharf Phase 4, Level 00 – GA Plan, February 2020, ref. 2791-04.

It is assumed that the Client has commissioned or obtained assignment of the above documents and Hydrock is entitled to full reliance upon their contents.

1.5 Regulatory context and guidance

The investigation work has been carried out in general compliance with recognised best practice, including (but not limited to) BS 5930:2015, BS 10175:2011+A2:2017 and the AGS (2006) 'Good Practice Guidelines for Site Investigations'.

The geo-environmental section of this report is written in broad accordance with BS 10175:2011+A2:2017, 'Land Contamination: Risk Management' (LCRM, 2019) and the AGS (2006) 'Good Practice Guidelines for Site Investigations'.

The methods used follow a risk-based approach, the first stage of which is a Phase 1 desk study and field reconnaissance, with the potential geo-environmental risk assessed qualitatively using the 'source-pathway-receptor contaminant linkage' concept to assess risk as introduced in the Environmental Protection Act 1990 (EPA, 1990). Potential geotechnical risks are also assessed.

Phase 2 comprises intrusive ground investigation work and testing. The factual information from Phase 1 and Phase 2 are used to develop the Conceptual Model (CM). This CM is based on a ground model of the site physical conditions and an exposure model of the possible contaminant linkages. The CM forms the basis for Generic Quantitative Risk Assessment (GQRA) in accordance with current guidelines. This GQRA might lead to more Detailed Quantitative Risk Assessment (DQRA).

Professional judgement is then used to evaluate the findings of the risk assessments and to provide recommendations for the development.

The geotechnical section of this report is prepared in general accordance with BS EN 1997-1+A1: 2013, BS EN 1997-2:2007 and BS 8004:2015. This report constitutes a Ground Investigation Report (GIR) as described in Part 2 of Eurocode 7 (BS EN 1997-2) (EC7). However, it is not intended to fulfil the requirements of a Geotechnical Design Report (GDR) as specified in EC7.

The geo-environmental and geotechnical aspects are discussed in separate sections. Throughout the report the term 'geotechnical' is used to describe aspects relating to the physical nature of the site (such as foundation requirements) and the term 'geo-environmental' is used to describe aspects relating to ground-related environmental issues (such as potential contamination). However, it should be appreciated that this is an integrated investigation and these two main aspects are inter-related. Designers should take all aspects of the investigation into account.

Remaining uncertainties and recommendations for further work are listed in Section 9 and Section 10.

Reference to the details of the approach and the methodologies adopted are provided in Appendix J.

2. PHASE 1 STUDY (DESK STUDY REVIEW)

2.1 Introduction

Hydrock completed a Desk Study for the site in October 2018 (Report ref. IWF-HYD-XX-XX-RP-GE-0001). The following sections summarise the findings of the desk study.

2.2 Site location

The site is located immediately to the southeast of the Junction of Old Mill Street and Great Ancoats Street, Manchester, M4 6DN. The National Grid Reference of the approximate centre of the site is 385246,398249.

2.3 Site description

At the time of investigation, the site was vacant, having been recently used as a construction compound for adjacent Phases of the Islington Wharf development. The majority of the site is surfaced with asphalt hardstanding with some areas of exposed sub base material and relic concrete foundation bases and floor slabs.

Based on the findings of the site walkover, there is currently no significant vegetation on site or close to the site boundaries.

Local ground levels across the site vary slightly, largely depending on the presence of hardstanding areas or whether such hardstanding has locally been broken out. Overall, the site falls towards the west, from a high point of 51.11.m OD in the east to a low point of 46.10m OD in the west.

The site is bound on the western, northern and eastern sides by Great Ancoats Street, Old Mill Street and an unnamed street respectively, and to the south by the Islington Wharf Phase 1 residential development. Land use beyond the roads includes residential to the west; and Islington Wharf Phase 3 to the east.

2.4 Site history

A review of historical maps indicates that as early as 1851 the site was completely covered by buildings and associated yards, with a road, Back Mill Street, running northwest-southeast close to the approximate centre of the site. Land uses to the west of Back Mill Street included a public house, a timber yard, a smithy and a number of houses.

The area to the east of Back Mill Street was occupied by a building and yard associated with Moore's cotton mill, which extended off-site towards the north and east, with houses in the southeast of the site. By 1889 the timber yard and smithy in the west had gone, and Moore's mill had been demolished and replaced with a school, with buildings and playgrounds forming the eastern part of the site. Some of the buildings present in 1938 in the north western part of the site had disappeared in the 1948 maps, indicating possible damage from German bombing during WW2.

The school in the east of the site had been demolished by 1985, with the area to the east of Back Mill Street being left as open ground. The remaining buildings occupying the site had been completely cleared by 1987, although Back Mill Street remained in situ until it was removed sometime between 2002 and 2010.

Historical land use in the surrounding areas during the latter half of the 19th Century and the 20th Century has been a mixture of industrial and residential.

2.5 Geology

The natural geology of the site consists of Glacial Till overlying strata of the Chester Formation, predominantly sandstones with subordinate siltstones and mudstones. A variable thickness of Made Ground will likely underlie the entire site associated with the site's historical use.

2.6 Hydrogeology

The Glacial Till is classified as being a Secondary (undifferentiated) aquifer, and the Chester Formation is a Principal aquifer.

The site is not within a groundwater Source Protection Zone (SPZ) and there are no active, licensed groundwater abstractions within 1km of the site.

2.7 Hydrology

The nearest surface water bodies are canals, located 50m and 70m away, and an unnamed river located 240m away. The River Medlock is located 465m to the southwest of the site.

There are no active licensed surface water abstractions within 1km of the site, and no discharge consents within 250m of the site.

2.8 Flood risk

The desk study information indicates the proposed development is in Flood Zone 1 (with a low probability of flooding from rivers).

No further consideration of flood risk is undertaken in this report. Specialist flood risk advice should be sought with regard to drainage and flooding.

2.9 Mining or mineral extraction

A Coal Authority Mining Report, Ref. 51001938505001, dated 28th September 2018, obtained for the site indicates risks from underground coal mining at the site are very low and no further consideration is required.

2.10 Natural ground instability

The Groundsure report indicates that hazards from shrink-swell clays, landslides, ground dissolution, compressible deposits, collapsible deposits and running sands range from negligible to very low.

2.11 Waste management

There are no recorded landfill sites within 250m of the site.

2.12 Regulatory information

Information provided in the previous desk study indicate the following regulatory information in the general area of the site:

- Numerous active trade directory entries within 250m including warehouses, electricity substation, recycling and disposal, construction, tool hire, metal fabricators and unspecified works amongst others.

2.13 Radon and ground gas

The site is not in a Radon Affected Area, as less than 1% of properties are above the Action Level. No radon protection measures are therefore required for new properties at this location.

2.14 Unexploded ordnance (UXO)

The specialist UXO risk assessment (EOD Contracts, Reference: 20124), indicates a medium risk based on the following:

The site and its surrounding area were the subject of two direct strikes which did cause widespread destruction.

It is difficult to ascertain the level of construction works that have taken part in and around the site area post WW2. It would appear however that there have been no significant structures that have been constructed post WW2. Therefore, it is possible that items of UXO may have remained undetected

The following mitigation measures are required:

- Specific procedures, training, briefings and permitting is required for all excavation works. These are to comprise:
  - UXO safety awareness training of site personnel and project staff.
  - Awareness training by a competent person as part of the project safety induction.
  - Specific safety briefings and toolbox talks to individuals involved in conducting intrusive earthworks.
  - UXO recognition and safety procedures to be written and followed on discovery of a suspicious object or the alarm being sounded.
  - Emergency procedures to be to be followed in the event of an explosion. This should include evacuation routes, muster stations and accounting for personnel.
  - Work permits, works methodology and specific UXO risk mitigation methods are to be written and followed.
  - Post-incident inspections and returning to normal works procedures will need to be written.
- Prior to any intrusive piling or drilling commencing, UXO safety testing and appropriate clearance certification to sufficient depth into the ground to provide clearance from UXO is required.

A copy of the UXO desk study is included in Appendix B.

3. OUTLINE CONCEPTUAL MODEL

3.1 Introduction

The outline Conceptual Model (oCM) incorporates evidence from the site walkover and the Desk Study carried out at the site. The formulation of an outline Conceptual Model is a key component of the LCRM methodology. The oCM incorporates a ground model of the site physical conditions and an exposure model of the possible contaminant linkages; it forms the basis for Generic Quantitative Risk Assessment (GQRA) in accordance with current guidelines.

3.2 Ground model

The preliminary ground model provides an understanding of the ground conditions and is the basis for preparing the preliminary geotechnical hazard assessment (Section 3.3) and the preliminary geo-environmental exposure model (Section 3.4).

3.3 Geotechnical hazard identification

3.3.1 Context

The preliminary geotechnical hazard identification has been undertaken in accordance with the general requirements of ICE/DETR Document 'Managing Geotechnical Risk' and the HE documents HD 41/15 and CD 622.

The following section sets out the identified geotechnical hazards and the development elements potentially affected (see Table J.1 in Appendix H for further information).

3.3.2 Plausible geotechnical hazards

Plausible geotechnical hazards identified at the site are:

- Uncontrolled Made Ground leading to excessive and / or differential settlement.
- Soft / loose compressible ground (low strength and high settlement potential).
- Variable ground conditions.
- Attack of buried concrete by aggressive ground conditions.

3.3.3 Potential development elements affected

Development elements potentially affected by geotechnical hazards are:

- Buildings – foundations.
- Buildings – floor Slabs
- Roads and pavements.
- Services.
- Concrete below ground.

Health and safety risks to site Contractors and maintenance workers have not been assessed during these works and will need to be considered separately during design.

The above plausible geotechnical hazards and development elements affected have been carried forward for investigation and assessment. The investigation is presented in Section 5 and the assessment is presented in Section 6.

3.4 Geo-environmental exposure model

3.4.1 Context

The preliminary exposure model is used to identify geo-environmental hazards and to establish potential pollution linkages, based on the source-pathway-receptor (SPR) approach.

A viable pollution linkage requires all the components of an SPR to be present. If only one or two are present, there is no linkage and no further assessment is required.

3.4.2 Potential contaminants

For the purpose of this assessment the potential contaminants have been separated according to whether they are likely to have originated from an on-site or off-site source.

Potential on-site sources of contamination

- Elevated concentrations of metals, polycyclic aromatic hydrocarbons, petroleum hydrocarbons and asbestos from general Made Ground associated with current and previous land use at the site.
- Ground gases (carbon dioxide and methane) from organic materials within any Made Ground that might underlie the site.

Potential off-site sources of contamination

The areas surrounding the site have historically been highly industrialised and several potentially contaminative land uses have been located close to the site. However, since the 1980s surrounding land use has been a mixture of residential, retail parks and warehousing, none of which would be expected to be potentially significantly contaminative. Furthermore, the areas to the east, south and west have been, or are in the process of being, developed for housing, and it is reasonable to assume that any soil contamination that might have been present in those areas will have been remediated as part of their development. The land surrounding the site would not, therefore, be expected to pose a significant risk to the current study site.

Off-site sources of gas are not considered further as there are no landfills recorded within 250m of the site.

3.4.3 Potential pathways

The following potential pathways have been identified.

- Humans: ingestion, skin contact, inhalation of dust and outdoor air.
- Buildings: direct contact with substances deleterious to building materials.
- Buildings: methane ingress via permeable soils and/or construction gaps.
- Underlying groundwater: migration of contaminants into the Chester Formation, classified as Principal Aquifer.
- Surface water: overland flow.
- Surface water: drainage discharge.

- Surface water: base flow from groundwater

3.4.4 *Potential receptors*

The following potential receptors have been identified.

- Humans (neighbours, site end users).
- Development end use (buildings, utilities and landscaping).
- Groundwater: Principal Aquifer status of the Chester Formation.

Health and safety risks to site development contractors and maintenance workers have not been assessed as part of this study and will need to be considered separately.

The above sources, pathways and receptors have been considered as part of the Preliminary Risk Assessment in accordance with LCRM (2019), are considered to be plausible in the context of this site and have been carried forward for investigation and assessment. The investigation is presented in Section 5 and the assessment is presented in Section 7. An assessment of the Source – Pathway – Receptor linkages is undertaken following the assessment (Section 7) and is presented in Appendix I (Table K.1).

4. GROUND INVESTIGATIONS

4.1 Investigation rationale

The ground investigation rationale was based on the findings of the preliminary risk assessment and is summarised in Table 4.1.

Table 4.1: Investigation rationale

Location	Purpose
BH01 – BH04	To assess deeper ground conditions and to allow in situ testing (SPTs) to be undertaken. To allow collection of samples for geotechnical characterisation. To allow collection of samples for contamination testing. Installation of gas/groundwater monitoring and sampling wells. Targeted within the proposed building footprint.
TP01 – TP06	To assess shallow ground conditions including trench stability. To allow collection of samples for contamination testing. To allow collection of samples for geotechnical characterisation. Positioned for general coverage to provide information on the Made Ground.

4.2 Constraints

A number of utilities including a water main and electricity cables are understood to run beneath the site, as such exploratory locations were partly determined by the positions of these utilities.

4.3 Site works

The fieldwork took place between 27th and 31st January 2020 and is summarised in Table 4.2. The ground investigation locations were surveyed in using topographic survey quality GPS and are shown on the Exploratory Hole Location Plan (Hydrock Drawing 10042-HYD-XX-XX-DR-GE-0003) in Appendix C.

The logs, including details of ground conditions, soil sampling, *in situ* testing and any installations, are also presented in Appendix C.

The weather conditions during the Hydrock fieldwork and for the previous week were cold and wet.

Table 4.2: Summary of site works

Activity	Method	No.	Depth Range (m bgl)	*In situ* tests	Notes (e.g. installations)
Drilling, Pitting and Probing					
Boreholes	Cable percussive	4	21.60 – 26.00	SPT	63mm HDPE wells with gas taps in each hole.
Trial pits	Machine (JCB 3X)	6	1.80 – 2.60	Hand shear vane (HSV)	Backfilled with arisings.

Wells for monitoring and sampling groundwater levels and ground gas concentrations, were installed in all cable percussion boreholes. A summary of the monitoring well installations is presented in Table 4.3.

Table 4.3: Summary of monitoring installations

Location	Ground level (m OD)	Standpipe diameter	Screen top and base depth (m bgl)	Screen top and base elevation (m OD)	Strata targeted
BH01	47.18	50	4.50 to 17.50	42.68 to 29.68	Upper Glacial Till (Cohesive)
BH02	46.10	50	0.50 to 2.50	45.60 to 43.60	Made Ground
BH03	47.18	50	18.00 to 26.00	29.18 to 21.18	Lower Glacial Till (Granular)
BH04	48.18	50	0.50 to 4.00	47.68 to 44.18	Made Ground

4.4 Geo-environmental testing

4.4.1 Sampling strategy and protocols

No specific features were identified during the desk study as requiring targeted investigation and a reasonably even spacing was used.

Samples were taken, stored and transported in general accordance with BS 10175:2011+A2:2017.

4.4.2 Geo-environmental monitoring

Gas monitoring boreholes have been monitored on six occasions. The results are presented in Appendix E.

4.4.3 Geo-environmental laboratory analyses

The chemical test certificates are provided in Appendix F. Wherever possible, UKAS and MCERTS accredited procedures have been used.

The chemical test certificates for testing undertaken as part of historical investigations are provided in the relevant reports in Appendix F.

The geo-environmental analyses undertaken on soils are summarised in Table 4.4.

Table 4.4: Geo-environmental analyses of soils

Determinand Suite	Made Ground
Hydrock minimum suite of determinands for solids*	11
Speciated aliphatic and aromatic banding Total petroleum hydrocarbons by HS-GC/MS and GC/FID (Hydrock Tier 2 TPH Suite)	3
Benzene, toluene, ethylbenzene and xylene (BTEX) by HS-GC/MS	3
MTBE (Methyl Tertiary Butyl Ether) by HS-GC/MS	3
Volatile organic compounds (VOC target list plus TIC) by HS-GC/MS	2
Semi-volatile organic compounds (SVOC target list plus TIC) by GC-MS	2
Asbestos Bulk I.D	2
Asbestos quantification	3
WAC Full Solid Suite	2
*Hydrock minimum soil suite comprises: As, B (water soluble), Be, Cd, Cr (total), Cr (VI), Cu, Hg, Ni, Pb, S (elemental), Se, V, Zn, cyanide (total), sulfide, pH, asbestos fibres, speciated polynuclear aromatic hydrocarbons (PAH, by GC-FID), total phenols and fraction of organic carbon	

The soils chemical test data are interpreted and assessed in Sections 7.3 and 7.4.

The geo-environmental analyses undertaken on waters are summarised in Table 4.5.

Table 4.5: Geo-environmental analyses of waters

Determinand Suite	Groundwater
Hydrock minimum suite of determinands for waters	4
Speciated aliphatic and aromatic banding Total petroleum hydrocarbons by HS-GC/MS and GC/FID (Hydrock Tier 2 TPH Suite)	3
Benzene, toluene, ethylbenzene and xylene (BTEX) by HS-GC/MS	3
Volatile organic compounds (VOC target list plus TIC) by HS-GC/MS	2
Semi-volatile organic compounds (SVOC target list plus TIC) by GC-MS	2
MTBE (Methyl Tertiary Butyl Ether) by HS-GC/MS	3

The groundwater chemical test data are interpreted and assessed in Section 7.5.

4.5 Geotechnical testing

4.5.1 Geotechnical laboratory testing

The geotechnical tests are summarised in Table 4.6 and the test certificates are provided in Appendix D. Wherever possible, UKAS accredited procedures have been used.

Table 4.6: Summary of sample numbers for geotechnical tests

Test	Made Ground	Glacial Till
Atterberg limits		16
Particle size distribution (sieve)		15
Sulfate and aggressive chemical environment classification for buried concrete classification (full BRE SD1 suite)	4	4
Single stage undrained triaxial compressive strength		11
One dimensional oedometer consolidation		8
Hand Vane		8

The geotechnical test data are summarised in Section 5.7 and interpreted in Section 6.

5. GROUND INVESTIGATION RECORDS AND DATA

5.1 Physical ground conditions

5.1.1 Summary of strata encountered

The following presents a summary of the properties of the ground and groundwater conditions encountered, based on field observations, interpretation of the field data and laboratory test results, taking into account drilling, excavation and sampling methods, transport, handling and specimen preparation.

Details of the ground investigation works are provided in the logs in Appendix C, previous data are provided in Appendix B, a summary of the ground model is presented in Table 5.1 and the individual strata are described in the sections below. Relevant cross-sections are presented in Appendix D.

Table 5.1: Strata encountered

Stratum	Depth to top (m bgl) (range)	Depth to base (m bgl) (range)	Thickness (m) (range)	Thickness (m) (average)
Surface Cover Asphalt	GL	0.08 – 0.10	0.08 – 0.10	0.09
Made Ground	GL – 0.10	1.20 – 4.00	1.20 – 4.00	2.22
Cohesive Glacial Till	1.20 – 4.00	15.50 – 17.00	12.00 – 14.20	13.05
Granular Glacial Till	15.50 – 17.00	>26.00	-	-

The investigation has identified the Made Ground to be deepest in the north eastern half of the site with an average thickness of 2.72m. In the south western half of the site the average Made Ground thickness reduces to 1.82m.

There was little variation to the top of the granular Glacial Till recorded at between 15.5m and 17.0m bgl. The base of the granular Glacial Till was proven to at least 26m bgl at the base of borehole BH04 although the contact with the underlying Chester Formation was not encountered.

5.1.2 Surface covering

Asphalt was encountered across approximately 75% of the site being generally absent from the perimeter. The asphalt is in good condition having been recently laid as part of the construction compound previously located on site.

5.1.3 Made Ground

Below the surface covering, Made Ground was recorded across the entire site to depths between 1.20 and 4.00m bgl. The Made Ground generally comprised brown slightly sandy clayey gravel and cobbles with metal, plastic and ceramic fragments and rare wood. The gravel and cobbles generally consisted of brick, concrete, sandstone and slate.

In TP03, TP04 and BH04 the Made Ground comprises gravelly clay with a low to medium cobble content and ashy pockets, with clinker encountered in TP04.

The composition of the Made Ground is slightly variable, with an increased clay and ash content in the north eastern half of the site.

5.1.4 *Upper Glacial Till (Cohesive)*

Below the Made Ground, cohesive Glacial Till was recorded across the entire site to depths between 15.50 and 17.00m bgl. The material generally comprised firm becoming stiff and very stiff brown with blue/grey veining slightly silty slightly gravelly clay with the gravel component consisting primarily of sandstone and quartz. Occasional reddish-brown sand lenses are reported in BH01, BH02 and BH03 below 7.00m bgl.

The Glacial Till generally becomes stiff between 11.00 and 15.00m bgl.

5.1.5 *Lower Glacial Till (Granular)*

Below the cohesive Glacial Till, granular Glacial Till was recorded across the entire site to the full depth of each borehole between 21.60 and 26.00m bgl.

In BH01 and BH04 the Glacial Till comprised very dense brown fine to coarse very sandy gravel and sand and gravel with low to medium cobble content. In BH04 the Glacial Till was noted to be slightly clayey between 18.00 to 23.00m bgl.

In BH02 and BH03 the Glacial Till comprised very dense reddish-brown fine to coarse sand over very dense multicoloured fine to coarse angular to sub rounded gravel with low to medium cobble content. In BH03 the Glacial Till is noted to be slightly sandy.

It is evident the composition of the granular Glacial Till varies across the site, generally comprising sand and gravel in the north eastern half of the site and in the south western portion there is a thin band of sand over predominantly gravel with cobbles.

5.2 Obstructions

One obstruction was encountered during the investigation in BH03 at 0.50m bgl in the form of concrete boulders. The hand-dug inspection pit was unable to be progressed through the buried concrete, and so was completed using an excavator to 1.3m bgl.

A total of 5 concrete boulders measuring 600 – 800mm in diameter were excavated between 0.50m and 1.30m bgl.

5.3 Visual and olfactory evidence of contamination (soil)

In addition to the more common man-made constituents (ash, clinker, plastic, metal etc), described above in Section 5.1.3, visual and olfactory evidence of potential contamination was noted in a number of locations, summarised in Table 5.2, with this information presented a contamination zonation plan (10042-HYD-XX-XX-DR-GE-0004) is provided in Appendix A.

Table 5.2: Visual and olfactory evidence of contamination - soils

Stratum	Location	Depth (m bgl)	Description
Made Ground	BH04	1.20 – 2.45	Slight hydrocarbon odour
Made Ground	TP04	0.55 – 1.20	Slight hydrocarbon odour
Made Ground	TP01	0.80	Suspected asbestos cement fragment
Made Ground	TP05	1.20	Suspected asbestos cement fragment

5.4 Groundwater

5.4.1 Groundwater observations and levels

Groundwater encountered during the investigation is listed in Table 5.3. A groundwater observation represents the depth at which groundwater was first observed and is likely to be deeper than the actual water table level at that location.

Table 5.3: Groundwater occurrence

Stratum	Date	Location	Fieldwork		Comment
			Groundwater observation (m bgl)	Rose to after 20 mins (m bgl)	
Made Ground	30/01/2020	BH01	3.10	3.10	Slight seepage
Glacial Till	28/01/2020	BH02	11.50	11.50	Slight seepage

Groundwater levels recorded during post-fieldwork monitoring are summarised in Table 5.4.

Table 5.4: Groundwater level data summary

Stratum	Date range	Location	Post-fieldwork monitoring	
			Depth to groundwater (range) (m bgl)	Groundwater elevation (range) (m OD)
Made Ground	03/02/20 – 05/06/20	BH02	1.23 – 1.80	44.87 – 44.30
		BH04	3.01 - 3.39	45.17 - 44.79
Upper Glacial Till (cohesive)	03/02/20 – 05/06/20	BH01	3.33 – 4.59	43.85 – 42.59
Lower Glacial Till (granular)	03/02/20 – 05/06/20	BH03	21.33 - 21.55	25.85 - 25.63

5.4.2 Groundwater summary

In general, shallow groundwater was encountered within the Made Ground towards the base of the stratum and the monitoring indicates there is a shallow groundwater body sitting just above the Glacial Till between 45.17 and 44.30m AOD.

Groundwater was encountered in the underlying cohesive Glacial Till between 4.5m (top of response zone) and 16.77m (base of response zone). The groundwater level has risen 1.09m above the top of the response zone due to the cohesive nature of the strata resulting in positive pore water pressure.

It is likely that groundwater ingress is originating from within the sand bands below 11.00m and is filling the standpipe due to the predominantly impermeable nature of the strata.

Deeper groundwater is present in the granular Glacial Till between 21.33m and 21.55m bgl.

5.5 Ground gases (carbon dioxide and methane)

Records from the gas monitoring boreholes are presented in Appendix E and summarised in Table 5.5.

A total of six two monitoring visits have been undertaken, and monitoring is now complete as part of the current commission. The data are assessed in Section 7.6.

Table 5.5: Range of ground gas data

Stratum	Methane (%)	Carbon dioxide (%)	Oxygen (%)	Steady flow rate (l/hr)	Comment
Made Ground	0.00	0.10 – 1.00	19.60 – 20.20	0.10 – 0.20	All carbon dioxide readings are below 5%. All methane readings are below detection.
Upper Glacial Till (cohesive)	0.00 – 8.20	0.10 – 2.80	16.80 - 19.40	0.10	All carbon dioxide readings are below 5%. Methane was recorded above detection on one occasion at 8.20% in BH01.
Lower Glacial Till (granular)	0.00	0.10 – 15.50	4.10 – 20.30	0.10 - 0.50	Carbon dioxide was recorded above 5% on one occasion at 15.50% in BH03. All methane readings are below detection.

5.6 Organic vapours

PID readings were taken from each standpipe on the first monitoring visit (03/02/20). All PID readings are below detection.

5.7 Geotechnical data

5.7.1 Introduction

Laboratory test results are contained in Appendix D with *in situ* test results shown on the relevant exploratory hole log or datasheet in Appendix C. The following sections summarise the main findings and provide interpretation where appropriate.

5.7.2 Plasticity

The volume change potentials in terms of BRE Digest 298 have been determined from the results of plasticity index tests on samples of soil. These are summarised in Table 5.6.

Table 5.6: Volume change potential

Stratum	No. of tests	Plasticity Index			Modified Plasticity Index (%)			Plasticity designation	Volume Change Potential
		Min.	Max.	Av.	Min.	Max.	Av.		
Upper Glacial Till (cohesive)	16	13	27	18	11	27	18	Low	Low

5.7.3 Particle size distribution

Particle Size Distribution test (PSDs) results are summarised in Table 5.7 and summary descriptions and PSD plots of the material analysed are presented in Appendix D.

Table 5.7: PSD results summary

Stratum	No. of tests	Silt %	Clay %	Sand %	Gravel %	Cobbles %
Lower Glacial Till (granular)	15	8.20 – 52.80	3.80 – 43.30	3.80 – 79.10	1.00 – 76.10	0.00 – 20.50

5.7.4 Soil strength

Table 5.8 summarises information pertaining to the shear strength of the soils according to geological stratum. Factual results are summarised for laboratory tests, field tests (e.g. hand shear vane) and uncorrected Standard Penetration Tests (SPT). Where the SPT is used to infer shear strength by published correlation, this is also tabulated. A shear strength versus depth profile is presented in Appendix D.

Table 5.8: Soil strength results and derived values

Stratum	No. of tests	SPT (N-value) (range)	c_u (kPa)	(kPa)	CBR (%) (Range)	Method
Made Ground	7	10 - 31	-	-	-	SPT – cable percussion.
					<2.5%	Correlation in accordance with IAN 73/06 Rev 1 based on plasticity and thin construction
Upper Glacial Till (cohesive)	36	16 - 50	64 - 200	-		SPT – cable percussion.
	15	-	-	83 - >130		Hand shear vane
	10	-	21 - 210	-		Laboratory triaxial test
Lower Glacial Till (granular)	27	48 - 50	-	-		SPT – cable percussion.

5.7.5 Compressibility

Table 5.9 presents a summary of the derived parameters for coefficient of consolidation and compressibility. The data indicates that the material is generally of medium to high compressibility over the pressure ranges tested. A shear strength (Cu) by depth plot is provided in Appendix D. The plot shows a linear increase in cohesive soil strength with depth.

Table 5.9: Summary of compressibility

Stratum	No. of tests / results	Method	Pressure range (kN/m²)	Coefficient of volume compressibility (m_v) (m²/MN)	Coefficient of consolidation (C_v) (m²/yr)
Upper Glacial Till (cohesive)	8	One Dimensional Oedometer Testing	50 - 100	0.13 – 0.25	1.2 – 9.1
			100 - 200	0.085 – 0.17	2.0 – 8.4
			200 - 400	0.056 – 0.10	1.9 – 9.5
			50	0.023 – 0.045	-

5.7.6 *Sulfate content*

In accordance with BRE (Special Digest 1), the Design Sulfate (DS) classification and the Aggressive Chemical Environment for Concrete (ACEC) classification are presented in Table 5.10. The assessment summary sheets are presented in Appendix D.

Table 5.10: Aggressive chemical environment concrete classification

Stratum	No. tests	DS	ACEC
Made Ground	3	DS-1	AC-1
Upper Glacial Till (cohesive)	3	DS-1	AC-1

5.7.7 *Subgrade Stiffness*

Table 5.11: CBR results and derived values

The subgrade stiffness (CBR and Modulus of Subgrade Reaction) results are summarised in Table 5.9.

Stratum	No. tests	Method	Moisture Content (%)	CBR (%) (Range)
Made Ground (cohesive)	-	Correlation in accordance with IAN 73/06 Rev 1 based on plasticity and thin construction	-	<2.5%

Cohesive Glacial Till will need to be tested at the top of the formation should the strata be exposed or if any of the Made Ground is over excavated.

6. GEOTECHNICAL ASSESSMENT

6.1 Geotechnical categorization of the proposed development

Eurocode 7, Section 2 advocates the use of geotechnical categorization of the proposed structures to establish the design requirements.

The proposed development is to comprise a new development with mixed commercial and residential end use with associated car parking in the south west and soft landscaping at the north and east perimeter. The apartment blocks will vary in height between 16 storeys and 11 storeys high.

Based on the above, for the purposes of this investigation, the proposed structures have been classed as Geotechnical Category 2.

Following site investigation and as part of the assessment discussed in the following section, the preliminary geotechnical hazard identification undertaken in Section 3.3 has been updated.

Assessment has been undertaken in accordance with the general requirements of ICE/DETR Document 'Managing Geotechnical Risk' and the HE documents HD 41/15 and CD 622. The Preliminary Geotechnical Risk Register following investigation is provided in Appendix H (Table J.3) and will need to be updated during future design works.

6.2 Characteristic design values

In accordance with BS EN ISO 1997-1 (EC 7), Hydrock consider the proposed structures would be classified as Category 2 structure. As part of the separate geotechnical design, the designer should determine the geotechnical design values.

Table 6.1 provides characteristic geotechnical values to assist the designer. These are based on laboratory testing, *in situ* testing and by professional judgement using published data together with knowledge and experience of the ground conditions. Care should be exercised in using these assumed soil strength parameters for any purpose beyond the scope of this report because it may be that additional sampling and testing are required for certain purposes (i.e. effective stress testing). The reader should refer to the original test results summarised in Section 5 and provided in Appendix C and Appendix D.

Table 6.1: Characteristic geotechnical values

Parameter Stratum	Bulk unit weight kN/m³	Effective angle of internal friction °	Undrained Shear strength kN/m²	Coefficient of Volume Compressibility (m^2/MN)	Subgrade Stiffness (%)
	γ [a]	ϕ' [b]	c_u	m_v	CBR[c]
Made Ground	20	–-	-	-	2.5%
Medium strength cohesive Glacial Till (Upper 14m)	20	-	60 - 140	0.15	3.0%
Higher strength cohesive Glacial Till (14 - 20m)	20	-	>-150	0.075	-

Parameter Stratum	Bulk unit weight kN/m³	Effective angle of internal friction °	Undrained Shear strength kN/m²	Coefficient of Volume Compressibility (m^2/MN)	Subgrade Stiffness (%)
	γ [a]	ϕ' [b]	c_u	m_v	CBR[c]
Lower Glacial Till (granular)	21	40	-	-	-

a. Measured as part of the triaxial strength test and estimated based on the recommendations of BS 8004-2015.

b. Internal friction (φ') values for the granular in-situ material derived from SPT data following the recommendations of Peck et al., (1967).

c. Based upon the equilibrium long term CBR from DMRB IAN 73/06 Rev 1 Table 5.1.

6.3 Groundwork

6.3.1 Site preparation

Buried concrete boulders were encountered in the vicinity of BH03, as such the possibility of further buried obstructions being encountered remains. Therefore, it is recommended that an allowance be made for breaking out obstructions, for example provision of pneumatic breakers for site plant. If underground structures cannot be removed, they will need to be surveyed in three dimensions and the new structures will need to be designed to accommodate them.

Consideration should be made in the enabling works design for the identification and removal of obstruction prior to piling in the location of the proposed structures.

6.3.2 Groundworks

Following breaking out of hardstanding and obstructions, excavation of shallow soils should be readily undertaken by conventional plant and equipment. However, excavation through any buried construction may require heavy-duty excavation plant/ripping plant/blasting/the use of specialist breaking equipment.

Collapse of machine excavated trial pit faces was noted during and following trial pit excavation. This was noted particularly in the Made Ground.

On this basis, and considering the variable strength and density of the Made Ground and shallow soils, random and sudden falls should be expected from the faces of excavations undertaken at the site. Instability of excavation faces will be more prevalent within the granular and silty horizons and especially where seepage and water ingress occur. These factors should be accounted for in the temporary works design.

Temporary trench support, or battering of excavation sides, is recommended for all excavations that are to be left open for any length of time and will definitely be required where man entry is required. Particular attention should be paid to excavation at, or close to, site boundaries/adjoining existing roads/structures/buildings, where collapse of excavation faces could have a disproportionate effect.

A risk assessment of the stability of any open excavation and a temporary works design should be undertaken by a competent person and appropriate measures adopted to ensure safe working practise in and around open excavations. Further guidance on responsibilities and requirements for working near, and in, excavations can be obtained from the Construction Design and Management Regulations

(2015); Construction Information Sheet 47: Inspections and Reports (2005) and HSG47: Avoiding Danger from Underground Services.

To ensure no loads are imposed on the sides of the excavation, spoil should not be placed immediately adjacent to the excavation. Spoil should be placed a suitable distance from the side of the excavation (as assessed by a competent person).

Based on monitoring observations, groundwater is present in the Made Ground between 1.0 and 1.5m bgl. as such groundwater controlled by sump pumping is likely to be sufficient.

However, it should be recognised that groundwater levels may vary from those at the time of the investigation, for example in response to seasonal fluctuations and the timing of construction may dictate the extent of groundwater control required.

Any water pumped from excavations may need to be passed via settlement tanks (to reduce suspended solids) before being discharged to the sewer. Discharge consents may also be required.

6.3.3 Earthworks/reuse of site-won materials

The excavation of soils at the site should be undertaken in accordance with an appropriate Materials Management Plan.

Should earthworks be required, such as raising of site levels or backfilling of excavations, supplementary earthworks testing and an earthworks design will be necessary to ensure the appropriate management and reuse of the existing soils. Where this is required reference should be made back to this office where further assistance can be provided.

6.4 Foundation recommendations

This section provides recommendations for the foundations for the proposed new buildings as indicated on Ryder Architecture Drawing IW4-RYD-00-00-DR-A-3000-S2-P03.

In accordance with EC7, BS EN 1997-1:2004+A1:2013, based on the assumed structural loadings in conjunction with the recorded ground conditions, the foundations for the proposed apartment buildings are considered to be Geotechnical Category 2. Recommendations for Geotechnical Category 2 structures are presented to aid development proposals only. A separate geotechnical design will be required at the design stage for the foundations.

6.4.1 Foundation Type

On the basis of the ground conditions indicated from the current investigations, and the anticipated loadings of the 16 to 11 storey building, piled foundations are recommended for the walls and columns.

6.4.2 Piled foundations

Whilst the proposed loadings have not been provided, piled foundations extending into the very dense granular Glacial Till are initially recommended to support the structural loadings of the new building. Although the strength of superficial deposits does eventually increase with depth, it is not until approximately 14.0 – 15.0m bgl that the Glacial Till becomes stiff. Based on the borehole data the very dense sand and gravel is recorded at approximately 17.0 – 20.0m below current ground level equivalent to 30.18m AOD – 27.18m AOD.

Depending on column loads and layouts, piles will likely be required to extend through the Made Ground and cohesive Glacial Till and end bear a suitable depth into the underlying granular Glacial Till. A proportion of the support will be achieved through shaft friction within the Glacial Till with adequate allowance being made for negative skin friction with the Made Ground.

CFA piles or Bored piles with casing should be suitable to support the foundations for the structure. However, the choice of piling system should be undertaken by a specialist piling Contractor and the design of piles is beyond the scope of this report. The decision on pile type and design should take into account the following factors relevant to the site:

- Obstructions in the ground resulting from previous development cannot be discounted, which could cause piles to stop shallower than the design depths, or to deviate from the vertical, thereby reducing their capacity. In some circumstances, obstructions can lead to pile breakage.
- Pile installation can create preferential pathways for the migration of contaminants to the groundwater.
- Unexploded ordnance clearance likely to be required at each pile location. Specialist advise should be sought.
- Groundwater is present in the Made Ground between 1.23 and 3.39m in the cohesive Glacial Till at 3.33 – 17.00m and in the granular Glacial till at approximately 21.33 - 21.55m bgl. Temporary casing is likely to be required for bored piles in at least the upper 4m of Made Ground. If CFA piles are used, concrete is placed as the auger is withdrawn, which can balance the water pressure if the operation is undertaken carefully.
- As the piles are to be constructed through compressible soils and have Made Ground/fill placed over them, piles should also be designed to cater for the potential down-drag effects of negative skin friction on piles from the secondary consolidation / creep of the recently placed Made Ground or fill.
- Collapse of the pile shaft can be caused by 'necking' of the pile in running sand conditions, leading to pile failure.

6.4.3 Foundation works risk assessment

A foundation risk assessment will be required to determine if the proposed piling will result in a significant increase in risk of pollution to Controlled Waters.

The foundation works risk assessment should be undertaken in accordance with the risk assessment flowchart from National Groundwater & Contaminated Land Centre Report NC/99/73 (Figure 6.1) and will need to identify what additional risks to the environment piling may introduce and, if necessary, identify mitigation measures that will need to be put in place to remove any significant adverse environmental impacts.

6.4.4 Working platform

A working platform will be required prior to the arrival on site of tracked piling plant. This should be designed and installed in accordance with BR470 (BRE 2004) based on data on the specific plant in accordance with an FPS certificate for the rig loadings.

6.5 Roads and pavements

Access roads and pavements in external areas are proposed as part of the development at the site. For permanent roads and pavements, a design subgrade CBR value of 2.5% should be assumed for the Made Ground.

Given the variability of the Made Ground, and in periods of inclement weather, localised soft spots should be anticipated.

Where the CBR is found to be less than the design value or as a means of increasing the subgrade stiffness the following measures could be undertaken:

- Over-excavation and re-engineering or replacement of the near surface (typically the upper 1m) soils in accordance with an appropriate specification;
- the inclusion of geogrid at the base of the capping or subbase which will have the effect of reducing the overall pavement foundation thickness; or
- subgrade stabilisation using hydraulic binders, which should be undertaken in accordance with an appropriate design.

Where temporary access roads are required a subgrade CBR of 2.5% should be assumed.

6.6 Buried concrete

Based on guidelines provided in BRE Special Digest 1 (BRE 2005) and the information presented in Section 5.5.5 (Table 5.10):

- the Made Ground and the superficial deposits (Glacial Till) can be classified as Design Sulfate Class DS-1 and ACEC Class AC-1.

The designer should check and confirm the classification of concrete using the information presented in Appendix C and Appendix D during the design.

7. GEO-ENVIRONMENTAL ASSESSMENT

7.1 Updated conceptual model

7.1.1 Updated ground model

The preliminary ground model developed from the desk study and field reconnaissance survey (Section 2.0) has been updated using the findings of the ground investigation and is presented in Section 5. This ground model is the basis for the geo-environmental assessment presented in this section.

7.1.2 Updated exposure model

Following the ground investigation, the plausible contaminant sources, receptors and pathways identified in the preliminary geo-environmental exposure model (Section 3), have been updated or confirmed as follows.

Sources

No potential sources have been removed from, or added to, the exposure model.

Receptors

No potential receptors have been removed from, or added to, the exposure model.

Pathways

No pathways have been removed from, or added to, the exposure model.

Using the updated ground model and updated exposure model, generic risk assessment is undertaken as presented below.

7.2 Risk assessment approach

Generic risk assessments have been undertaken in accordance with the principles of LCRM (Environment Agency, 2019) using the CM that has been updated following the ground investigation.

Firstly, the risks associated with the identified potential contaminant linkages have been estimated using standardised methods (typically involving comparison of site data with published 'screening values'). Secondly, where screening values are exceeded, the result has been evaluated in an authoritative review of the findings with other pertinent information to determine whether or not the exceedance is, or is not acceptable in the site-specific circumstances. Further explanation is presented in Appendix J.

The data sets used in the assessment comprise the analytical results obtained by Hydrock as listed in Section 4.

In cases where unacceptable risks are indicated, actions such as more advanced stages of risk assessment or remediation are proposed in Section 0.

7.3 Human health risk assessment

This is a Tier 2 assessment using soil screening values applicable to the residential without plant uptake, CLEA land use scenario.

The soil screening values used are generic assessment criteria (GAC). It should be noted that Category 4 Screening Levels (C4SL) for lead have been used as there is no recognised GAC for lead and the use of the term 'GAC' in this report includes the C4SL for lead.

Statistical testing is used where data sets are suitable. The critical issue is sample numbers. For data sets with low sample numbers or where sampling is targeted at specific areas, individual sample test results are compared directly with the screening values. Larger and non-targeted data sets are subject to statistical testing.

The phrase 'further assessment required' is used to denote soil concentrations that are equal to, or exceed, a GAC. This does not necessarily mean that the soil is 'contaminated' or not otherwise suitable for use. The assessment and any mitigation required are to ensure the site does not pose an 'unacceptable risk'.

The results of the assessment are presented in Appendix F.

7.3.1 Averaging areas

The 'averaging area' used in this report is based on the conceptual model and the proposed development, and is taken to be the entire area of the site.

7.3.2 Risk estimation (including statistical testing)

Outliers

The data set for each chemical determinand has been assessed for potential outliers (based on the conceptual model). No outliers have been removed.

Statistical assessment

In accordance with the guidance provided by the CIEH (May 2008) the 95th upper confidence level on the true mean (US_{95}) has been calculated from the sample data. Reference to the methodology for statistical assessment is given in Appendix J.

Based on a US_{95} exceedance of the GAC, the pervasive chemicals of potential concern which require further assessment are summarised in Table 7.1.

Table 7.1: Pervasive chemicals of potential concern for which further assessment is required (human health)

Chemical of potential concern	Generic criterion (mg/kg)	Basis for generic criterion	No. samples	Min. (mg/kg)	Max. (mg/kg)	US_{95} (mg/kg)	No. samples exceeding generic criterion
Made Ground							
Arsenic	40	GAC	10	8.3	270	153.97	1
Lead	310	GAC	10	95	3400	2,088.96	6
Benz(a)anthracene	7.8	GAC	10	2.1	31	25.68	4
Benzo(a)pyrene	1.6	GAC	10	1.7	26	21.02	10
Benzo(b)fluoranthene	4	GAC	10	1.3	27	20.68	4
Benzo(k)fluoranthene	16	GAC	10	0.9	21	13.19	1

Chemical of potential concern	Generic criterion (mg/kg)	Basis for generic criterion	No. samples	Min. (mg/kg)	Max. (mg/kg)	US_{95} (mg/kg)	No. samples exceeding generic criterion
Chrysene	16	GAC	10	1.4	20	16.87	2
Dibenz(a,h)anthracene	1.4	GAC	10	0.24	3.1	2.80	4
Indeno(1,2,3,cd)pyrene	6.6	GAC	10	0.85	9.4	8.83	4

The presence of metals and PAH in the Made Ground requires further consideration.

7.3.3 *Risk estimation (without statistical testing)*

Hydrock default list of determinands

Based on individual test results that exceed the GAC, the chemicals of potential concern which require further assessment are summarised in Table 7.2.

Table 7.2: Chemicals of potential concern for which further assessment is required (human health)

Chemical of potential concern	Generic criterion (mg/kg)	Basis for generic criterion	No. samples	Min. (mg/kg)	Max. (mg/kg)	No. samples exceeding generic criterion
Made Ground						
Aliphatics >EC12-EC16	24	GAC	3	7.4	54	2
Aromatics >EC21-EC35	1,100	GAC	3	200	1,300	1

The presence of petroleum hydrocarbons elevated above the GAC requires further consideration.

Asbestos

There is visual evidence of Asbestos Containing Materials (ACM) at one exploratory hole location. These locations are summarised in Table 7.3. In addition, asbestos has been identified by laboratory testing of soil samples as provided in Table 7.4.

Table 7.3: Visual evidence of Asbestos Containing Materials

Location	Depth (m bgl)	Comment
TP05	0.40	Chrysotile-Hard/Cement Type Material

Table 7.4: Asbestos in soil samples (laboratory testing)

Location	Depth (m bgl)	% Asbestos (w/w)	Comment
BH02	0.70	<0.001	Loose Fibres (chrysotile).
TP03	0.60	<0.001	Loose Fibres (chrysotile).
TP01	0.40	<0.001	Loose Fibres (chrysotile).

The presence of Asbestos Containing Materials and asbestos fibres in soil requires further consideration.

Volatile organic compounds - soils

Selected soil samples were laboratory tested for VOCs, with PID readings also taken at monitoring locations after the fieldworks.

A total of two soil samples were screened for VOC's with no readings above detection level. PID readings taken post-fieldwork were also below the detection level. No further consideration is required for VOCs.

Semi-Volatile organic compounds - soils

Selected soil samples were laboratory tested for SVOCs, with PID readings also taken at monitoring locations after the fieldworks.

A total of two samples were screened for SVOC's, with both recording slightly elevated concentrations in the PAH fractions. However, SVOCs are at concentrations below the GACs for the indoor air pathway. No further consideration to SVOCs is required.

7.3.4 Risk evaluation

The screening exercise has identified asbestos, metals, PAH and petroleum hydrocarbons in the Made Ground at concentrations above the GAC. These are considered further here to assess if the exceedance may be acceptable with respect to the proposed development. The phrase 'further assessment' does not necessarily mean that the soil is 'contaminated' or not fit for use.

Asbestos

Asbestos Containing Materials is present in TP05 at 0.4m bgl in the form of chrysotile cement. In addition, asbestos fibres (at <0.001% of chrysotile) have been detected in three samples of the Made Ground which requires further consideration.

Guidance on the assessment of risk associated with asbestos in soils was published by CIRIA C733 in 2014. This proposed a semi-quantitative risk assessment methodology for asbestos, based on potential for inhalation of airborne fibres. As many factors affect the potential magnitude of fibre inhalation in addition to concentration, it is not practicable to derive generic screening criteria for asbestos concentrations in soil. Risk factors applicable to the site are considered below:

- Visible evidence of asbestos materials was noted in one exploratory hole (TP05), suggesting that asbestos materials are present only as very minor constituents in the soil.
- Where asbestos was identified by laboratory testing, the concentration was assessed as being less than the limit of detection (0.001%).
- Only chrysotile (white) asbestos fibres were identified. Chrysotile is the least hazardous of the three principle asbestos forms, most commonly associated with asbestos cement products.
- Although the impacted soils might be excavated and disturbed, with consequent potential for fibre release during groundworks, future disturbance is likely to be minimal due to the proposals for hardstanding cover across the majority of the site.

- The materials in which asbestos was identified were of mixed composition but included some clay content. The likelihood of asbestos fibres being released from cohesive materials is less than might be the case for loose material such as sand /silt.

Subject to regulatory approval, whilst Hydrock consider it plausible for asbestos to be present in any of the Made Ground soils, overall, the risk associated with the identified presence of asbestos is considered to be low. However, mitigation will be required to ensure risks to site users remains negligible.

PAH in Made Ground

Benzo(a)pyrene is present in the Made Ground with a US_{95} of 21.02mg/kg, which is a significant exceedance of the GAC (1.6mg/kg). A concentration of Benzo(a)pyrene, greater than fifteen times the GAC was recorded in TP04 at 0.55m at 26mg/kg.

Benzo(b)fluoranthene is present in the Made Ground with a US_{95} of 20.68mg/kg, which is a significant exceedance of the GAC (4.0mg/kg).

Benz(a)anthracene is present in the Made Ground with a US_{95} of 25.68mg/kg, which is a significant exceedance of the GAC (7.8mg/kg).

Dibenz(a,h)anthracene is present in the Made Ground with a US_{95} of 2.80mg/kg, which is two times in exceedance of the GAC (1.40mg/kg).

These are significant exceedances, and are considered to be an unacceptable risk, which requires mitigation for the proposed end use.

Indeno(1,2,3,cd)pyrene is present in the Made Ground with a US_{95} of 8.83mg/kg, which is a slight exceedance of the GAC (6.6mg/kg).

Chrysene is present in the Made Ground with a US_{95} of 16.87mg/kg, which is a slight exceedance of the GAC (16.0mg/kg).

Benzo(k)fluoranthene is present in the Made Ground with a US_{95} of 13.19mg/kg, which is below the GAC (16.0mg/kg). There is only one sample slightly exceeding the GAC with a concentration of 21mg/kg.

Due to the low concentrations across the averaging area of Indeno(1,2,3,cd)pyrene, Chrysene and Benzo(k)fluoranthene relative to the screening value Hydrock believes mitigation measures with regards to Indeno(1,2,3,cd)pyrene, Chrysene and Benzo(k)fluoranthene are unnecessary.

These significant exceedances of the GAC for a number of PAH are exhibited at four locations (BH04, TP03, TP04 and TP02). At the remaining locations, only Benzo(a)pyrene slightly exceeds the GAC, with no other PAH exceedances.

The concentrations of PAH identified are a significant exceedance of the GAC and considered to be an unacceptable risk, which require mitigation for the proposed end use.

Lead / Arsenic in the Made Ground

Concentrations of lead were identified in the Made Ground with a US_{95} of 2,088.96mg/kg compared to a GAC of 310mg/kg. A concentration of lead, greater than ten times the GAC was recorded in TP02 at 0.7 – 0.80m at 3,400mg/kg.

These significant exceedances of the GAC are exhibited by the concentration identified in TP02 (3,400mg/kg) and to a lesser extent TP03 (1,000mg/kg). However, the other four lead concentrations above the GAC range only between 340mg/kg to 770mg/kg.

Lead concentrations at TP02 is a significant exceedance, and is considered to be an unacceptable risk, which requires mitigation for the proposed end use.

Concentrations of arsenic were identified in the Made Ground with a US_{95} of 153.97mg/kg compared to a GAC of 40mg/kg. However, there is only one exceedance of the GAC for Arsenic, identified in TP02 at a concentration of 270mg/kg

The concentration of Arsenic identified in TP02 is a significant exceedance of the GAC and considered to be an unacceptable risk, which requires mitigation for the proposed end use.

Petroleum Hydrocarbons

The concentration of Aliphatic 12-16 and Aromatics >EC21-EC35 identified in BH02 are recorded at elevated levels above the GAC. BH02 is located in an area of proposed soft landscaping, as such Hydrock consider the presence of petroleum hydrocarbons in this area of the site to be an unacceptable risk, which requires mitigation for the proposed end use.

A contamination zonation plan (10042-HYD-XX-XX-DR-GE-0004) is provided in Appendix A.

7.4 Plant life risk assessment

7.4.1 Risk estimation

As part of the sites redevelopment there is a strip of soft landscaping proposed along the western boundary. As such the risk to plant life from existing site soils is assessed below.

Priority phytotoxic chemical concentrations have been screened against published values to determine the likely risk to plant growth and the findings presented in Appendix F. As with human health, statistical testing is used where data sets are suitable, otherwise individual sample test results are compared directly with the screening values.

Based on a US_{95} exceedance of the GAC, the pervasive chemicals of potential concern which require further assessment are summarised in Table 7.5

Table 7.5: Pervasive chemicals of potential concern for which further assessment is required (risk to plants)

Chemical of potential concern	Generic criterion (mg/kg)	Basis for generic criterion	No. samples	Min. (mg/kg)	Max. (mg/kg)	US_{95} (mg/kg)	No. samples exceeding generic criterion
Made Ground							
Arsenic	250	Australian B(1) 1999	10	8.3	270	153.97	1
Copper	135	Australian B(1) 1999	10	40	420	296.16	4
Nickel	75	Australian B(1) 1999	10	17	120	78.60	1
Zinc	300	Australian B(1) 1999	10	110	640	588.66	4

7.4.2 *Risk evaluation*

Within the Made Ground, concentrations of arsenic, copper, nickel and zinc are elevated when compared to the GAC. Detriment to plant life is difficult to quantify and many of the GAC are based on agricultural crop yields rather than harm to particular plant species. The exceedance of the GAC indicates the probability of an unacceptable risk to plant life and mitigation may be required.

Notwithstanding the concentrations of contamination identified, there is no subsoil or topsoil growing medium on the site and this will require import.

The requirement for mitigation of risk to human health (as discussed in Section 7.3.4) will also serve to mitigate risks to plant life.

7.5 Pollution of controlled waters risk assessment

7.5.1 *Risk estimation*

The risks to groundwater and surface water from contaminants on site have been assessed in accordance with the Environment Agency (2006) Remedial Targets Methodology (RTM).

Site contaminant loadings are compared with relevant screening values (Water Quality Targets), which are linked to the Conceptual Model.

Acceptable WQT are defined for protection of human health (based on Drinking Water Standards (DWS)) and for protection of aquatic ecosystems (Environmental Quality Standards (EQS)).

As related specifically to this site, the data are compared with criteria selected in accordance with the methodology presented in Appendix J. This methodology involves selecting which of several alternative risk scenarios apply in this case. The assessment is presented in Table 7.6 below, with the justification for the scenarios selected explained in the following text:

- Although the depth to the Sandstone Principal Aquifer is unproven, it has been confirmed that underlying the site is 10 – 15.0m of cohesive Glacial Till. This will act as an aquitard and as such there is no long-term viable pathway to the groundwater receptor.
- The Ashton Canal is located 70m to the south east, however overland flow is not considered to be a viable pathway due to the presence of an under-croft wall structure along the sites south eastern perimeter. In addition, the surface level gradient of the land increasing in between the site toward the Canal. There is also an under-croft wall structure along the sites south eastern perimeter

Table 7.6: Summary of water quality risk assessment protocol

Hydrock scenario	Water body receptors	Secondary receptors	Example contaminant linkages	RTM level and data used	Water quality targets
B	Groundwater. Surface water.	Aquatic ecosystem.	Contaminants from site leach or seep into a groundwater body that feeds inland surface water by base flow. The surface water may be an aquatic ecosystem.	RTM Level 2 - Groundwater. Direct comparison of surface water samples	EQS (inland)

Hydrock scenario	Water body receptors	Secondary receptors	Example contaminant linkages	RTM level and data used	Water quality targets

Notes:

Some EQS are water hardness dependent. This is measured either in the receiving surface water or in groundwater (if it is part of the pathway), or is estimated from national maps.

Inland waters EQS applicable to freshwater, 'other' waters EQS applicable to coastal or transitional waters.

This table and the results of the assessment are considered as a first screening for potential risks of pollution of Controlled Waters. More specific requirements may be stipulated by the relevant Agency.

The results of the screening assessment are presented in Appendix F and are summarised in Table 7.7.

In some instances, the reporting limit (or detection limit) quoted by the laboratory may be greater than the WQT that it is being assessed against. As the current exercise is an initial screening assessment, further assessment of these elements has not been undertaken.

Table 7.7: Chemicals of potential concern for which further assessment is required (controlled waters)

Chemical of potential concern	Water quality target (WQT) (µg/l)	Basis for water quality target	No. samples	No. samples above LoD	Min. (µg/l)	Max. (µg/l)	No. samples exceeding WQT and above LoD
Shallow groundwater in the Made Ground							
Metals							
Cadmium	0.08	EQS	2	2	0.03	3	1
Cobalt	3	EQS	2	2	0.8	92	1
Chromium (III)	4.7	EQS	2	1	1.1	12	1
Copper	1	EQS	2	2	4.6	180	2
Manganese	123	EQS	2	2	99	15,000	1
Nickel	4	EQS	2	2	3.1	140	1
Lead	1.2	EQS	2	2	1.2	1,300	2
Vanadium	20	EQS	2	2	1	170	1
Zinc	12.3	EQS	2	2	10	390	1
Inorganics							
Cyanide (free)	1	EQS	2	2	2	3	2
Sulfate	400,000	EQS	2	2	41,400	495,000	1
Polycyclic hydrocarbons							
Anthracene	0.1	EQS	2	1	<0.01	4.27	1
Benzo(a)pyrene	0.00017	EQS	2	1	<0.01	27.1	1
Fluoranthene	0.0063	EQS	2	1	<0.01	42	1
Petroleum Hydrocarbons							
Aro > EC12-EC16	10	EQS	2	1	<10	100	1
Aro > EC16-EC21	10	EQS	2	1	<10	120	1
Aro > EC21-EC35	10	EQS	2	1	<10	230	1

Chemical of potential concern	Water quality target (WQT) (µg/l)	Basis for water quality target	No. samples	No. samples above LoD	Min. (µg/l)	Max. (µg/l)	No. samples exceeding WQT and above LoD
Deeper groundwater in the Glacial Till							
Cadmium	0.08	EQS	2	2	0.03	0.17	1
Cobalt	3	EQS	2	2	1.3	3.4	1
Copper	1	EQS	2	2	6.1	9	2
Manganese	123	EQS	2	2	48	3700	1
Nickel	4	EQS	2	2	3.4	8.6	1
Lead	1.2	EQS	2	2	1.1	4.3	1
Zinc	12.3	EQS	2	2	7.7	38	1
Ammoniacal Nitrogen	300	EQS	2	2	1000	17,000	2
Phenol	7.7	EQS	2	2	4.5	65	1

Note: the maximum recorded value is compared with the water quality target.

* The Water Supply Regulations 1989 and the Private Water Supply Regulations 1991 both contained a prescribed concentration of 10 µg/l for 'dissolved or emulsified hydrocarbons (after extraction with petroleum ether); mineral oils'. This was removed when these Regulations were updated in 2000 (consolidated 2007) and 2009, respectively. However, 10 µg/l is used in this report as an initial screening assessment as it is frequently the preferred approach of the Environment Agency.

† The EQS for these substances represents a bioavailable concentration, which will be a proportion of the actual dissolved concentrations in water. No site-specific bioavailablity testing was able to be undertaken at the site and therefore the EQS bioavailable represents a conservative screening approach.

7.5.2 Risk evaluation

For perched groundwater in the Made Ground the EQS for several metals, inorganics, PAH and some petroleum hydrocarbons exceed their respective screening value. The perched groundwater at BH02 appears to exhibit more prevalent and higher concentrations than the perched water at BH04 suggesting a localised impact.

The Glacial Till beneath the site characteristically has a low permeability which in theory would restrict downward migration of contaminants. In addition, the elevated chemical concentrations exhibited are prevalent in brownfield and urban settings, and their occurrence are likely to be a reflection of background shallow groundwater quality.

However, it is noted that the Glacial Till will be penetrated during piling works creating a temporary pathway between contaminated Made Ground and the Secondary A Aquifer of the Glacial Till. Vertical migration of contamination into the aquifer is plausible during piling works, as such it is recommended that a piling risk assessment is undertaken prior to intrusive work in order to assess the risk and any mitigation measures that may be required.

In addition, the risk of the contaminated shallow groundwater interacting with the Ashton Canal is considered to be very low due to the presence of an under-croft wall structure along the sites south eastern perimeter. This structure, therefore will sever the pathway between the source and receptor.

Significantly elevated concentrations of ammoniacal nitrogen and phenol to a lesser extent, were found in the deeper groundwater in the Glacial Till. As neither of these substances were encountered on site in the perched groundwater or soils, then it can only be assumed the deeper groundwater local to this area has been impacted by an off-site source, and may in fact reflect the local groundwater quality.

Furthermore, the inland EQSs for copper, manganese, nickel and zinc are based on the bioavailable fraction and because bioavailability has not been calculated for these metals the assessment is conservative as it is based on the assumption of 100% bioavailability.

It would be technically challenging and probably disproportionately costly to remove these natural and possibly anthropogenic contaminants from the deeper groundwater or to prevent further infiltration.

Hydrock believes that the requirement for hotspot delineation and possible removal of impacted soils will go some way to improving shallow groundwater. It would also be prudent to undertake one additional sampling visit with chemical analysis of the shallow groundwater once hotspot soil removal has taken place.

7.6 Ground gases risk assessment

7.6.1 Data

It is judged from the available evidence that the gas generation potential at the site is low to moderate due to the presence of Made Ground underlying the site and that the sensitivity of the development is low to moderate due to the site's redevelopment for high rise apartments. Consequently, and in accordance with CIRIA C665 (Table 5.5a and 5.5b), an appropriate minimum monitoring regime is 6 readings over 3 months, provided other monitoring requirements are also met, such as prevailing atmospheric pressure conditions (for example, BS 8485:2015 +A1:2019 suggests monitoring should include a period of falling atmospheric pressure).

Hydrock has undertaken the six readings required, including periods of falling and low atmospheric pressure, the conclusions presented below are considered interim, pending a review of ongoing ground gas monitoring.

7.6.2 Assessment

The risks associated with the ground gases methane (CH_4) and carbon dioxide (CO_2) have been assessed using BS 8485:2015 +A1:2019, which cites the guidelines published by CIRIA (Wilson et al 2007) (known as Situation A).

There is an alternative assessment method described by the NHBC (Boyle and Witherington 2007) (known as Situation B). Whilst 'Situation B' may also be suitable for the assessment, it is Hydrock's opinion that the NHBC Guidelines are not at the current time fully aligned with current ground gas risk assessment principles (as described in BS 8485:2015 +A1:2019). As such, 'Situation A' has been chosen as the means by the gas risk will be assessed.

The assessment guidelines published by CIRIA are based on interpretation of the gas concentrations and the gas flow rates, amongst other variables, and are compliant with the model procedures of LCRM. The modified Wilson and Card assessment has been used by comparing the maximum gas concentrations

and gas screening values (GSV[1]) in Appendix D with the published table (CIRIA Table 8.5) and the assessment is summarised in Table 7.8. The assessment is presented in Appendix E.

Table 7.8: Ground gas risk assessment

	Min	Max	Typical (i)	Comment
Steady Flow Rate (l/hr)	0.1	0.5	0.1	Gas flow was recorded at 0.2 and 0.5l/hr on one occasion. The typical flow rate was 0.1l/hr.
Methane (%)	0.0	8.2	<1	Methane was recorded above detection on one occasion. However, As the typical methane concentration is less than 1.0% Hydrock consider the Characteristic Situation, as CS1.
Carbon Dioxide (%)	0.1	15.5	<1	Carbon Dioxide was recorded above 5.0% on one occasion. However, as the typical carbon dioxide concentration is less than 5.0%, Hydrock consider the Characteristic Situation, as CS1.
Carbon Monoxide (ppm)	0.0	1.0	-	Identified at 1.0ppm on three occasions. No further consideration is required.
Hydrogen Sulphide (ppm)	0.0	2.0	-	Identified at 2.0ppm on one occasion. No further consideration is required.
Oxygen (%)	17.9	20.3	-	-
Carbon Dioxide GSV (l/hr)	0.00	0.078	<0.07	CS1*
Methane GSV (l/hr)	0.00	0.008	<0.07	CS1

For the purposes of the calculation, where the recorded gas flow rate is below the manufacturer's limit of detection for the instrument used, the detection limit has been adopted for the gas flow rate.

*CIRIA C665 indicates CS2 measures are to be applied where the GSV for carbon dioxide exceeds 0.07l/hr. However, Hydrock believe CS1 measures can be applied in this instance, the justification for this is provided below.

As indicated in Table 7.8:

- The gas monitoring flow rate data indicates negligible gas flow readings generally 0.1 l/hr and on this basis, it can be concluded the site is typically very low flow.
- carbon dioxide concentrations exceed 5.0% on one occasion, however this is considered to be an anomaly and not envisaged to present a risk. This is due to the exceedance being recorded only on a single occasion, and the fact the reading was from within the lower granular till material. The lower granular till is separated from the site by >15.0m of cohesive till and ground gas is not expected to migrate onto the site through this stratum.
- methane concentrations exceed 1% on one occasion and are not envisaged to present a risk. This exceedance is considered to be an anomaly, likely a result of very high groundwater within the standpipe. The top of the standpipe screen depth is 4.50m and groundwater was recorded at 4.59m, which potentially allowed the accumulation of methane between the water table and the top of the standpipe, and is therefore not representative of the response zone and stratum. Furthermore, the exceedance of Methane was recorded only on a single occasion, and can therefore be regarded as anomalous over the six readings.

[1] Note: GSV is synonymous with 'site characteristic hazardous gas flow rate' (Q_{hgs}) of BS 8485:2015 +A1:2019 Table.

In conclusion, the low gas flows, typically low ground gas concentrations for carbon dioxide and methane, characteristically indicate a CS1 classification, and no gas mitigation measures are considered necessary for the proposed development.

7.6.3 Off-site risks from carbon dioxide and methane

The National Planning Policy Framework requires that a site should be incapable of being determined as contaminated land under Part 2A of the Environmental Protection Act 1990. This includes the potential for off-site migration of ground gases that may impact adjacent properties.

Consequently, it may be necessary to consider the imposition of measures to protect adjacent, off-site receptors. In this case the site does not present a risk from ground gases and therefore off site properties do not require consideration in this instance.

7.7 Construction materials risk assessment

7.7.1 Water pipelines

A formal water pipe investigation and risk assessment is beyond the scope of this report. However, the findings of this investigation have been compared to the threshold values in Water UK HBF (2014), Table 1 as far as is practicable, to give an indication of the possible restrictions to the use of plastic pipes for water supply to the site (see the reference in Appendix J for further details).

The site is brownfield. However, the investigation has not detected organic contamination in significant exceedance of the threshold values and Hydrock believes standard pipework may be suitable for the site. However, confirmation should be sought from the water supply company at the earliest opportunity.

7.7.2 Other construction materials

The implications for buried concrete are discussed in Section 0.

7.8 Contamination risks to ground workers

7.8.1 Introduction

Whilst risks to construction workers are not discussed in detail, the following section discusses potential risks that should be considered.

Information presented in this document is provided to assist in managing the risk associated with contamination in soil and groundwater at the site but is not definitive. The Contractors are responsible for undertaking their own assessments and assessing what risks are present and what control measures are required.

Task specific risk assessments and method statements should be in place, and risks and required mitigation measures communicated to all relevant personnel prior to the works commencing. Appropriate PPE and, if required, RPE should be provided and utilised.

7.8.2 Metals, PAH, petroleum hydrocarbons and asbestos

The Made Ground contains elevated concentrations of metals, PAH and petroleum hydrocarbons with loose asbestos fibres identified at BH02, TP03 and TP01. Hard cement type ACM was encountered in TP05.

7.8.3 Ground Gas

It is noted that concentrations of carbon dioxide (an asphyxiant) in the soil exceed HSE Workplace Exposure Limits for personnel in the working environment of 1.5% for short term (15 minutes) exposure or 0.5% for long term exposure. Furthermore, soil concentrations of oxygen are below the HSE recommendations of 18%.

Soil gas concentrations are not necessarily reflected by those in the breathing zone, as such, all Contractors and maintenance workers should be made aware of the possible presence of carbon dioxide and should take all necessary health and safety precautions when working in trenches or confined spaces.

7.8.4 Asbestos

One visible fragment of suspected asbestos cement sheeting has been identified during the ground investigation and low concentrations of asbestos fibres (<0.001%) have been identified during the laboratory testing of soils.

All site staff should be made aware that there is a likelihood of encountering further asbestos containing materials within the Made Ground anywhere on the site, and at any stage of the development. It is advised that the Contractor should supply suitable and sufficient 'Asbestos Awareness' training (specific to asbestos in soils) to all site staff who could foreseeably encounter asbestos containing materials during the course of their work.

The Contractor for each stage of works must undertake a suitable and sufficient Risk Assessment in accordance the Regulation 6 of the Control of Asbestos Regulations 2012 (CAR2012). The results of the assessment should be used to compile a methodology in accordance with Regulation 7 of CAR2012, which limits potential exposure and spread of asbestos fibre. Appropriate training should be provided to all site staff identified within the risk assessment as having the potential to be exposed or encounter asbestos during their work in accordance with Regulation 10 of CAR2012.

It is the responsibility of the Contractor to ensure that mitigation measures are suitable and sufficient to prevent exposure to airborne asbestos so far as is reasonably practicable in accordance with Regulation 11 of CAR2012.

It is recommended that any asbestos cement sheeting encountered is handpicked under controlled conditions in accordance with HSG210 'Asbestos Essentials'. Hand picking needs to be undertaken by suitably qualified Contractors in accordance with HSE guidance and an Environmental Permit. All ACM must be suitably packaged, placed in a dedicated, covered and lockable skip pending off-site disposal to a suitably licensed waste facility.

In addition to the presence of one visible fragments of suspected asbestos cement sheeting, the soils contain low concentrations of asbestos fibre (<0.001%). The Contractors for each stage of works must manage the risks in accordance with HSE Guidance and CAR 2012. However, the asbestos fibres detected at the site are within a soil matrix, and if this is kept damp, this should assist in minimising the risk of the release of airborne fibres.

7.9 Findings of the generic contamination risk assessments

The potential sources, pathways and receptors identified in the desk study (Section 3) have been investigated (Sections 4 and 5) and assessed (Sections 7.2 to 7.7). A Source-Pathway-Receptor linkage assessment has been undertaken and is presented in Appendix I (Table K.2).

A summary of the Source-Pathway-Receptor (SPR) contaminant linkages for which the risks may be unacceptable and require mitigation (those that are moderate or higher) are discussed in Table 7.9.

Table 7.9 assumes the following SPR linkages which have been discounted (subject to agreement) at the risk evaluation stage are confirmed by the regulators and the warranty provider as not requiring further consideration (mitigation). If these assumptions are not agreed during regulatory discussions, the conclusions as noted in Table 7.9 will need to be updated:

- Significantly elevated concentrations of PAH in the Made Ground at BH04, TP03, TP04 and TP02.
- Significantly elevated concentrations of Lead in the Made Ground at TP02, and one significantly elevated concentration of Arsenic at TP02.
- Asbestos fibres (<0.001%v/v of chrysotile) detected in the Made Ground at three locations (BH02, TP03 and TP01) and one asbestos cement fragment identified in TP05.
- Elevated concentrations of petroleum hydrocarbons Aliphatic 12-16 and Aromatics >EC21-EC35 at BH02.
- Elevated concentrations of metals, inorganics, PAH and petroleum hydrocarbons in the perched groundwater at BH02.

A contamination zonation plan (10042-HYD-XX-XX-DR-GE-0004) is provided in Appendix A.

Table 7.9: Residual risks following risk evaluation

Contaminant Linkage				Comments	
Pollutant Linkage	Sources	Pathways	Receptors	General	Mitigation
PL 1.	Significantly elevated concentrations of PAH in the Made Ground at BH04, TP03, TP04 and TP02	Ingestion or direct contact.	Human health.	Significant exceedance of the GAC.	Additional trial pits to facilitate the deeper Made Ground to be sampled at TP03, TP04 and TP02. Establish the volume of PAH impacted material in the north east portion of the site. Hotpot removal to be considered in a remediation strategy.
		Temporary Vertical Migration through the superficial	Controlled water of the Secondary A Aquifer (Glacial Till) and Principal Aquifer (Sandstone).		A piling works risk assessment will be required to establish if mitigation measures will be necessary.

Contaminant Linkage				Comments	
Pollutant Linkage	Sources	Pathways	Receptors	General	Mitigation
		deposits during piling works.			
PL 2.	Significantly elevated concentrations of Lead and Arsenic in the Made Ground at TP02	Ingestion or direct contact.	Human health.	Significant exceedance of the GAC.	Additional trial pits to delineate the extent of the Made Ground impacted by lead and arsenic in the vicinity of TP02. Hotpot removal to be considered in a remediation strategy.
PL 3.	Asbestos fibres in the Made Ground at BH02, TP03 and TP01 and one asbestos cement fragment at TP05.	Inhalation	Human health.	Loose Fibres identified in WS02 at concentration of <0.001% and ACM is hard cement bound material.	The proposed development will see the introduction of hard standing across the majority of the site footprint. Acting as a barrier between the Made Ground and end user to sever the pathway between source and receptor. The proposed strip of soft landscaping along the western perimeter will require a simple cover system.
PL 4.	Elevated concentrations of petroleum hydrocarbons at BH02	Ingestion or direct contact.	Human health.	Exceedance of the GAC.	Located in the area of proposed soft landscaping. A simple cover system is required in areas of soft landscaping.
PL 5.	Elevated concentrations of metals, inorganics, PAH and petroleum hydrocarbons in the perched groundwater at BH02.	Temporary Vertical Migration through the superficial deposits during piling works.	Controlled water of the Secondary A Aquifer (Glacial Till) and Principal Aquifer (Sandstone).	Significant Exceedance of the EQS.	A piling works risk assessment will be required to establish if mitigation measures will be necessary.

7.10 Mitigation measures

Redevelopment proposals for the site include the introduction of hardstanding and a new building across the majority of site footprint, which is expected to go some way to sever the link between the source and end user. However, there are hotspots of unacceptable concentrations of metals, PAH and petroleum hydrocarbons in the Made Ground and shallow groundwater. These residual risks can be mitigated against using standard methods including:

- hotspot delineation through trial pitting and additional sampling;
- Possible hotspot removal and replacement (to be verified after delineation);
- Introduction of a simple cover system in areas of soft landscaping; and
- A piling works risk assessment;

The methodology for the remediation should be detailed in a Remediation Strategy and Verification Plan, which will need to be submitted to the regulatory authorities for approval.

In addition, the writing and approval of a Materials Management Plan will be required to allow reuse of suitable material at the site (if required).

Verification reports by a suitably qualified independent geo-environmental specialist will be required following completion of any remedial works.

As detailed in Table 7.9 (and subject to regulatory agreement), Hydrock consider the following mitigation is required to ensure the site is suitable for use for the proposed end use. These mitigation works will be undertaken in a number of phases and can be separated into:

- Enablement Phase
- Construction Phase.

There will also be a requirement to undertake works to ensure the site is geotechnically suitable.

The methodology for the remediation should be detailed in a Remediation Strategy and Verification Plan, which will need to be submitted to the regulatory authorities for approval.

The writing and approval of a Materials Management Plan will be required to allow reuse of suitable material at the site. As processing of Made Ground is required, an appropriate Environmental Permit will also be required.

Verification reports by a suitably qualified independent geo-environmental specialist will be required following completion of any remedial works.

7.10.1 Enablement Phase

The following works are considered necessary during the Enablement Phase of works:

- Contamination hotspot delineation through trial pitting and additional sampling at PAH impacted area;
- Production of a Remediation Strategy to ensure the contractor addresses any mitigation measures required.

- Production of a piling works risk assessment to establish the risk to aquifers beneath the site from contamination hotspots present in the Made Ground.
- break out of all hardstanding and below ground obstructions and processing for reuse in accordance with a suitable specification and a Materials Management Plan (MMP);
- removal of any existing drainage system and associated pipework;
- excavation of Made Ground and natural soils as required to allow construction with appropriate materials management and processing of excavated soils using a combination of: excavation and stockpiling and screening of soils to leave the site at the level required for the installation of a working platform, pavement construction.
- off-site disposal of unsuitable or excess material; and
- verification during enablement works.

7.10.2 Construction Phase

The Construction Phase of works will comprise:

- appropriate materials handling and stockpiling in accordance with the Materials Management Plan (MMP);
- installation of Protectaline pipework (subject to confirmation);
- import of subsoil and topsoil for soft landscaping in accordance with the Materials Management Plan (MMP);
- the installation of a simple cover system in soft landscaped areas comprising:
  - Imported subsoil / topsoil (450mm), comprising a minimum of 150mm topsoil and 300mm subsoil.

8. WASTE AND MATERIALS MANAGEMENT

8.1 Introduction

The Waste Framework Directive (WFD) (2009/98/EC) defines waste as '*any substance which the holder discards or intends to discard.*' In a geo-environmental context, the waste is most often 'soil' and the two main scenarios are offsite disposal of the material as a waste and/or reuse of the material on site. For cost and sustainability reasons, reuse is preferred to off-site disposal.

Section 8.2 below describes the key issues relating to off-site disposal to landfill and Section 8.3 considers requirements relating to reuse of soils and materials management.

8.2 Waste disposal

8.2.1 Principles

Based on the WFD, any material excavated on site may be classified as waste and it is the responsibility of the producer of a material to determine whether or not it is waste. Where off-site disposal is undertaken, the following guidance applies.

Classification is a staged process:

- A hazardous waste is defined under the WFD as one which possesses one or more of fifteen defined hazardous properties. If a waste is not defined as hazardous, then it is non-hazardous.
- Where the materials are soil, it is then be assigned using the 'List of Waste Codes', which classifies the material as either:
  - hazardous (17-05-03), which is defined as "*soil and stones containing hazardous substances*"; or
  - non-hazardous (17-05-04), which is defined as "*soil and stones other than those mentioned in 17-05-03*".
  - Hydrock utilise the proprietary assessment tool, HazWasteOnline™ to undertake this assessment.
- Waste Acceptance Criteria (WAC) testing is then undertaken if required, and are only applicable following classification of the waste, and only where the waste is destined for disposal to landfill. The WAC are both qualitative and quantitative. The WAC and the associated laboratory analyses (leaching tests) are not suitable for use in the determination of whether a waste is hazardous or non-hazardous.

It should be noted that some non-hazardous wastes may be suitable for disposal at an inert landfill as non-hazardous waste, subject to meeting the appropriate waste acceptance criteria.

It should be noted that classification must be undertaken on the waste produced, by the waste producer. Necessary sampling frequency to adequately characterise a soil population is defined within WM3.

Further discussion with regards to the characterisation process for different scenarios and waste types is provided below.

Topsoil and Peat

Topsoil and peat are biodegradable, therefore if they are surplus to requirements and cannot be re-used in accordance with a Materials Management Plan, they cannot be classified as inert. As such, topsoil and peat need to be classified by a staged assessment and sampling process and would either be classified as hazardous or non-hazardous, depending upon the results of the assessment.

Greenfield Sites

Waste from completely greenfield sites may be accepted at a landfill as inert waste if it meets the requirements of paragraph 10 (wastes acceptable without testing at landfills for inert waste) of the Landfill (England and Wales) (Amendment) Regulations (2005) ('the Regulations') can be met. Paragraph 10 of the Regulations states, "*soils may be able to be classified as inert waste without testing, if:*

- *they are single stream waste of a single waste type;*
- *there is no suspicion of contamination and they do not contain other material or substances such as metals, asbestos, plastics, chemicals, etc….."*

As such, where the site is greenfield and the waste producer is confident about the quality of a soil (i.e. naturally occurring and uncontaminated), further sampling and laboratory testing is not necessary for the Basic Characterisation and this can be undertaken on qualitative Waste Acceptance Criteria testing.

In this instance the waste producer can characterise the waste based on visual assessment and written description of the waste in addition to supporting evidence such as a desk study assessment of the greenfield status. However, it should be noted this characterisation is subject to agreement by the landfill operator who may require testing to be undertaken to confirm classification.

Contaminated or potentially contaminated sites

If the site is brownfield, contaminated or potentially contaminated, the waste must undergo an initial waste classification exercise using background information on the source and origin of the waste and assessment of chemical test data in accordance with Environment Agency Technical Guidance WM3.

If following the initial waste classification exercise, the soils are acceptable for disposal to a non-hazardous landfill, further qualitative Waste Acceptance Criteria (WAC) testing is not required.

However, if soils are potentially able to be disposed to an inert landfill as non-hazardous waste, or require testing to determine if they can be disposed of to a stable non-reactive hazardous or hazardous class of landfill, the next stage of assessment is to undertake qualitative WAC testing. This will determine the Basic Characterisation and the landfill category at which the soils can be accepted.

Hazardous material must be subjected to WAC testing to determine whether it requires treatment before it can be accepted at the hazardous landfill, while non-hazardous material can be tested to determine whether it may be suitable for placement in an inert landfill.

8.2.2 WAC Testing

The site is brownfield and the qualitative WAC tests are provided in Appendix I and a summary of the preliminary waste disposal options is provided below in Section 8.2.3.

8.2.3 Preliminary waste classifications

Based on the site history, WAC testing and the HazWasteOnline™ assessment (see Appendix G) it is considered that:

- the natural soils are likely to be classified as non-hazardous and may be able to be disposed of at an inert landfill;
- The Made Ground at BH02, BH04 and TP02 is likely to be classified as hazardous waste due to the presence of petroleum hydrocarbons at BH02 and BH04, and significant lead concentrations at TP02.
- The remainder of the Made Ground is likely to be classified as non-hazardous waste and may be able to be disposed of at an inert landfill.
- Any soils containing > 0.1% asbestos or visible asbestos containing materials would be considered as hazardous.

It should be noted that:

- The above preliminary assessment has been made on the basis of the soils tested as part of the ground investigation. Prior to disposal, the characteristics of the actual soils to be disposed of will need testing and classification in consultation with landfill sites and waste disposal Contractors. The receiving landfill will make the final decision on the classification and acceptability of the waste.
- Non-hazardous soils require pre-treatment (separation, sorting and screening) prior to disposal.
- The costs for disposal of non-hazardous and hazardous soils are significant compared to disposal of inert material.
- In addition to disposal costs, landfill tax will be applicable. Non-hazardous and hazardous waste will generally be subject to the Standard Rate Landfill Tax (£84.40 per tonne as at 1 April 2017). Inert waste will generally be subject to the Lower Rate Landfill Tax (£2.70 per tonne as at 1 April 2017).

8.2.4 General waste comments

It should be noted that:

- It is the waste producer's responsibility to segregate the waste at source and waste producers must not mix waste materials/streams or dilute hazardous components, for example by mixing with less or non-hazardous waste on site to meet WAC limit values.
- The above preliminary assessment has been made on the basis of the soils tested as part of the ground investigation, using WAC testing and the HazWasteOnline™ assessment. However, the formal classification of waste can only be undertaken on the material to be disposed of, and by the waste producer and the receiving landfill as license conditions vary from landfill to landfill.
- Basic Characterisation should be undertaken in accordance with Environment Agency guidance by the waste producer. Hydrock can assist if required and this report will assist the characterisation. However, Basic Characterisation does not form part of the current commission and would require further assessment and testing on the wastes actually to be disposed.

- Once the waste producer has undertaken an initial Basic Characterisation on each waste stream, they can manage the soils as part of the on-site processing programme (for example, stockpiling, treatment, screening and separation). The waste producer and landfill operator will then need to agree the suite of compliance testing for regularly generated waste to demonstrate compliance with the initial Basic Characterisation prior to disposal.
- At the time of disposal, additional testing on the excavated soils to be disposed of, will likely be necessary.
- Non-hazardous and hazardous soils require pre-treatment (separation, sorting and screening) prior to disposal.
- The costs for disposal of non-hazardous and hazardous soils are significant compared to disposal of inert material.
- In addition to disposal costs, landfill tax will be applicable. Non-hazardous and hazardous waste will generally be subject to the Standard Rate Landfill Tax. Inert or inactive waste will generally be subject to the Lower Rate Landfill Tax. The landfill tax value changes each April and can be found at https://www.gov.uk/government/publications/rates-and-allowances-landfill-tax/landfill-tax-rates-from-1-april-2013.
- Before a waste producer can move waste to a landfill site for disposal, they need to check the landfill site has the appropriate permit and must have completed the following[2]:
  - Duty of care transfer note / Hazardous Waste consignment note, including comment as to if pre-treatment has been undertaken; and
  - Basic Characterisation of the waste, to include: description of the waste; waste code (using list of wastes); composition of the waste (by testing, if necessary) and; WAC testing (if required).

8.3 Materials management

8.3.1 Introduction

Soils that are to remain on site, should be managed and reused in accordance with a Materials Management Plan (MMP), prepared in accordance with 'The Definition of Waste: Development Industry Code of Practice', Version 2 (CL:AIRE), known as the DoWCoP. Where all aspects of the DoWCoP are followed the soils are considered not to be waste, because they were never discarded in the first place.

Version 2 of the DoWCoP clearly sets out the principles and an outline of the requirements of a MMP. The following compliance criteria must be seen to apply to the MMP for the site:

- Factor 1: Protection of human health and protection of the environment.
- Factor 2: Suitability for use, without further treatment.
- Factor 3: Certainty of Use.
- Factor 4: Fixed Quantity of Material.

The reuse of soils at sites should be considered during the planning and development design process so that compliance with issues such as fixed quantity and certainty of use clearly relate to agreed site

[2] ENVIRONMENT AGENCY. November 2010. Guidance on waste acceptance procedures and criteria. Waste acceptance at landfills. The Environment Agency.

levels. Suitability of Use is normally evident from the remediation strategy or the design statement, which form an integral part of a MMP. However, some soils may need to be tested post-excavation to prove they are suitable for use.

Once the MMP is finalised, it must be declared by a Qualified Person (QP). The Declaration is an on-line submission as part of which the QP is required to confirm that the declaration is being made before the relevant works have commenced (i.e. it is not a retrospective application).

Once all material movements have been completed in accordance with the MMP a verification report must be produced, kept for 2 years and provided to the EA on request.

It should be noted that failure to comply with the requirements of the DoWCoP when re-using materials has potentially significant consequences for the waste holder. The risk is that the reused materials are still regarded as a waste that has been illegally deposited. From 1 April 2018, the scope of Landfill Tax has been extended to sites operating without the appropriate environmental disposal permit, and operators of illegal waste sites will now be liable for Landfill Tax. Further information is available at: https://www.gov.uk/government/publications/landfill-tax-disposals-not-made-at-landfill-sites/landfill-tax-disposals-not-made-at-landfill-sites.

If soils are excavated and reused on sites (or moved to another site) without a MMP, exemption, or appropriate Permit in place, anyone who knowingly facilitates the disposal may be '*jointly and severally liable*' to any assessment of tax, fines or prosecution.

8.3.2 Materials management scenarios

The materials management scenarios present on site are discussed below.

It should be noted that more than one scenario may apply, dependent upon where the soils are proposed for reuse.

Made Ground and other contaminated soils

On sites where Made Ground or contaminated soils are present, any soils excavated will be a waste as soon as they are excavated (even if they are clean, naturally occurring materials), unless they are subject to reuse in accordance with the DoWCoP. As such, for any brownfield site or a site where Made Ground is present and soils are being moved and reused, the materials could be deemed a waste, subject to either:

- a Materials Management Plan (MMP), to prevent the material being classified as a waste following reuse; or
- an exemption (for limited volumes); or
- an environmental permit, dependant on its status.

Other commonly occurring circumstances are:

If Made Ground is being moved between sites, it must be ensured that appropriate permits are in place to ensure the soils are not classified as a waste. Made Ground cannot be moved between sites under DoWCoP alone and would require relevant permits as part of the MMP documentation for the Hub site the material is being treated at.

Made Ground and other contaminated soils

All recycled materials (6F2 etc.) must be produced under the 2013 WRAP 'Quality Protocol: Aggregates from inert waste', whether on site or off-site. If they are not, they will be deemed a waste and can only be used on site under a permit. More information can be found at https://www.gov.uk/government/publications/quality-protocol-production-of-aggregates-frm-inert-waste.

Geotechnical improvement requirements

Construction activities carried out on uncontaminated soils solely for the purpose of improving geotechnical properties e.g. lime / cement modification, are not generally regarded as waste treatment operations and do not require a permit.

However, should processing be needed (such as screening, treatment or improvement), that would constitute a waste activity and require a mobile treatment permit. This may be as simple as removing oversize material with an excavator bucket, to using a riddle bucket to remove hardcore to full mechanical screening.

9. UNCERTAINTIES AND LIMITATIONS

9.1 General comments

Hydrock Consultants Limited (Hydrock) has prepared this report in accordance with the instructions of Waterside Places (the Client), by e-mail dated January 2020 under the terms of appointment for Hydrock, for the sole and specific use of the Client and parties commissioned by them to undertake work where reliance is placed on this report. Any third parties who use the information contained herein do so at their own risk. Hydrock shall not be responsible for any use of the report or its contents for any purpose other than that for which it was prepared or for use of the report by any parties not defined in Hydrock's appointment.

This report details the findings of work carried out in January 2020. The report has been prepared by Hydrock on the basis of available information obtained during the study period. Although every reasonable effort has been made to gather all relevant information, not all potential environmental constraints or liabilities associated with the site may have been revealed.

Hydrock has used reasonable skill, care and diligence in the design of the investigation of the site and in its interpretation of the information obtained. The inherent variation of ground conditions allows only definition of the actual conditions at the locations and depths of trial pits and boreholes at the time of the investigation. At intermediate locations, conditions can only be inferred.

Groundwater data are only representative of the dates on which they were obtained and both levels and quality may vary.

Unless otherwise stated, the recommendations in this report assume that ground levels will remain as existing. If there is to be any re-profiling (e.g. to create development platforms or for flood alleviation) then the recommendations may not apply.

Information provided by third parties has been used in good faith and is taken at face value; however, Hydrock cannot guarantee its accuracy or completeness.

The work has been carried out in general accordance with recognised best practice. The various methodologies used are referenced in Appendix J. Unless otherwise stated, no assessment has been made for the presence of radioactive substances or unexploded ordnance. Where the phrase 'suitable for use' is used in this report, it is in keeping with the terminology used in planning control and does not imply any specific warranty or guarantee offered by Hydrock.

The chemical analyses reported were scheduled for the purposes of risk assessment with respect to human health, plant life and controlled waters as discussed in the report. Whilst the results may be useful in applying the Hazardous Waste Assessment Methodology given in Environment Agency Technical Guidance WM3, they are not primarily intended for that purpose and additional analysis will be required at the time of disposal to fully classify waste. Discussion and comment with regards to waste classification are preliminary and do not form the requirements of 'Basic Characterisation' as required.

Assessment and testing for the presence of coal tar has only been completed at the locations of exploratory holes undertaken for risk assessment purposes. This investigation is not designed to provide a definitive assessment of the risk from coal tar, nor the waste classification for bituminous bound pavement arisings at the site.

Unless otherwise stated, at the time of this investigation the future routes of water supply pipes had not been established. This investigation and sampling strategy may not be fully compliant with UKWIR recommendations. Consequently, a targeted investigation and specific sampling and chemical testing may be required at a later date once the routes of the supply pipes are known. In addition, it is recommended that the relevant water supply company be contacted at an early stage to confirm its requirements for assessment, which may not necessarily be the same as those recommended by UKWIR.

Whilst the preliminary risk assessment process has identified potential risks to construction workers, consideration of occupational health and safety issues is beyond the scope of this report.

Please note that notwithstanding any site observations concerning the presence or otherwise of archaeological sites, asbestos-containing materials or invasive weeds, this report does not constitute a formal survey of these potential constraints and specialist advice should be sought.

Any site boundary line depicted on plans does not imply legal ownership of land.

10. RECOMMENDATIONS FOR FURTHER WORK

Following the ground investigation works undertaken to date, the following further works will be required:

- Delineation and additional sampling of deeper Made Ground in the north east portion of the site to determine the volume of material impacted by metals and PAH;
- Should any suspected contamination be identified during the enablement works, Hydrock should be informed and the requirement for remedial measures will be re-visited;
- discussion and agreement with service providers regarding the materials suitable for pipework;
- discussions with regulatory bodies regarding the conclusions of this report;
- production of a piling works risk assessment to establish the risk to underlying aquifers;
- discussions with piling Contractors regarding conclusions of this report and design of the piles;
- provision of geotechnical design for the Category 2 structures (floor slabs, foundations etc.);
- a remediation strategy is required to mitigate the risk of asbestos identified in soils and reuse of any site won soils;
- writing of a Materials Management Plan relating to reuse of soils at the site and import of soils to the site, unless it may be captured via a waste exemption;
- remediation and mitigation works; and
- verification of the earthworks, remediation and mitigation works.

11. REFERENCES

ASSOCIATION OF GROUND INVESTIGATION SPECIALISTS. 2006. Guidelines for Good Practice in Site Investigation. Issue 2. AGS, Beckenham.

BRE. 2016. Soakaway design. BRE DG 365. BRE, Garston.

BRE. 2005. Concrete in aggressive ground. BRE Special Digest 1, 3rd Edition. BRE, Garston.

BRITISH PLASTIC FEDERATION. August 2018. 'Designing Drains and Sewers for Brownfield Sites. Guidance Notes'. BPF Pipes Group (https://www.bpfpipesgroup.com/media/29155/Designing-drains-and-sewers-for-brownfield-sites.pdf)

BRITISH STANDARDS INSTITUTION. 2015. Code of Practice for Foundations. BS 8004. BSI, London.

BRITISH STANDARDS INSTITUTION. 2015+A2 2019. Concrete – complementary British Standard to BS EN 206-1 – Part 1: Method of specifying and guidance to the specifier. BS 8500-1+A2 2019. BSI, London.

BRITISH STANDARDS INSTITUTION. 2007. Eurocode 7 – Geotechnical design - Part 2: Geotechnical investigation and testing. BS EN 1997-2. BSI, London.

BRITISH STANDARDS INSTITUTION. 2009. Code of practice for earthworks. BS 6031 Incorporating Corrigendum No.1:2010. BSI, London.

BRITISH STANDARDS INSTITUTION. 2011. Code of Practice for Investigation of Potentially Contaminated sites. BS 10175 Incorporating Amendment No. 2:2017. BSI, London.

BRITISH STANDARDS INSTITUTION. 2012. Trees in relation to design, demolition and construction – Recommendations. BS 5837. BSI, London.

BRITISH STANDARDS INSTITUTION. 2004+A1 2013. Eurocode 7 – Geotechnical design - Part 1: General rules. BS EN 1997-1+A1. Incorporating Corrigendum February 2009. BSI, London.

BRITISH STANDARDS INSTITUTION. 2015. Specification for topsoil. BS 3882. BSI, London.

BRITISH STANDARDS INSTITUTION. 2015. Code of practice for ground investigations. BS 5930. BSI, London.

CARD, G., WILSON, S. and MORTIMER, S. 2012. A pragmatic approach to ground gas risk assessment. CL:AIRE Research Bulletin RB17. CL:AIRE, London.

CIEH and CL:AIRE. May 2008. Guidance on comparing soil contamination data with a critical concentration. Chartered Institute of Environmental Health and Contaminated Land: Applications in Real Environments, London.

CLAYTON, C. R. I. 2001. Managing Geotechnical Risk. Improving productivity in UK building and construction. Thomas Telford, London.

CL:AIRE. March 2011. The Definition of Waste: Development Industry Code of Practice, Version 2. Contaminated Land: Applications in the Real Environment (CL:AIRE), London.

CONCRETE SOCIETY, THE. 2013. Concrete industrial ground floors. A guide to design and construction. Technical Report 34 (4th Ed.). The Concrete Society, Camberley.

DEPARTMENT FOR ENVIRONMENT FOOD AND RURAL AFFAIRS (DEFRA). 2005. 'Landfill (England and Wales) (Amendment) Regulations', (with reference to previous iterations of the regulations).

DEFRA. March 2014. SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination – Policy Companion Document. Defra, London.

ENVIRONMENT AGENCY. 2006. Remedial Targets Methodology. Hydrogeological Risk Assessment for Land Contamination. The Environment Agency, Bristol.

ENVIRONMENT AGENCY. November 2010. Guidance on waste acceptance procedures and criteria. Waste acceptance at landfills. The Environment Agency.

ENVIRONMENT AGENCY. November 2011. Treatment of waste for landfill. Report – GEHO1111BVDF-E-E 913_11, Version 2 The Environment Agency. http://publications.environment-agency.gov.uk/pdf/GEHO1111BVDF-E-E.pdf

ENVIRONMENT AGENCY. 2018. Waste classification. Guidance on the classification and assessment of waste (1st Edition v1.1) Technical Guidance WM3. The Environment Agency.

ENVIRONMENT AGENCY. 2019. Land Contamination: Risk Management (LCRM). The Environment Agency.

HATANAKA, M, UCHIDA, A, KAKURAI, M, and AOKI, M. 1980. A consideration on the relationship between SPT N-value and internal friction angle of sandy soils. Journal of Structural and Construction Engineering (Transactions of AIJ). 63. 125-129. 10.3130/aijs.63.125_2.

HEALTH and SAFETY EXECUTIVE. December 2005. Construction Information Sheet 47: Inspections and Reports (CIS 47 (Rev 1)). HSE.

HEALTH and SAFETY EXECUTIVE. 2014. HSG47 - Avoiding danger from underground services (Third edition). HSE.

HIGHWAYS AGENCY. 2009. Design Guidance for Road Pavement Foundations (Draft HD25). Interim Advice Note 73/06. Rev 1. Highway Agency, London.

HIGHWAYS AGENCY. 2014. Manual of Contract Documents for Highway Works, Specification for Highway Works: Volume 1, Amendment August 2014. Highway Agency, London.

THE HIGHWAYS AGENCY. 2015. Design Manual, Road and Bridges: Volume 4, Geotechnics and Drainage; Section 1, Earthworks; Part 3, HD 41/15, Maintenance of highway geotechnical assets. HD 41/15.

THE HIGHWAYS AGENCY. 2019. Design Manual for Roads and Bridges. Managing Geotechnical Risk. CD 622 Rev 0. Highway Agency, London.

MILES, J. C. H., APPLETON, J. D., REES, D. M., GREEN, B. M. R., ADLAM. K. A. M. and MYRES. A. H. 2007. Indicative Atlas of Radon in England and Wales. Health Protection Agency and British Geological Survey. Report HPA-RPD-033.

MINISTRY OF HOUSING, COMMUNITIES and LOCAL GOVERNMENT (MHCLG). Internet published Planning practice guidance https://www.gov.uk/government/collections/planning-practice-guidance. MHCLG. London

PECK, R.B., HANSON, W.E., AND THORNBURN, T.H., Foundation Engineering, 2nd Edn, John Wiley, New York, 1967, p.310.

RAWLINS, B. G., McGRATH, S. P., SCHEIB, A. J., CAVE, N., LISTER, T. R., INGHAM, M., GOWING, C. and CARTER, S. 2012 .The advanced geochemical atlas of England and Wales. British Geological Survey, Keyworth.

SCIVYER, C. 2015. Radon: Guidance on protective measures for new buildings. Building Research Establishment Report BR 211. BRE, Garston.

STONE, K., MURRAY, A., COOKE, S., FORAN, J. and GOODERHAM, L. 2009. Unexploded ordnance (UXO), a guide to the construction industry. CIRIA Report C681. Contaminated Land: Applications in Real Environments, London.

STROUD, M. A. 1975. The standard penetration test in insensitive clays and soft rocks. Proceedings of the European Symposium on penetration testing, 2, 367-375.

TOMLINSON. M.J. 2001. Foundation Design and Construction (6th Edition and 7th Edition). Prentice Hall Press

WASTE AND RESOURCES ACTION PROGRAMME (WRAP). October 2013. Quality Protocol. Aggregates from inert waste. End of waste criteria for the production of aggregates from inert waste.

WATER UK HBF. January 2014. Contaminated Land Assessment Guidance. Water UK and the Home Builders Federation.

Appendix A

Drawings

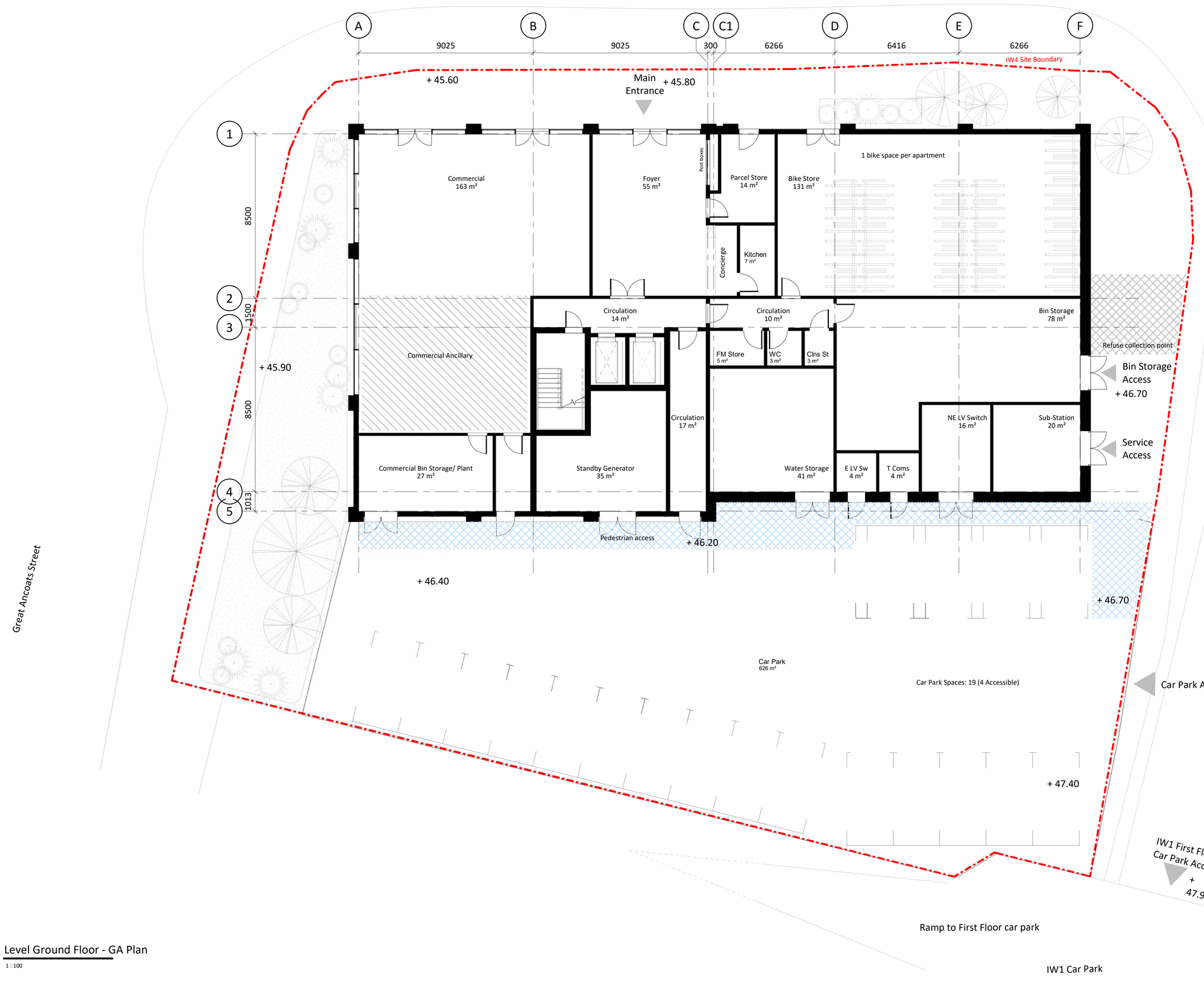
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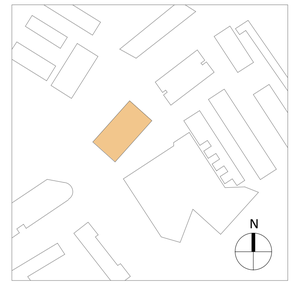
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Level Ground Floor - GA Plan

1 : 100



Flat Type Count and Unit Mix

Name	Count	Unit Mix
1B2P	33	31.1%
2B4P	73	68.9%

Grand total: 106

Total Car Park Spaces: 19 (4 accessible)

Total Cycle spaces: 106 (1:1 ratio)

Refuse Capacity: 12 x 240 L
22 x 1110 L

Note: refuse capacity calculated using the Manchester Residential Quality Guidance

Revision	Date	Drawn by	Checked by
P03	04.02.20	AAl	MSmi

Partition shown between Lobby and Commercial area
Concierge kitchen and WC added. Cleaners Store added
External doors added to Generator and Commercial Bin Store

Revision	Date	Drawn by	Checked by
P02	27.01.20	AAl	MSmi

Updated following Design Review

Revision	Date	Drawn by	Checked by
P01	18.12.19	HBa	MSmi

First issue for comment

Amendment

Purpose of Issue
Issued for information

Project
Muse Development
Islington Wharf - Phase 4
Manchester

Drawing
Level 00 - GA Plan

Drawing No.

Project ID	Originator	Zone	Level	Type	Role	Number
IW4	- RYD	- 00	- 00	- DR	- A	-3000

Ryder Project No.	Scale at A1	Drawn By	Status	Revision
2791-04	As indicated	HBa	S2	P03

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www.ryderarchitecture.com

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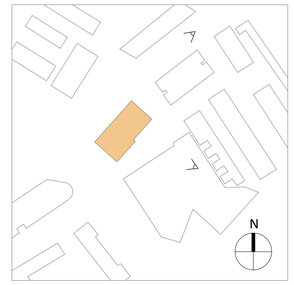
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View of Old Mill Street

View from phase 1 terrace

Revision	Date	Drawn by	Checked by
P01 First Issue	25/03/20	AAl	MSm

Amendment

Purpose of Issue
Issued for information

Project
Muse Development
Islington Wharf - Phase 4
Manchester

Drawing
Visuals 2

Drawing No.

Project ID	Originator	Zone	Level	Type	Role	Number
IW4	- RYD	- 00 -	XX -	VS -	A	-3611

Ryder Project No.	Scale at A1	Drawn By	Status	Revision
2791-04		AAl	S2	P01

info@ryderarchitecture.com
www.ryderarchitecture.com

Ryder

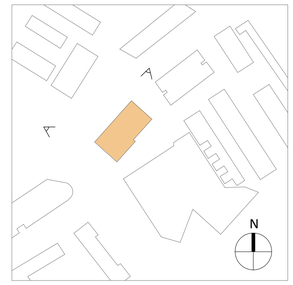
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Corner View from Great Ancoats Street



View from Old Mill Street

Revision	Date	Drawn by	Checked by
P02	24/03/20	AAl	MSm
Updated in line with design development			
P01	13/02/20	AAl	MSm
First Issue			

Amendment

Purpose of Issue
Issued for information

Project
Muse Development
Islington Wharf - Phase 4
Manchester

Drawing
Visuals 1

Drawing No. Project ID	Originator	Zone	Level	Type	Role	Number
IW4	- RYD	- 00 -	XX -	VS -	A	-3610

Ryder Project No.	Scale at A1	Drawn By	Status	Revision
2791-04		AAl	S2	P02

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Ryder

OS NORTH

BH01

TP01

TP02

BH04

BH02

TP03

TP04

TP05

TP06

BH03

SIGNIFICANTLY ELEVATED CONCENTRATIONS OF LEAD AND ARSENIC

LOOSE ASBESTOS FIBRES DETECTED (<0.001%) (CHRYSOTILE)

ELEVATED CONCENTRATIONS OF PETROLEUM HYDROCARBONS IN THE MADE GROUND. ELEVATED CONCENTRATIONS OF METALS, INORGANICS, PAH AND PETROLEUM HYDROCARBONS IN SHALLOW GROUNDWATER.

SLIGHT HYDROCARBON ODOUR

LOCATIONS WITH SIGNIFICANTLY ELEVATED CONCENTRATIONS OF PAH, AND CONJECTURED AREA OF PAH IMPACTED MADE GROUND

SLIGHT HYDROCARBON ODOUR

HARD CEMENT BOUND ACM FRAGMENT (CHRYSOTILE)

KEY

TPXX Hydrock Trial Pit

BHXX Hydrock Borehole

NOTES

1. All dimensions are to be checked on site before the commencement of works. Any discrepancies are to be reported to the Architect & Engineer for verification. Figured dimensions only are to be taken from this drawing.

2. This drawing is to be read in conjunction with all relevant Engineers' and Service Engineers' drawings and specifications.

3. This drawing has been based on the following drawings and information: xxxxxxx

REV.	REVISION NOTES/COMMENTS	DRAWN BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE
P1	FIRST ISSUE	JB	05/03/20	AC	05/03/20	NAME	XX/XX/XX

Hydrock
4 Lakeside
Festival Way
Stoke-on-Trent
ST1 5RY
t: +44(0) 1782 261919
e: stoke@hydrock.com
or visit www.hydrock.com

CLIENT: WATERSIDE PLACES

PROJECT: ISLINGTON WHARF PHASE 4

TITLE: CONTAMINATION ZONATION PLAN

HYDROCK PROJECT NO.: C-10042

SCALE @ A3: NTS

PURPOSE OF ISSUE: SUITABLE FOR INFORMATION

STATUS: S2

DRAWING NO. (PROJECT CODE-ORGINATOR-ZONE-LEVEL-TYPE-ROLE-NUMBER): 10042-HYD-XX-XX-DR-GE-0004

REVISION: P1

Appendix B

Desk Study Research Information

Specialist UXO Desk Top Study

EOD Contracts Ltd

International Unexploded Ordnance Risk Mitigation

Many People... ...One Aim



EXPLOSIVE ORDNANCE DESK TOP STUDY FOR:

PROJECT 20124

ISLINGTON WHARF MANCHESTER M4 6DN

Hydrock





Institute of Explosives Engineers
VOICE OF THE EXPLOSIVES INDUSTRIES

www.eodcontractsltd.com | Tel: 01926 485708

EXPLOSIVE ORDNANCE DESK TOP STUDY

Of

ISLINGTON WHARF
MANCHESTER
M4 6DN

Conducted by EOD Contracts Limited

On behalf of

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Document Originator	Alan Hall	13/01/2020
Authorised Release	Shane Meaker	14/01/2020

All enquiries regarding this document should be directed to:
Email: shane.meaker@eodcontractsltd.com
Telephone: 01926 485708.
Alternatively; the persons named above can be reached at the above address.

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TERMS AND DEFINITIONS

Anti-Aircraft Shells (AA)

Small High Explosive Shells (HE) shells ranging up to 100mm in diameter.

Battlefield Area Clearance (BAC)

The systematic clearance of munitions from military property or old battle sites e.g. ranges, airfields etc.

Borehole Search

The placing of boreholes in a set pattern, then using a magnetometer to take readings at specific depths along each borehole. When used with a geophysical survey system this will give a magnetic signature of the area. The depth of the borehole and the pattern will depend upon the type of Unexploded Bombs (UXB) and the geology of the ground.

Doodle Bug (See Pilotless Aircraft)

Explosive Ordnance (EO)

All munitions containing explosives, nuclear fission/fusion materials and or biological and chemical agents. This includes bombs and warheads; guided and ballistic missiles; artillery, mortar, rocket and Small Arms Ammunition (SAA); all mines, torpedoes and depth charges; pyrotechnics; clusters and dispensers; cartridge and propellant actuated devices; electro-explosive devices; clandestine and improvised explosive devices (IED); and all similar or related items or components explosive in nature.

Explosive Ordnance Clearance (EOC)

See BAC.

Explosive Ordnance Disposal (EOD)

The detection, identification, field evaluation, render safe, recovery and disposal of **UXO**.

Geophysical Survey

The survey of an area using a Magnetometer and geophysical gathering device, after interpretation, this will produce a geophysical map and an object list for any metallic anomalies.

High Explosive (HE)

High explosives burn/detonate at rates of up to 9,000 m/per second.

Incendiary Bomb (IB)

Incendiary bombs ranged from 1kg in size to 500kg the larger sizes were sometimes called Oil Bombs. Fills range from thermite mixtures, phosphorus to kerosene.

Intrusive Survey

The use of a cone penetrometer (MagCone) or drilled boreholes (MagDrill) to take magnetometer test in a set pattern (see borehole search), or to prove pile positions.

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Land Service Ammunition (LSA)

LSA is defined as “All items containing explosives or pyrotechnic compounds which are placed, thrown or projected so as to cause damage to men and equipment during land warfare.

Long Range Rocket (LRR)

The long range rocket sometimes codenamed Big Ben is the V2 rocket designed to deliver an approximate payload of 1000 kg.

Oil Bomb (OB)

A bomb containing a flammable liquid, normally the KC 250 Flam or the C 500 flam.

Pilot less Aircraft (PAC)

A flying bomb (Fly) or doodlebug is the V1 rocket or predecessors designed to deliver an explosive payload of approximately 500kg - 800kg.

Parachute Mine (PM)

Air dropped mine may have been used as a blast effect bomb maximum explosive content 1600lb always fitted with anti-handling and anti-stripping equipment.

Unexploded Bomb (UXB)

Any air dropped bomb that has failed to operate.

Unexploded Ordnance (UXO)

Explosive ordnance that has been primed, fused, armed or otherwise prepared for use or used. It may have been fired, dropped, launched or projected yet remains unexploded either through malfunction or design or for any other cause.

Vengeance Weapons (V)

V1 see Pilotless Aircraft.
V2 see Long Range Rocket.

WWI

First World War 1 (1914 – 1918)

WWII

Second World War 2 (1939 – 1945)

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EXECUTIVE SUMMARY

1 INSTRUCTION

EOD Contracts Ltd, have been commissioned by HYDROCK (hereafter, “the Client”) to undertake a desktop study for potential historic Unexploded Ordnance (UXO) contamination for the future works being carried out within the highlighted areas provided within the CLIENTS drawing below (**Photo 2.1**).

2 SCOPE OF WORK

The scope of this EO Risk Assessment/Desk Study is to assess the likelihood of buried EO/UXO within the environs of “the site” (See **Photo 2.1**), in view of further development. A further aim was to evaluate the implication from UXO contamination during any future intrusive land use.

2.1 LOCATION

The site is located immediately to the southeast of the Junction of Old Mill Street and Great Ancoats Street, Manchester, M4 6DN. The National Grid Reference of the approximate centre of the site is 385246,398249.

Title	Description (Centre of Site)
Address	Islington Wharf, Manchester
Post Code	M4 6DN
Grid Reference	SJ 852982 / SJ 8252398254
OS (X)	385253
OS (Y)	398254

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3 SOURCES OF UXO CONTAMINATION

3.1 Through the use of thorough research (utilising both modern and historic data) EOD Contracts Ltd deem that the two main sources of UXO contamination pertaining to the site are as follows;

- Air delivered ordnance bombs and sub munitions/incendiaries.
- Anti-Aircraft Ammunition (AA)

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4 KEY FINDINGS

4.1 Based on the information researched by EOD Contracts Ltd for the proposed works being carried out in and around the area of Islington Wharf, Manchester, EOD Contracts Ltd can conclude the following.

4.2 Manchester/Salford was not the subject of any bomb strikes during WW1 (see **Annex C**).

4.3 During WW2 Manchester wasn't specifically targeted by the Luftwaffe a great number of times compared to some other cities outside of London (Manchester was the 11th "most Bombed City"). The most devastating period for Manchester was the "Christmas Raids" which took place on the nights of the 22nd to 24th December 1940.

4.4 The site and its surrounding area were the subject of two direct strikes which did cause widespread destruction.

4.5 It is difficult to ascertain the level of construction works that have taken part in and around the site area post WW2. It would appear however that there have been no significant structures that have been constructed post WW2. Therefore, it is possible that items of UXO may have remained undetected.

4.6 There was no recorded evidence of any close proximity HAA gun emplacements in close proximity to the site location.

4.7 EOD Contracts could find no evidence that the site had had any Military usage in the past.

4.8 Therefore (to summarise) EOD Contracts Ltd deem that there is a **MEDIUM** Risk pertaining to items of UXO being located within the site boundaries. See Risk Map (below).

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5 RECOMMENDATIONS

5.1 It is recommended that the following risk mitigation strategy be executed during phases of the project indicated previously as a **MEDIUM** risk.

5.2 Communicating the risks, all stakeholders should be made aware of the UXO situation on the site and the possible impact it may have on the project works and day to day running of the district. Clients have a legal duty under the Construction Design & Management Regulations (CDM) and Health & Safety at Work legislation to provide Designers and Contractors with project specific information needed to identify hazards and risks associated with the design and construction work. The possibility that UXO may be encountered on site falls within the category of a significant risk and as such it should be addressed as early as possible in the lifecycle of the project.

5.3 Further planning - the risks posed by UXO should be brought to the attention of the Project CDM Coordinators and other individuals with a responsibility for project safety and operations at the site. The matter of UXO should be considered critical to project safety and one requiring high priority action.

5.4 UXO safety awareness training should be given at all levels of site personnel and selected individuals on the project staff with relevant responsibilities. A competent person as part of the project safety induction course should provide the awareness training. It should be reinforced with specific safety briefings and toolbox talks to individuals involved in conducting intrusive earthworks.

5.5 Project overview and the responsibilities of those working on site with regard to duty of care and public safety.

5.6 UXO recognition and safety procedures to be followed on discovery of a suspicious object or the alarm being sounded.

5.7 Emergency procedures to be followed in the event of an explosion. Evacuation routes, muster stations and accounting for personnel.

5.8 Work permits, works methodology and specific UXO risk mitigation methods. Post-incident inspections and returning to normal works.

5.9 Prior to any intrusive piling or drilling commencing, UXO safety testing and appropriate clearance certification into the ground to sufficient depth to provide clearance from UXO. This can be done using a progressive drilling process or (where large numbers of piles are to be placed and ground permitting) using a vehicle borne hydraulic system to push a magnetometer into the ground to test for the presence of UXO prior to piling.

5.10 UXO safety monitoring of all “at risk” excavations, including geotechnical or archaeological trial pits to be conducted during the project. A UK Home Office Authorised EOD/UXO Contractor using qualified EOD Engineer with specialist locators and detectors to scan the ground ahead of the excavation wherever possible should provide this.

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6 SPECIFICALLY

6.1 Geotechnical investigations, percussive drilling/trial pits/window/samples, require an EOD Engineer over watch.

6.2 The removal of all buildings within the site footprint can be removed down to ground level (including basements).

6.4 New foundations with piling should be mitigated by the insertion of a magnetometer to encompass the pile position, this would be carried out using a CPT rig (magcone), the expected radius of the magcone is 1.5m therefore multiple piles could be checked.

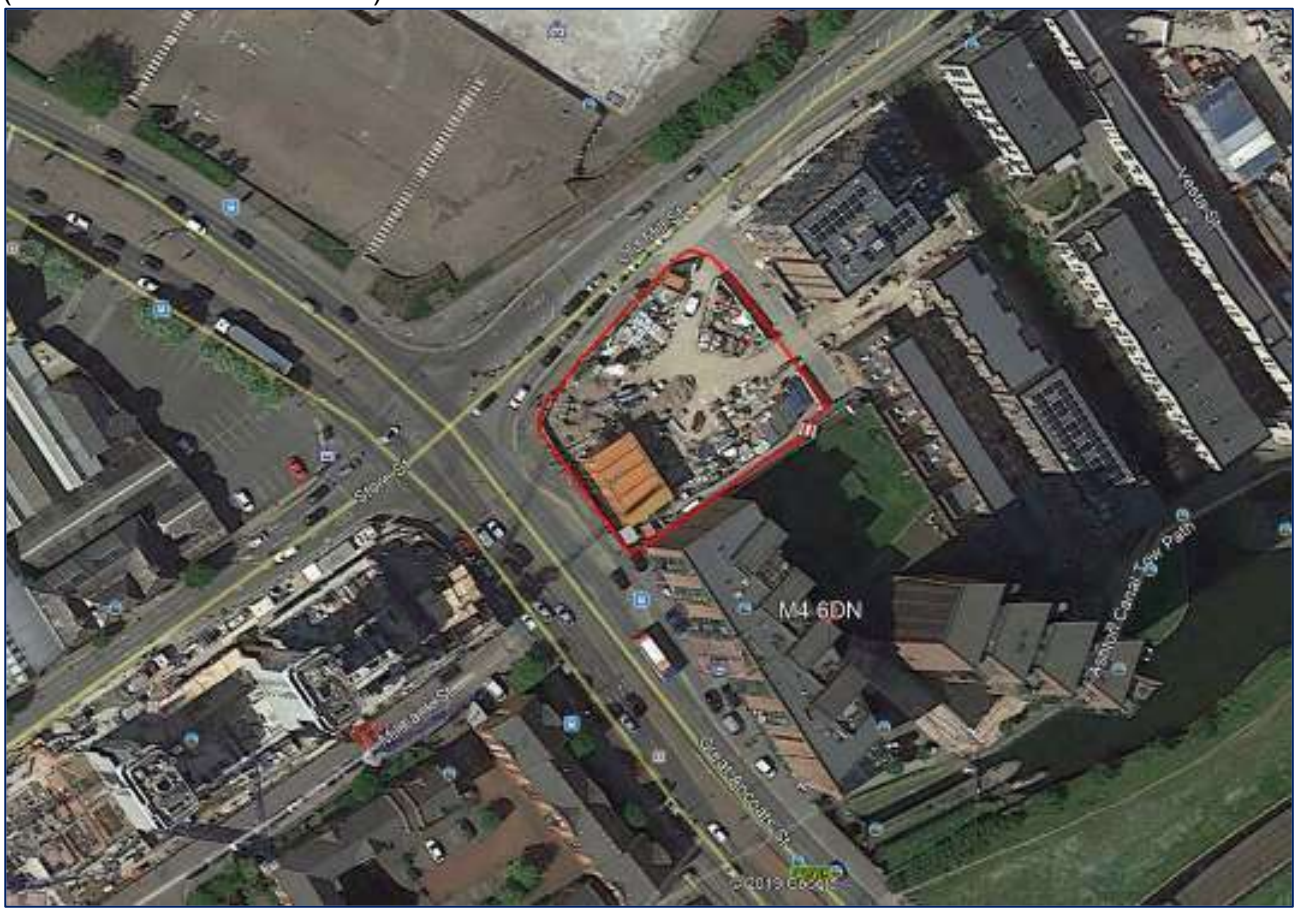
6.5 Non-Intrusive Magnetometer surveys generally prove inconclusive on “Brownfield sites”, this is due to the high ferromagnetic background, therefore this methodology is not recommended for this site and shallow excavations should be overseen by a qualified EOD Engineer.

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EOD Contracts Ltd can supply a turnkey solution to your UXO requirements. Therefore, the following mitigation strategies can be supplied for land or water-based operations:

- Intrusive survey using CPT *(Cone Pressure Testing)* or borehole equipment, *supplying risk mitigation to all Borehole and Pile locations, down to a maximum bomb penetration depth determined within this document.*
- Non-Intrusive Survey using multiple array system with DGPS *(Digital Global targets be identified.*
- Offshore, near-shore, estuarine and freshwater water environments magnetic, side scan and bathymetric supported by state of the art DGPS.
- The aforementioned surveys are supported with post processing of data and intrusive investigations if required.
- EOD Engineer over watch using Suitably Qualified and Experienced Personnel, normally former British Army, Navy or RAF Bomb Disposal specialists.
- Explosive Ordnance Safety Presentations.

PHOTO 2.1: Clients Scope of works, This DTS will be covering all areas within the site footprint (bordered and shaded in red).



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1.0 INTRODUCTION

1.1 Instruction

EOD Contracts Ltd, have been commissioned by HYDROCK (hereafter, “the Client”) to undertake a desktop study for potential historic Unexploded Ordnance (UXO) contamination for the future works being carried out within the highlighted areas provided within the CLIENTS drawing (**Photo 2.1**).

1.2 Scope Of Work

The scope of this EO Risk Assessment/Desk Study is to assess the likelihood of buried EO/UXO within the environs of “the site” in view of further development. A further aim was to evaluate the implication from UXO contamination during any future intrusive land use.

1.3 Restrictions

It must be emphasized that a desk study can only indicate the potential for UXO to be present on the site. A geophysical survey and intrusive investigation is fundamentally important to provide proof that the site is free of the UXO threat.

This study was written with the site conditions prevailing at the time of the study and no liability can be accepted for any change in the condition of the area.

Please note that our appraisal relies on the accuracy of the information contained in the documents consulted and that EOD Contacts Ltd will in no circumstances be held responsible for the accuracy of such information or data supplied.

1.4 Sensitive Documentation

Information may be classified, restricted or deemed to be confidential in nature to EOD Contracts Limited, where such material has been gained a summary of the documentation has been approved.

1.5 Objective

The objective of this document is to define the UXO contamination routes as defined in Unexploded ordnance (UXO) A guide for the construction industry (C681) dated July 2015 and offer remediation methodologies if required.

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2.0 SOURCES OF INFORMATION

Research of the site's history, with regard to military usage, bombing raids and bomb impacts has been undertaken to establish the following:

- Frequency and intensity of enemy bombing raids for the site and immediate vicinity up to 500m.
- Bomb impacts and associated damage on the Site and in the immediate vicinity.
- The potential for UXO to remain on the Site and in the vicinity.
- Records of UXO removal activities for the Site and immediate vicinity.

The main sources of information consulted include:

- EOD Contracts Ltd company records
- Ministry of Defence records
- Central and Local Government Records
- The University of Manchester (Library)
- Public Records Office (Kew)
- Historic Maps and Air Photography
- Open Source information (Internet)

2.1 Ministry of Defence (MOD) Records

33 Engineer Regiment (Explosive Ordnance Disposal) Royal Engineers is the unit responsible for maintaining the records concerning conventional Bomb incidents, reports, clearances and related UXO matters. These records are known to be incomplete and are no longer supplied. Based on in-house information released by the MOD previously, it is considered unlikely that any information released will have any significant impact on the findings of this study.

2.2 Attack Record Keeping

In general, the quality and accuracy of bombing and shelling records prior to 1939 varied greatly from one region to another. Records relating to the limited air attacks on the United Kingdom are considered to be sufficiently accurate in urban areas to provide a reasonable level of confidence in determining the likelihood that an area was or was not bombed during this period. Wartime records, maps etc held within the civil archives are considerably more comprehensive than those still in existence within the MOD, where it is acknowledged that large numbers of records have been disposed of since 1945. Records from some areas, particularly rural districts or near large bodies of water should still be regarded as an incomplete picture of the extent and effect of the bombing campaign.

2.3 Attack Record Accuracy.

While an Air Raid was in progress it was inevitable that mistakes would be made in the transcription of rushed verbal reports into the written records. Discrepancies did occur between the total of bombs dropped against detonations witnessed. In some cases, records were made several hours after the event and mistakes were inevitable. Some reports were drafted before the full extent of the raid had been determined which has led to significant omissions in the records. Reports of raids on rural areas were often witnessed and submitted by untrained individuals and passed through third parties before being recorded. Suspect UXBs occasionally went unreported by local farmers and freeholders

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who saw the event as insignificant, or were reluctant to report their findings for fear of valuable land or crops being destroyed by the authorities in their attempts to find the UXB. It should also be noted that bomb strikes in water were notoriously difficult to spot, particularly if the bomb had failed to detonate. As a result, bomb record accuracy in areas containing large bodies of water or marshland is considered to be questionable.

2.4 Errors and Omissions

The accuracy of bombing records has been shown to vary greatly; this may have been a result of the individual record keeper's expertise. Additionally, in some cases, errors occurred as a result of poor or incomplete transcription and copying. Some "errors and omissions" were intentional, designed to serve as dis-information to confuse German intelligence. So long after the event, official verification of such incidents has often proven to be impossible to obtain. At present, UXBs are found on construction sites and other locations where there had been no documentary evidence to suggest their presence. These events, although infrequent, do serve as confirmation that records cannot be considered definitive.

2.5 Bibliography

The significant published documents referred to during this study are listed below:

- HO 193 series from National Archives
- HO 198 series from National Archives
- GB127.MISC_1192_1_001-045 Manchester Bomb Damage Maps
- The Blitz Then and Now Volumes 1 to 3
- AA Command Colin Dobinson
- German Air Raids on Britain 1914-1918
- http://luna.manchester.ac.uk/luna/servlet/view/all/where/England%253A%2BGreater%2BManchester%253A%2BManchester/when/20th%2BCentury%2BCE/1940-1941/
- http://aircrashsites.co.uk/air-raids-bomb-sites/the-christmas-blitz-on-manchester-1940/
- https://www.iwm.org.uk/history/the-manchester-blitz
- http://aircrashsites.co.uk/air-raids-bomb-sites/luftwaffe-v1-attack-on-manchester-christmas-eve-1944/
- https://www.manchestereveningnews.co.uk/news/greater-manchester-news/manchester-christmas-blitz-1940-five-10509677
- http://www.bbc.co.uk/history/ww2peopleswar/stories/82/a2078282.shtml

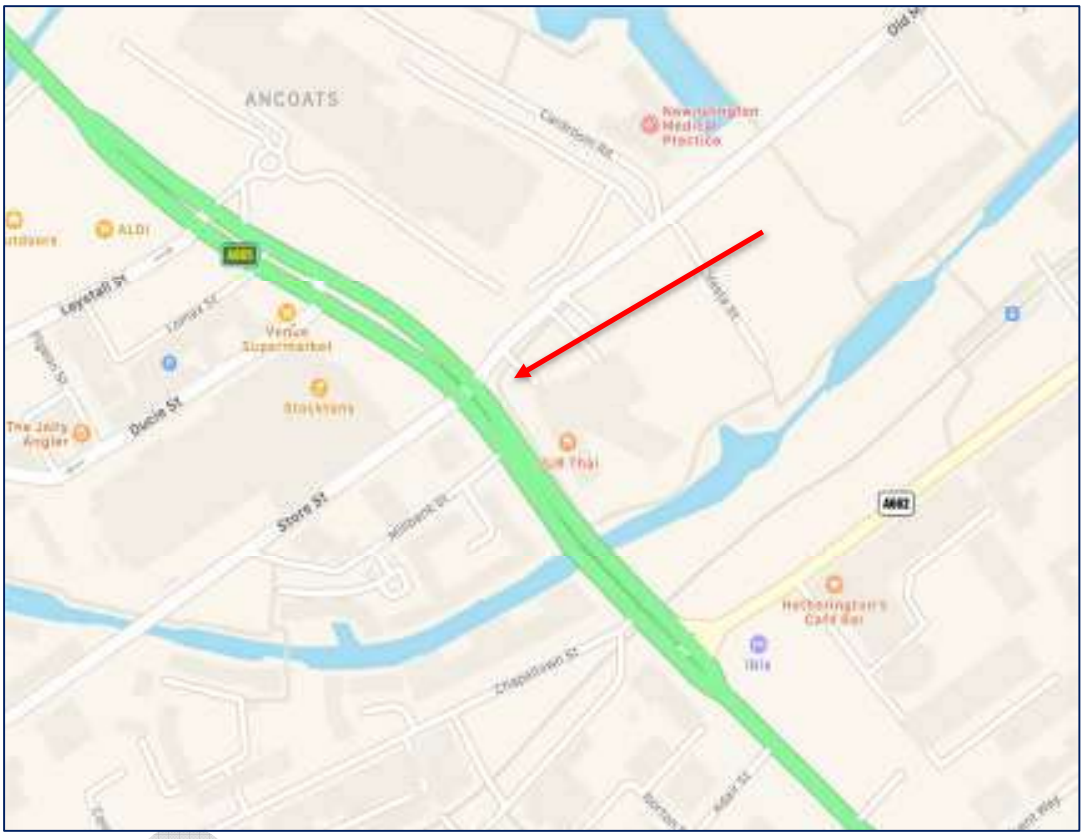
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3.0 SITE DESCRIPTION AND DETAILS

3.1 Location

The site is located immediately to the southeast of the Junction of Old Mill Street and Great Ancoats Street, Manchester, M4 6DN. The National Grid Reference of the approximate centre of the site is 385246,398249.



Title	Description (Centre of Site)
Address	Islington Wharf, Manchester
Post Code	M4 6DN
Grid Reference	SJ 852982 / SJ 8252398254
OS (X)	385253
OS (Y)	398254

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3.2 Description

SOURCE: *Hydrock – Ground Condition Desk Study (Doc Ref:- IW4-HYD-XX-XX-RP-GE—0001_Desk_Study)*

- Site Access: Via two gateways leading directly off the unnamed road forming the eastern site boundary.
- Site Area: Irregular parcel of land approximately 0.18 ha
- Site boundaries and surrounding land: The site is bound on the western, northern and eastern sides by Great Ancoats Street, Old Mill Street and an unnamed street respectively, and to the south by the recently constructed Islington Wharf Phase 1 residential development. Land use beyond the roads includes residential to the west; a construction site to the east (Islington Wharf Phase 3); and the Central Retail Park to the north.

3.3 Geology

The general geology of the site area is shown on the British Geological Survey (BGS) 1:50,000 geological map of Manchester (Sheet 85) and is summarised in Table 3.1.

Table 3.1: General geology for the site area
SOURCE: *Hydrock – Ground Condition Desk Study (Doc Ref:- IW4-HYD-XX-XX-RP-GE—0001_Desk_Study)*

Ref. for Figures	Location	Stratigraphic Name	Description
Superficial Deposits (Figure 2.6)			
1	Beneath the whole site.	Glacial Till	Typically firm to stiff clays and silts with varying amounts of sand, gravel and cobbles of mixed lithology. Locally may also contain occasional boulders.
Solid Geology (Figure 2.7)			
1	Beneath the whole site.	Chester Formation	Typically red or brown pebbly sandstones with generally thin, subordinate siltstones and mudstones.

3.4 Current Site Use

See **3.2 Description** & **Annex A**.

At the time of writing the site was being used by Eric Wright Construction, the main contractor responsible for the construction of the Islington Wharf development, as a materials storage yard and site offices during the building of the adjacent phases of the development. Besides general construction materials (e.g. scaffolding, insulated wall panels, bricks, concrete blocks, timber, pallets etc.), the yard also includes two mortar silos, located adjacent to the northwest site boundary. Also, in this area of the site is an above ground diesel storage tank. The tank is not bunded or protected in any way and stands on two concrete blocks over a sheet of DPC membrane or similar, which itself lies on bare earth. Staining of the membrane was noted.

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A temporary, three-storey office complex, comprising 15 Portacabins arranged in three rows of five, is located in the southwestern part of the site.

3.5 Future Works

At the time of writing this report it is understood that the site will be redeveloped (the exact scope of works is not known at this time). Therefore, it is assumed that the following intrusive construction works will be carried out:

- Geotechnical investigations, percussive drilling/trial pits/window/samples
- Removal of buildings to ground level
- Removal of old foundations
- Foundations with large diameter rotary bored piling

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4.0 HISTORICAL REVIEW

4.1 Historical Mapping and Aerial Photography

Annex B contains a full historic map break down of the site.

- Historic Map 1922 - 1932 - shows the site area (bordered in pink). The site at this time is occupied. However, the layout is not as it is in present day. The site is intersected with a street that is no longer there (Back Mill Street). Either side of the street are various buildings (these vary from a Pub to furniture factories and also partly over a Technical School).
- Historic Map 1950 - 1951 – Some of the buildings that previously occupied the site layout appear now not to be listed (this can be explained in Annex D in which the site was the subject of two bomb strikes within the site area).
- Historic Map 1989 – 1992 – This map highlights all the previous buildings that occupied the site area have since been removed.
- Aerial Photo 1999, this more modern site aerial photo shows that there has been very little change to the site layout since the previous map. The site area appears to have been left derelict post demolition.
- 2019 modern day map. No apparent changes to the site layout.

4.2 WWI

Although many people associate wartime bombing with The Blitz during World War II, the first airborne terror campaign in Britain took place during the First World War. Air raids in World War One caused significant damage and took many lives. German raids on Britain, for example, caused 1,413 deaths and 3,409 injuries. Air raids provided an unprecedented means of striking at resources vital to an enemy's war effort. Many of the novel features of the war in the air between 1914 and 1918 the lighting restrictions and blackouts, the air raid warnings and the improvised shelters became central aspects of the Second World War less than 30 years later. The East End of London was one of the most heavily targeted places. Poplar, in particular, was struck badly by some of the air raids during the First World War. Initially these were at night by Zeppelins, which bombed the area indiscriminately, leading to the death of innocent civilians.

The first daylight bombing attack on London by a fixed-wing aircraft took place on 13 June 1917. Fourteen German Gotha G bombers led by Squadron Commander Hauptmann Ernst Brandenberg flew over Essex and began dropping their bombs. It was a hot day and the sky was hazy; nevertheless, onlookers in London's East End were able to see 'a dozen or so big aeroplanes scintillating like so many huge silver dragonflies'. These three-seater bombers were carrying shrapnel bombs, which, were dropped just before noon. Numerous bombs fell in rapid succession in various districts. In the East End alone 104 people were killed, 154 seriously injured and 269 slightly injured.

The gravest incident that day was a direct hit on a primary school in Poplar. In the Upper North Street School at the time were girls' class on the top floor, a boys' class on the middle floor and an infant class of about 50 students on the ground floor. The bomb fell through the roof into the girls' class; it then proceeded to fall through the boys' classroom before finally exploding in the infant class. Eighteen students were killed, of whom sixteen were aged from 4 to 6 years old. The tragedy shocked the British public at the time.

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Using the map located within **Annex C** it would appear that the area in which the subject site is located was not the subject of bombardment throughout WWI, with the closest recorded incidents being located in Birmingham & Coventry.

4.3 WWII

4.4 The Blitz Around Britain

The 'Blitz' – from the German term Blitzkrieg ('lightning war') – was the sustained campaign of aerial bombing attacks on British towns and cities carried out by the Luftwaffe (German Air Force) from September 1940 until May 1941.

The Blitz began on 7 September, 'Black Saturday', when German bombers attacked London, leaving 430 dead and 1,600 injured. London was then bombed for 57 consecutive nights, and often during daytime too. London experienced regular attacks and on 10-11 May 1941 was hit by its biggest raid. German bombers dropped 711 tons of high explosive and 2,393 incendiaries. 1,436 civilians were killed. However, this proved to be the last major raid until January 1943.

While London was bombed more heavily and more often than anywhere else in Britain, the Blitz was an attack on the whole country. Very few areas were left untouched by air raids. In relatively small compact cities, the impact of a severe air raid could be devastating.

From mid-November 1940, major provincial cities and industrial centres were targeted. In early 1941 another wave of attacks began, primarily against ports. Respite finally came from June when much of the Luftwaffe was directed against Russia and targets in the Mediterranean.

4 .5 Manchester during the Blitz

Manchester and its surrounding area were a major centre of industry during the Second World War. Many large firms were concentrated in the Trafford Park area, making it an important target for the Luftwaffe. Major producers included the aircraft manufacturers A V Roe that produced Manchester and Lancaster Bombers; Ford also employed 17,000 workers making aero engines in a huge new factory complex. During the raids on 22nd – 24th December 1940, the Metropolitan-Vickers works in Mosley Road was just one of the areas factories that was badly damaged. In a later raid 1n 1941 Manchester United's Stadium was hit by a bomb and remained out of action till 1949.

Manchester was attacked on the night of 22nd – 23rd December and again the following night of 23rd – 24th December 1940 (the Christmas raids). On the first night of the raids over 272 tons of HE Bombs was dropped, followed the next night by a further 195 tons. In cooperation to this the Luftwaffe also dropped around 2000 Incendiary bomblets across the city.

Additionally, to these raids, Manchester also suffered smaller attacks, including one in June 1941 when the Blitz was thought to be over. The city had three major raids over the Blitz period (a major raid being defined when over 100 tons of HE Bombs have been dropped) in total, more than 578 tons of explosives were aimed at the city making it the 11th most heavily raided city in Britain.

During the Christmas Raids over 600 fires were started by Incendiary bombs, unfortunately the majority of these were allowed to burn causing further damage. This was due to the

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cities 3,500 full and part time fire fighters had not returned from Liverpool where they had been sent several days before to help fight fires caused by previous raids. In some cases, the Army was utilised to demolish surrounding buildings to stop the fire from spreading further. Some of the fires continued to burn throughout the day on the 23rd December, providing a beacon for the German Luftwaffe upon its return that night.

So far as the cities infrastructure was concerned, following the Christmas raids both of Manchester's railway stations had been hit, as were the major bus stations. Deansgate and Oxford Road were blocked by debris from damaged buildings; bomb craters and UXBs meant that whole sections of the city had to be cordoned off. Water supplies were also affected and electricity was rationed.

The site itself does appear to have suffered a direct strike throughout the Christmas raids.

4.6 V1 & V2 Bomb strikes

On Christmas Eve 1944, Heinkel He111 bombers flying over the Yorkshire coast launched 45 flying bombs at Manchester. No V-1s landed in Manchester itself, but 27 people in neighbouring Oldham were killed by a stray bomb. Another 17 people were killed elsewhere and 109 wounded overall. RAF De Havilland Mosquitos shot down one German bomber over the North Sea and severely damaged another, causing it to crash land in Germany

4.7 Abandoned Bombs/UXO

EOD Contracts records could find no evidence of any items of UXO abandoned in or around the subject site.

4.8 Anti-Aircraft Artillery

The nearest recorded location of heavy anti-aircraft gun (HAA) position was over 4km northwest of the site.

4.13 Prior Clearance Operations

EOD Contracts could find no evidence to suggest that there have been any prior UXO clearance operations in or around the site footprint.

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5.0 SOURCES OF UXO CONTAMINATION

The main sources of UXO contamination that are deemed a threat to the site are:

- Air delivered ordnance bombs and sub-munitions/incendiaries.
- Anti-Aircraft Ammunition (AA).

5.1 GENERAL

EOD Contracts conclude that a **MEDIUM** risk is considered to exist with respect to UXO for areas within the site footprint. Although the site itself has been the subject of demolition works post WW2 there is still the possibility that items of ordnance could have remained undetected down to bomb penetration depth.

UXOs are essentially dangerous; therefore, further information on UXO and Safety is detailed in **Annex E**.

5.2 BOMB PENETRATION DEPTHS

5.3 Weapon Sub-surface Penetration.

Weapons penetrate a significant depth into the ground and other types of ammunition are designed to permit the weapon time to penetrate deeply into the target before detonating a short time after coming to rest or a considerable number of hours afterwards. The second reason is where the weapon has failed to function as designed becoming a UXB. A number of studies have been carried out into weapon penetration and it is an inevitable consequence of a number of variable factors acting on the bombs trajectory that figures can and do differ significantly. Careful consideration must be given to the weapon's velocity, trajectory and shape. Also surface conditions and subsurface geology. The largest of the common German bombs, (500kg) can penetrate to significant depths given favourable conditions for penetration. In the case of projectiles and shells, the potential for deep penetration is significantly less.

5.4 Penetration Assumptions.

A number of assumptions were used in determining the maximum threat depth within the project footprint, which were;

5.6 Factors Affecting Penetration

The penetration of sub-surface bombs will be affected by the following:

- Height of release
- Weight, shape and design of bomb
- Aerodynamic qualities
- Angle of flight and impact
- Nature of impact surface
- Nature of sub soil

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The expected bomb depths for the site assuming the following criteria:

- 15,000 feet, the vast majority of bombs were dropped from height to avoid AA fire and balloons
- General Purpose Bombs of 50kg to 1000kg
- Near Vertical impact 80 to 90 degrees
- Surface geotechnical conditions are made ground
- Subsurface geotechnical conditions are generally clays.

Therefore, the expected depths for Air dropped UXBs on site are indicated in **RED** in the following table:

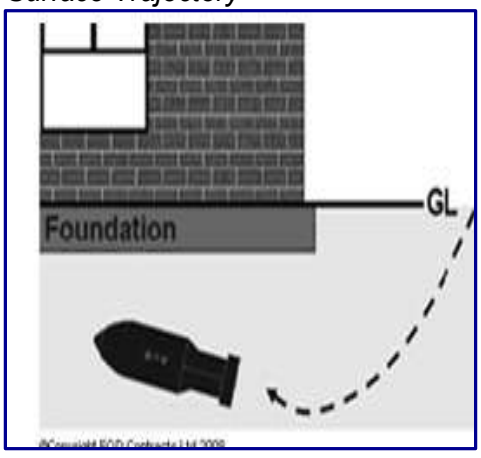
TABLE 5.1: *Bomb Penetration Depths*

	Bomb Weights			
Sub Soil Type	50kg	250kg	500kg	1000kg
Soft Rock	2.442	5.016	6.006	7.062
Gravel	**2.442**	**5.016**	**6.006**	**7.062**
Sand	**2.442**	**5.016**	**6.006**	**7.062**
Chalk	3.7	7.6	9.1	10.7
Shingle	3.7	7.6	9.1	10.7
Dry Clay	**3.7**	**7.6**	**9.1**	**10.7**
Wet Sand	5.55	11.4	13.65	16.05
Wet Clay	5.55	11.4	13.65	16.05
Average Offset (m)	**0.8-1.6**	**1.6-3.7**	**3-4.5**	**3.4-5.3**

Bombs on penetration of the surface do not follow a straight-line trajectory they can and do curve; this is called a “J” curve where the bomb’s path bends back towards the surface. This gives what is known as the Offset, which may place a bomb under a structure and at a shallow depth.

Figure 5.1 – 5.3: Sub-Surface Trajectories & Safety Buffers

Figure 5.1: *Common Sub-Surface Trajectory*



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Figure 5.2: *Anomalous Sub-Surface Trajectory*

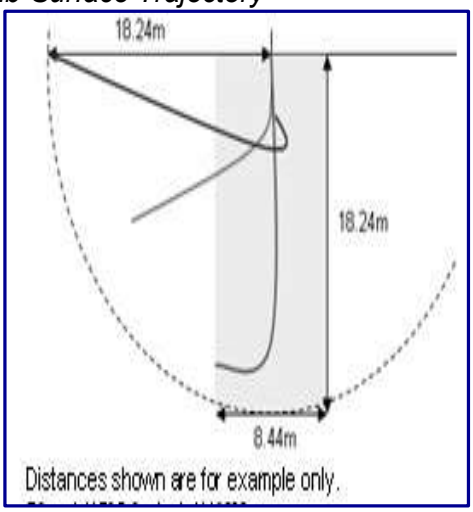
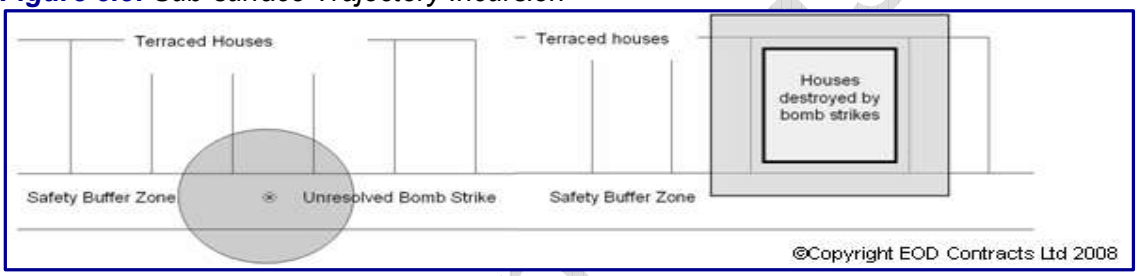


Figure 5.3: *Sub-surface Trajectory Incursion*



NOTE: *the common sub-surface trajectory will follow a path best described as a 'J' curve. The curve can result in a weapon coming to rest some distance from its impact point. The distance from impact point to resting place is referred to as the "Off set Distance and is normally considered to be 1/3 of the depth. This mechanism can permit a weapon to strike outside a building and travel below ground finally coming to rest within the building footprint. Where a strike is known to have occurred close to a building or structure such as a dock wall, a danger zone should be considered to exist around the area of the strike of sufficient size to accommodate the likely sub-surface travel distance for the weapon.*

NOTE: *the typical offset distance is shown as the shaded area, on rare occasions a near surface deflection of the weapon can occur and the offset distance can be substantially increased up to 5/4 of the penetration depth. This mechanism does however reduce the penetration depth considerably with the net result that while the offset is increased the overall travel distance is for the most part unaffected.*

NOTE: *scenario 1 (Figure 5.1) shows a hypothetical bomb strike outside a structure or building. The strike location has been accurately identified and as a consequence; a potential danger zone (circular shaded area) can be placed around the point of impact. Scenario 2 shown top right; depicts a direct HE bomb or Incendiary strike within a building which totally destroyed the building. In circumstances such as this UXB entry the building rubble may have concealed hole and the weapon may still be present within the building footprint or it may have travelled sub-surface and come to rest outside the footprint. Here the danger zone (square shaded Area) extends outwards on all sides of the original building footprint.*

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5.7 RECENT UXO FINDS WITHIN THE UK

The present-day threat of finding items of UXO within the UK is still high, as highlighted within **Annex F**.

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6.0 RISK ASSESSMENT

6.1 Risk Assessment

Assessing both the likelihood of occurrence and the consequences of the encounter has derived the overall risk for the site from unexploded ordnance. Review of the site's history and geographic location can provide an overall likelihood of encounter factor, which is used in the subsequent determination of a risk level when a Figure can be determined for the consequence.

6.2 Likelihood of Encounter

Given the study findings and other criteria (See **Annex G** Tables) it is considered that there is a **MEDIUM** risk of encountering UXO within the site footprints. This finding is based on assessment of all of the available information.

6.3 Consequence of Encounter

The consequence (See **Annex E**) of an uncontrolled encounter with UXO, given its lethal design and its unpredictable nature could be catastrophic and warrants a high severity factor. With regards to the consequences, the following factors were considered:

The project works may make use of a number of common ground investigation and construction techniques in its methodology during the project. Any intrusive groundwork has the potential to encounter UXO.

Intrusive earthwork, piling driving and dynamic ground compaction are by nature, aggressive, significant force (kN) is often required to achieve the desired results. As a precaution it is prudent to assume that any external stimulus, no matter how slight, may result in an unstable weapon detonating.

Records of encounters with UXO, particularly where plant machinery has been involved have resulted in detonations of the items with varying degrees of consequence; ranging from slight injuries sustained to piling contractors when a bomb detonated at 6.0m bgl to fatal injuries sustained to a construction worker while conducting near surface machine works on a motorway.

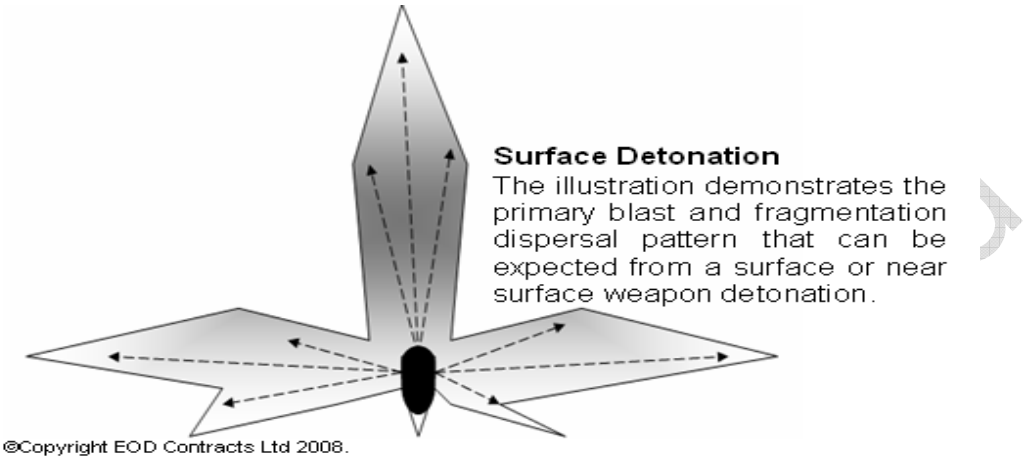
Detonation on land; the effects of a detonation at depth will be more localised and less destructive than one occurring on the surface. Figure 6.1 shows an illustration of the primary blast and fragmentation dispersal from explosive ordnance when it detonates on the surface. The weapon's design, and other key factors such as the ratio of explosive charge weight to total weapon weight (CWR) and the Net Explosive Quantity (NEQ) will determine the size and effects of a blast. The effects will also be enhanced or reduced by a number of factors including, the presence of other energetic materials in close proximity to the blast or if the weapon is buried or exposed on the surface. As a guide Figure 6.1 gives an indication of the likely blast radius for common types of UXO.

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Figure 6.1: *Primary Blast & Fragmentation on Land*

Blast and fragmentation dispersal.



In addition to the dangers of explosion, many common chemicals used in the manufacture of explosive ordnance fillings are; in sufficient quantity, and level of exposure, toxic or poisonous. Although it is unlikely that such chemicals would be encountered in significant quantity to represent a significant risk to personnel, leakage or venting could pose a risk to the local marine environment. In addition to heavy metals; copper, lead, zinc etc used in the weapon body and fuze, hydrocarbon propellants such as Kerosene may also be present.

6.4 Risk Level

The overall risk has been determined to apply to all of the ground within the site footprint.

The prevailing risk level has been determined to be **MEDIUM** risk for some of the positions located within the site footprint. These have been highlighted within the Risk Map situated in **Annex H**.

6.5 Encounter Consequences

It is acknowledged that when viewed from a “likelihood versus consequence” scenario; the consequences of an explosion may have the potential to include:

- Multiple casualties or fatalities.
- Extensive damage to high value private and public assets and property.
- Significant delays to the construction project.

6.6 Those at Risk

The risk is considered to have the potential to pose a direct and indirect threat to a wide range of individuals and facilities. While the impact on fixed assets can be estimated based on the asset’s proximity to the seat of the explosion. The impact to transient assets and people will, for the most part, be the result of both; proximity to the explosion and the time at which the event occurs. The overall impact therefore has the potential to range

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from little more than a minor localised event to a level, which may be considered to be a more widespread major incident involving some or all of the following:

- Construction and other specialist personnel carrying out the work.
- General public in open spaces, at their places of work and transient population on foot or road users in proximity to the construction work.
- Public services including; transport, water, gas and electricity supplies.
- Public facilities, including; buildings, vehicles, other high value assets and equipment.
- Private business property including construction equipment.
- Private residential property in proximity to the work.

6.7 At Risk Activities

Based on our understanding of the scope of the most common construction projects, it is considered that a wide range of intrusive processes may be required to complete the project. Any intrusive groundworks have the potential to encounter UXO and each activity therefore has a degree of risk attached to it. The severity or level of the risk is derived as a consequence of activity's; location, methodology and volume or quantity of risk material to be worked, at risk activities are considered to include:

- Intrusive geotechnical and archaeological investigations including drilling and pitting.
- Foundation construction, trenching and other excavations.
- Intrusive construction works, which may include piling. The study findings and other criteria (See **Annex G** Tables) it is considered that there is a **MEDIUM** risk of encountering UXO within the site footprint. This finding is based on assessment of all of the available information and taking account of the following factors:

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7.0 CONCLUSIONS

Based on the information researched by EOD Contracts Ltd for the proposed works being carried out in and around the area of Islington Wharf, Manchester, EOD Contracts Ltd can conclude the following.

Manchester/Salford was not the subject of any bomb strikes during WW1 (see **Annex C**).

During WW2 Manchester wasn't specifically targeted by the Luftwaffe a great number of times compared to some other cities outside of London (Manchester was the 11th "most Bombed City"). The most devastating period for Manchester was the "Christmas Raids" which took place on the nights of the 22nd to 24th December 1940.

The site and its surrounding area were the subject of two direct strikes which did cause widespread destruction.

It is difficult to ascertain the level of construction works that have taken part in and around the site area post WW2. It would appear however that there have been no significant structures that have been constructed post WW2. Therefore, it is possible that items of UXO may have remained undetected.

There was no recorded evidence of any close proximity HAA gun emplacements in close proximity to the site location.

EOD Contracts could find no evidence that the site had had any Military usage in the past.

Therefore (to summarise) EOD Contracts Ltd deem that there is a **MEDIUM** Risk pertaining to items of UXO being located within the site boundaries. See Risk Map (below).

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8.0 RECOMMENDATIONS

It is recommended that the following risk mitigation strategy be executed during phases of the project indicated previously as a **MEDIUM** risk.

Communicating the risks, all stakeholders should be made aware of the UXO situation on the site and the possible impact it may have on the project works and day to day running of the district. Clients have a legal duty under the Construction Design & Management Regulations (CDM) and Health & Safety at Work legislation to provide Designers and Contractors with project specific information needed to identify hazards and risks associated with the design and construction work. The possibility that UXO may be encountered on site falls within the category of a significant risk and as such it should be addressed as early as possible in the lifecycle of the project.

Further planning - the risks posed by UXO should be brought to the attention of the Project CDM Coordinators and other individuals with a responsibility for project safety and operations at the site. The matter of UXO should be considered critical to project safety and one requiring high priority action.

UXO safety awareness training should be given at all levels of site personnel and selected individuals on the project staff with relevant responsibilities. A competent person as part of the project safety induction course should provide the awareness training. It should be reinforced with specific safety briefings and toolbox talks to individuals involved in conducting intrusive earthworks.

Project overview and the responsibilities of those working on site with regard to duty of care and public safety.

UXO recognition and safety procedures to be followed on discovery of a suspicious object or the alarm being sounded.

Emergency procedures to be followed in the event of an explosion. Evacuation routes, muster stations and accounting for personnel.

Work permits, works methodology and specific UXO risk mitigation methods. Post-incident inspections and returning to normal works.

Prior to any intrusive piling or drilling commencing, UXO safety testing and appropriate clearance certification into the ground to sufficient depth to provide clearance from UXO. This can be done using a progressive drilling process or (where large numbers of piles are to be placed and ground permitting) using a vehicle borne hydraulic system to push a magnetometer into the ground to test for the presence of UXO prior to piling.

UXO safety monitoring of all “at risk” excavations, including geotechnical or archaeological trial pits to be conducted during the project. A UK Home Office Authorised EOD/UXO Contractor using qualified EOD Engineer with specialist locators and detectors to scan the ground ahead of the excavation wherever possible should provide this.

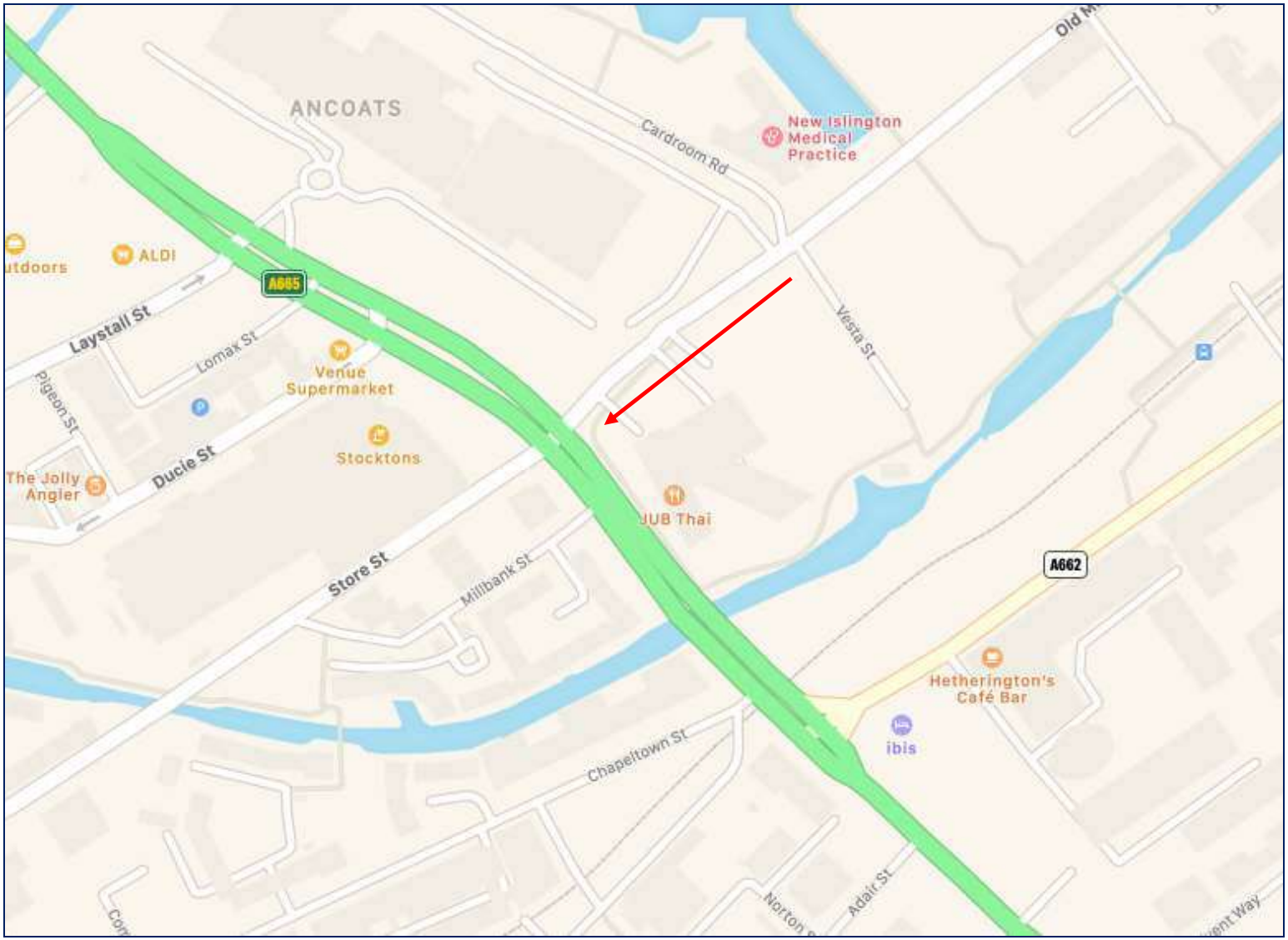
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Annex A

SITE LOCATION

NOTE: Site indicated with Red arrow.



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Annex B

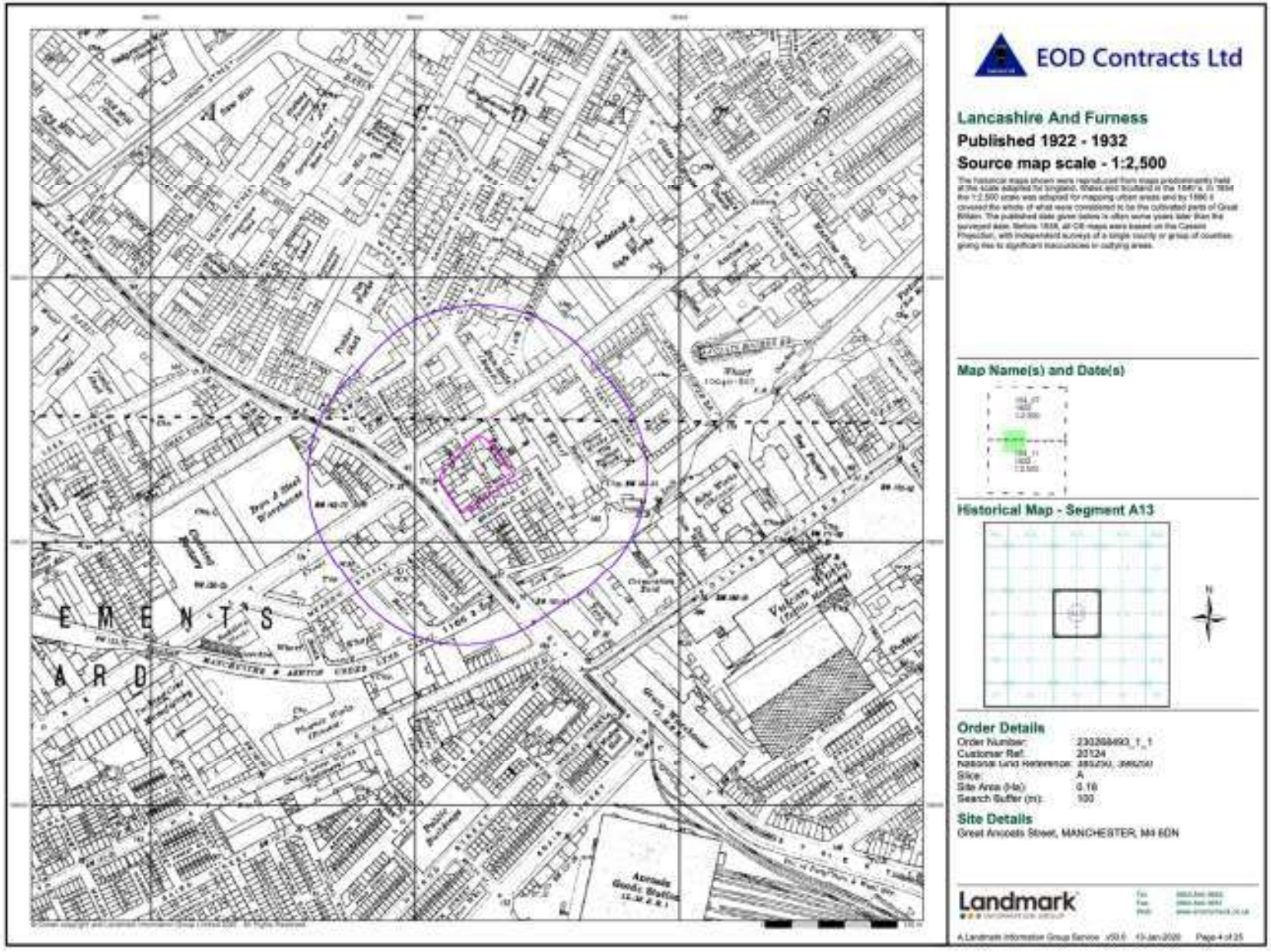
HISTORIC MAPPING

Index:

- **Page B-2 –** Historic Map 1922 - 1932 - shows the site area (bordered in pink). The site at this time is occupied. However, the layout is not as it is in present day. The site is intersected with a street that is no longer there (Back Mill Street). Either side of the street are various buildings (these vary from a Pub to furniture factories and also partly over a Technical School).
- **Page B-3 –** Historic Map 1950 - 1951 – Some of the buildings that previously occupied the site layout appear now not to be listed (this can be explained in **Annex D** in which the site was the subject of two bomb strikes within the site area).
- **Page B-4 –** Historic Map 1989 – 1992 – This map highlights all the previous buildings that occupied the site area have since been removed.
- **Page B-5 –** Aerial Photo 1999, this more modern site aerial photo shows that there has been very little change to the site layout since the previous map. The site area appears to have been left derelict post demolition.
- **Page B-6 –** 2019 modern day map. No apparent changes to the site layout.

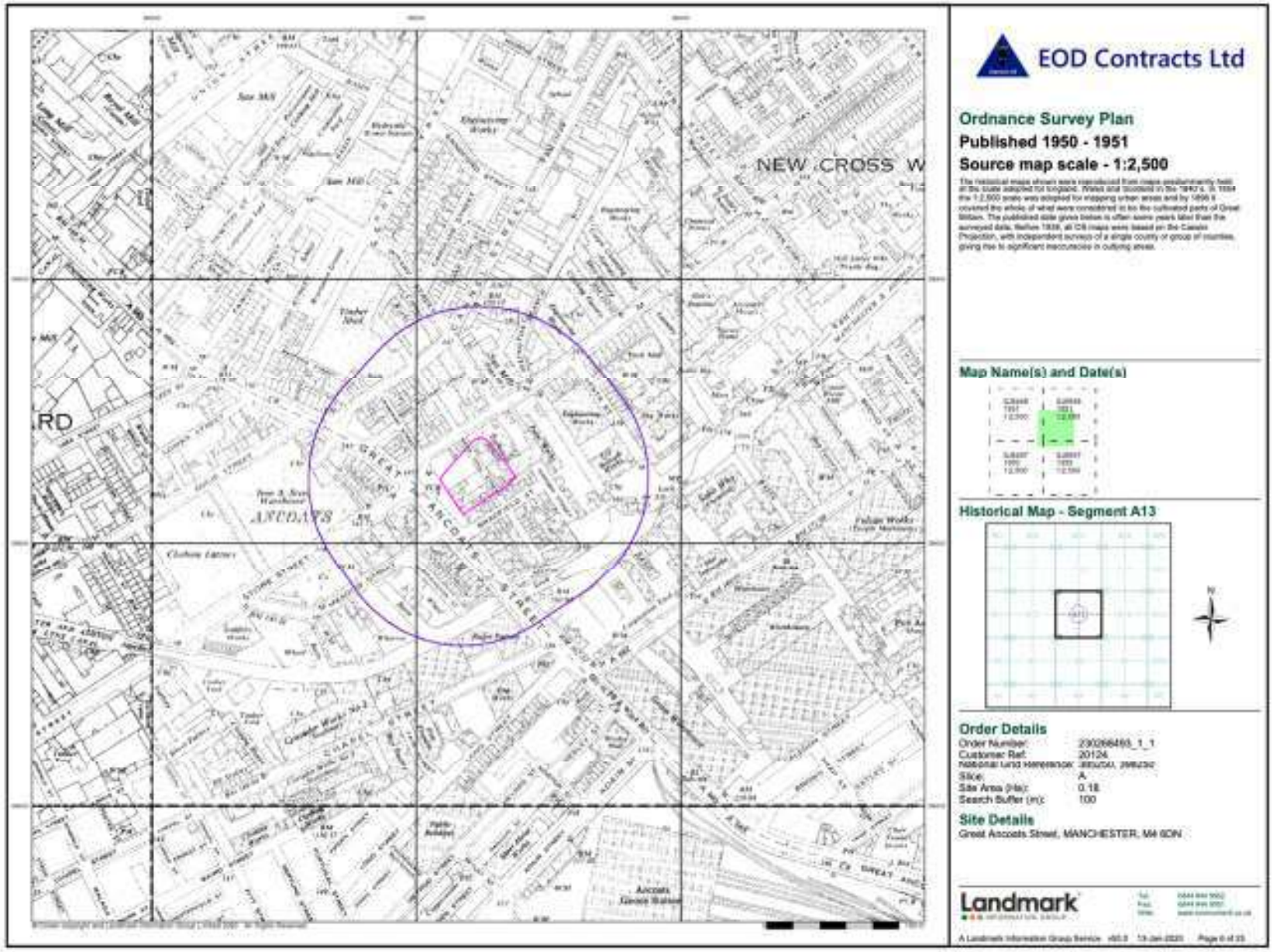
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Photo Extract: 1922 - 1932 - Historic Map



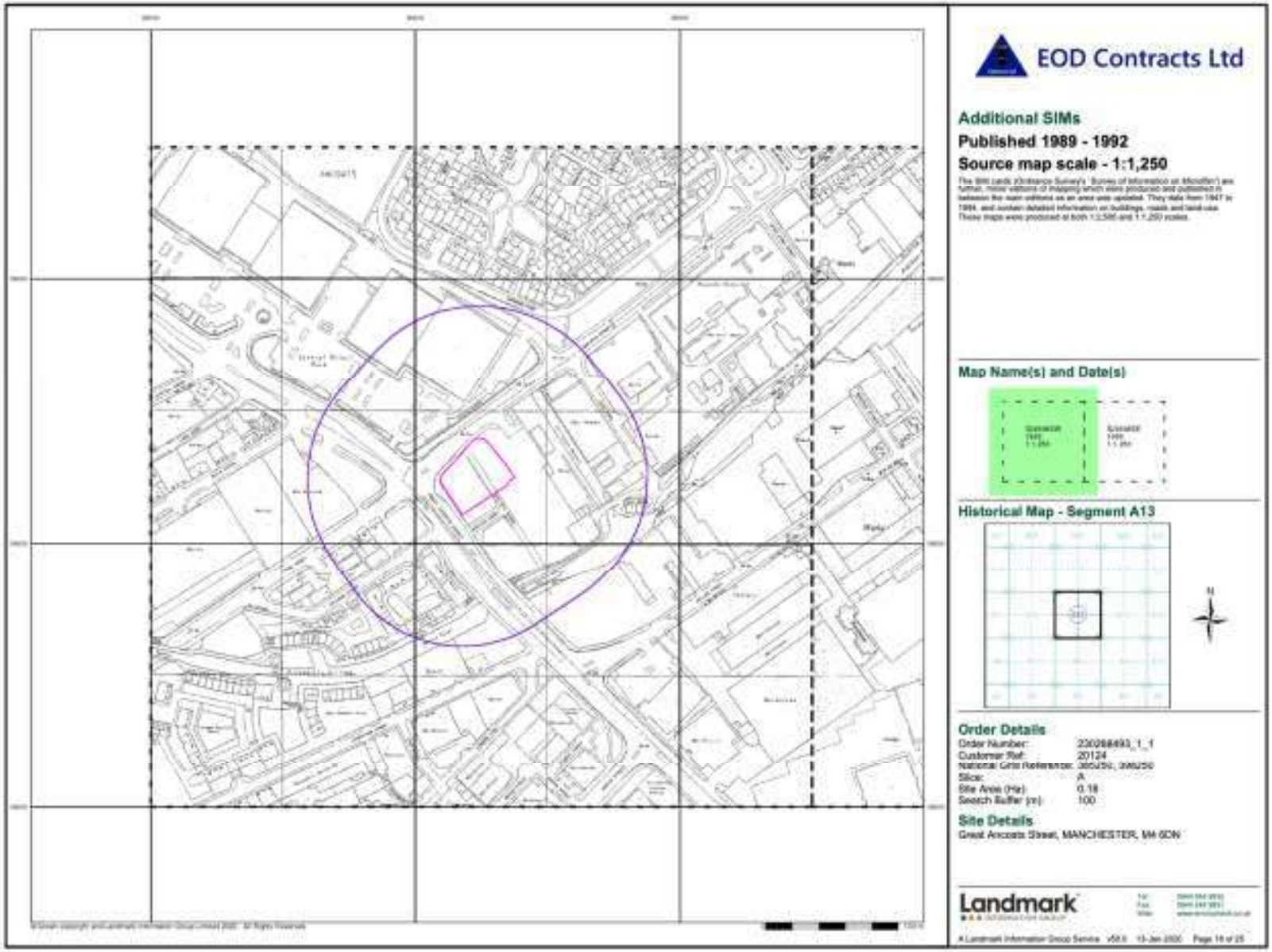
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Photo Extract: 1950 – 1951 – Historic map



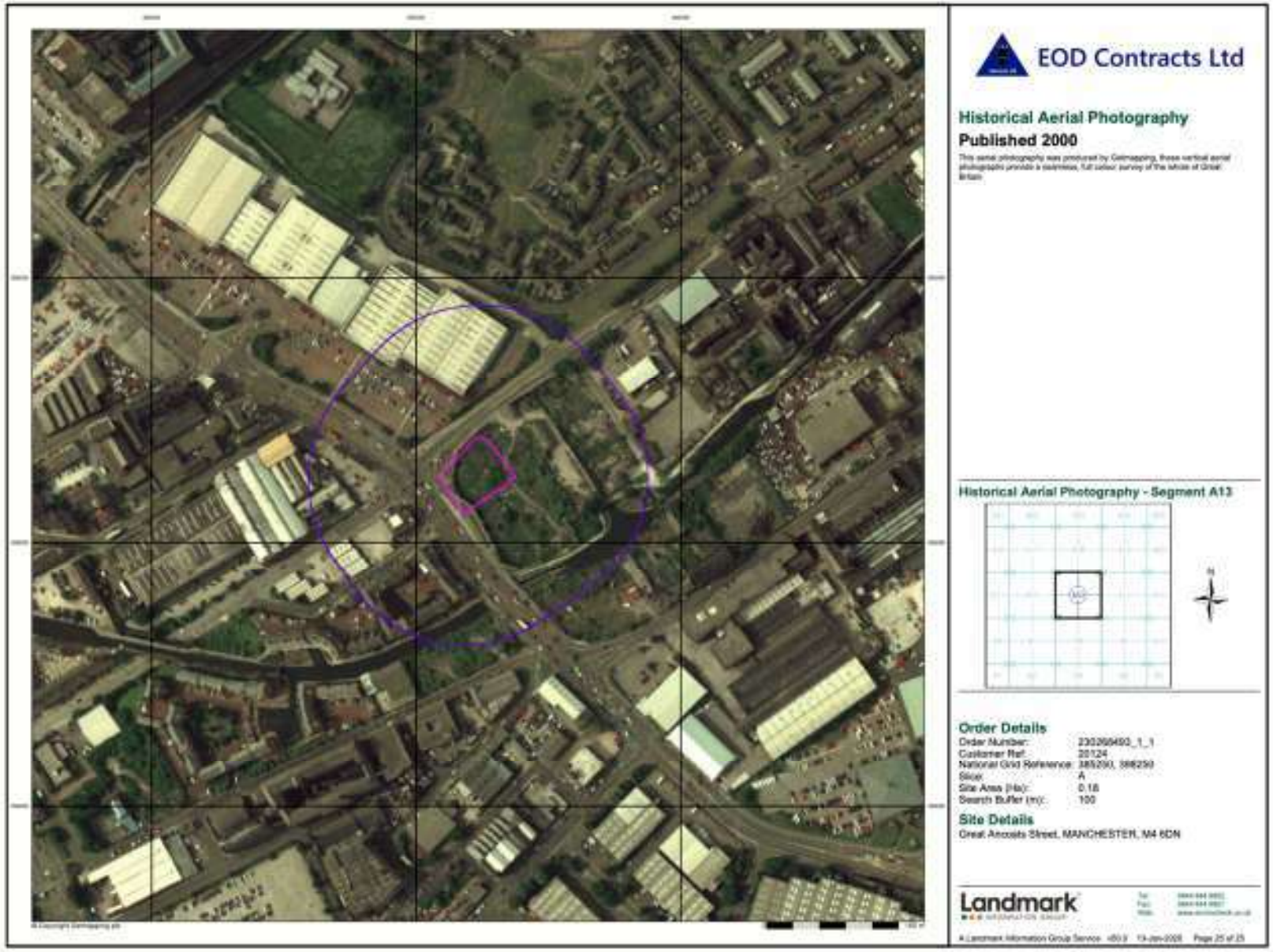
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Photo Extract: 1989 – 1992 – Historic Map



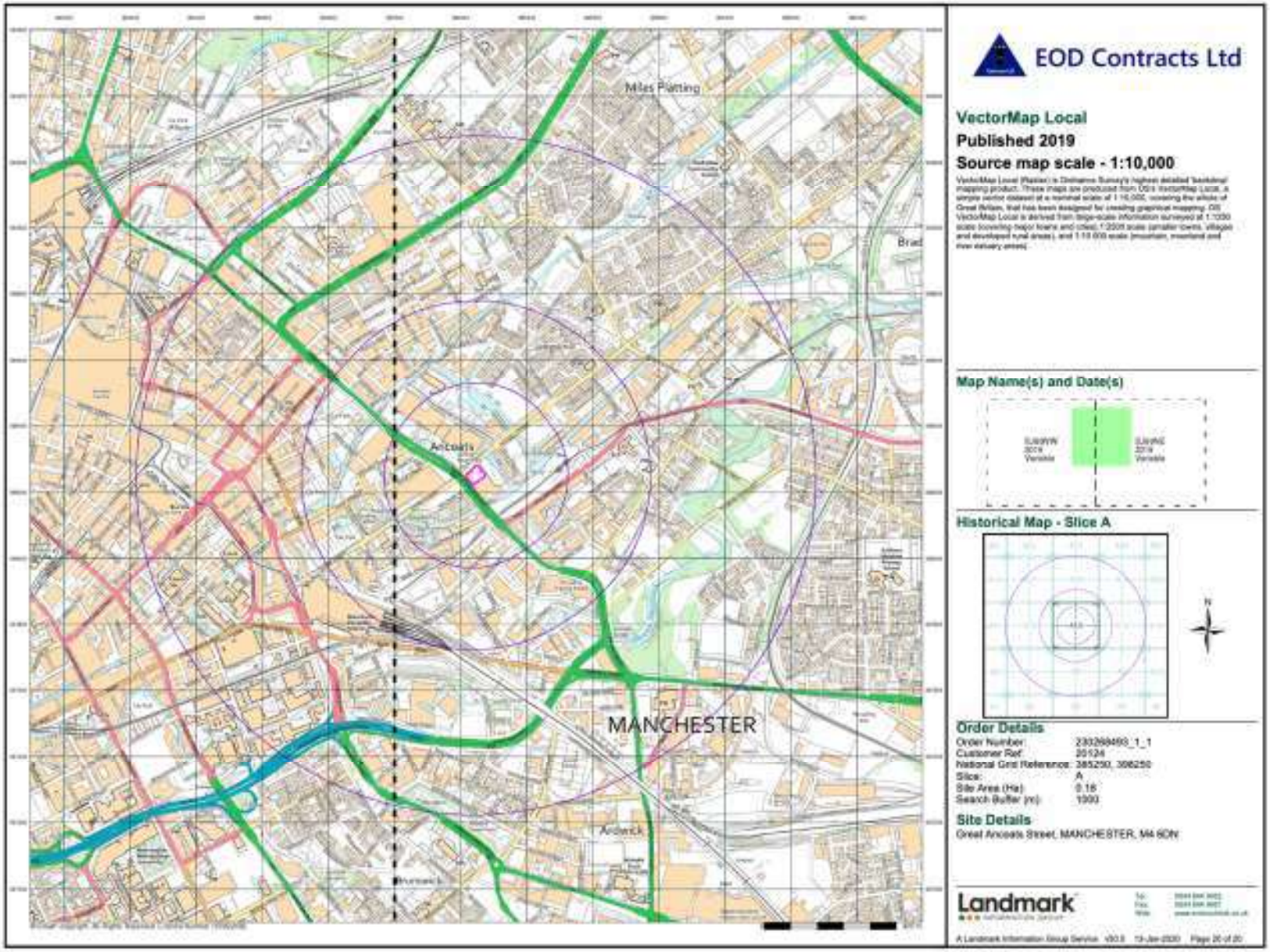
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Photo Extract: 2000 – Aerial Photo



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Photo Extract: Modern day map 2019



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Annex C

BOMB RAIDS WWI

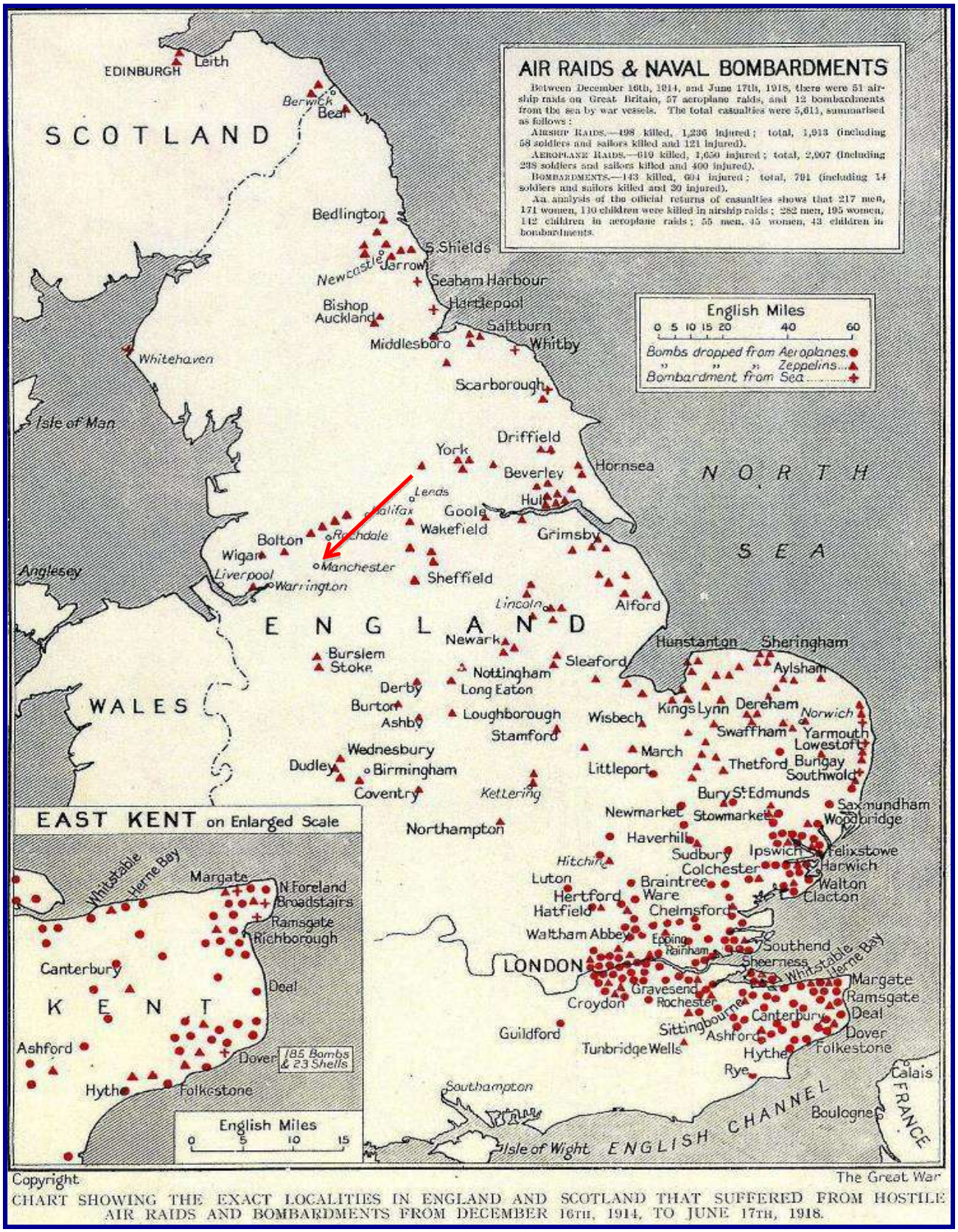


CHART SHOWING THE EXACT LOCALITIES IN ENGLAND AND SCOTLAND THAT SUFFERED FROM HOSTILE AIR RAIDS AND BOMBARDMENTS FROM DECEMBER 16TH, 1914, TO JUNE 17TH, 1918.

Site location indicated by red arrow.

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Annex D

BOMB IMPACT MAPS

MEDIUM RISK

Map Series: Manchester City Council Bomb Damage Maps

Key:

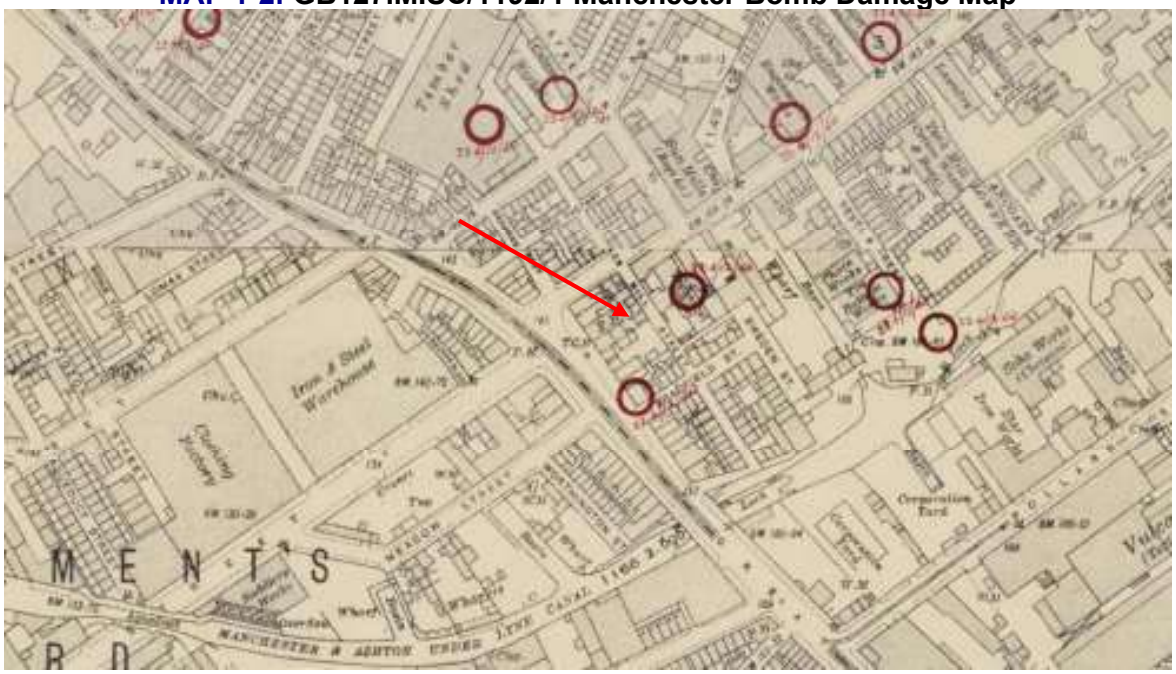
IBs	Indicated where applicable (usually denoted by hashed lines over a wide area)
UXB	
HE Bomb	
Para Mine	

Map Reference OS: Not known
Site Position: Site bordered in yellow

NOTE: *The above map highlights Bomb damage caused throughout WW2 (Manchester Blitz Period) the varying degrees of Red indicates more damage sustained (shaded red – repairable/Dark red – beyond repair). The red circles* indicate HE Bomb Strikes and the red circle coloured blue highlights a UXB

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MAP 1-2: GB127.MISC/1192/1 Manchester Bomb Damage Map



The above map shows a wide area map (centre of site indicated by a red arrow) of the site and its surrounding area. There are several HE Bomb strikes indicated within close proximity to the site; it also indicates that the site itself was the subject of two direct strikes. Below, shows a closer look at the two bombs that fell within the site area (22nd-24th December 1940).



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Annex E

EXPLOSIVE ORDNANCE SAFETY AND INFORMATION

UNEXPLODED ORDNANCE

Since the end of WWII, there have been a limited number of recorded incidents in the UK where bombs have detonated during engineering works, though a significant number of bombs have been discovered.

The threat to any proposed investigation or development on the site may arise from the effects of a partial or full detonation of a bomb or ordnance item. The major effects usually being shock, blast, heat and shrapnel damage. It should be noted that the detonation of a 50kg buried bomb could damage brick/concrete structures up to 16m away and unprotected personnel on the surface up to 70m away from the blast. Larger ordnance is obviously more destructive. Table 1 denotes recommended safe distance for UXO.

Table 1: Safety Distances for Personnel

UXO (Kg)	Safety Distances (m)			
	Surface UXO		Buried UXO	
	Protected	Unprotected	Protected	Unprotected
2	2O	200	10	20
10	50	400	20	50
50	70	900	40	70
250	185	1100	120	185
500	200	1250	140	200
1000	275	1375	185	275
3000	450	1750	300	450
5000	575	1850	400	575

Explosives rarely become inert or lose effectiveness with age. Over time, fuzing mechanisms can become more sensitive and therefore more prone to detonation.

This applies equally to items that have been submersed in water or embedded in silt, clay, peat or similar materials.

Once initiated, the effects of the detonation of the explosive ordnance such as shells or bombs are usually extremely fast, often catastrophic and invariably traumatic to the personnel involved.

The degradation of a shell or bomb may also offer a source of explosive contamination into the underlying soils. Although this contamination may still present an explosion hazard, it is not generally recognised that explosives offer a significant toxicological risk at concentrations well below that at which a detonation risk exists.

TYPES OF ORDNANCE

German Air Delivered Ordnance. Technical information on the nature and characteristics of the ordnance used by the German Air Force during both world wars has been available for a number of years. Assessment that began during the 1930's has continued to the present day. Experts have conducted research in many countries as part of national research programmes and as individual research projects. Consequently, a well-informed assessment of the threat posed by unexploded ordnance, and the hazards that they represent, can be made with a high degree of confidence.

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Terminology. It should be noted that two terms used in bomb records can lead to some confusion as to their meaning and therefore significance. The term Unexploded Bomb (UXB) refers to a bomb that has fallen, failed to function and has been subsequently dealt with and removed from the site. The term Abandoned Bomb (A/UXB) refers to a UXB that could not be found or recovered, or the decision was taken not to pursue the matter further. Consequently, the unexploded bomb remains where it came to rest when it was dropped or fell to the present day. It should also be noted the word 'bomb' can be used to describe an airdropped bomb or a shell as in some cases no differentiation was made, and the term was interchangeable.

Abandoned Bombs. The records of known abandoned unexploded bomb locations in the London area were released in response to a written Parliamentary Question from Simon Hughes. (Hansard: Volume; 282. Dated 15th October 1996). The information was provided by the Ministry of Defence (MOD) and supplied under an indemnity.

Explosive Ordnance Failure Rates. Over the course of both World Wars a considerable quantity of ordnance dropped on UK targets failed to function as designed and subsequently penetrated the ground without exploding. Information gathered during the war by the MOD and its research partners provide typical failure rates for different types of ordnance. Figures significant to this study are:

- 10% of all German airdropped bombs failed to function as intended.
- 30% of all anti-aircraft and other types of shells failed to function as intended.

Deductions & Considerations. The following points were considered as part of the assessment and have been given due consideration:

Records were found that indicated that the general area was subjected to heavy bombing.

Bombs, which struck previously, hit or burned out targets and did not function; consequently their impact was unseen and therefore no report was ever made.

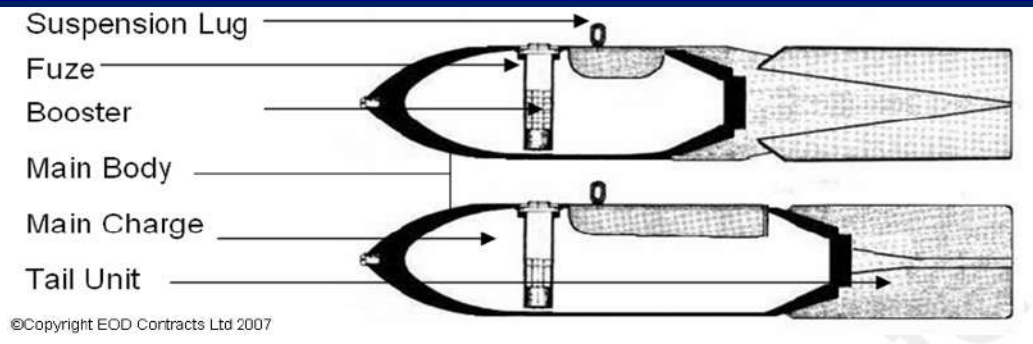
In all likelihood, the local anti-aircraft battery would have fired a far higher number of shells than the bombers dropped HE bombs. Contamination by anti aircraft shells can not be rules out.

Generic German Bomb Types. The majority of German bombs dropped were 50kg in weight, accounting for approximately 16% of the total bombs dropped. The range of common bombs increased in weight to a maximum of 1700kg. Regardless of size, German bombs were fitted with one or more Electrical Condenser Resistance (ECR) fuzes many of which included a mechanical component. The fuzes were mounted transversely in the bomb body with the booster directly below, and in contact with, the fuze. The booster; sometimes referred to as the Gaine, is composed of a sensitive explosive material (Picric Acid). Picric Acid is known to deteriorate over time becoming increasingly unstable. The internal layout of two common German bombs and a German fuze is shown in Figures 6.1 & 6.2.

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FIGURE 1: Generic German Bomb Design.

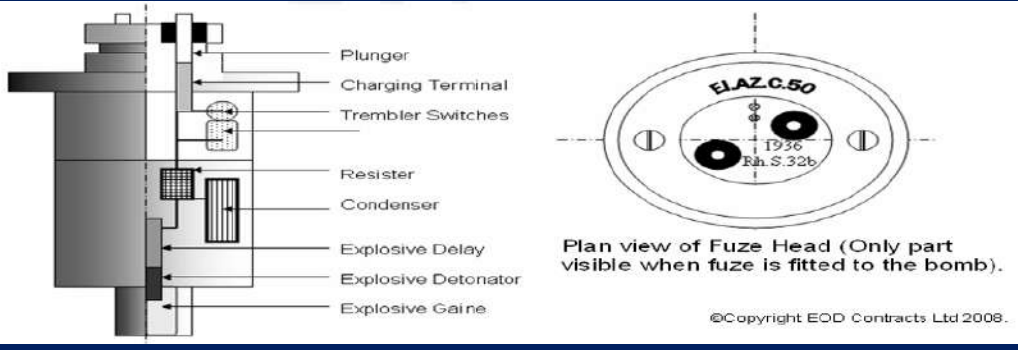
Graphic Cross Section through the most common German bombs (50kg)



Note; the diagram shows that there can be a significant difference in the quantity of High Explosive contained within bombs of similar size and shape; the Grade 1 bomb on the bottom having 30% more HE than the Grade 2 shown at the top. This serves to demonstrate the importance of an accurate identification of any item of UXO.

FIGURE 2: Generic German Bomb Fuze Design.

Graphic Cross Section through a typical German fuze (ECR)



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FIGURE 3: Range of HE bombs dropped on the United Kingdom.

German bombs



NOTE: The smaller sub-munitions (Bomblets) seen to the right, ranged in size between 1 and 3kg, were dropped in large numbers and were intended as incendiary bombs, anti-personnel bombs or as bombs filling both roles. The smaller bomblets were dropped in larger container bombs designed to hold between 360 and 620 of the bomblets. The containers were designed to burst open at a predetermined height above ground level, dispersing the bomblets over a wide area. Air raid damage was far greater by using both incendiary, and HE bombs on a single raid. The fires started by the incendiaries being rapidly spread by the blast waves from the HE bomb. This scenario was shown to devastating effect on the 14th February 1945 in the German city of Dresden. Where fires started and spread by the bombing increased to a point where the oxygen was being sucked into the flames at such a high speed that the fire became a "Fire Storm". At the time the city's population had increased due to a high number of refugees fleeing the Russian advance to the east, the exact civilian death toll from fire and suffocation will never be known, but is considered to be somewhere between 25,000 and 100,000.

High Explosive (HE) Bomb. Some of the most common type of ordnance to be dropped on the United Kingdom, HE bombs are often the type encountered as UXBs. Relatively thick cased, they are still recovered in remarkably good condition. Ranging in size from 50 to 1700 kg, their typical release height (1,500m) allowed them to penetrate deep into the ground as a result of design or flaw. Towards the end of the bombing campaign, as steel became scarce the German Engineers produced a range of bombs that used steel reinforced concrete as the bomb body. Figure 6.3 shows the range of steel HE bombs dropped on the UK.

Incendiary Bomb. The larger incendiary bombs, containing bottles of white phosphorus and an incendiary mixture contained within a thin steel case were designed to burst on contact with the ground. A fixed dispenser on the aircraft delivered the smaller type of bomb or 'Bomblet' to the target area in container bombs or; both types of container would open dispersing the smaller Incendiary bombs. Relatively small and light they were unlikely to penetrate the ground to any significant depth. However, once concealed in bomb damage rubble or below water they were easily missed and are still unearthed today from in-fill and drained land. Later versions of the incendiary bomb contained an additional explosive charge used as a short delay "Booby Trap" device that contained a significant amount of high explosive. The Booby Trap component was designed to kill or injure fire fighters and hinder the damage control. See Figure 4.

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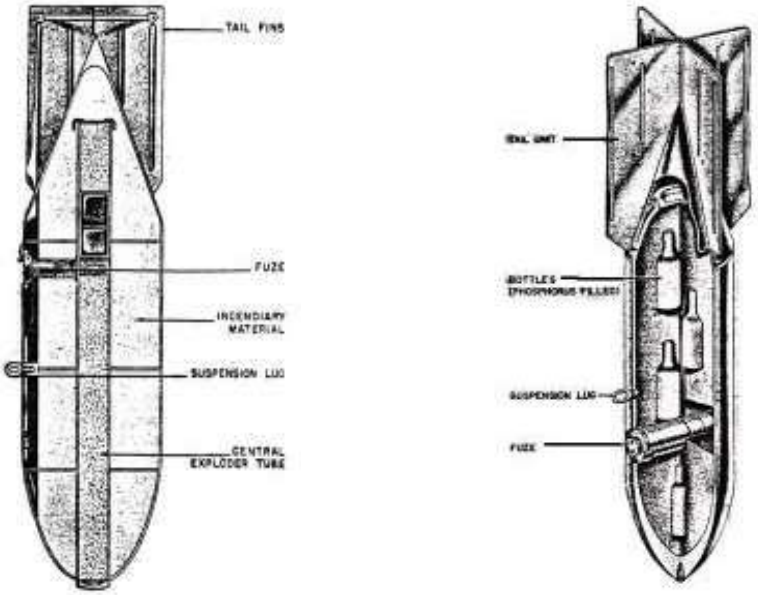
FIGURE 4: Incendiary Bombs.

Common German Incendiary Bombs



250 mm

Above 1kg incendiary bomblet, below left the larger 500kg incendiary bomb Below right a 50kg incendiary bomb containing bottles of white phosphorus.



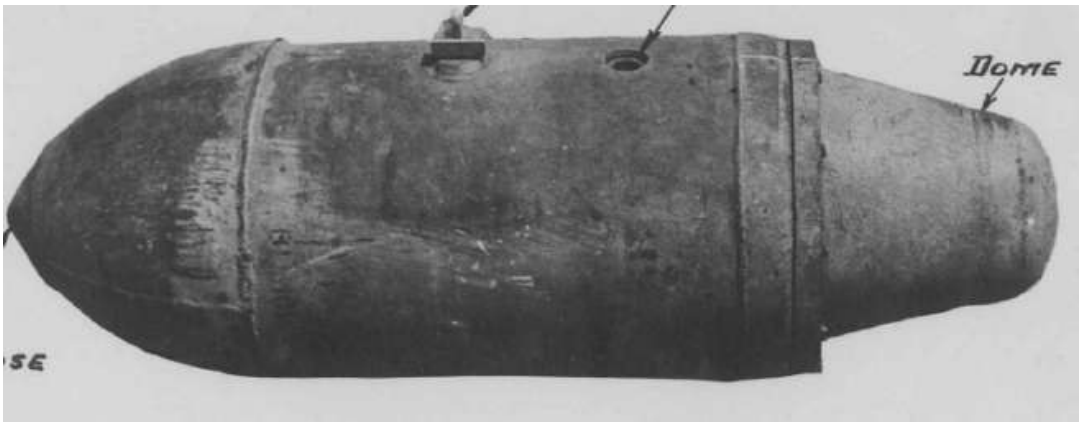
Note; Incendiary bomblets were made of a flammable alloy similar in appearance to aluminium, which resists corrosion well. The tail unit was made of thin tin-plate steel and is more prone to have rusted away. Some Incendiary models were fitted with a High Explosive (HE) steel nose. With the tail and explosive nose attached the bomb was 480mm long.

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Blast Bomb / Parachute Mine. The parachute mine was extensively used on land and at sea and was fitted with specialist fuzes designed to trigger the weapon at a predetermined altitude, water depth or to switch on other magnetic influence mechanisms to trigger the weapon when a ship approached (Magnetic or Acoustic influence). While early versions were based on the standard 1000kg SD Bomb case others were specially designed and manufactured with an aluminium body, making them extremely difficult to detect using magnetometers. The thin cased versions would normally disintegrate on impact on land and are normally considered to pose little threat to work on land based projects, but the risk increases significantly on projects over water or in marshland. Thicker cased versions however will survive impact and pose a significant risk regardless of the local ground conditions. (See Figure 5)

FIGURE 5: Common Airdropped Mines.

Parachute & Ground Mines





Note; all mine fuzes were designed to arm after deployment from the ship, submarine or aircraft, some fuze designs incorporated anti-removal booby traps. Unexploded mines found today are the result of a failure within the arming mechanism or procedure whereby the mine never fully armed. Sudden shock or jarring of a weapon in this state has the potential to complete the arming sequence and could result in the mine detonating with lethal consequences.

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Non Steel Cased Bombs. Used primarily in the construction of training or practice bombs, some high explosive variants were introduced towards the end of the war. With resources running scarce, German Engineers produced a small number of blast bombs with a concrete body. The design utilised a steel framework onto which concrete was cast. The explosive filling was also contained within a thin steel container within the bomb body. Very few "concrete" bombs were dropped on the UK. In common with standard steel cased weapons, this type of bomb can be detected using standard magnetometer detection techniques (albeit; providing a smaller ferromagnetic signature than its all steel counterparts). This type of bomb represents a very small percentage of the total number of bombs dropped worldwide and are not considered a significant threat, particularly when viewed from an overall bomb threat in the UK.

Anti-Personnel Bomb. Generally these were small weapons of 1-3 kilograms in weight and are often referred to as 'Bomblets' and possessing similar ground penetration ability as the Incendiary Bomblets. They were often located during the post-raid searches. This type of bomb has been recovered within the bomb rubble being cleared or used as in-fill on construction projects and poses the same potential to function as the Incendiary bomb with a greater potential to cause localised casualties.

Specialist Bomb. These types of bombs were designed to meet a specific mission requirement. Typically, this would be a design modification or special fusing to enable the bomb to destroy hardened/armoured targets or deep buried and sub-marine targets. Similar to the more common HE bombs, they differ in that they rarely contain large amounts of high explosive. Therefore the consequence of a detonation is reduced but remains a significant risk, particularly when the detonation occurs on or near the surface.

Depth Bombs & Depth Charges. These types of weapons were designed to meet a specific mission requirement. Typically, the modifications would include the type of explosive filling and special fusing to enable the bomb to penetrate to a significant depth into the ground or water before detonating. Depth bombs intended for maritime attack and sub-marine targets would be fitted with one or more fuzes, one of which would be a hydrostatic fuze designed to detonate the bomb at a predetermined depth. The bomb would be fitted with an anti skip ring to reduce the deflection of the bomb as it entered the water. Similar in many ways to Depth Bombs, Depth Charges were exclusively designed to detonate at a predetermined depth. This was achieved by fitting the Charge with a short time delay or hydrostatic fuze. Depth bombs; having a similar configuration to general purpose bombs had the potential to penetrate deeply into the sea bed where an attack occurred in the relatively shallower water of a dock.

Unmanned Rocket Bombs & Missiles. The most famous in this category of weapons were the V1 (Fi103 flying bomb) commonly known as the Doodlebug and the Larger V2 (A4 missile). Both V1 & V2 with high explosive warheads containing 850kg & 1000kg (respectively) represent some of the largest weapons to land in the United Kingdom. Both types were built in a similar manner to an aircraft and would generally disintegrate on impact even if the warhead failed to detonate. The impact would spread debris over a wide area which was difficult to miss and any resulting unexploded 'V' weapons were comprehensively dealt with at the time. For this reason they are rarely encountered on land. However, where a 'V' weapon landed in water the opportunity for the event to have been missed and/or follow-up action abandoned was greater and they continue to pose a significant risk. Other, less well known rocket bombs were also produced by the Luftwaffe to attack maritime targets. Some were equipped with TV/Radio guidance from the parent bomber. Two of the most common were the Fritz X which consisted of an adapted SD1400kg bomb and the Henschel Hs293 which was based on a smaller 500kg bomb. No record of one having been recovered on land as a UXB can be found but these large HE bombs are considered to pose a significant risk, particularly to maritime projects. No records were found to indicate this type of bomb was ever used on targets in the area.

Photoflash Bomb. This type of bomb was dropped by specialist "Pathfinder" aircraft and although this type of bomb can be included with the category of specialist bombs, it is worthy of

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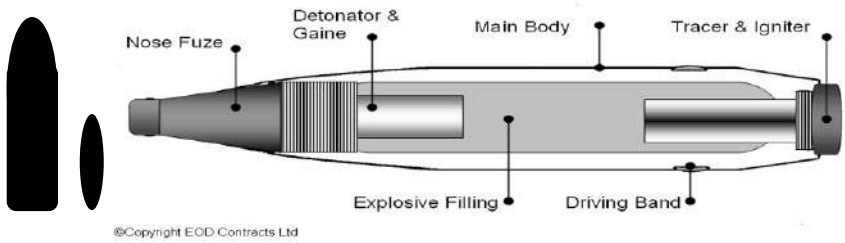
specific comment due to the danger it may still pose. Photoflash bombs were designed to explode with a blinding flash, rather like a camera flashbulb. They were used to enable photographs to be taken of targets at night and also served to identify ground targets for other aircraft to attack. The speed at which the highly energetic filling detonated, and energy it produced in doing so, was significant. Although these bombs were thin skinned and are prone to corrosion the functioning of one can be compared to a high explosive bomb detonation.

High Explosive Shells & Projectiles. As mentioned previously, one of the most common sources of UXO contamination encountered in the United Kingdom is High Explosive Shells and Projectiles. This is most commonly found to be as the result of firing practice ranges, bombardment and anti-aircraft defence, the latter often positioned to defend Major cities and Strategic installations and ports from German Bombing. Anti Aircraft Shells and projectiles are generally smaller (Up to 4.7" inch diameter) than the airdropped bombs and as a consequence were more easily missed amongst the bomb rubble. However, coastal bombardment guns could fire a shell weighing 1000kg, (larger than most common airdropped bombs) and capable of significant ground penetration. The generic layout of a projectile can be found at Figure 6.6. It should be noted that the fatal incident on the German autobahn in 2006 was thought to be the result of a shell or projectile detonating, not an airdropped bomb as first reported.

The Fuzes used in Anti-Aircraft Ammunition were designed to ensure the projectile would detonate in contact with the target, or at a pre-set altitude, or in close proximity to the target. The fuzes employed different means to achieve this, including; direct impact, or indirect impact, Barometric, Delay and Electro-magnetic influence. Some were fitted with more than one fuze, which served to reduce the chance of the projectile falling to earth and detonating. Artillery fuzes are activated during the firing process, using the projectile's acceleration or spin within the gun barrel to switch off the safety mechanisms. For this reason fired projectiles are considered more dangerous than unfired ones.

FIGURE 6: Generic Shell Design

Scale & Graphic Cross Section of a typical High Explosive (HE) Shell



Approximate size of a large shell used by battleships and coastal bombardment guns (Left) and Anti-aircraft shell (Right)

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Other Types of Ordnance.

The following additional sources of ordnance types have been considered, and inherent risks taken account of:

Flares and Pyrotechnics. Flares and pyrotechnics were used for a variety of reasons throughout the war and continue to be found today in the most unlikely places. However, due to the thin casings of these weapons a high level of corrosion is likely to have occurred since manufacture. Depending on the specific nature of the weapon, this effectively renders them inert with the exception of any white phosphorous content or explosive gaine.

Land Service Ammunition (LSA). While as the name implies this type of ammunition was designed for use on land, it was also issued to naval personnel for close protection of vessels and their crew and to provide a limited offensive capability even to relatively small craft. This type of ammunition includes some shells and projectiles such as those covered previously. Other natures of LSA range from Small Arms Ammunition (SAA), having little or no high explosive content to Grenades, Mortars and Rockets which may pose a risk of detonation due to their explosive content and the design of their fuzes (impact) which; if subjected to sufficient shock or friction may result in the weapon functioning. (See Figure 7)

FIGURE 7: Common Categories of Land Service Ammunition

Land Service Ammunition

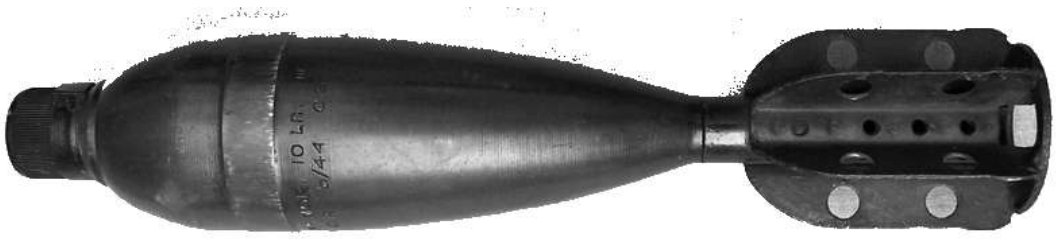
Small Arms Ammunition



Grenades



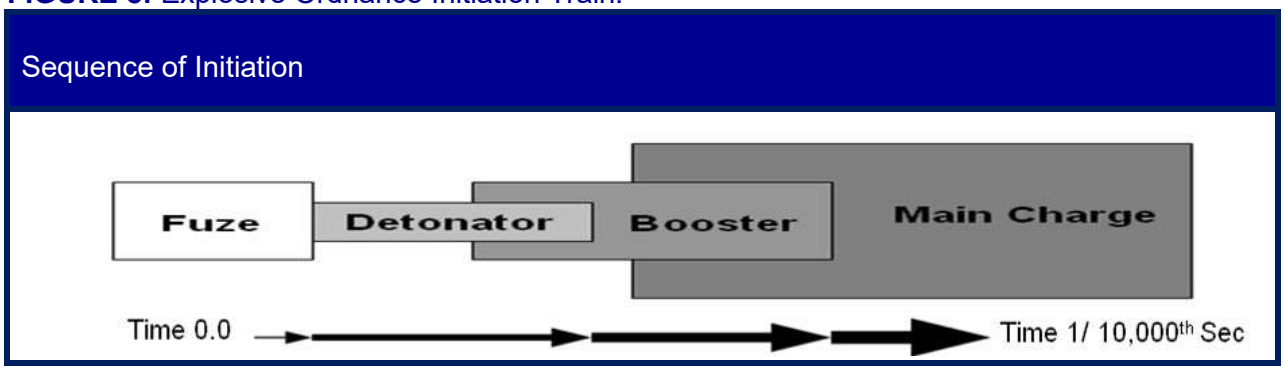
Mortar Bombs



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Initiation of Unexploded Ordnance. Explosive Ordnance is highly unlikely to spontaneously explode. The energetic chemical compounds, (Explosives) used in weapon manufacture are chosen to be as stable as possible and they all require a significant application of additional energy to create the right conditions for detonation to occur. If stored correctly, most explosive materials are designed to remain stable for the duration of their expected lifespan (typically 20 years). During this time, the correct functioning of the weapon is achieved by means of the 'Initiation Train' (See Figure 8).

FIGURE 8: Explosive Ordnance Initiation Train.



Initiation Train. This is a means by which, once the safety features have been switched off or removed, a chain reaction occurs through the weapon. Starting within the fusing system as a small ignition or spark, causing a detonator to explode, which in turn causes the booster charge to detonate with a greater energy and ending in the full detonation of the main explosive filling. Each part of the process has in-built safety features to prevent an unintended detonation. A failure in any of the components within the Initiation Train can result in a UXO. In the case of a UXB; the chain reaction has broken down and the Initiation Train is brought to a halt, albeit, a temporary one. There are a number of ways that sufficient energy could be introduced to the otherwise stable UXB / UXO that may allow the Initiation Train to set off once more, overcoming the initial reason for failure. In addition to subjecting the weapon to excessive heat, such as a fire, the most common methods to bring about an explosive detonation in such items are considered to be:

Direct impact onto the main body of the bomb by mechanical excavation or pile driving: Such an occurrence can cause the bomb to detonate, should the point of impact be on the bomb fuze; less force would be required to bring about a full or partial explosive detonation.

Re-starting the clock timer in the bomb fuze. Only a small percentage of bombs were fitted with clockwork fuzes. It is likely that corrosion has taken place within the fuze that may prevent the clockwork mechanism from functioning. However, the restarting of the clock is by no means a scenario that can be completely ruled out. This is considered to be one of the two most credible mechanisms by which sufficient energy could be introduced to the bomb and result in a detonation.

Induction of a static charge or exposure to an external power source (Electrical Services), causing a current in an electrical fuze. The majority of German bombs employed an electrical component within the fuzes, it is likely that corrosion would have taken place within the fuze mechanism and that it would no longer contain, or conduct sufficient electrical charge to initiate the bomb.

Friction initiating the sensitive fuze explosive. Some chemical constituents may have deteriorated, due to oxidisation. Components designed with a high degree of stability at the time of manufacture may no longer be as safe. **This is considered to be the most likely mechanism by which sufficient energy could be introduced to the bomb and result in a detonation.**

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Annex F

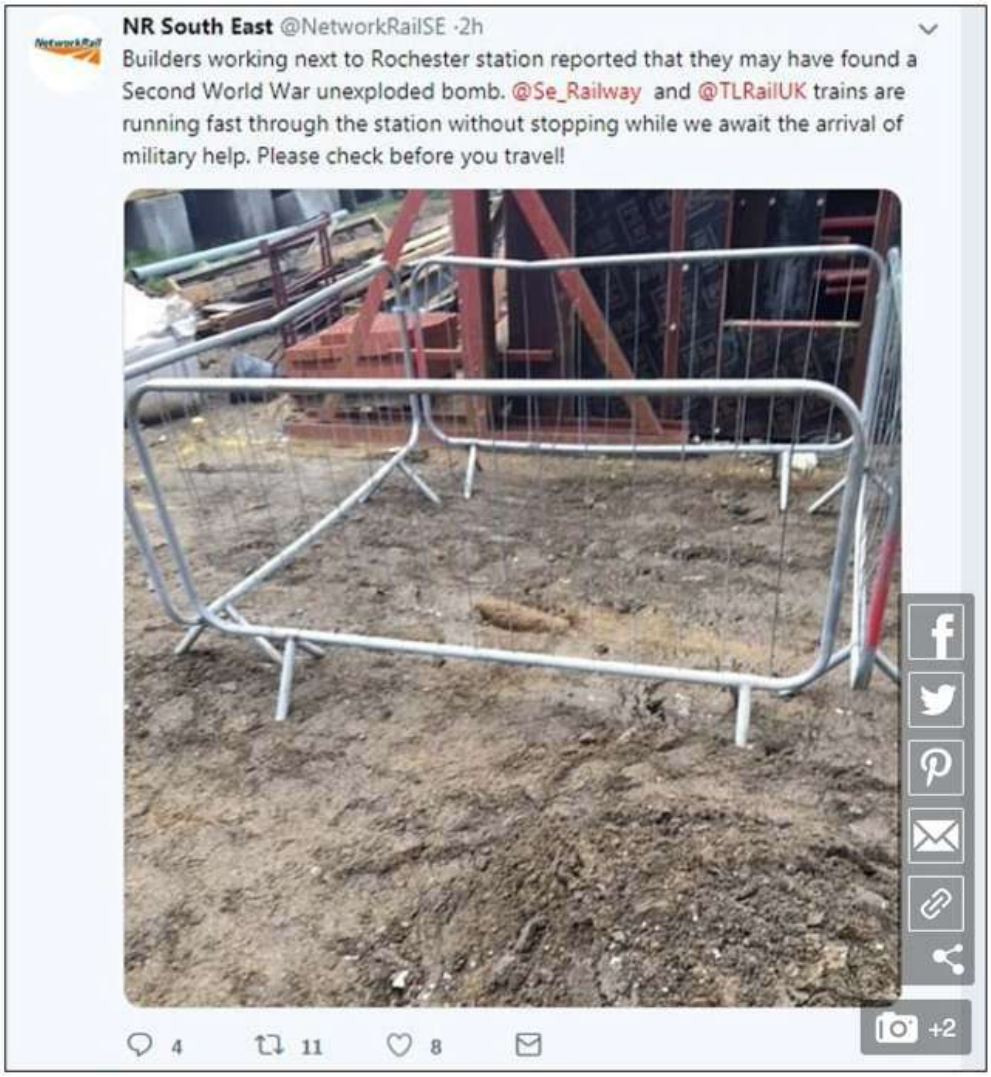
Mail Online

5th February 2019

Railway station is evacuated and trains ordered not to stop when builders find unexploded World War Two bomb

- **Rochester Station was closed for over two hours after the bomb was found**
- **The military and British Transport Police were called in to deal with the threat**
- **While they worked trains were allowed to run fast through the station**
- **Builders at a nearby construction site found the shell in the mud at around 1pm**

A railway station was evacuated this afternoon after a WWII bomb was discovered by builders working in Rochester, Kent.
British Transport Police and military personnel descended on the train station following the construction workers finding the unexploded shell underground.
The station was evacuated at 1.25pm and trains could run fast through the station while they worked to remove the hazard.



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By 3pm - and in time for rush hour - the bomb had been safely removed by the bomb squad and Rochester Station could resume normal service.
South Eastern Tweeted: 'Builders working next to Rochester station reported that they may have found a Second World War unexploded bomb.
'@Se_Railway (Southeastern) and @TLRailUK (Thameslink) trains are running fast through the station without stopping while we await the arrival of military help. Please check before you travel!'
The WWII bomb was discovered on a building site off the station's land, but close enough that trains were unable to stop as a safety precaution.
Later on Network Rail updated passengers and wrote: 'The bomb has been removed and normal service has resumed. Thank you for your patience.'

https://www.dailymail.co.uk/news/article-6670491/Railway-station-evacuated-trains-ordered-not-stop-builders-unexploded-WWII-bomb.html

Manchester Evening News

12th November 2018

Watch: Bomb squad carry out controlled explosion after live device found on farm

The explosive was found on Barnsfold Manor Farm in Stockport

This was the moment a device was blown up by the bomb squad after it was found on a Stockport farm.
The explosive, believed to be from World War Two, was found by the farmer at Barnsfold Manor Farm in Marple on Friday afternoon.
Police were called after the farmer, who didn't want to be named, found the device while he was cutting down a bramble bush.
They then returned on Saturday and carried out a controlled explosion.
A loud bang can be heard in video footage of the explosion, as the device is blown up in a field.





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Photos from the scene show several police cars were called to the farm, as well as the bomb disposal unit.

https://www.manchestereveningnews.co.uk/news/greater-manchester-news/watch-bomb-squad-carry-out-15402772

Manchester Evening News

Two unexploded World War II bombs discovered on building site

The building site has been evacuated twice this morning due to the separate discoveries

17th January 2018



Two suspected World War II bombs have been discovered at a building site in Warrington.
The site on Edgewater Park, off Thelwall Lane, was first evacuated on Wednesday morning after the unexploded artillery shell was discovered.
Several roads were sealed off while the bomb squad carried out a controlled explosion.
Workers were allowed to return to the site later today, but a second unexploded bomb was discovered a short time afterwards.
As a result of the incident a number of properties in the local area have been evacuated and a police cordon is currently in place as a precautionary measure."
Motorists are being advised to avoid the area at the junction of Thelwall Lane and Kingsway South.
The discovery was made just before midday and the bomb squad were called back to the

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scene.
A statement from Cheshire Police said: “Officers are currently in attendance at the scene and explosive ordnance have been alerted to the incident.
https://www.manchestereveningnews.co.uk/news/local-news/two-unexploded-world-war-ii-14167608

BirminghamLive

30th May 2018

Suspected unexploded World War 2 bomb found in Birmingham - live updates

A suspected unexploded device, which is believed to date back to World War II, has been found in Birmingham. Islington Row Middleway up to Bath Row has been evacuated. West Midlands Police has evacuated a construction site.

The explosive ordnance disposal team has been called to the scene and closed Islington Row Middleway up to Bath Row near the city centre.

It comes a year after a WWII bomb was discovered in Aston.



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A team from The Royal Logistics Corp (Bomb Disposal) were on scene to make the device safe for removal and destruction at a later date.

KentLive

23rd January 2018

The 'bomb' that forced businesses in Sevenoaks to evacuate had been donated to Oxfam



The manager of a charity shop in Sevenoaks says the suspect device, which caused a number of businesses to evacuate in the High Street, was a round from an armoured personnel carrier.

Peter Higgs, manager of the Oxfam shop, said he believes the device was donated on Sunday (January 21) and initially thought it was trench art.

Mr Higgs told Kent Live: "An item was donated over the weekend, Sunday we think. It's obviously been sat in the shop.

"Looking at it this morning we thought it was a piece of trench art, it had a brass casing.

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"There was a little label on it that said it was a '30mm round from an armoured personnel carrier' and it had been fired.

"This implied it was not in any way a live round or anything like that."

Upon inspecting the round, Mr Higgs decided to call the local police station to inform them of his find.

He added: "The police were here within 10 minutes of me making a call. I put it in an area way from any people and were advised to evacuate the shop.

"They looked at it and decided that they were pretty certain it was not going to be problematic."

Officers are still on the scene but the store is now open.

Mr Higgs added that the item was placed away from the public and was awaiting disposal by police.

http://www.kentlive.news/news/kent-news/bomb-forced-businesses-sevenoaks-evacuate-1105839

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Annex G

Risk Assessment Tables

Table 1: Summary of Potential Contamination Sources

Source	Applicable	Not Applicable
Enemy Attack & Counter Measures		
Bombing WW1		☒
Manned Aircraft Bombing WW2 (direct strike)	☒	
Unmanned V1 & V2 Rocket Attack		☒
Shelling		☒
Anti-Shipping Mines & Depth Charges		☒
Anti-Aircraft Shells & Rockets		☒
Beach Mines & Coastal Defences.		☒
Airfield/Key Point Defensive Mines/Charges		☒
Abandoned Unexploded Bomb (A/UXB)		☒
Migration of UXO		
UXO Migration in Rubble & Infill		☒
UXO Migration by Tide & River Current		☒
UXO Migration by Marine Dredging		☒
Shipwrecks		☒
Dispersal by Explosion, Fire & Accident		☒
Aeroplane Crash		☒
Private Collections		☒
MOD Facilities		
Bombing Range		☒
Artillery, Mortar & Tank Range		☒
Grenade Range		☒
Small Arms Firing Range		☒
Weapon Research & Development Facilities		☒
Ammunition Burial Grounds		☒
Docks & Harbour Facilities		☒
Offshore Ammunition Dumping Grounds		☒
Ammunition Storage & Manufacture Sites		☒
Airfields & Air Stations		☒
Bombing Decoy Site		☒
Army Barracks & Camps		☒
MOD Training / Concentration Areas		☒
Home Guard & SOE Weapon Caches		☒

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Table 2: Baseline Bomb Penetration Assessment

Sub Soil Type	Bomb Weights 50kg	250kg	500kg	1000kg
Soft Rock	2.442	5.016	6.006	7.062
Gravel	**2.442**	**5.016**	**6.006**	**7.062**
Sand	**2.442**	**5.016**	**6.006**	**7.062**
Chalk	3.7	7.6	9.1	10.7
Shingle	3.7	7.6	9.1	10.7
Dry Clay	**3.7**	**7.6**	**9.1**	**10.7**
Wet Sand	5.55	11.4	13.65	16.05
Wet Clay	5.55	11.4	13.65	16.05
Average Offset (m)	**0.8-1.6**	**1.6-3.7**	**3-4.5**	**3.4-5.3**

Table 3: Site Specific Bomb Penetration Assessment

Input Figures			
Bomb Weight	Release Height	Velocity on Impact	Angle of Strike
500 kg	5000 m	340 $m.s^{-1}$	10º to vertical
Geology	Typically, firm to stiff clays and silts with varying amounts of sand, gravel and cobbles of mixed lithology. Locally may also contain occasional boulders.		

Output Figures	
Maximum Penetration Depth	Maximum Offset
10.7 m	**5.3 m**

The maximum threat depth from airdropped weapons is considered to be: **Bombs 10.7 m**

The maximum threat depth for smaller shells is considered to be: **AA Shells 3.0 m**

Input figures based on the most common bombing methods and largest common bomb type Figures derived from computer simulation. All depths based on 1939 levels.

Table 4: Airdropped Weapon Strike Indicators (UK)

Item	Increasing Potential level ⇨			
Site Location	Rural	Small Town	Brown Field Large Towns	**Cities**
Site Description and Use	Greenfield or Agricultural Land	**Near Strategic Target**	Adjacent to Strategic Target	Strategic Target
Site History	No history of Attack	Near area of Attack	**Immediate Area Attacked**	Direct Attack

Strategic Target: Military Installation, Industrial or Munitions Manufacturer, Power Station, Gas or Water Works, Port, Dock, Railway Yard, Decoy Site.

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Table 5: Weapon Strike Records (UK)

Source	Availability			
Archive	None	Non specific	Specific	**Extensive**
In-house	None	Non specific	**Specific**	Extensive
Anecdotal	None	**Non specific**	Specific	Confirmed

Table 6: Anti-Aircraft Weapon Strike Indicators (UK)

Item	Increasing Potential level ⇨			
Site Location	Rural	Town	**City**	Military Site
Fixed Battery Location	None	General Area	**Nearby**	Onsite
Mobile Battery	Rural	Town	**City**	Military Site
Military Site: Airfield, Port, Radar, Barracks, Depots, Arsenal or Similar.				

Table 7: Abandoned Bomb Records (UK)

Item	Increasing Potential level ⇨		
In-house	**None**	Yes	On-site
Other	**None**	Yes	On-site

Table 8: Bomb Strike Density Assessment

Bombs & Mines	Manchester officially recorded 737 High Explosive (HE) bombs with a low-moderate regional bombing density of 27 bombs per 405 hectares (ha).

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Table 9: Opportunity to have detected Bomb or Shell Strikes (UK)

Increasing Potential level ⇨
Light bomb damage
Good ARP cover
Significant development (on some areas of the site)
No significant ground cover
Light bomb damage
Moderate ARP cover
Moderate development
Frequent public access
Little ground cover
Significant bomb damage
Poor ARP cover
Minimal development limited to shallow excavations (within some areas of site investigation)
Infrequent public access
Moderate ground cover
Heavy bomb damage
No ARP cover
Development limited to site clearance
Controlled private access
Heavy ground cover, vegetation, ploughing or body of water

Table 10: Post Contamination Development Indicators (UK)

Nature of Post Contamination Development	Increasing Potential level ⇨
	100% excavations of the entire site to below contamination depth.
	Significant development
	Moderate development
	Minimal development
	No development

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Table 11: Construction Activities Encounter Indicators

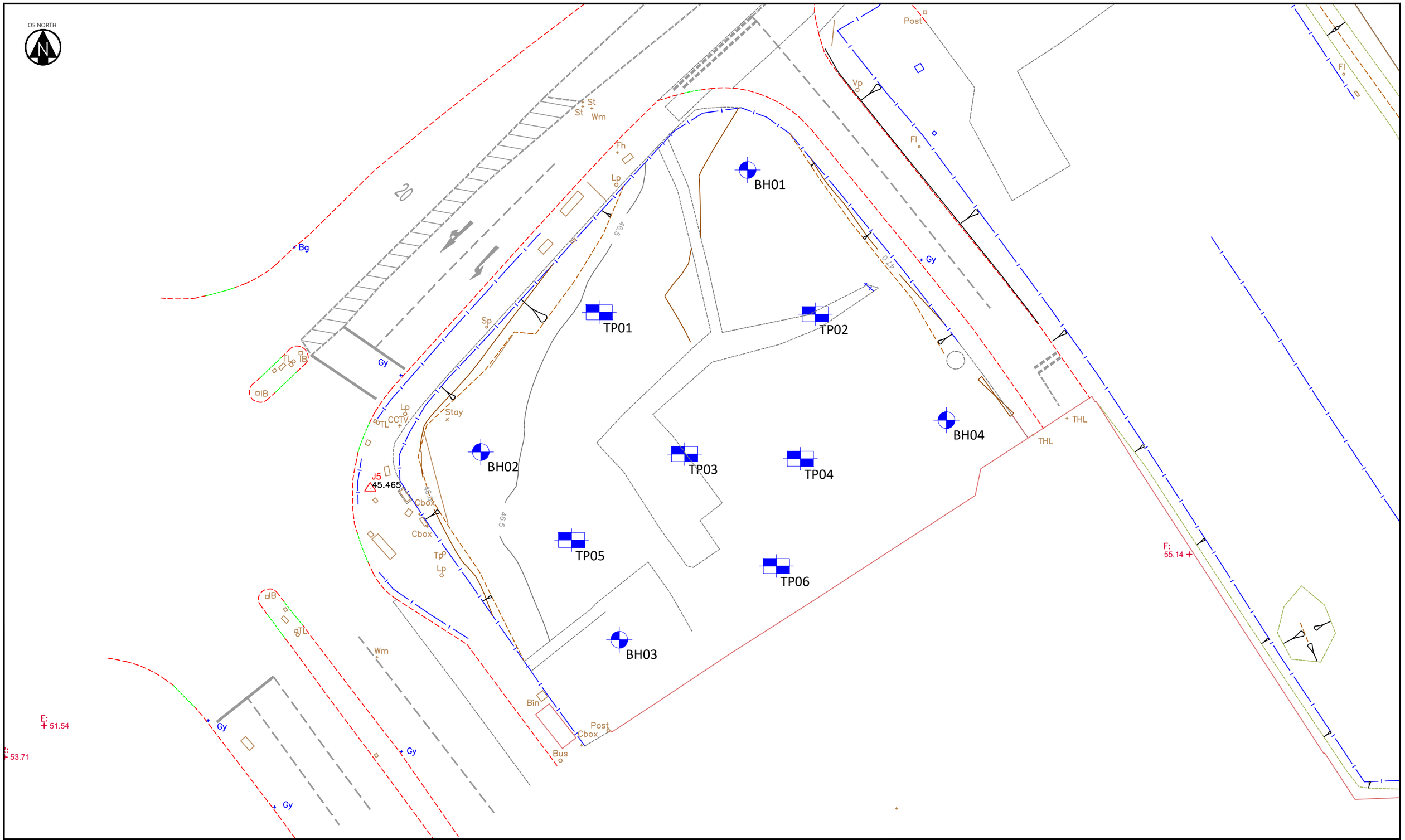
Activities	Increasing Potential level ⇨
	Borehole Drilling
	Dynamic Sampling
	Shallow Trial Pit (within made ground)
	Services Trenching
	Bored (CFA) Piling
	Sheet Piling
	Shallow Excavations over extended area (within made ground)
	Deep Excavations over a limited area
	High Density Piles
	Deep Excavations over extended area
	Bulk Excavations

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Appendix C

Exploratory Hole Location Plan, Exploratory Hole Logs and Photographs

Exploratory Hole Location Plan



KEY

- TPXX — Hydrock Trial Pit
- BHXX — Hydrock Borehole

NOTES

1. All dimensions are to be checked on site before the commencement of works. Any discrepancies are to be reported to the Architect & Engineer for verification. Figured dimensions only are to be taken from this drawing.
2. This drawing is to be read in conjunction with all relevant Engineers' and Service Engineers' drawings and specifications.
3. This drawing has been based on the following drawings and information: xxxxxxx

REV.						
P1	FIRST ISSUE	JB	02/03/20	AC	02/03/20	NAME	XX/XX/XX
REV.	REVISION NOTES/COMMENTS	DRAWN BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE

Hydrock
4 Lakeside
Festival Way
Stoke-on-Trent
ST1 5RY
t: +44(0) 1782 261919
e: stoke@hydrock.com
or visit www.hydrock.com

CLIENT: WATERSIDE PLACES

PROJECT: ISLINGTON WHARF PHASE 4

TITLE: EXPLORATORY HOLE LOCATION PLAN

HYDROCK PROJECT NO.	SCALE @ A3
C-10042	NTS

PURPOSE OF ISSUE	STATUS
SUITABLE FOR INFORMATION	S2

DRAWING NO. (PROJECT CODE-ORGINATOR-ZONE-LEVEL-TYPE-ROLE-NUMBER): 10042-HYD-XX-XX-DR-GE-0003

REVISION: P1

Exploratory Hole Logs

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Cable Percussion

Borehole No. BH01

Sheet 1 of 3

Project Name:	Islington Wharf Phase 4		**Co-ords:**	385250E, 398274N	**Hole Type:** CP
Location:	Great Ancoats Street / Old Mill Street, Manchester, M4 6DN	**Project No:** C-10042-C	**Ground Level:**	47.18m OD	**Scale:** 1:50
Client:	Waterside Places		**Date(s):**	30/01/20 - 31/01/20	**Hole Diameter:**

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m OD)	Legend	Stratum Description
		0.00-1.20	B		0.10	47.08		ASPHALT HARDSTANDING. (MADE GROUND)
		0.00-1.20	ES					Brown slightly sandy GRAVEL with high cobble and boulder content. Gravel is fine to coarse angular to subangular of concrete, brick, glass, wood, metal, ash with pockets of clay. Cobbles are boulders are subangular of brick and concrete. (MADE GROUND)
		1.00	D					
		1.20-1.65	B					
		1.20	SPT	N=19 (2,3/7,6,4,2)				
		2.00	D					*Below 2.00m bgl low cobble and boulder content.*
		2.00-2.45	B					
		2.00	SPT	N=11 (2,3/3,4,3,1)				
		3.00	D					*At 3.00m bgl fine to medium angular gravel used for coating services. Recovered some metal fragments. Becomes wet and soft slightly gravelly slightly silty CLAY. Gravel is fine to coarse angular to subangular of sandstone, brick and concrete.*
		3.00-3.45	B					
		4.00	D		4.00	43.18		Stiff dark brown slightly gravelly CLAY with grey veins. Gravel is fine to coarse subrounded of mudstone, sandstone. (GLACIAL TILL)
		4.00-4.45	U	0 Blows				
		4.00-4.45	U	125 Blows (50% rec)				
		4.50	D					
		5.00-5.45	B					
		5.00-5.45	D					
		5.00	SPT	N=24 (3,4/5,6,6,7)				
		6.00-6.45	U	0 Blows				
		6.00-6.45	U	115 Blows (100% rec)				
		6.50	D					
		7.00-7.45	B					
		7.00-7.45	D					
		7.00	SPT	N=24 (2,3/5,6,7,6)				
		8.00-8.45	U	0 Blows				
		8.00-8.45	U	125 Blows (100% rec)				
		8.50	D					
		9.00-9.45	B					
		9.00-9.45	D					*At 9.00m bgl with occasional fine angular gravel of coal.*
		9.00	SPT	N=26 (3,4/5,7,7,7)				
		10.00-10.45	U	0 Blows				
		10.00-10.45	U	125 Blows (100% rec)				

Remarks: 1) Location cleared for utilities and UXO 2) Hand-dug inspection pit completed to 1.2m bgl. 3) Borehole complete at 23.0m bgl. 4) Borehole installed with standpipe on completion.

B = Bulk Sample
D = Disturbed Sample
U = Undisturbed Sample
UT = Undisturbed Sample (Thin Wall)
ES = Environmental Sample
W = Water Sample
PID = Photoionization Detector (ppm)
SPT = Standard Penetration Test
AB = Asbestos Bulk Sample

Groundwater: Seepage at 3.10m bgl

Logged: DS **Checked:** RS

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Cable Percussion

Borehole No. BH01

Sheet 2 of 3

Project Name:	Islington Wharf Phase 4		**Co-ords:**	385250E, 398274N	**Hole Type:** CP
Location:	Great Ancoats Street / Old Mill Street, Manchester, M4 6DN	**Project No:** C-10042-C	**Ground Level:**	47.18m OD	**Scale:** 1:50
Client:	Waterside Places		**Date(s):**	30/01/20 - 31/01/20	**Hole Diameter:**

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description
		Depth (m)	Type	Results				
		10.50	D					Stiff dark brown slightly gravelly CLAY with grey veins. Gravel is fine to coarse subrounded of mudstone, sandstone. (GLACIAL TILL)
		11.00-11.45	B					
		11.00-11.45	D					
		11.00	SPT	N=25 (2,3/5,6,8,6)				*Below 11.00m bgl becomes firm to stiff slightly sandy to sandy with small sand bands.*
		12.00-12.45	U	0 Blows				
		12.00-12.45	U	125 Blows (100% rec)				
		12.50	D					
		13.00-13.45	B					
		13.00-13.45	D					
		13.00	SPT	N=31 (3,3/5,8,9,9)				*At 13.00m bgl with sand lenses.*
		14.00-14.45	B					
		14.00	SPT	N=28 (2,4/5,7,8,8)				
		15.00-15.45	B					
		15.00	SPT	N≥50 (25 for 20mm/50 for 65mm)				
		16.00-16.45	B					
		16.00	SPT	N=36 (10,11/10,9,8,9)				
								Below 16.50m bgl with low to medium cobble content of reddish sandstone.
		17.00-17.45	B		17.00	30.18		
		17.00-17.45	B					
		17.00	SPT	N≥50 (10,9/50 for 225mm)				Reddish brown clayey fine to coarse SAND (GLACIAL TILL)
		17.50	D		17.50	29.68		Stiff brown slightly gravelly to gravelly CLAY. Gravel is fine to coarse subrounded of sandstone. (GLACIAL TILL)
		18.00-18.45	U	0 Blows				
		18.00-18.45	U	125 Blows (100% rec)				
		18.50	D					
		19.00-19.45	B					
		19.00-19.45	B					
		19.00-19.45	D					
		19.00	SPT	N=31 (3,4/6,8,8,9)	19.50	27.68		Dense brown SAND and GRAVEL with low cobble content. Gravel is fine to coarse subrounded of sandstone. Cobbles
		20.00-20.45	B					

Remarks: 1) Location cleared for utilities and UXO 2) Hand-dug inspection pit completed to 1.2m bgl. 3) Borehole complete at 23.0m bgl. 4) Borehole installed with standpipe on completion.

B = Bulk Sample
D = Disturbed Sample
U = Undisturbed Sample
UT = Undisturbed Sample (Thin Wall)
ES = Environmental Sample
W = Water Sample
PID = Photoionization Detector (ppm)
SPT = Standard Penetration Test
AB = Asbestos Bulk Sample

Groundwater: Seepage at 3.10m bgl

Logged: DS **Checked:** RS

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Cable Percussion

Borehole No. BH01

Sheet 3 of 3

Project Name:	Islington Wharf Phase 4		**Co-ords:**	385250E, 398274N	**Hole Type:** CP
Location:	Great Ancoats Street / Old Mill Street, Manchester, M4 6DN	**Project No:** C-10042-C	**Ground Level:**	47.18m OD	**Scale:** 1:50
Client:	Waterside Places		**Date(s):**	30/01/20 - 31/01/20	**Hole Diameter:**

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description
		Depth (m)	Type	Results				
		20.00	SPT	N≥50 (25 for 50mm/50 for 60mm)				Dense brown SAND and GRAVEL with low cobble content. Gravel is fine to coarse subrounded of sandstone. Cobbles are subangular of sandstone. (GLACIAL TILL)
		21.00-21.45	B					
		21.00	SPT	N≥50 (25 for 40mm/50 for 70mm)				
		22.00-22.45	B					
		22.00-22.45	B					
		22.00	SPT	N≥50 (25 for 60mm/50 for 145mm)				
		23.00	SPT	N≥50 (25 for 50mm/50 for 50mm)	23.00	24.18		End of Borehole at 23.00m

21.0 22.0 23.0 24.0 25.0 26.0 27.0 28.0 29.0 30.0

Remarks: 1) Location cleared for utilities and UXO 2) Hand-dug inspection pit completed to 1.2m bgl. 3) Borehole complete at 23.0m bgl. 4) Borehole installed with standpipe on completion.

B = Bulk Sample
D = Disturbed Sample
U = Undisturbed Sample
UT = Undisturbed Sample (Thin Wall)
ES = Environmental Sample
W = Water Sample
PID = Photoionization Detector (ppm)
SPT = Standard Penetration Test
AB = Asbestos Bulk Sample

Groundwater: Seepage at 3.10m bgl

Logged: DS **Checked:** RS

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Cable Percussion

Borehole No. BH02

Sheet 1 of 3

Project Name:	Islington Wharf Phase 4		**Co-ords:**	385226E, 398248N	**Hole Type:** CP
Location:	Great Ancoats Street / Old Mill Street, Manchester, M4 6DN	**Project No:** C-10042-C	**Ground Level:**	46.10m OD	**Scale:** 1:50
Client:	Waterside Places		**Date(s):**	28/01/20 - 29/01/20	**Hole Diameter:**

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m OD)	Legend	Stratum Description
		0.50-1.20	B		0.50	45.60		Greyish beige slightly sandy GRAVEL. Gravel is fine to coarse subangular of limestone. (MADE GROUND)
		0.70-1.20	ES					
		1.20-1.65	B					Greyish brown slightly sandy clayey GRAVEL. Gravel is fine to medium subangular of brick, concrete, sandstone and slate with occasional metal, glass, plastic, and rare wood fragments. (MADE GROUND)
		1.20	SPT	N=16 (3,5/5,4,3,4)	1.30	44.80		
		1.80-2.00	ES					Dark brownish black slightly ashy clayey GRAVEL with medium cobble content. Gravel is fine to coarse subangular of brick, concrete, sandstone and slate with metal, glass, plastic and ceramic fragments. Cobbles are subangular of brick, concrete, sandstone and slate. (MADE GROUND)
		2.00-2.45	B					
		2.00	SPT	N=19 (3,5/5,5,5,4)				
		2.50-3.00	B		2.50	43.60		Firm becoming stiff slightly silty slightly gravelly CLAY. Gravel is fine to medium sub angular to sub rounded of sandstone. (GLACIAL TILL)
		3.00-3.45	B					*At 2.5m bgl: Occasional blue veining*
		3.00-3.45	D					
		3.00	SPT	N=18 (3,2/3,4,5,6)				
		4.00-4.45	U	0 Blows				
		4.00-4.45	U	40 Blows (100% rec)				
		4.50	D					
		5.00-5.45	D					
		5.00	SPT	N=24 (4,5/6,6,6,6)				*At 5.2m bgl: becoming reddish brown*
		6.00-6.45	U	0 Blows				
		6.00-6.45	U	43 Blows (100% rec)				
		7.00-7.45	B					*At 7.0m bgl: becoming slightly sandy*
		7.00-7.45	D					
		7.00	SPT	N=24 (5,5/6,6,6,6)				
		8.00-8.45	U	0 Blows				
		8.00-8.45	U	46 Blows (75% rec)				
		8.50	D					
		9.00-9.45	D					
		9.00	SPT	N=25 (5,6/6,6,7,6)				
		10.00-10.45	U	0 Blows				
		10.00-10.45	U	47 Blows (100% rec)				

1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0

Remarks: 1) Location cleared for utilities and UXO 2) Hand-dug inspection pit completed to 1.2m bgl. 3) Borehole complete at 22.5m bgl. 4) Borehole installed with standpipe on completion.

B = Bulk Sample
D = Disturbed Sample
U = Undisturbed Sample
UT = Undisturbed Sample (Thin Wall)
ES = Environmental Sample
W = Water Sample
PID = Photoionization Detector (ppm)
SPT = Standard Penetration Test
AB = Asbestos Bulk Sample

Groundwater: Seepage at 11.50m bgl

Logged: DS / JB **Checked:** RS

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Cable Percussion

Borehole No. BH02

Sheet 2 of 3

Project Name:	Islington Wharf Phase 4		**Co-ords:**	385226E, 398248N	**Hole Type:** CP
Location:	Great Ancoats Street / Old Mill Street, Manchester, M4 6DN	**Project No:** C-10042-C	**Ground Level:**	46.10m OD	**Scale:** 1:50
Client:	Waterside Places		**Date(s):**	28/01/20 - 29/01/20	**Hole Diameter:**

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description
		Depth (m)	Type	Results				
		10.50	D					Firm becoming stiff slightly silty slightly gravelly CLAY. Gravel is fine to medium sub angular to sub rounded of sandstone. (GLACIAL TILL)
		11.00-11.45 11.00	D SPT	N=36 (4,6/8,10,9,9)				*At 11.0m bgl: becoming stiff and slightly silty*
		12.00-12.45 12.00-12.45	U U	0 Blows 51 Blows (70% rec)				
		12.50	D					
		13.00-13.45 13.00	D SPT	N=31 (4,7/7,8,8,8)				
		14.00-14.45 14.00-14.45 14.00	B B SPT	N=45 (4,6/8,10,12,15)	14.00	32.10		Very stiff brown slightly sandy slightly gravelly laminated CLAY. Gravel is fine sub angular of sandstone and quartz. (GLACIAL TILL)
		15.00-15.45 15.00	D SPT	N=49 (5,8/8,11,15,15)				*Between 14.5 and 15.5m bgl: occasional pockets of orangish red medium to coarse sand* *At 14.0m bgl: sandy*
		16.00-16.45 16.00	D SPT	N≥50 (6,9/50 for 225mm)	15.50	30.60		Very dense red slightly gravelly fine to medium SAND. Gravel is fine to medium sub angular of sandstone. (GLACIAL TILL)
		17.00-17.45 17.00-17.45 17.00	B B SPT	N≥50 (6,10/50 for 235mm)	16.50 17.00	29.60 29.10		Very stiff brown slightly sandy slightly gravelly laminated CLAY. Gravel is fine sub angular of sandstone and quartz. (GLACIAL TILL) Very dense multicoloured GRAVEL with medium cobble content. Gravel is fine to coarse subangular to subrounded of sandstone, mudstone and siltstone. Cobbles are subangular of sandstone. (GLACIAL TILL)
		18.00-18.45 18.00	D SPT	N≥50 (16,5/50 for 152mm)				
		19.00-19.45 19.00	D SPT	N≥50 (10,12/50 for 162mm)				
		20.00-20.45	D					

Remarks: 1) Location cleared for utilities and UXO 2) Hand-dug inspection pit completed to 1.2m bgl. 3) Borehole complete at 22.5m bgl. 4) Borehole installed with standpipe on completion.

B = Bulk Sample
D = Disturbed Sample
U = Undisturbed Sample
UT = Undisturbed Sample (Thin Wall)
ES = Environmental Sample
W = Water Sample
PID = Photoionization Detector (ppm)
SPT = Standard Penetration Test
AB = Asbestos Bulk Sample

Groundwater: Seepage at 11.50m bgl

Logged: DS / JB **Checked:** RS

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Cable Percussion

Borehole No. BH02

Sheet 3 of 3

Project Name:	Islington Wharf Phase 4		**Co-ords:**	385226E, 398248N	**Hole Type:** CP
Location:	Great Ancoats Street / Old Mill Street, Manchester, M4 6DN	**Project No:** C-10042-C	**Ground Level:**	46.10m OD	**Scale:** 1:50
Client:	Waterside Places		**Date(s):**	28/01/20 - 29/01/20	**Hole Diameter:**

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description
		Depth (m)	Type	Results				
		20.00	SPT	N≥50 (25 for 78mm/50 for 151mm)				Very dense multicoloured GRAVEL with medium cobble content. Gravel is fine to coarse subangular to subrounded of sandstone, mudstone and siltstone. Cobbles are subangular of sandstone. (GLACIAL TILL)
		21.00-21.45	D					*Below 20.0m bgl: gravel predominantly sub rounded*
		21.00	SPT	N≥50 (25 for 98mm/50 for 166mm)				
					21.60	24.50		End of Borehole at 21.60m

21.0
22.0
23.0
24.0
25.0
26.0
27.0
28.0
29.0
30.0

Remarks: 1) Location cleared for utilities and UXO 2) Hand-dug inspection pit completed to 1.2m bgl. 3) Borehole complete at 22.5m bgl. 4) Borehole installed with standpipe on completion.

B = Bulk Sample
D = Disturbed Sample
U = Undisturbed Sample
UT = Undisturbed Sample (Thin Wall)
ES = Environmental Sample
W = Water Sample
PID = Photoionization Detector (ppm)
SPT = Standard Penetration Test
AB = Asbestos Bulk Sample

Groundwater: Seepage at 11.50m bgl

Logged: DS / JB **Checked:** RS

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Cable Percussion

Borehole No. BH03

Sheet 1 of 3

Project Name:	Islington Wharf Phase 4		**Co-ords:**	385239E, 398232N	**Hole Type:** CP
Location:	Great Ancoats Street / Old Mill Street, Manchester, M4 6DN	**Project No:** C-10042-C	**Ground Level:**	47.18m OD	**Scale:** 1:50
Client:	Waterside Places		**Date(s):**	29/01/20 - 31/01/20	**Hole Diameter:**

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m OD)	Legend	Stratum Description
					0.10	47.08		ASPHALT HARDSTANDING (MADE GROUND)
								Brown slightly sandy GRAVEL with high cobble and boulder content. Gravel is fine to coarse angular to subangular of concrete, brick, glass, wood, metal, ash with pockets of clay. Cobbles are boulders are angular to subangular of brick and concrete. (MADE GROUND)
					1.30	45.88		Firm to stiff dark brown slightly gravelly CLAY with occasional grey veins. Gravel is fine to coarse subrounded of mudstone, sandstone. (GLACIAL TILL)
		2.00-2.45	B					
		2.00-2.45	D					
		2.00	SPT	N=16 (2,3/4,4,4,4)				
		3.00-3.45	D					
		3.00	SPT	N=17 (3,4/4,5,4,4)				*At 3.00m bgl becomes reddish brown with occasional bands of sand.*
		4.00-4.45	U	0 Blows				
		4.00-4.45	U	38 Blows (70% rec)				
		4.50	D					*Below 4.50m bgl becomes stiff.*
		5.00-5.45	B					
		5.00-5.45	D					
		5.00	SPT	N=20 (3,5/5,5,5,5)				
		6.00-6.45	U	0 Blows				
		6.00-6.45	U	43 Blows (100% rec)				
		6.50	D					
		7.00-7.45	D					
		7.00	SPT	N=23 (4,5/5,6,6,6)				
		8.00-8.45	U	0 Blows	8.00	39.18		Firm to stiff dark brown CLAY. (GLACIAL TILL)
		8.00-8.45	U	46 Blows (70% rec)				
		8.50	D					
		9.00-9.45	B					
		9.00-9.45	D					
		9.00	SPT	N=25 (5,6/6,7,6,6)				
		10.00-10.45	U	0 Blows				
		10.00-10.45	U	52 Blows (60% rec)				

1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0

Remarks: 1) Location cleared for utilities and UXO 2) Machine excavated Inspection pit to 1.5m bgl, due to concrete obstruction 3) Borehole complete at 26.0m bgl. 4) Borehole installed with standpipe on completion.

B = Bulk Sample
D = Disturbed Sample
U = Undisturbed Sample
UT = Undisturbed Sample (Thin Wall)
ES = Environmental Sample
W = Water Sample
PID = Photoionization Detector (ppm)
SPT = Standard Penetration Test
AB = Asbestos Bulk Sample

Groundwater: DRY

Logged: DS **Checked:** RS

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Cable Percussion

Borehole No. BH03

Sheet 2 of 3

Project Name:	Islington Wharf Phase 4		**Co-ords:**	385239E, 398232N	**Hole Type:** CP
Location:	Great Ancoats Street / Old Mill Street, Manchester, M4 6DN	**Project No:** C-10042-C	**Ground Level:**	47.18m OD	**Scale:** 1:50
Client:	Waterside Places		**Date(s):**	29/01/20 - 31/01/20	**Hole Diameter:**

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m OD)	Legend	Stratum Description
		10.50	D					Firm to stiff dark brown CLAY. (GLACIAL TILL)
		11.00-11.45	D					
		11.00	SPT	N=22 (4,4/5,5,6,6)				
		12.00-12.45	D					*Below 12.00m bgl with bands of orangish sands and occasional fine to medium angular gravel of coal.*
		12.00	SPT	N=25 (4,5/6,6,6,7)				
		13.00-13.45	D					
		13.00	SPT	N=26 (4,6/6,6,7,7)				
		14.00-14.45	D					
		14.00	SPT	N=27 (5,6/7,6,7,7)				
		14.80	B		14.80	32.38		
		14.80	B					Firm to stiff dark brown slightly gravelly CLAY. Gravel is fine to coarse subangular to subrounded of mudstone and sandstone. (GLACIAL TILL)
		15.00-15.45	D					
		15.00	SPT	N=44 (7,9/10,11,11,12)				
		15.50	D		15.50	31.68		*Below 15.00m bgl becomes sandy to very sandy with sand bands.*
		16.00-16.45	B					Reddish brown fine to coarse SAND with pockets of clay. (GLACIAL TILL)
		16.00-16.45	B					
		16.00-16.45	D					
		16.00	SPT	N≥50 (8,12/50 for 85mm)				
		17.00-17.45	B		17.00	30.18		
		17.00-17.45	B					Multicoloured slightly sandy GRAVEL with low cobble content. Gravel is fine to coarse angular to subrounded of mudstone, sandstone, siltstone and quartzite. Cobbles are subrounded of sandstone. (GLACIAL TILL)
		17.00	SPT	N≥50 (6,12/50 for 156mm)				
		18.00-18.45	D					
		18.00	SPT	N≥50 (9,14/50 for 154mm)				
		19.00-19.45	D					
		19.00	SPT	N≥50 (25 for 97mm/50 for 151mm)				
		20.00-20.45	D					

11.0 12.0 13.0 14.0 15.0 16.0 17.0 18.0 19.0 20.0

Remarks: 1) Location cleared for utilities and UXO 2) Machine excavated Inspection pit to 1.5m bgl, due to concrete obstruction 3) Borehole complete at 26.0m bgl. 4) Borehole installed with standpipe on completion.

B = Bulk Sample
D = Disturbed Sample
U = Undisturbed Sample
UT = Undisturbed Sample (Thin Wall)
ES = Environmental Sample
W = Water Sample
PID = Photoionization Detector (ppm)
SPT = Standard Penetration Test
AB = Asbestos Bulk Sample

Groundwater: DRY

Logged: DS **Checked:** RS

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Cable Percussion

Borehole No. BH03

Sheet 3 of 3

Project Name:	Islington Wharf Phase 4		**Co-ords:**	385239E, 398232N	**Hole Type:** CP
Location:	Great Ancoats Street / Old Mill Street, Manchester, M4 6DN	**Project No:** C-10042-C	**Ground Level:**	47.18m OD	**Scale:** 1:50
Client:	Waterside Places		**Date(s):**	29/01/20 - 31/01/20	**Hole Diameter:**

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description
		Depth (m)	Type	Results				
		20.00	SPT	N≥50 (25 for 85mm/50 for 90mm)				Multicoloured slightly sandy GRAVEL with low cobble content. Gravel is fine to coarse angular to subrounded of mudstone, sandstone, siltstone and quartzite. Cobbles are subrounded of sandstone. (GLACIAL TILL)
		21.00-21.45	B					
		21.00-21.45	B					
		21.00	SPT	N≥50 (25 for 78mm/50 for 85mm)				
		22.00	SPT	N≥50 (16,9/50 for 92mm)				
		23.00	SPT	N≥50 (25 for 78mm/50 for 85mm)				
		24.00	SPT	N≥50 (25 for 95mm/50 for 88mm)				
		25.00	SPT	N≥50 (25 for 84mm/50 for 93mm)				
					26.00	21.18		End of Borehole at 26.00m

21.0 22.0 23.0 24.0 25.0 26.0 27.0 28.0 29.0 30.0

Remarks: 1) Location cleared for utilities and UXO 2) Machine excavated Inspection pit to 1.5m bgl, due to concrete obstruction 3) Borehole complete at 26.0m bgl. 4) Borehole installed with standpipe on completion.

B = Bulk Sample
D = Disturbed Sample
U = Undisturbed Sample
UT = Undisturbed Sample (Thin Wall)
ES = Environmental Sample
W = Water Sample
PID = Photoionization Detector (ppm)
SPT = Standard Penetration Test
AB = Asbestos Bulk Sample

Groundwater: DRY

Logged: DS **Checked:** RS

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Cable Percussion

Borehole No. BH04

Sheet 1 of 3

Project Name:	Islington Wharf Phase 4		**Co-ords:**	385268E, 398251N	**Hole Type:** CP
Location:	Great Ancoats Street / Old Mill Street, Manchester, M4 6DN	**Project No:** C-10042-C	**Ground Level:**	48.18m OD	**Scale:** 1:50
Client:	Waterside Places		**Date(s):**	28/01/20 - 29/01/20	**Hole Diameter:**

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m OD)	Legend	Stratum Description
					0.08	48.10		ASPHALT HARDSTANDING. (MADE GROUND)
		0.30-1.20	B		0.20	47.98		Greyish beige slightly sandy GRAVEL. Gravel is fine to coarse subangular of limestone. (MADE GROUND)
		0.50	ES		0.30	47.88		CONCRETE HARDSTANDING. (MADE GROUND)
		1.00	D					Dark brownish black slightly sandy clayey GRAVEL with medium cobble content. Gravel is fine to coarse subangular of brick, concrete, sandstone and slate with metal, glass, plastic and ceramic fragments. Cobbles are subangular of brick, concrete, slate and sandstone. (MADE GROUND)
		1.20-1.65	B					
		1.20-2.00	ES					
		1.20	SPT	N=10 (2,3/3,2,1,4)				
		2.00	D					*Between 1.2m and 2.45m bgl: slight hydrocarbon odour*
		2.00-2.45	B					
		2.00	SPT	N=31 (2,3/4,10,9,8)				
		3.00	D					*Between 3.0m and 3.5m bgl: occasional metal fragments*
		3.00-3.45	B					
		3.00	SPT	N=14 (2,3/3,4,3,4)				
		4.00-4.45	B		4.00	44.18		Firm becoming stiff slightly gravelly CLAY. Gravel is fine to medium sub angular to sub rounded of sandstone. (GLACIAL TILL)
		4.00-4.45	D					
		4.00	SPT	N=23 (3,4/4,6,6,7)				
		5.00-5.45	U	100 Blows (70% rec)				
		5.50	D					*At 5.5m bgl: occasional blue veining*
		6.00-6.45	B					
		6.00-6.45	D					
		6.00	SPT	N=26 (4,5/5,6,7,8)				
		7.00-7.45	U	0 Blows				
		7.00-7.45	U	120 Blows (75% rec)				
		7.50	D					
		8.00-8.45	D					*At 8.0m bgl: becoming slightly sandy*
		8.00	SPT	N=22 (2,3/4,5,6,7)				
		9.00-9.45	B					*Between 8.5m and 12.0m bgl: rare fine to medium gravel of sub angular sandstone and mudstone*
		9.00-9.45	B					
		9.00-9.45	U	125 Blows				
		10.00-10.45	D					
		10.00	SPT	N=23 (3,3/4,5,7,7)				

1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0

Remarks: 1) Location cleared for utilities and UXO 2) Hand-dug inspection pit completed to 1.2m bgl. 3) Borehole complete at 25.45m bgl. 4) Borehole installed with standpipe on completion.

B = Bulk Sample
D = Disturbed Sample
U = Undisturbed Sample
UT = Undisturbed Sample (Thin Wall)
ES = Environmental Sample
W = Water Sample
PID = Photoionization Detector (ppm)
SPT = Standard Penetration Test
AB = Asbestos Bulk Sample

Groundwater: DRY

Logged: DS / JB **Checked:** RS

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Cable Percussion

Borehole No. BH04 Sheet 2 of 3

Project Name:	Islington Wharf Phase 4		**Co-ords:**	385268E, 398251N	**Hole Type:** CP
Location:	Great Ancoats Street / Old Mill Street, Manchester, M4 6DN	**Project No:** C-10042-C	**Ground Level:**	48.18m OD	**Scale:** 1:50
Client:	Waterside Places		**Date(s):**	28/01/20 - 29/01/20	**Hole Diameter:**

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m OD)	Legend	Stratum Description
		11.00-11.45	U	0 Blows				Firm becoming stiff slightly gravelly CLAY. Gravel is fine to medium sub angular to sub rounded of sandstone. (GLACIAL TILL)
		11.00-11.45	U	125 Blows (80% rec)				
		11.50	D					
		12.00-12.45	B					
		12.00-12.45	D					*At 12.0m bgl: becoming stiff*
		12.00	SPT	N=32 (6,7/8,7,8,9)				
		13.00-13.45	U	0 Blows				
		13.00-13.45	U	120 Blows (85% rec)				
		13.50	D					
		14.00-14.45	B		14.00	34.18		
		14.00-14.45	D					Stiff brown slightly sandy slightly gravelly laminated CLAY. Gravel is fine sub angular of sandstone and quartz. (GLACIAL TILL)
		14.00	SPT	N=22 (3,3/4,5,6,7)				*Between 14.0m and 16.0m bgl: occasional reddish brown thinly bedded sand bands*
		15.00-15.45	U	125 Blows (100% rec)				
		15.50	D					
		15.70-16.00	B					
		15.70-16.00	B					
		16.00-16.45	D		16.00	32.18		Very dense light brown very gravelly fine to coarse SAND. Gravel is fine to coarse sub angular to sub rounded of sandstone. (GLACIAL TILL)
		16.00	SPT	N=48 (9,10/11,12,13,12)				
		17.00-17.45	D		17.00	31.18		Stiff brown slightly sandy slightly gravelly laminated CLAY. Gravel is fine sub angular of sandstone and quartz. (GLACIAL TILL)
		17.00	SPT	N=34 (4,5/7,8,9,10)				*Between 14.0m and 16.0m bgl: occasional reddish brown thinly bedded sand bands*
		18.00-18.45	B		18.00	30.18		
		18.00-18.45	B					Very dense slightly clayey sandy GRAVEL with medium cobble content. Gravel is fine to coarse sub rounded of sandstone. Cobbles are subrounded of sandstone. (GLACIAL TILL)
		18.00-18.45	D					
		18.00	SPT	N≥50 (25 for 75mm/50 for 50mm)				
		19.00-19.45	D					
		19.00-19.45	D					
		19.00	SPT	N≥50 (10,12/50 for 225mm)				
		20.00-20.45	B					
		20.00-20.45	B					

Remarks: 1) Location cleared for utilities and UXO 2) Hand-dug inspection pit completed to 1.2m bgl. 3) Borehole complete at 25.45m bgl. 4) Borehole installed with standpipe on completion.

B = Bulk Sample
D = Disturbed Sample
U = Undisturbed Sample
UT = Undisturbed Sample (Thin Wall)
ES = Environmental Sample
W = Water Sample
PID = Photoionization Detector (ppm)
SPT = Standard Penetration Test
AB = Asbestos Bulk Sample

Groundwater: DRY

Logged: DS / JB **Checked:** RS

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Cable Percussion

Borehole No. BH04

Sheet 3 of 3

Project Name:	Islington Wharf Phase 4		**Co-ords:**	385268E, 398251N	**Hole Type:** CP
Location:	Great Ancoats Street / Old Mill Street, Manchester, M4 6DN	**Project No:** C-10042-C	**Ground Level:**	48.18m OD	**Scale:** 1:50
Client:	Waterside Places		**Date(s):**	28/01/20 - 29/01/20	**Hole Diameter:**

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description
		Depth (m)	Type	Results				
		20.00	SPT	N≥50 (25 for 75mm/50 for 135mm)				Very dense slightly clayey sandy GRAVEL with medium cobble content. Gravel is fine to coarse sub rounded of sandstone. Cobbles are subrounded of sandstone. (GLACIAL TILL)
		21.00-21.45 21.00	B SPT	N≥50 (10,12/50 for 125mm)				
		22.00-22.45 22.00	B SPT	N≥50 (10,15/50 for 150mm)				
		23.00-23.45 23.00	B SPT	N≥50 (25 for 65mm/50 for 80mm)	23.00	25.18		Very dense orangish brown coarse SAND and GRAVEL. Gravel is fine to coarse sub angular to sub rounded of sandstone and siltstone. (GLACIAL TILL)
		24.00-24.45 24.00	B SPT	N≥50 (25 for 60mm/50 for 125mm)				
		25.00-25.45 25.00	B SPT	N≥50 (25 for 55mm/50 for 70mm)	25.45	22.73		End of Borehole at 25.45m

21.0 22.0 23.0 24.0 25.0 26.0 27.0 28.0 29.0 30.0

Remarks: 1) Location cleared for utilities and UXO 2) Hand-dug inspection pit completed to 1.2m bgl. 3) Borehole complete at 25.45m bgl. 4) Borehole installed with standpipe on completion.

B = Bulk Sample
D = Disturbed Sample
U = Undisturbed Sample
UT = Undisturbed Sample (Thin Wall)
ES = Environmental Sample
W = Water Sample
PID = Photoionization Detector (ppm)
SPT = Standard Penetration Test
AB = Asbestos Bulk Sample

Groundwater: DRY

Logged: DS / JB **Checked:** RS

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Trial Pit

Trial Pit No: TP01 Sheet 1 of 1

Project Name:	Islington Wharf Phase 4		**Dimensions:**	0.60m x 2.40m	**Hole Type:** TP
Location:	Great Ancoats Street / Old Mill Street, Manchester, M4 6DN	**Project No:** C-10042-C	**Co-ords:**	385237E, 398261N	**Scale:** 1:25
			Ground Level:	46.37m OD	
Client:	Waterside Places		**Date(s):**	29/01/20	**Plant Used:** JCB 3CX

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description
	Depth (m)	Type	Results				
				0.25	46.12		Grey sandy GRAVEL. Gravel is fine to coarse sub angular of concrete. (MADE GROUND)
	0.40	ES					Dark brown slightly sandy clayey GRAVEL with medium cobble content. Gravel are fine to coarse subangular of brick, concrete, sandstone and slate with metal, glass, plastic and ceramic fragments. Cobbles are subangular fine to coarse of brick, sandstone, concrete and slate. (MADE GROUND)
	0.50	D					
	0.80	ASB					*At 0.8m bgl: possible asbestos cement fragment*
	2.10	B		2.10	44.27		Firm orangish brown slightly gravelly silty CLAY. Gravel is fine to medium sub angular to sub rounded of sandstone. (GLACIAL TILL)
	2.20	HSV	83				*Between 2.1m and 2.6m bgl: occasional blue veining*
				2.60	43.77		End of Trial Pit at 2.60m

1.0
2.0
3.0
4.0
5.0

Remarks: 1) Location cleared for utilities and UXO 2) Trial pit complete at 2.6m bgl due to obstructions and pit instability 3) Trial pit backfilled with arisings on completion

Stability: Stable.

Groundwater: Groundwater not encountered

B = Bulk Sample
D = Disturbed Sample
ES = Environmental Sample
W = Water Sample
PID = Photoionization Detector (ppm)
CBR = In Situ California Bearing Ratio (%)
HSV = Hand Shear Vane (kPa)
HP = Hand Penetrometer (kPa)
AB = Asbestos Bulk Sample

Logged: JB **Checked:** RS

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Trial Pit

Trial Pit No: TP02 Sheet 1 of 1

Project Name:	Islington Wharf Phase 4		**Dimensions:**	0.60m x 2.40m	**Hole Type:** TP
Location:	Great Ancoats Street / Old Mill Street, Manchester, M4 6DN	**Project No:** C-10042-C	**Co-ords:** 385256E, 398261N **Ground Level:** 47.75m OD		**Scale:** 1:25
Client:	Waterside Places		**Date(s):**	29/01/20	**Plant Used:** JCB 3CX

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description
	Depth (m)	Type	Results				
				0.08	47.67		ASPHALT HARDSTANDING. (MADE GROUND)
				0.20	47.55		Greyish beige slightly sandy GRAVEL. Gravel is fine to coarse sub angular of limestone. (MADE GROUND)
				0.30	47.45		Red and grey gravelly fine to coarse SAND. Gravel is fine to coarse sub angular to sub rounded of sandstone, brick and limestone. (MADE GROUND)
	0.70 0.70	B ES		0.70	47.05		Grey sandy GRAVEL. Gravel is fine to coarse sub angular of concrete. (MADE GROUND)
							Dark brown slightly sandy clayey GRAVEL with medium cobble content. Gravel is fine to coarse subangular of brick, concrete, sandstone and slate with metal, glass, plastic and ceramic fragments. Cobbles are subangular of slate, sandstone, brick and concrete. (MADE GROUND) *At 0.7m bgl: black geotextile membrane*
	2.00	D					
				2.30	45.45		End of Trial Pit at 2.30m

1.0
2.0
3.0
4.0
5.0

Remarks: 1) Location cleared for utilities and UXO 2) Trial pit complete at 2.3m bgl due to pit instability 3) Trial pit backfilled with arisings on completion

Stability: Unstable below 0.7m bgl.

Groundwater: Groundwater not encountered

B = Bulk Sample
D = Disturbed Sample
ES = Environmental Sample
W = Water Sample
PID = Photoionization Detector (ppm)
CBR = In Situ California Bearing Ratio (%)
HSV = Hand Shear Vane (kPa)
HP = Hand Penetrometer (kPa)
AB = Asbestos Bulk Sample

Logged: JB **Checked:** RS

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Trial Pit

Trial Pit No: TP03

Sheet 1 of 1

Project Name:	Islington Wharf Phase 4		**Dimensions:**	0.80m x 2.20m	**Hole Type:** TP
Location:	Great Ancoats Street / Old Mill Street, Manchester, M4 6DN	**Project No:** C-10042-C	**Co-ords:** 385244E, 398248N **Ground Level:** 46.60m OD		**Scale:** 1:25
Client:	Waterside Places		**Date(s):**	29/01/20	**Plant Used:** JCB 3CX

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description
	Depth (m)	Type	Results				
				0.08	46.52		ASPHALT HARDSTANDING. (MADE GROUND)
				0.20	46.40		Greyish beige slightly sandy GRAVEL. Gravel is fine to coarse sub angular of limestone. (MADE GROUND)
	0.60 - 0.80	ES					Soft brown gravelly CLAY with low cobble content . Gravel is fine to coarse sub angular of brick, concrete, sandstone and slate with metal, glass, plastic and ceramic fragments. Cobbles are subangular of brick, concrete, sandstone and slate. (MADE GROUND)
	0.90	D					
	1.45 1.50	HSV B	99	1.40	45.20		Stiff orangish brown slightly gravelly silty CLAY. Gravel is fine to medium sub angular to sub rounded of sandstone. (GLACIAL TILL)
							Between 1.4 and 1.7m bgl: occasional blue veining
				1.80	44.80		End of Trial Pit at 1.80m

1.0
2.0
3.0
4.0
5.0

Remarks: 1) Location cleared for utilities and UXO 2) Trial pit complete at 1.8m bgl due to clay stiffness 3) Trial pit backfilled with arisings on completion

Stability: Stable.

Groundwater: Groundwater not encountered

B = Bulk Sample
D = Disturbed Sample
ES = Environmental Sample
W = Water Sample
PID = Photoionization Detector (ppm)
CBR = In Situ California Bearing Ratio (%)
HSV = Hand Shear Vane (kPa)
HP = Hand Penetrometer (kPa)
AB = Asbestos Bulk Sample

Logged: JB **Checked:** RS

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Trial Pit

Trial Pit No: TP04 Sheet 1 of 1

Project Name:	Islington Wharf Phase 4		**Dimensions:**	0.70m x 2.30m	**Hole Type:** TP
Location:	Great Ancoats Street / Old Mill Street, Manchester, M4 6DN	**Project No:** C-10042-C	**Co-ords:** 385255E, 398248N **Ground Level:** 47.67m OD		**Scale:** 1:25
Client:	Waterside Places		**Date(s):**	29/01/20	**Plant Used:** JCB 3CX

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description
	Depth (m)	Type	Results				
				0.08	47.59		ASPHALT HARDSTANDING. (MADE GROUND)
	0.20	ES		0.20	47.47		Greyish beige slightly sandy GRAVEL. Gravel is fine to coarse sub angular of limestone. (MADE GROUND)
	0.30	D					Soft brown sandy gravelly CLAY with medium cobble content. Gravel is fine to coarse subangular of brick, concrete, sandstone and slate with metal, glass, plastic and ceramic fragments. Cobbles are subangular of brick, slate, concrete and sandstone (MADE GROUND)
	0.55	ES		0.55	47.12		Soft brownish black slightly gravelly ashey CLAY. Gravel is fine to medium sub angular to sub rounded of clinker and brick. (MADE GROUND)
							Between 0.55m and 1.2m bgl: slight hydrocarbon odour
	1.20	B		1.20	46.47		
	1.20	HSV	101				Stiff orangish brown slightly gravelly silty CLAY. Gravel is fine to medium sub angular to sub rounded of sandstone. (GLACIAL TILL)
	2.00	HSV	105	2.00	45.67		End of Trial Pit at 2.00m

1.0 2.0 3.0 4.0 5.0

Remarks: 1) Location cleared for utilities and UXO 2) Trial pit complete at 2.0m bgl due to clay stiffness 3) Trial pit backfilled with arisings on completion

Stability: Unstable below 0.3m bgl.

Groundwater: Groundwater not encountered

B = Bulk Sample
D = Disturbed Sample
ES = Environmental Sample
W = Water Sample
PID = Photoionization Detector (ppm)
CBR = In Situ California Bearing Ratio (%)
HSV = Hand Shear Vane (kPa)
HP = Hand Penetrometer (kPa)
AB = Asbestos Bulk Sample

Logged: JB **Checked:** RS

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Trial Pit

Trial Pit No: TP05 Sheet 1 of 1

Project Name:	Islington Wharf Phase 4		**Dimensions:**	0.80m x 1.90m	**Hole Type:** TP
Location:	Great Ancoats Street / Old Mill Street, Manchester, M4 6DN	**Project No:** C-10042-C	**Co-ords:**	385234E, 398241N	**Scale:** 1:25
			Ground Level:	46.42m OD	
Client:	Waterside Places		**Date(s):**	29/01/20	**Plant Used:** JCB 3CX

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description
	Depth (m)	Type	Results				
				0.08	46.34		ASPHALT HARDSTANDING. (MADE GROUND)
				0.30	46.12		Greyish beige slightly sandy GRAVEL. Gravel is fine to coarse sub angular of limestone. (MADE GROUND)
	0.40	ES					Dark brown slightly sandy clayey GRAVEL. Gravel is fine to coarse sub angular of brick, concrete, sandstone and slate with metal, glass, plastic and ceramic fragments. Cobbles are subangular of brick, concrete, sandstone and slate. (MADE GROUND)
	0.60	D					
	1.20	ASB					*At 1.2m bgl: possible asbestos cement fragment*
	1.60 - 2.00	ES					
	2.10 - 2.30	B		2.10	44.32		Stiff light brown slightly gravelly silty CLAY. Gravel is fine to medium sub angular to sub rounded of sandstone. (GLACIAL TILL)
	2.20	HSV	105				*Between 2.1m and 2.3m bgl: occasional blue veining*
				2.30	44.12		End of Trial Pit at 2.30m

1.0
2.0
3.0
4.0
5.0

Remarks: 1) Location cleared for utilities and UXO 2) Trial pit complete at 2.3m bgl due to pit instability 3) Trial pit backfilled with arisings on completion

Stability: Unstable below 0.6m bgl.

Groundwater: Groundwater not encountered

B = Bulk Sample
D = Disturbed Sample
ES = Environmental Sample
W = Water Sample
PID = Photoionization Detector (ppm)
CBR = In Situ California Bearing Ratio (%)
HSV = Hand Shear Vane (kPa)
HP = Hand Penetrometer (kPa)
AB = Asbestos Bulk Sample

Logged: JB **Checked:** RS

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Trial Pit

Trial Pit No: TP06 Sheet 1 of 1

Project Name:	Islington Wharf Phase 4		**Dimensions:**	0.70m x 2.30m	**Hole Type:** TP
Location:	Great Ancoats Street / Old Mill Street, Manchester, M4 6DN	**Project No:** C-10042-C	**Co-ords:** 385253E, 398238N **Ground Level:** 51.11m OD		**Scale:** 1:25
Client:	Waterside Places		**Date(s):**	29/01/20	**Plant Used:** JCB 3CX

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description
	Depth (m)	Type	Results				
				0.08	51.03		ASPHALT HARDSTANDING. (MADE GROUND)
				0.15	50.96		Greyish beige slightly sandy GRAVEL. Gravel is fine to coarse sub angular of limestone. (MADE GROUND)
	0.30	ES					Firm brown gravelly CLAY with low cobble content. Gravel fine to coarse subangular of brick, concrete, sandstone and slate with metal, glass, plastic and ceramic fragments. Cobbles are subangular of brick, concrete, sandstone and slate. (MADE GROUND)
	0.40	D					
	1.40	B		1.40	49.71		Stiff orangish brown slightly gravelly silty CLAY. Gravel is fine to medium sub angular to sub rounded of sandstone. (GLACIAL TILL)
	1.45	HSV	113				*Between 1.4m and 1.7m bgl: occasional relict rootlets*
							Between 1.4 and 2.1m bgl: occasional blue veining
	2.00	HSV	105				
				2.10	49.01		End of Trial Pit at 2.10m

1.0 2.0 3.0 4.0 5.0

Remarks: 1) Location cleared for utilities and UXO 2) Trial pit complete at 2.1m bgl due to clay stiffness 3) Trial pit backfilled with arisings on completion

Stability: Unstable below 1.2m bgl.

Groundwater: Groundwater not encountered

B = Bulk Sample
D = Disturbed Sample
ES = Environmental Sample
W = Water Sample
PID = Photoionization Detector (ppm)
CBR = In Situ California Bearing Ratio (%)
HSV = Hand Shear Vane (kPa)
HP = Hand Penetrometer (kPa)
AB = Asbestos Bulk Sample

Logged: JB **Checked:** RS

Exploratory Hole Photographs

Site Investigation Photograph 1	
Date: 29/01/20	
Direction Photograph Taken: n/a.	
Description: TP01 trial pit short wall.	

Site Investigation Photograph 2	
Date: 29/01/20	
Direction Photograph Taken: n/a.	
Description: TP01 trial pit long wall.	

Site Investigation Photograph 3	
Date: 29/01/20	
Direction Photograph Taken: n/a.	
Description: TP01 spoil heap	

Site Investigation Photograph 4	
Date: 29/01/20	
Direction Photograph Taken: n/a.	
Description: TP02 trial pit short wall.	

Site Investigation Photograph 5	
Date: 29/01/20	
Direction Photograph Taken: n/a.	
Description: TP02 trial pit long wall.	

Site Investigation Photograph 6	
Date: 29/01/20	
Direction Photograph Taken: n/a.	
Description: TP02 spoil heap.	

Site Investigation Photograph 7 **Date:** 29/01/20 **Direction Photograph Taken:** n/a. **Description:** TP03 trial pit short wall.	

Site Investigation Photograph 8 **Date:** 29/01/20 **Direction Photograph Taken:** n/a. **Description:** TP03 trial pit long wall.	

Site Investigation Photograph 9	
Date: 29/01/20	
Direction Photograph Taken: n/a.	
Description: TP03 spoil heap.	

Site Investigation Photograph 10	
Date: 29/01/20	
Direction Photograph Taken: n/a.	
Description: TP04 trial pit short wall.	

Site Investigation Photograph 11	
Date: 29/01/20	
Direction Photograph Taken: n/a.	
Description: TP04 trial pit long wall.	

Site Investigation Photograph 12	
Date: 29/01/20	
Direction Photograph Taken: n/a.	
Description: TP04 spoil heap.	

Site Investigation Photograph 13 **Date:** 29/01/20 **Direction Photograph Taken:** n/a. **Description:** TP05 trial pit short wall.	

Site Investigation Photograph 14 **Date:** 29/01/20 **Direction Photograph Taken:** n/a. **Description:** TP05 trial pit long wall.	

Site Investigation Photograph 15	
Date: 29/01/20	
Direction Photograph Taken: n/a.	
Description: TP05 spoil heap.	

Site Investigation Photograph 16	
Date: 29/01/20	
Direction Photograph Taken: n/a.	
Description: TP06 trial pit short wall.	

Site Investigation Photograph 17	
Date: 29/01/20	
Direction Photograph Taken: n/a.	
Description: TP06 trial pit long wall.	

Site Investigation Photograph 18	
Date: 29/01/20	
Direction Photograph Taken: n/a.	
Description: TP06 spoil heap.	

Appendix D

Geotechnical Test Results and Geotechnical Plots

Geotechnical Laboratory Test Results

TEST CERTIFICATE

Liquid and Plastic Limits

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Tested in Accordance with: BS 1377-2: 1990: Clause 4.3 and 5

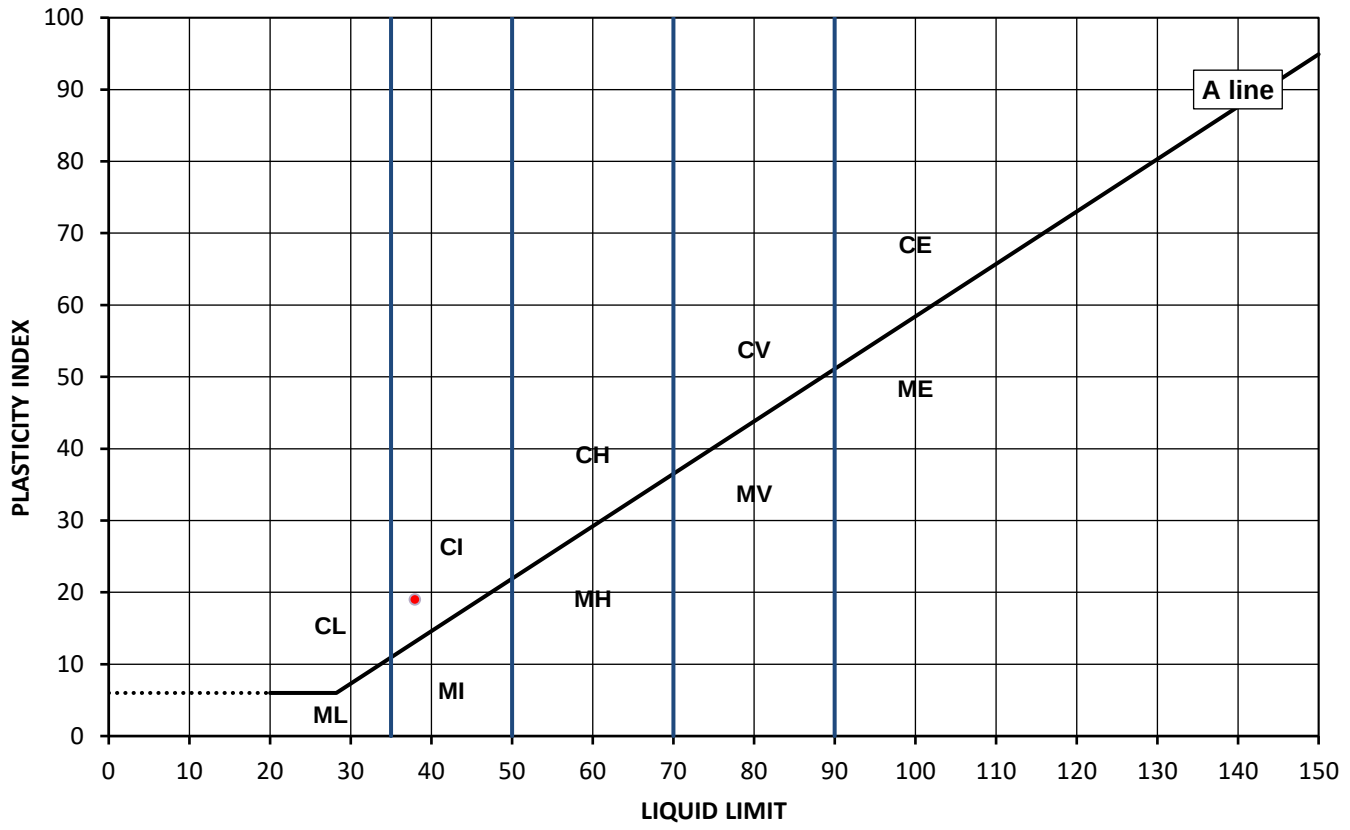
Client:	Hydrock Consultants Ltd	Client Reference:	C10042
Client Address:	4 Lakeside, Festival Park, Stoke on Trent, ST1 5RY	Job Number:	20-85152
		Date Sampled:	Not Given
		Date Received:	04/02/2020
Contact:	Jason Bradley	Date Tested:	14/02/2020
Site Address:	Islington Wharf	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1433754	Depth Top [m]:	4.00
Hole No.:	BH01	Depth Base [m]:	4.45
Sample Reference:	Not Given	Sample Type:	U
Soil Description:	Brown slightly gravelly sandy CLAY		
Sample Preparation:	Tested after >425um removed by hand		

As Received Moisture Content [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	% Passing 425µm BS Test Sieve
16	38	19	19	95



Legend, based on BS 5930:2015 Code of practice for site investigations

		Plasticity		Liquid Limit
C	Clay	L	Low	below 35
M	Silt	I	Medium	35 to 50
		H	High	50 to 70
		V	Very high	70 to 90
		E	Extremely high	exceeding 90
	Organic	O	append to classification for organic material (eg CHO)	

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

Remarks:

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Signed: Dariusz Piotrowski
PL Geotechnical Laboratory Manager
for and on behalf of i2 Analytical Ltd

Date Reported: 20/02/2020

GF 236.7

TEST CERTIFICATE

Liquid and Plastic Limits

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Tested in Accordance with: BS 1377-2: 1990: Clause 4.3 and 5

Client: Hydrock Consultants Ltd
Client Address: 4 Lakeside, Festival Park, Stoke on Trent, ST1 5RY
Contact: Jason Bradley
Site Address: Islington Wharf

Client Reference: C10042
Job Number: 20-85152
Date Sampled: Not Given
Date Received: 04/02/2020
Date Tested: 14/02/2020
Sampled By: Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

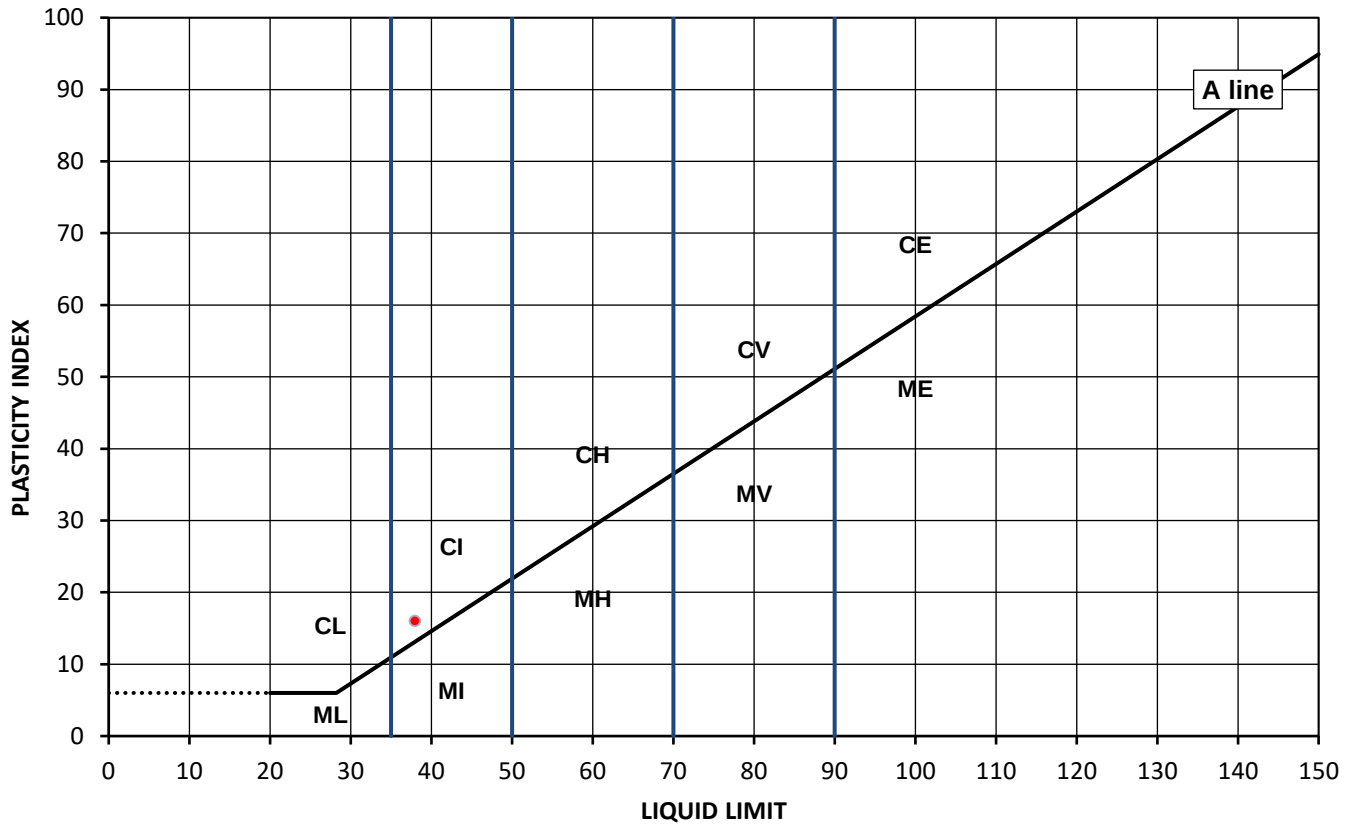
Test Results:

Laboratory Reference: 1433755
Hole No.: BH01
Sample Reference: Not Given
Soil Description: Brown slightly gravelly sandy CLAY

Depth Top [m]: 6.00
Depth Base [m]: 6.45
Sample Type: U

Sample Preparation: Tested after washing to remove >425um

As Received Moisture Content [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	% Passing 425µm BS Test Sieve
20	38	22	16	92



Legend, based on BS 5930:2015 Code of practice for site investigations

		Plasticity		Liquid Limit
C	Clay	L	Low	below 35
M	Silt	I	Medium	35 to 50
		H	High	50 to 70
		V	Very high	70 to 90
		E	Extremely high	exceeding 90
	Organic	O	append to classification for organic material (eg CHO)	

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

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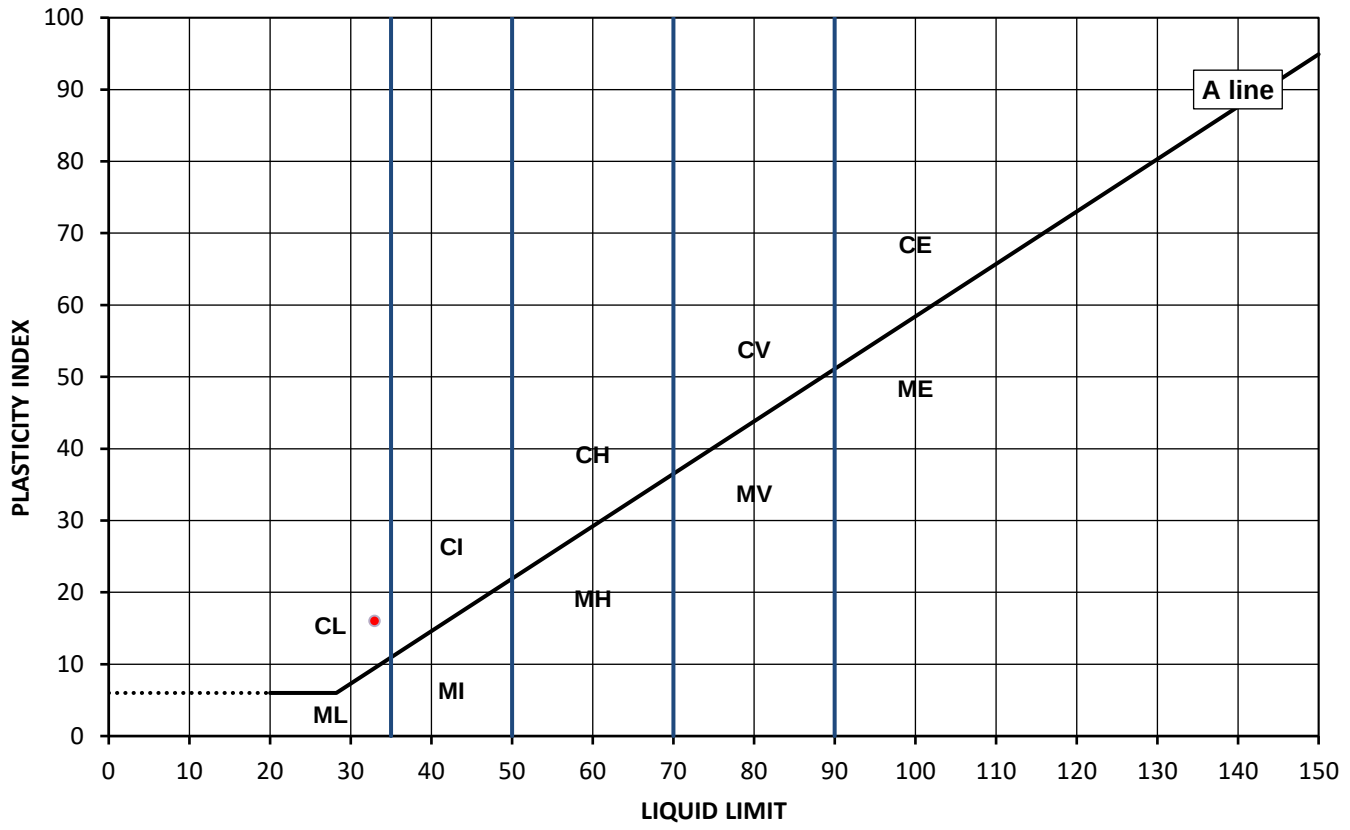
Client:	Hydrock Consultants Ltd	Client Reference:	C10042
Client Address:	4 Lakeside, Festival Park, Stoke on Trent, ST1 5RY	Job Number:	20-85152
		Date Sampled:	Not Given
		Date Received:	04/02/2020
Contact:	Jason Bradley	Date Tested:	12/02/2020
Site Address:	Islington Wharf	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1433756	Depth Top [m]:	8.00
Hole No.:	BH01	Depth Base [m]:	8.45
Sample Reference:	Not Given	Sample Type:	U
Soil Description:	Brown slightly gravelly very sandy CLAY		
Sample Preparation:	Tested after >425um removed by hand		

As Received Moisture Content [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	% Passing 425µm BS Test Sieve
15	33	17	16	99



Legend, based on BS 5930:2015 Code of practice for site investigations

		Plasticity		Liquid Limit
C	Clay	L	Low	below 35
M	Silt	I	Medium	35 to 50
		H	High	50 to 70
		V	Very high	70 to 90
		E	Extremely high	exceeding 90
	Organic	O	append to classification for organic material (eg CHO)	

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

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Northampton NN4 7EB

4041

Tested in Accordance with: BS 1377-2: 1990: Clause 4.3 and 5

Client: Hydrock Consultants Ltd
Client Address: 4 Lakeside, Festival Park, Stoke on Trent, ST1 5RY
Contact: Jason Bradley
Site Address: Islington Wharf

Client Reference: C10042
Job Number: 20-85152
Date Sampled: Not Given
Date Received: 04/02/2020
Date Tested: 12/02/2020
Sampled By: Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

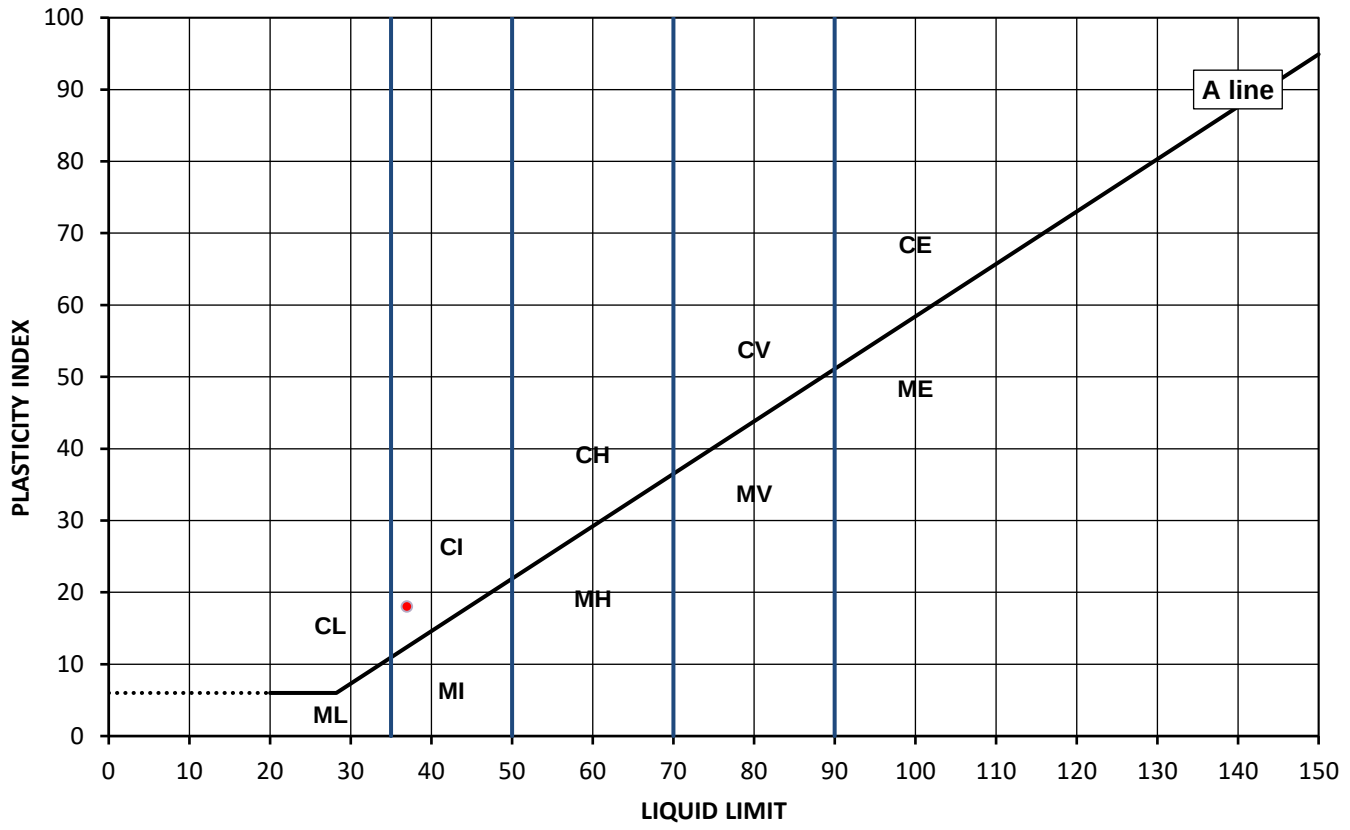
Test Results:

Laboratory Reference: 1433757
Hole No.: BH01
Sample Reference: Not Given
Soil Description: Brown slightly gravelly sandy CLAY

Depth Top [m]: 10.00
Depth Base [m]: 10.45
Sample Type: U

Sample Preparation: Tested after washing to remove >425um

As Received Moisture Content [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	% Passing 425µm BS Test Sieve
19	37	19	18	92



Legend, based on BS 5930:2015 Code of practice for site investigations

		Plasticity		Liquid Limit
C	Clay	L	Low	below 35
M	Silt	I	Medium	35 to 50
		H	High	50 to 70
		V	Very high	70 to 90
		E	Extremely high	exceeding 90
	Organic	O	append to classification for organic material (eg CHO)	

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

Remarks:

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Date Reported: 20/02/2020

GF 236.7

TEST CERTIFICATE

Liquid and Plastic Limits

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Tested in Accordance with: BS 1377-2: 1990: Clause 4.3 and 5

Client: Hydrock Consultants Ltd
Client Address: 4 Lakeside, Festival Park, Stoke on Trent, ST1 5RY
Contact: Jason Bradley
Site Address: Islington Wharf

Client Reference: C10042
Job Number: 20-85152
Date Sampled: Not Given
Date Received: 04/02/2020
Date Tested: 17/02/2020
Sampled By: Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

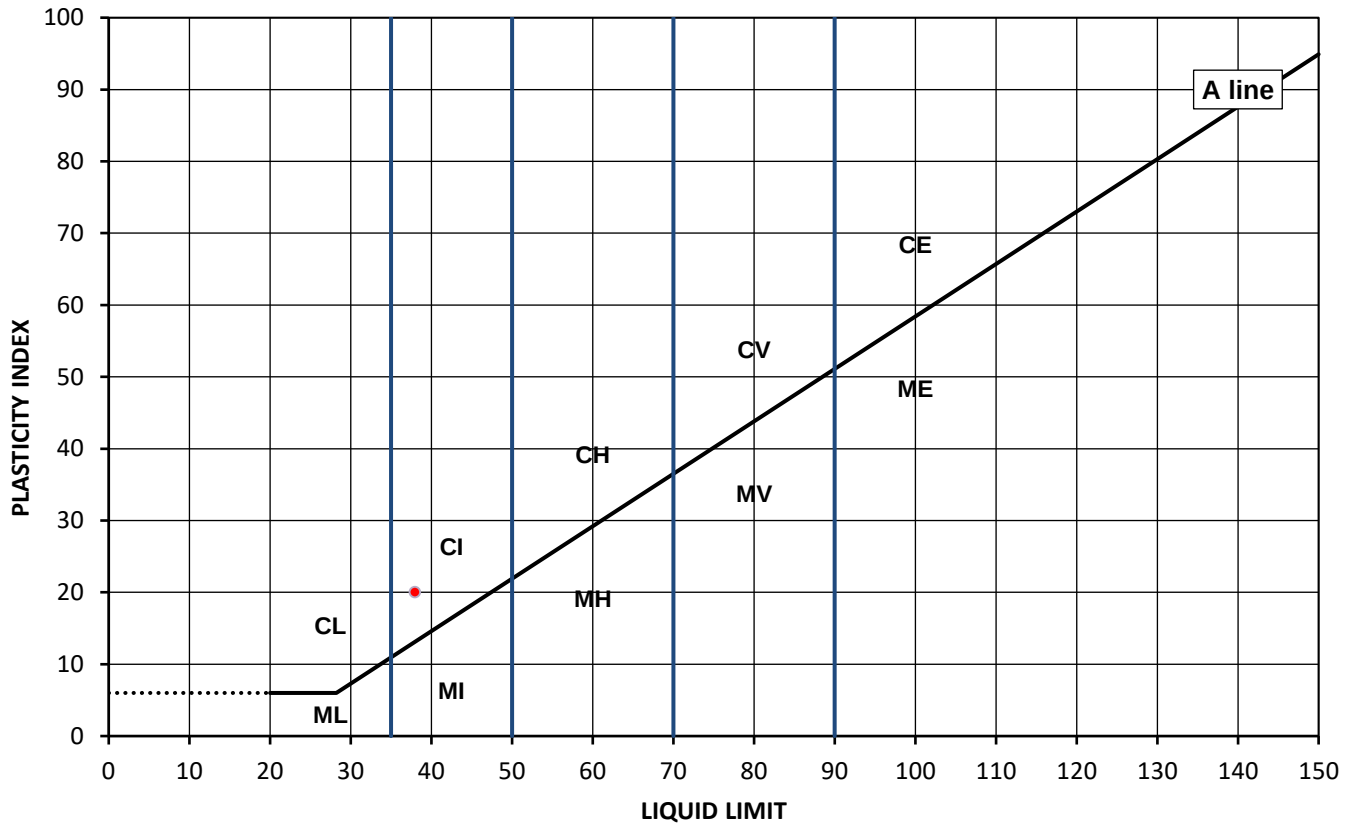
Test Results:

Laboratory Reference: 1433758
Hole No.: BH01
Sample Reference: Not Given
Soil Description: Brown slightly gravelly sandy CLAY

Depth Top [m]: 12.00
Depth Base [m]: 12.45
Sample Type: U

Sample Preparation: Tested after washing to remove >425um

As Received Moisture Content [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	% Passing 425µm BS Test Sieve
16	38	18	20	94



Legend, based on BS 5930:2015 Code of practice for site investigations

		Plasticity		Liquid Limit
C	Clay	L	Low	below 35
M	Silt	I	Medium	35 to 50
		H	High	50 to 70
		V	Very high	70 to 90
		E	Extremely high	exceeding 90
	Organic	O	append to classification for organic material (eg CHO)	

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

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Date Reported: 20/02/2020

GF 236.7

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i2 Analytical Ltd
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Northampton NN4 7EB

4041

Tested in Accordance with: BS 1377-2: 1990: Clause 4.3 and 5

Client: Hydrock Consultants Ltd
Client Address: 4 Lakeside, Festival Park, Stoke on Trent, ST1 5RY
Contact: Jason Bradley
Site Address: Islington Wharf

Client Reference: C10042
Job Number: 20-85152
Date Sampled: Not Given
Date Received: 04/02/2020
Date Tested: 12/02/2020
Sampled By: Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

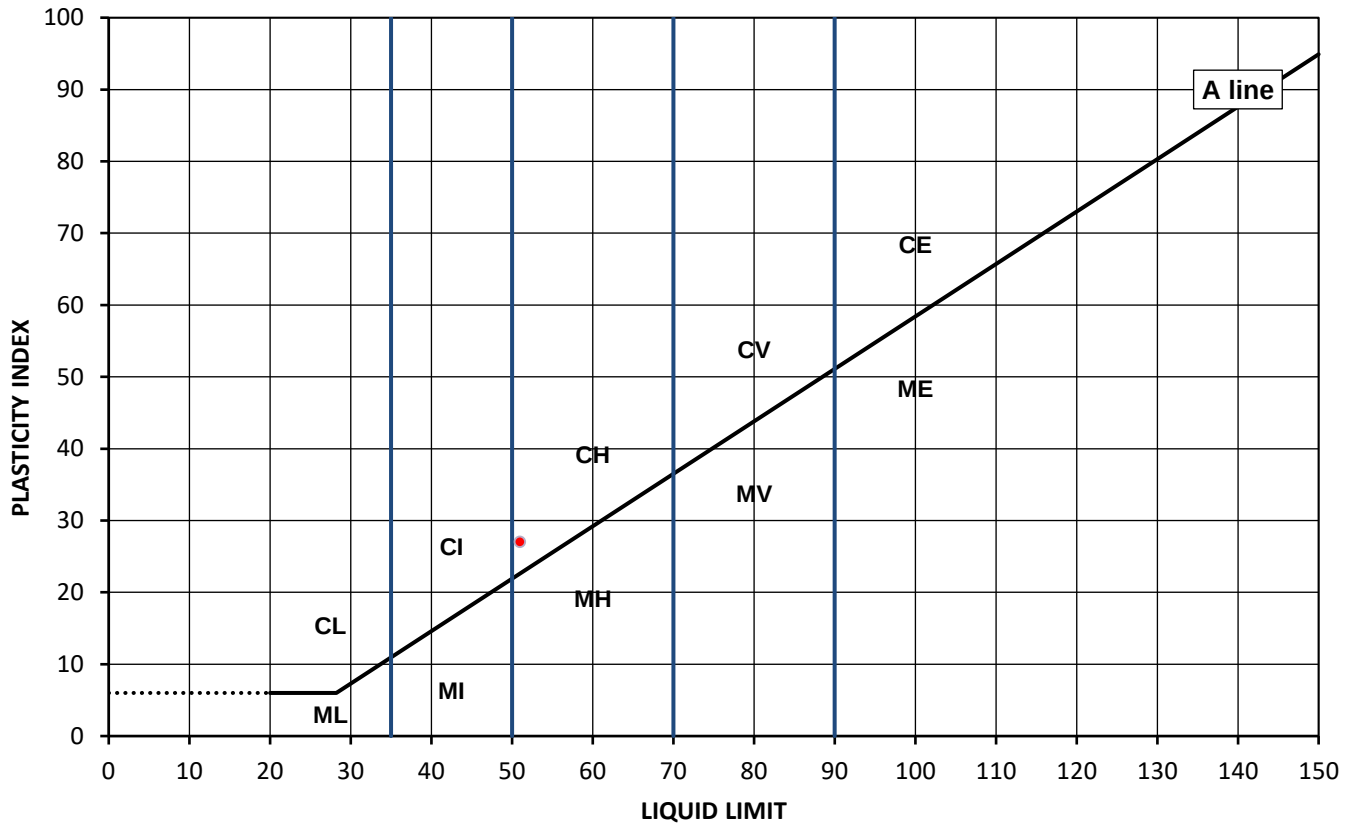
Test Results:

Laboratory Reference: 1433760
Hole No.: BH01
Sample Reference: Not Given
Soil Description: Brown slightly sandy CLAY

Depth Top [m]: 18.00
Depth Base [m]: 18.45
Sample Type: U

Sample Preparation: Tested in natural condition

As Received Moisture Content [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	% Passing 425µm BS Test Sieve
20	51	24	27	100



Legend, based on BS 5930:2015 Code of practice for site investigations

		Plasticity		Liquid Limit
C	Clay	L	Low	below 35
M	Silt	I	Medium	35 to 50
		H	High	50 to 70
		V	Very high	70 to 90
		E	Extremely high	exceeding 90
	Organic	O	append to classification for organic material (eg CHO)	

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

Remarks:

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Date Reported: 20/02/2020

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i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

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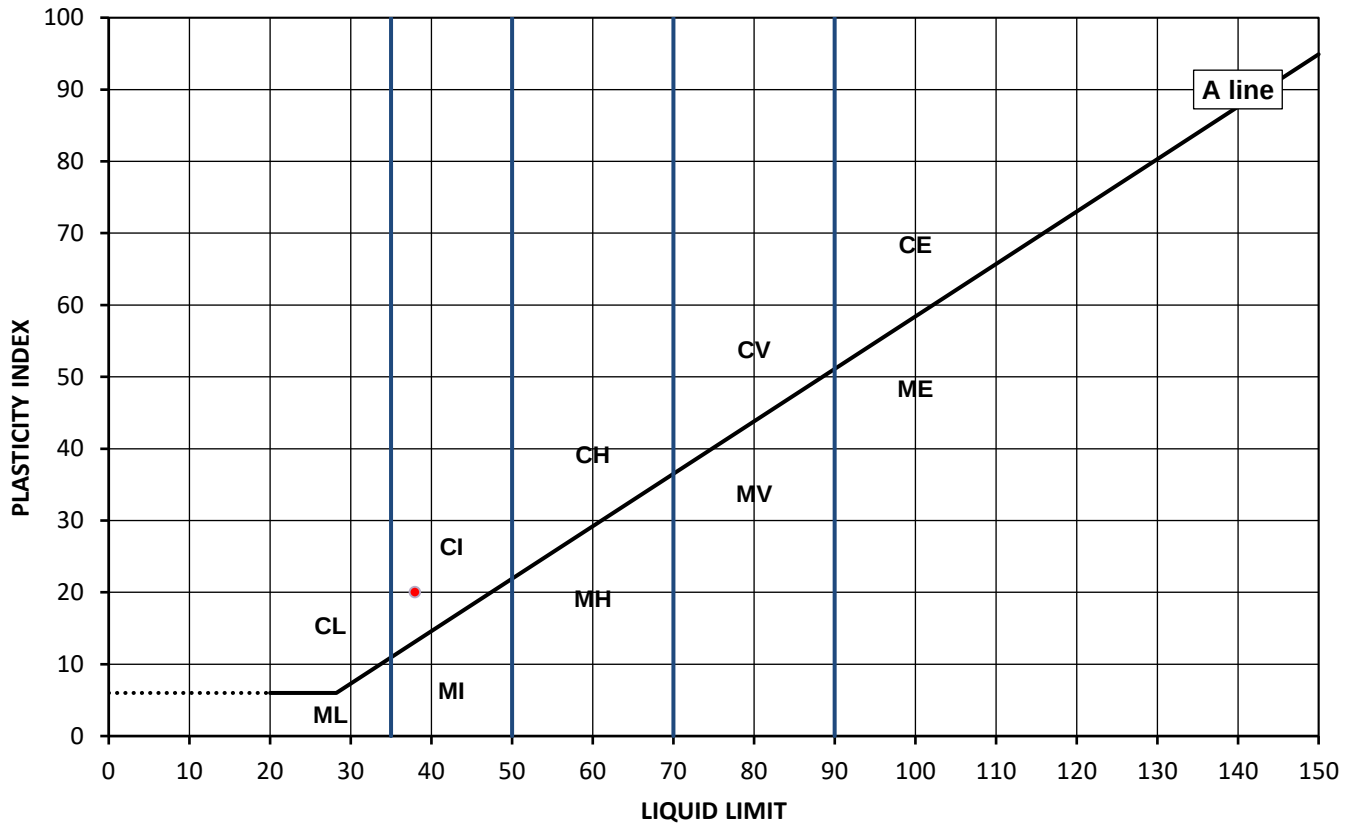
Client:	Hydrock Consultants Ltd	Client Reference:	C10042
Client Address:	4 Lakeside, Festival Park, Stoke on Trent, ST1 5RY	Job Number:	20-85152
		Date Sampled:	Not Given
		Date Received:	04/02/2020
Contact:	Jason Bradley	Date Tested:	12/02/2020
Site Address:	Islington Wharf	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1433763	Depth Top [m]:	4.00
Hole No.:	BH02	Depth Base [m]:	4.45
Sample Reference:	Not Given	Sample Type:	U
Soil Description:	Brown slightly gravelly sandy CLAY		
Sample Preparation:	Tested after >425um removed by hand		

As Received Moisture Content [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	% Passing 425µm BS Test Sieve
17	38	18	20	99



Legend, based on BS 5930:2015 Code of practice for site investigations

		Plasticity		Liquid Limit
C	Clay	L	Low	below 35
M	Silt	I	Medium	35 to 50
		H	High	50 to 70
		V	Very high	70 to 90
		E	Extremely high	exceeding 90
	Organic	O	append to classification for organic material (eg CHO)	

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

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Signed: Dariusz Piotrowski
PL Geotechnical Laboratory Manager
for and on behalf of i2 Analytical Ltd

Date Reported: 20/02/2020

GF 236.7

TEST CERTIFICATE

Liquid and Plastic Limits

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Tested in Accordance with: BS 1377-2: 1990: Clause 4.3 and 5

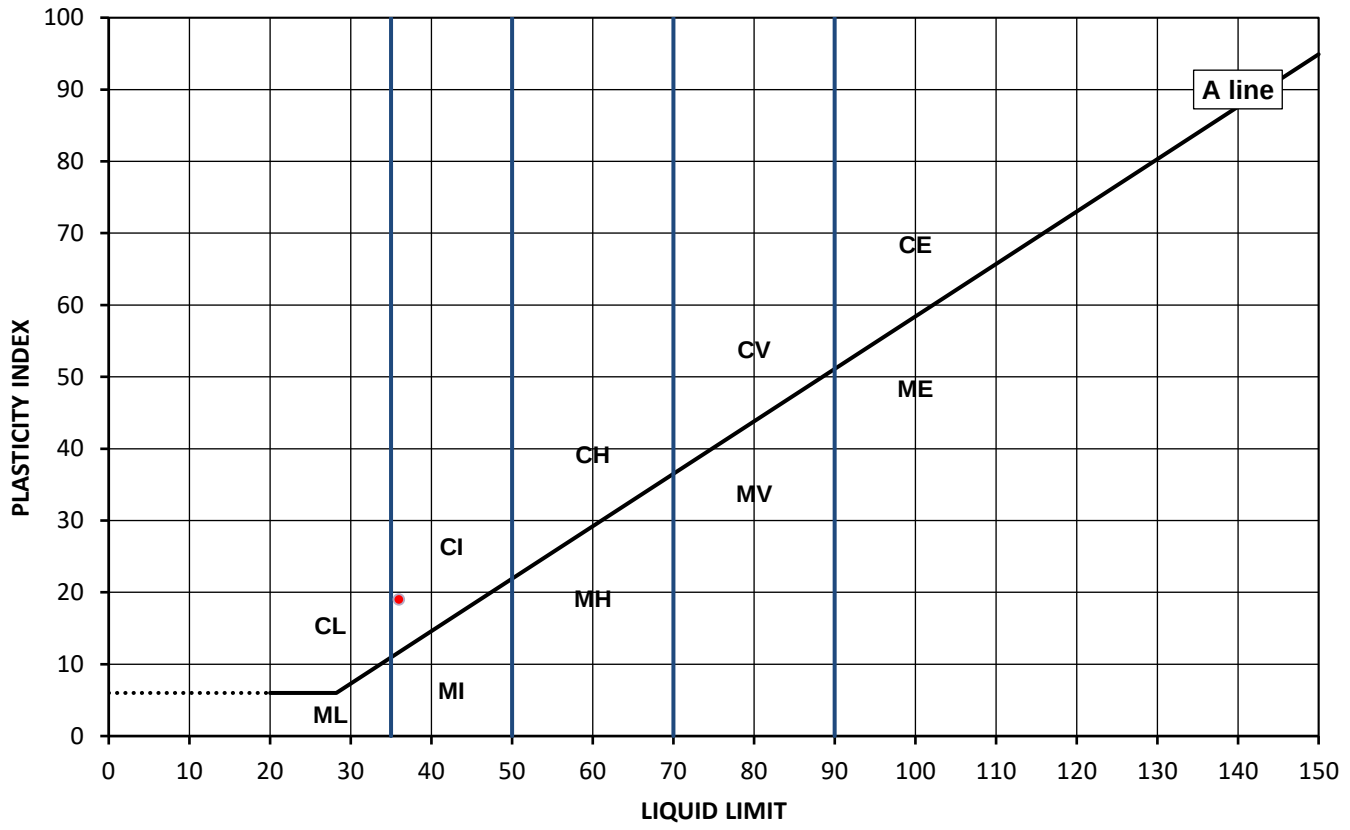
Client:	Hydrock Consultants Ltd	Client Reference:	C10042
Client Address:	4 Lakeside, Festival Park, Stoke on Trent, ST1 5RY	Job Number:	20-85152
		Date Sampled:	Not Given
		Date Received:	04/02/2020
Contact:	Jason Bradley	Date Tested:	17/02/2020
Site Address:	Islington Wharf	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1433764	Depth Top [m]:	6.00
Hole No.:	BH02	Depth Base [m]:	6.45
Sample Reference:	Not Given	Sample Type:	U
Soil Description:	Brown slightly gravelly sandy CLAY		
Sample Preparation:	Tested after >425um removed by hand		

As Received Moisture Content [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	% Passing 425µm BS Test Sieve
16	36	17	19	97



Legend, based on BS 5930:2015 Code of practice for site investigations

		Plasticity		Liquid Limit
C	Clay	L	Low	below 35
M	Silt	I	Medium	35 to 50
		H	High	50 to 70
		V	Very high	70 to 90
		E	Extremely high	exceeding 90
	Organic	O	append to classification for organic material (eg CHO)	

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

Remarks:

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Northampton NN4 7EB

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Client: Hydrock Consultants Ltd
Client Address: 4 Lakeside, Festival Park, Stoke on Trent, ST1 5RY
Contact: Jason Bradley
Site Address: Islington Wharf

Client Reference: C10042
Job Number: 20-85152
Date Sampled: Not Given
Date Received: 04/02/2020
Date Tested: 12/02/2020
Sampled By: Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

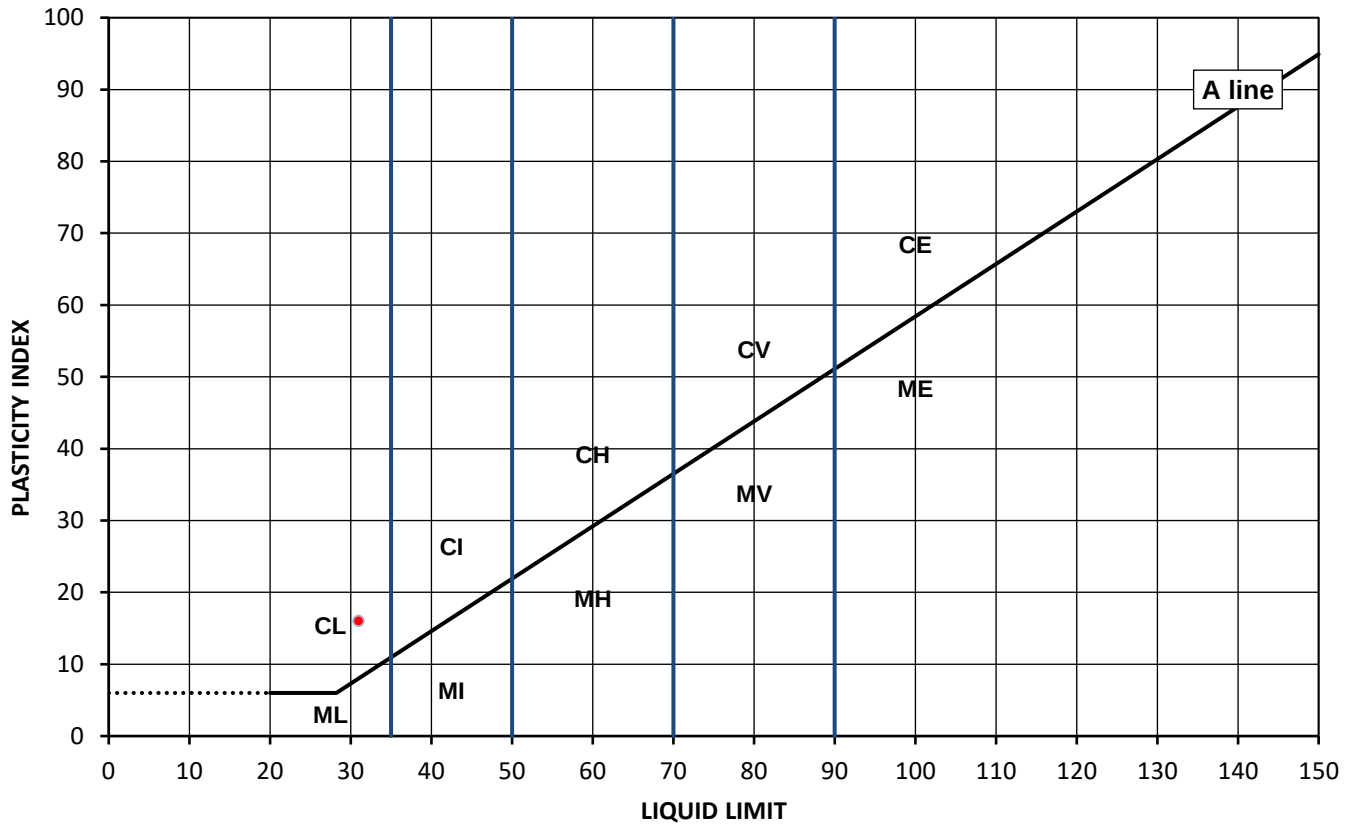
Test Results:

Laboratory Reference: 1433765
Hole No.: BH02
Sample Reference: Not Given
Soil Description: Brown slightly gravelly very sandy CLAY

Depth Top [m]: 8.00
Depth Base [m]: 8.45
Sample Type: U

Sample Preparation: Tested after >425um removed by hand

As Received Moisture Content [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	% Passing 425µm BS Test Sieve
14	31	15	16	96



Legend, based on BS 5930:2015 Code of practice for site investigations

		Plasticity		Liquid Limit
C	Clay	L	Low	below 35
M	Silt	I	Medium	35 to 50
		H	High	50 to 70
		V	Very high	70 to 90
		E	Extremely high	exceeding 90
	Organic	O	append to classification for organic material (eg CHO)	

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

Remarks:

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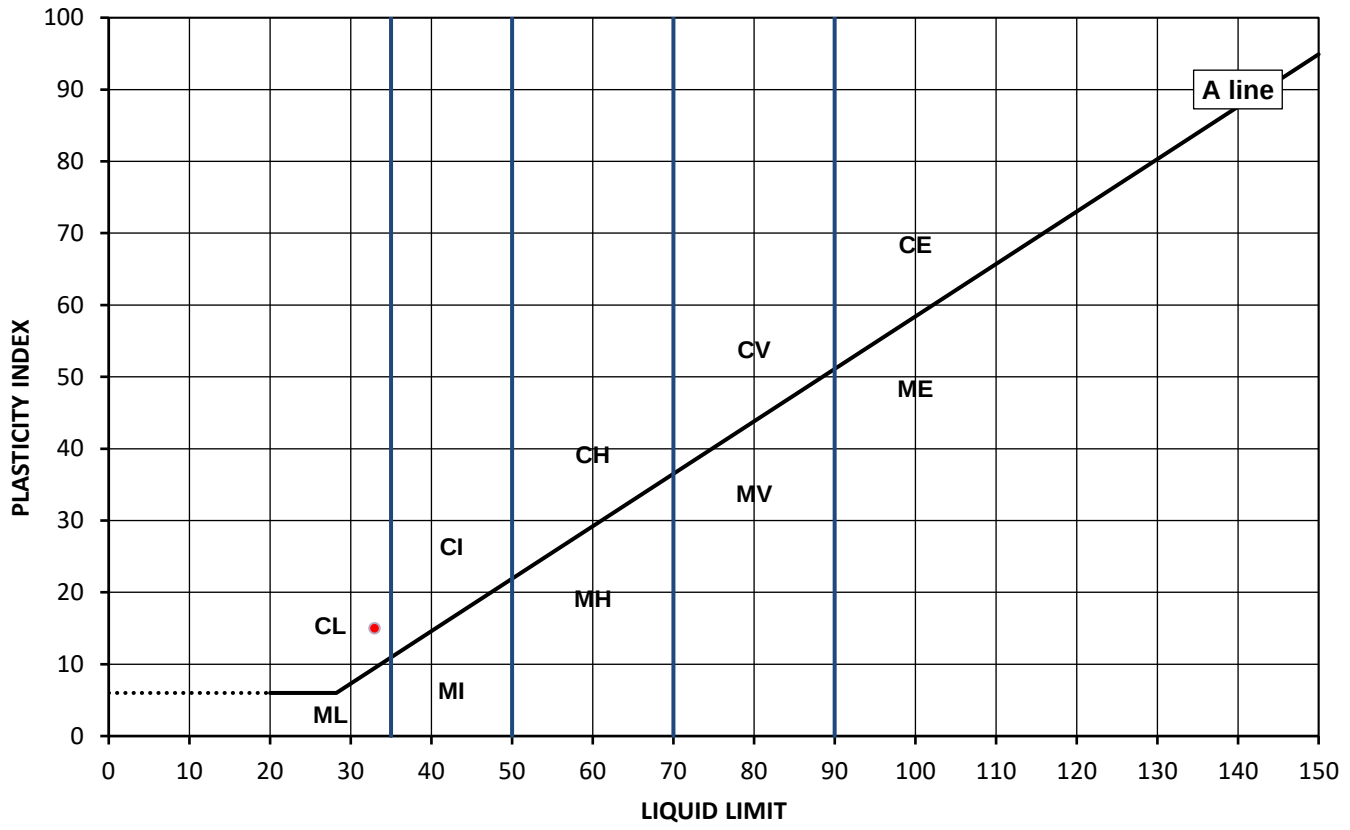
Client:	Hydrock Consultants Ltd	Client Reference:	C10042
Client Address:	4 Lakeside, Festival Park, Stoke on Trent, ST1 5RY	Job Number:	20-85152
		Date Sampled:	Not Given
		Date Received:	04/02/2020
Contact:	Jason Bradley	Date Tested:	17/02/2020
Site Address:	Islington Wharf	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1433766	Depth Top [m]:	10.00
Hole No.:	BH02	Depth Base [m]:	10.45
Sample Reference:	Not Given	Sample Type:	U
Soil Description:	Brown slightly gravelly very sandy CLAY		
Sample Preparation:	Tested after >425um removed by hand		

As Received Moisture Content [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	% Passing 425µm BS Test Sieve
16	33	18	15	98



Legend, based on BS 5930:2015 Code of practice for site investigations

		Plasticity		Liquid Limit
C	Clay	L	Low	below 35
M	Silt	I	Medium	35 to 50
		H	High	50 to 70
		V	Very high	70 to 90
		E	Extremely high	exceeding 90
	Organic	O	append to classification for organic material (eg CHO)	

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

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Client: Hydrock Consultants Ltd
Client Address: 4 Lakeside, Festival Park, Stoke on Trent, ST1 5RY
Contact: Jason Bradley
Site Address: Islington Wharf

Client Reference: C10042
Job Number: 20-85152
Date Sampled: Not Given
Date Received: 04/02/2020
Date Tested: 10/02/2020
Sampled By: Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

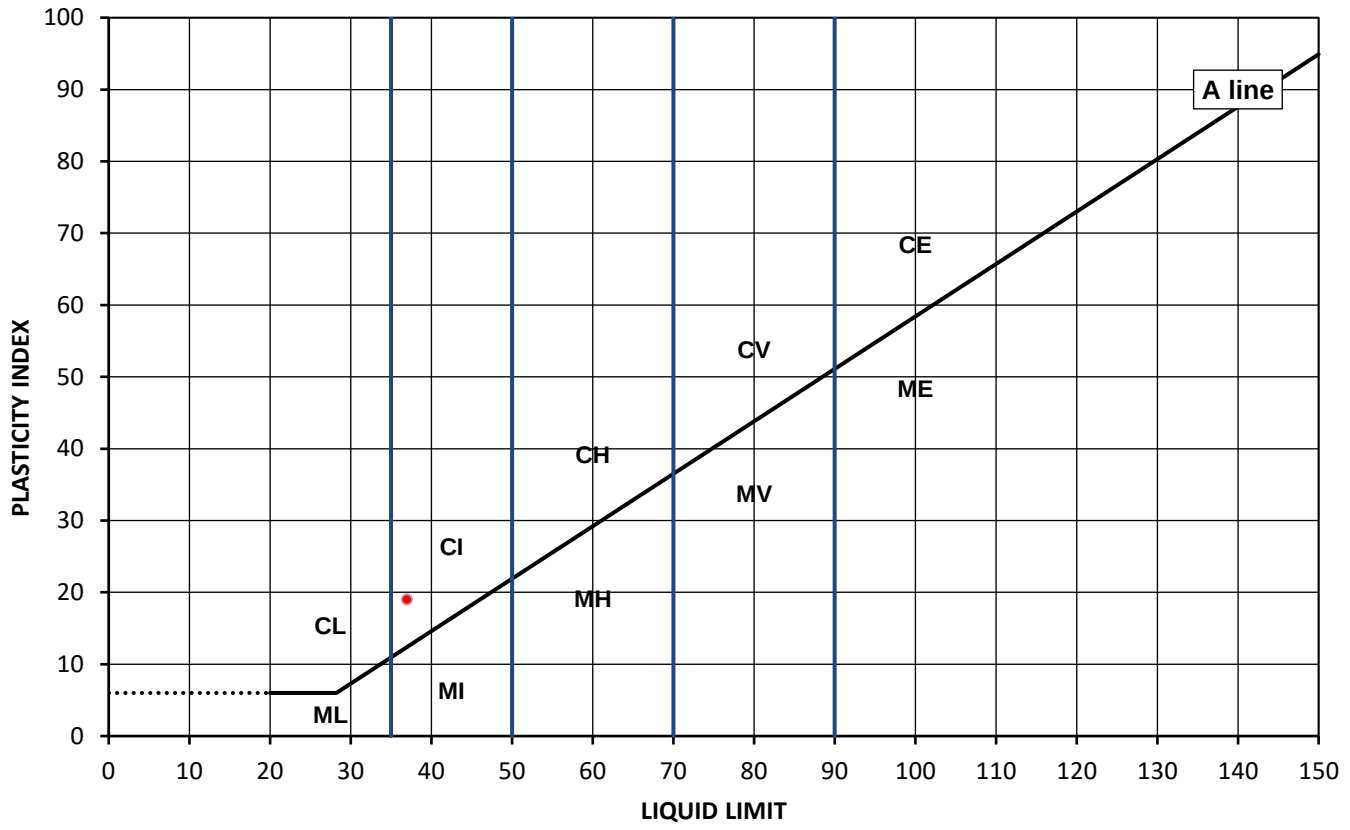
Test Results:

Laboratory Reference: 1433767
Hole No.: BH02
Sample Reference: Not Given
Soil Description: Brown slightly gravelly sandy CLAY

Depth Top [m]: 12.00
Depth Base [m]: 12.45
Sample Type: U

Sample Preparation: Tested after washing to remove >425um

As Received Moisture Content [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	% Passing 425µm BS Test Sieve
17	37	18	19	90



Legend, based on BS 5930:2015 Code of practice for site investigations

		Plasticity		Liquid Limit
C	Clay	L	Low	below 35
M	Silt	I	Medium	35 to 50
		H	High	50 to 70
		V	Very high	70 to 90
		E	Extremely high	exceeding 90
	Organic	O	append to classification for organic material (eg CHO)	

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

Remarks:

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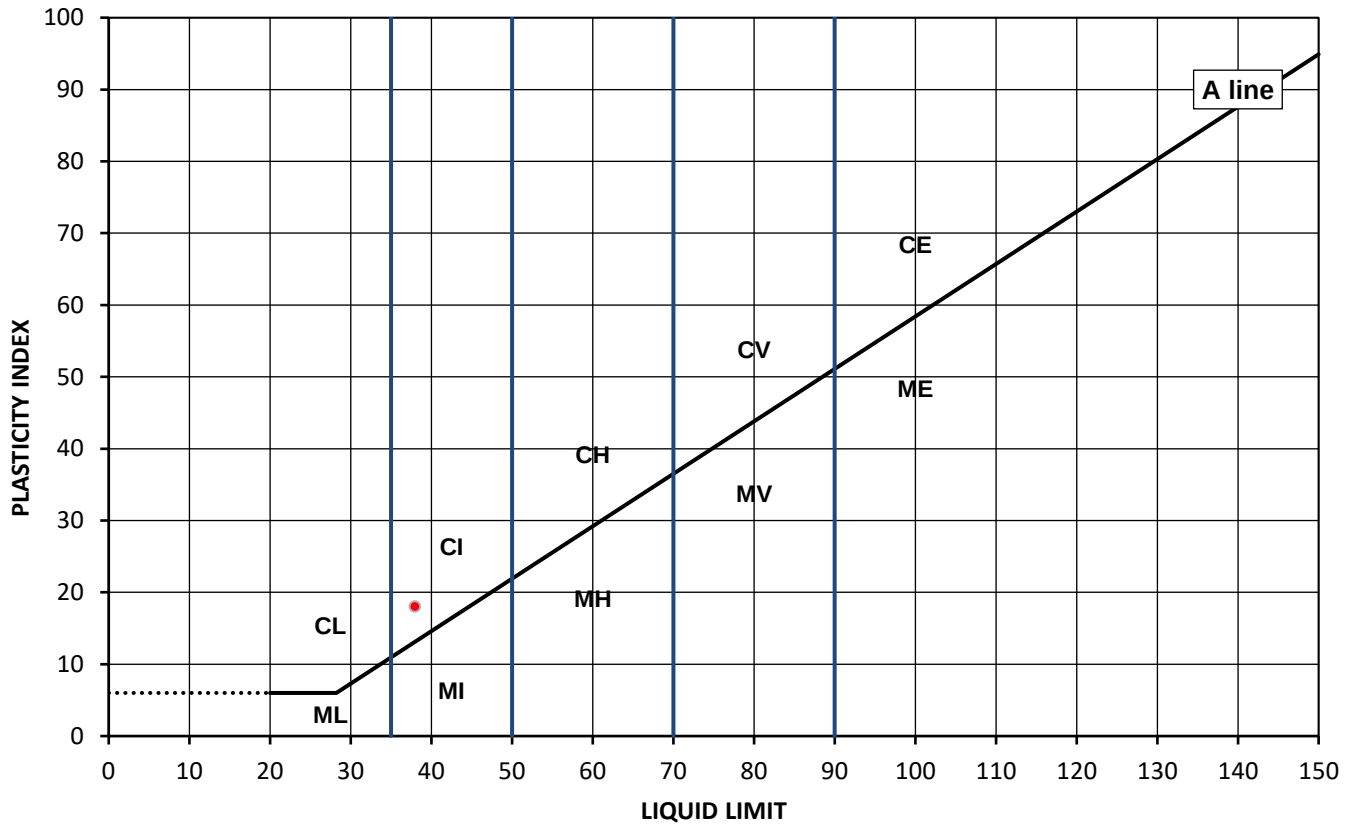
Client:	Hydrock Consultants Ltd	Client Reference:	C10042
Client Address:	4 Lakeside, Festival Park, Stoke on Trent, ST1 5RY	Job Number:	20-85152
		Date Sampled:	Not Given
		Date Received:	04/02/2020
Contact:	Jason Bradley	Date Tested:	10/02/2020
Site Address:	Islington Wharf	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1433770	Depth Top [m]:	4.00
Hole No.:	BH03	Depth Base [m]:	4.45
Sample Reference:	Not Given	Sample Type:	U
Soil Description:	Brown slightly gravelly sandy CLAY		
Sample Preparation:	Tested after >425um removed by hand		

As Received Moisture Content [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	% Passing 425µm BS Test Sieve
15	38	20	18	97



Legend, based on BS 5930:2015 Code of practice for site investigations

		Plasticity		Liquid Limit
C	Clay	L	Low	below 35
M	Silt	I	Medium	35 to 50
		H	High	50 to 70
		V	Very high	70 to 90
		E	Extremely high	exceeding 90
	Organic	O	append to classification for organic material (eg CHO)	

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

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Northampton NN4 7EB

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Tested in Accordance with: BS 1377-2: 1990: Clause 4.3 and 5

Client: Hydrock Consultants Ltd
Client Address: 4 Lakeside, Festival Park, Stoke on Trent, ST1 5RY
Contact: Jason Bradley
Site Address: Islington Wharf

Client Reference: C10042
Job Number: 20-85152
Date Sampled: Not Given
Date Received: 04/02/2020
Date Tested: 17/02/2020
Sampled By: Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

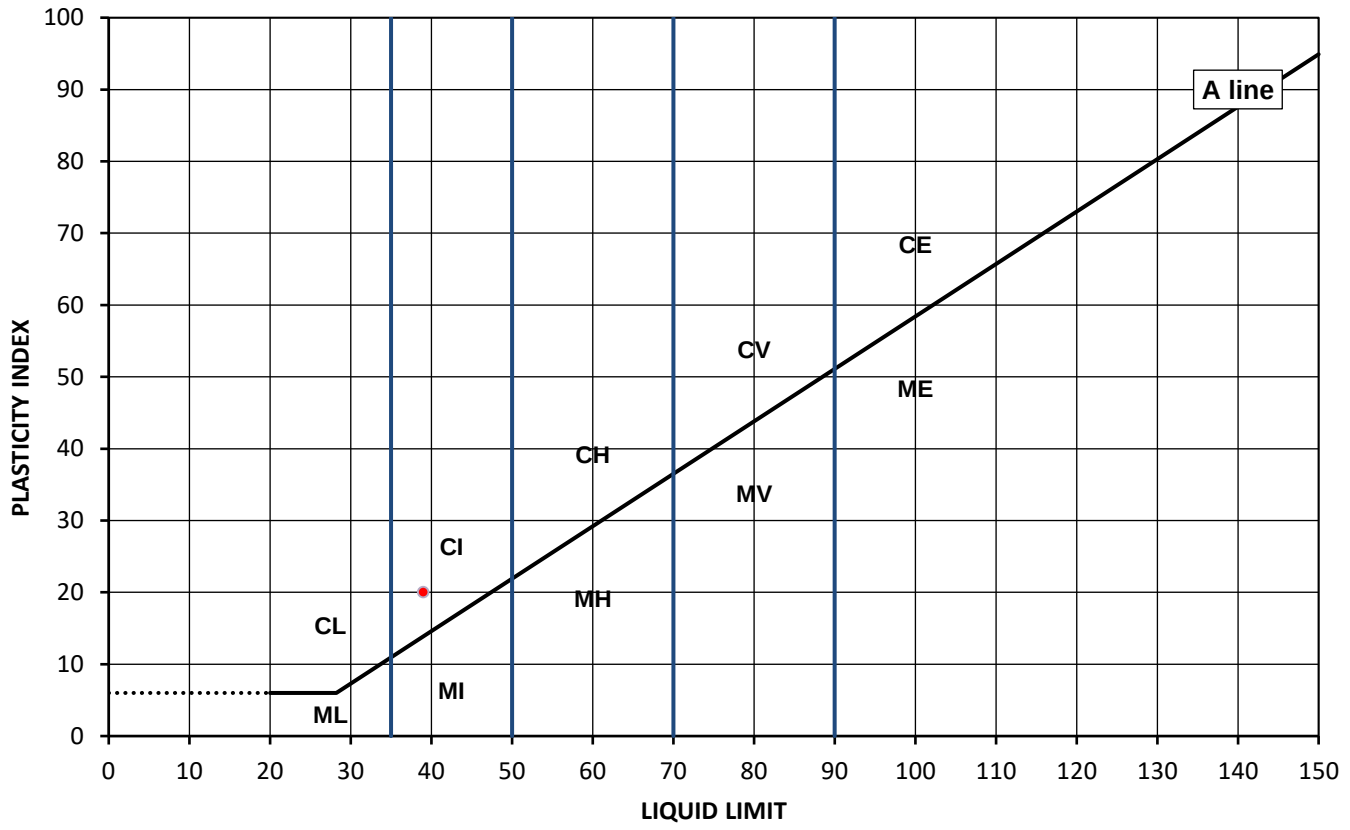
Test Results:

Laboratory Reference: 1433771
Hole No.: BH03
Sample Reference: Not Given
Soil Description: Brown slightly gravelly sandy CLAY

Depth Top [m]: 6.00
Depth Base [m]: 6.45
Sample Type: U

Sample Preparation: Tested after washing to remove >425um

As Received Moisture Content [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	% Passing 425µm BS Test Sieve
16	39	19	20	94



Legend, based on BS 5930:2015 Code of practice for site investigations

		Plasticity		Liquid Limit
C	Clay	L	Low	below 35
M	Silt	I	Medium	35 to 50
		H	High	50 to 70
		V	Very high	70 to 90
		E	Extremely high	exceeding 90
	Organic	O	append to classification for organic material (eg CHO)	

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

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Northampton NN4 7EB

4041

Tested in Accordance with: BS 1377-2: 1990: Clause 4.3 and 5

Client: Hydrock Consultants Ltd
Client Address: 4 Lakeside, Festival Park, Stoke on Trent, ST1 5RY
Contact: Jason Bradley
Site Address: Islington Wharf

Client Reference: C10042
Job Number: 20-85152
Date Sampled: Not Given
Date Received: 04/02/2020
Date Tested: 10/02/2020
Sampled By: Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

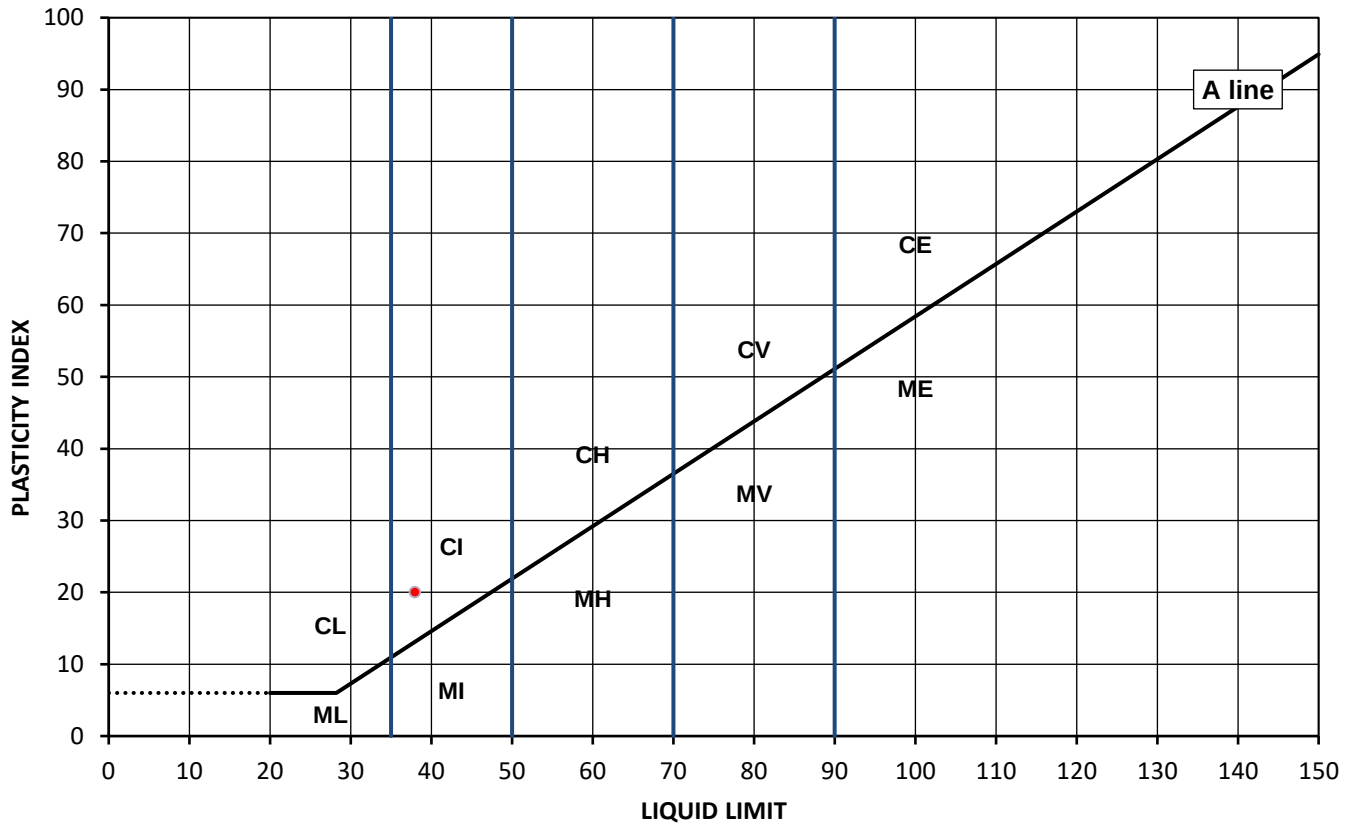
Test Results:

Laboratory Reference: 1433772
Hole No.: BH03
Sample Reference: Not Given
Soil Description: Dark brown slightly gravelly sandy CLAY

Depth Top [m]: 8.00
Depth Base [m]: 8.45
Sample Type: U

Sample Preparation: Tested after washing to remove >425um

As Received Moisture Content [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	% Passing 425µm BS Test Sieve
18	38	18	20	93



Legend, based on BS 5930:2015 Code of practice for site investigations

		Plasticity		Liquid Limit
C	Clay	L	Low	below 35
M	Silt	I	Medium	35 to 50
		H	High	50 to 70
		V	Very high	70 to 90
		E	Extremely high	exceeding 90
	Organic	O	append to classification for organic material (eg CHO)	

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

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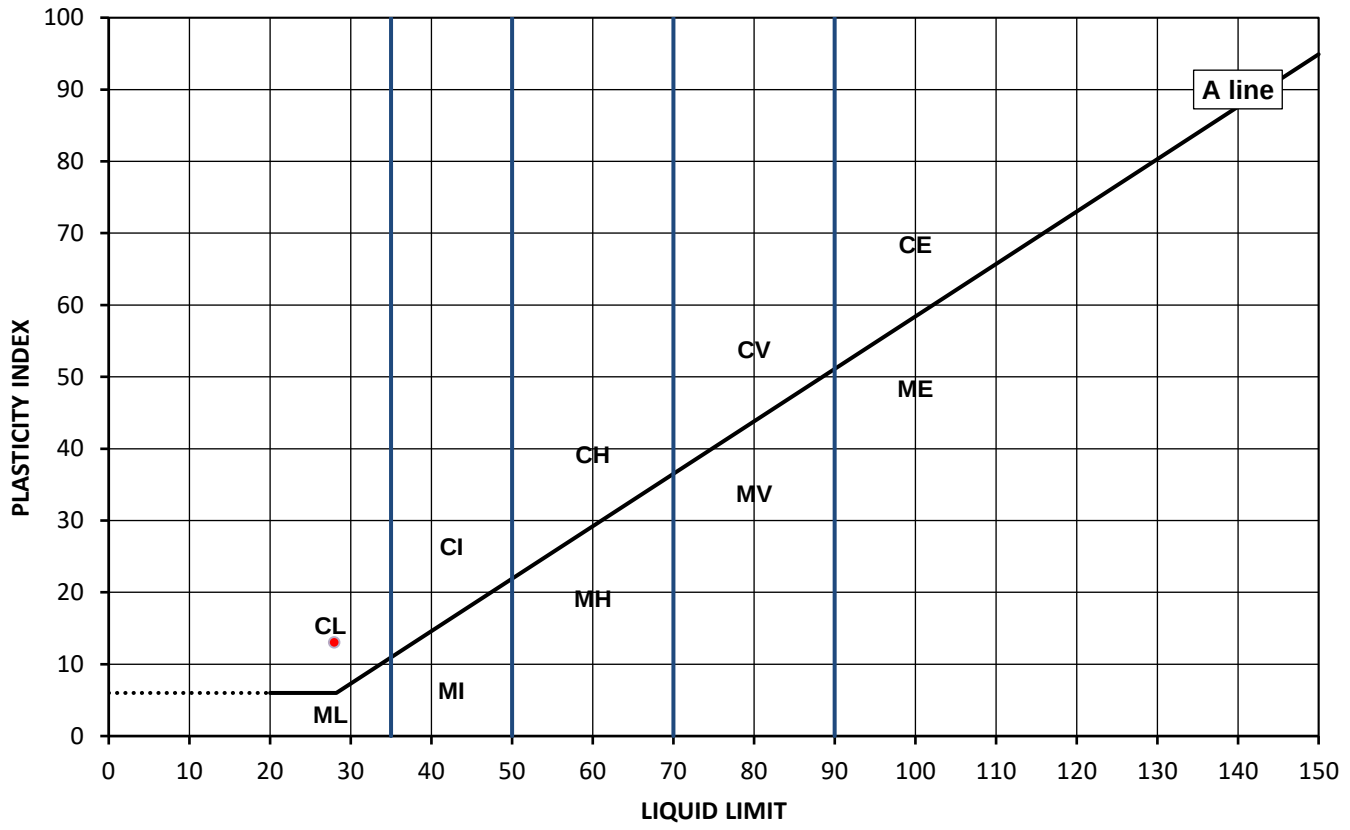
Client:	Hydrock Consultants Ltd	Client Reference:	C10042
Client Address:	4 Lakeside, Festival Park, Stoke on Trent, ST1 5RY	Job Number:	20-85152
		Date Sampled:	Not Given
		Date Received:	04/02/2020
Contact:	Jason Bradley	Date Tested:	10/02/2020
Site Address:	Islington Wharf	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1433779	Depth Top [m]:	9.00
Hole No.:	BH04	Depth Base [m]:	9.45
Sample Reference:	Not Given	Sample Type:	B
Soil Description:	Brown slightly gravelly vey sandy CLAY		
Sample Preparation:	Tested after washing to remove >425um		

As Received Moisture Content [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	% Passing 425µm BS Test Sieve
18	28	15	13	90



Legend, based on BS 5930:2015 Code of practice for site investigations

		Plasticity		Liquid Limit
C	Clay	L	Low	below 35
M	Silt	I	Medium	35 to 50
		H	High	50 to 70
		V	Very high	70 to 90
		E	Extremely high	exceeding 90
	Organic	O	append to classification for organic material (eg CHO)	

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

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Tested in Accordance with: BS 1377-2: 1990: Clause 4.3 and 5

Client: Hydrock Consultants Ltd
Client Address: 4 Lakeside, Festival Park, Stoke on Trent, ST1 5RY
Contact: Jason Bradley
Site Address: Islington Wharf

Client Reference: C10042
Job Number: 20-85152
Date Sampled: Not Given
Date Received: 04/02/2020
Date Tested: 12/02/2020
Sampled By: Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

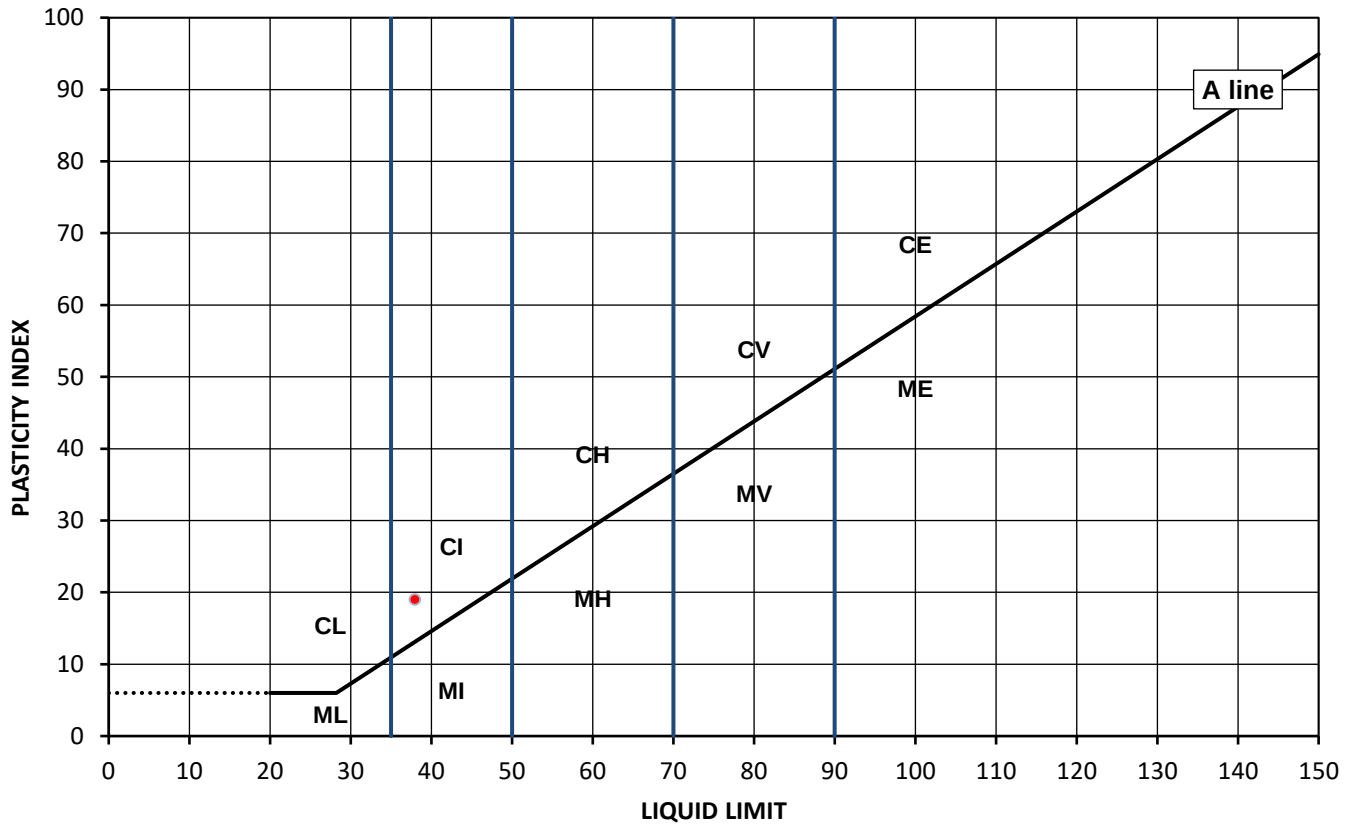
Test Results:

Laboratory Reference: 1433781
Hole No.: BH04
Sample Reference: Not Given
Soil Description: Brown slightly gravelly sandy CLAY

Depth Top [m]: 13.00
Depth Base [m]: 13.45
Sample Type: U

Sample Preparation: Tested after washing to remove >425um

As Received Moisture Content [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	% Passing 425µm BS Test Sieve
18	38	19	19	96



Legend, based on BS 5930:2015 Code of practice for site investigations

		Plasticity		Liquid Limit
C	Clay	L	Low	below 35
M	Silt	I	Medium	35 to 50
		H	High	50 to 70
		V	Very high	70 to 90
		E	Extremely high	exceeding 90
	Organic	O	append to classification for organic material (eg CHO)	

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

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Date Reported: 20/02/2020

GF 236.7

SUMMARY REPORT

Summary of Classification Test Results

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Client: Hydrock Consultants Ltd

Client Address: 4 Lakeside, Festival Park, Stoke on Trent, ST1 5RY

Contact: Jason Bradley

Site Address: Islington Wharf

Tested in Accordance with:

MC by BS 1377-2: 1990: Clause 3.2; WC by BS EN 17892-1: 2014; Atterberg by BS 1377-2: 1990: Clause 4.3, Clause 4.4 and 5; PD by BS 1377-2: 1990: Clause 8.2

Client Reference: C10042
Job Number: 20-85152
Date Sampled: Not Given
Date Received: 04/02/2020
Date Tested: 12/02 - 17/02/2020
Sampled By: Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks	MC	WC	Atterberg				Density			Total Porosity#		
		Reference	Depth Top	Depth Base	Type					% Passing 425um	LL	PL	PI	bulk	dry	PD			
			m	m				%	%	%	%	%	%	Mg/m3	Mg/m3	Mg/m3	%		
1433754	BH01	Not Given	4.00	4.45	U	Brown slightly gravelly sandy CLAY	Atterberg 4 Point	16		95	38	19	19						
1433755	BH01	Not Given	6.00	6.45	U	Brown slightly gravelly sandy CLAY	Atterberg 4 Point	20		92	38	22	16						
1433756	BH01	Not Given	8.00	8.45	U	Brown slightly gravelly very sandy CLAY	Atterberg 4 Point	15		99	33	17	16						
1433757	BH01	Not Given	10.00	10.45	U	Brown slightly gravelly sandy CLAY	Atterberg 4 Point	19		92	37	19	18						
1433758	BH01	Not Given	12.00	12.45	U	Brown slightly gravelly sandy CLAY	Atterberg 4 Point	16		94	38	18	20						
1433760	BH01	Not Given	18.00	18.45	U	Brown slightly sandy CLAY	Atterberg 4 Point	20		100	51	24	27						
1433763	BH02	Not Given	4.00	4.45	U	Brown slightly gravelly sandy CLAY	Atterberg 4 Point	17		99	38	18	20						
1433764	BH02	Not Given	6.00	6.45	U	Brown slightly gravelly sandy CLAY	Atterberg 4 Point	16		97	36	17	19						
1433765	BH02	Not Given	8.00	8.45	U	Brown slightly gravelly very sandy CLAY	Atterberg 4 Point	14		96	31	15	16						
1433766	BH02	Not Given	10.00	10.45	U	Brown slightly gravelly very sandy CLAY	Atterberg 4 Point	16		98	33	18	15						

Note: # Non accredited; NP - Non plastic

Comments:

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for and on behalf of i2 Analytical Ltd

Date Reported: 20/02/2020

GF 238.9

SUMMARY REPORT

Summary of Classification Test Results

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Tested in Accordance with:

MC by BS 1377-2: 1990: Clause 3.2; WC by BS EN 17892-1: 2014; Atterberg by BS 1377-2: 1990: Clause 4.3, Clause 4.4 and 5; PD by BS 1377-2: 1990: Clause 8.2

Client: Hydrock Consultants Ltd

Client Address: 4 Lakeside, Festival Park, Stoke on Trent, ST1 5RY

Contact: Jason Bradley

Site Address: Islington Wharf

Client Reference: C10042
Job Number: 20-85152
Date Sampled: Not Given
Date Received: 04/02/2020
Date Tested: 10/02 - 17/02/2020
Sampled By: Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks	MC	WC	Atterberg				Density			Total Porosity#		
		Reference	Depth Top	Depth Base	Type					% Passing 425um	LL	PL	PI	bulk	dry	PD			
			m	m				%	%	%	%	%	%	Mg/m3	Mg/m3	Mg/m3	%		
1433767	BH02	Not Given	12.00	12.45	U	Brown slightly gravelly sandy CLAY	Atterberg 4 Point	17		90	37	18	19						
1433770	BH03	Not Given	4.00	4.45	U	Brown slightly gravelly sandy CLAY	Atterberg 4 Point	15		97	38	20	18						
1433771	BH03	Not Given	6.00	6.45	U	Brown slightly gravelly sandy CLAY	Atterberg 4 Point	16		94	39	19	20						
1433772	BH03	Not Given	8.00	8.45	U	Dark brown slightly gravelly sandy CLAY	Atterberg 4 Point	18		93	38	18	20						
1433779	BH04	Not Given	9.00	9.45	B	Brown slightly gravelly vey sandy CLAY	Atterberg 4 Point	18		90	28	15	13						
1433781	BH04	Not Given	13.00	13.45	U	Brown slightly gravelly sandy CLAY	Atterberg 4 Point	18		96	38	19	19						

Note: # Non accredited; NP - Non plastic

Comments:

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Signed: Dariusz Piotrowski
PL Geotechnical Laboratory Manager
for and on behalf of i2 Analytical Ltd

Date Reported: 20/02/2020

GF 238.9

TEST CERTIFICATE

Particle Size Distribution

Tested in Accordance with: BS 1377-2: 1990

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Client: Hydrock Consultants Ltd
Client Address: 4 Lakeside, Festival Park, Stoke on Trent, ST1 5RY
Contact: Jason Bradley
Site Address: Islington Wharf

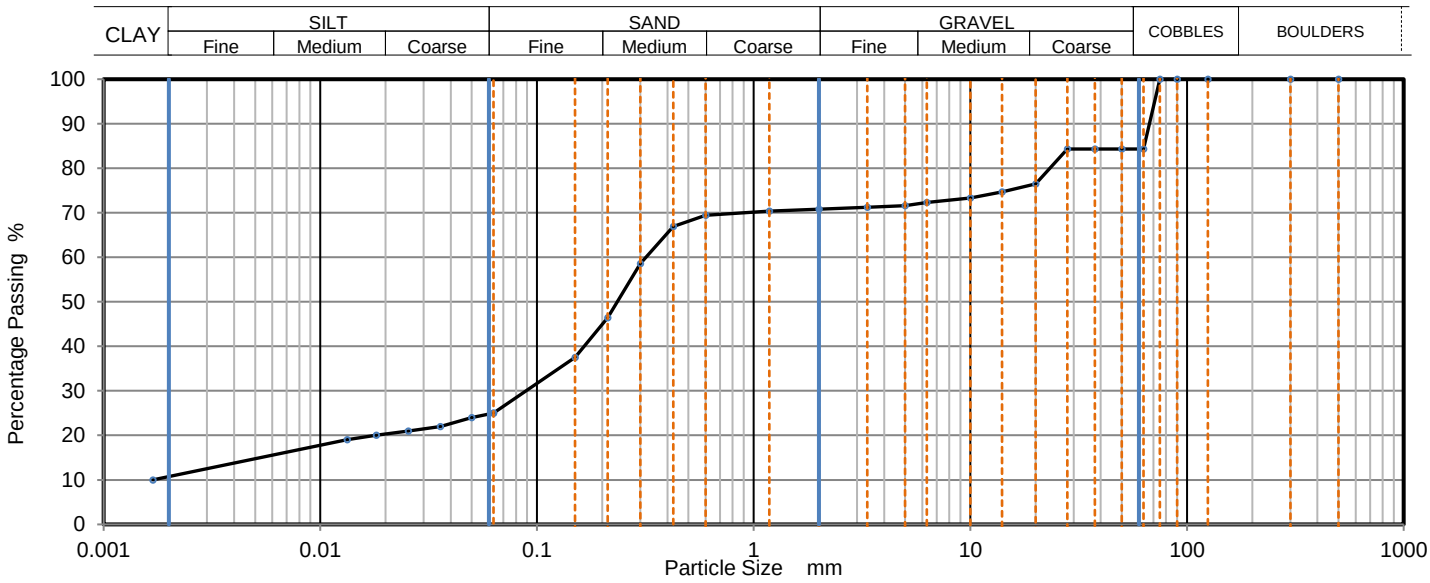
Client Reference: C10042
Job Number: 20-85152
Date Sampled: Not Given
Date Received: 04/02/2020
Date Tested: 10/02/2020
Sampled By: Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference: 1433759
Hole No.: BH01
Sample Reference: Not Given
Sample Description: Brown slightly clayey slightly gravelly silty SAND

Depth Top [m]: 17.00
Depth Base [m]: 17.45
Sample Type: B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100	0.0630	25
300	100	0.0500	24
125	100	0.0358	22
90	100	0.0255	21
75	100	0.0181	20
63	84	0.0133	19
50	84	0.0017	10
37.5	84		
28	84		
20	77		
14	75		
10	73		
6.3	72		
5	72		
3.35	71		
2	71	Particle density	(assumed)
1.18	70	2.65	Mg/m3
0.6	69		
0.425	67		
0.3	59		
0.212	46		
0.15	38		
0.063	25		

Sample Proportions	% dry mass
Very coarse	15.70
Gravel	13.50
Sand	45.40
Silt	14.70
Clay	10.70

Grading Analysis		
D100	mm	75
D60	mm	0.318
D30	mm	0.0876
D10	mm	0.00171
Uniformity Coefficient		190
Curvature Coefficient		14

Note: Tested in Accordance with BS1377:Part 2:1990, clauses 9.2 and 9.5

Remarks: The material submitted - fails to meet the minimum mass requirements as stated in BS1377 Part 2 Table 3

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Signed: Dariusz Piotrowski
PL Geotechnical Laboratory Manager
for and on behalf of i2 Analytical Ltd

Date Reported: 20/02/2020

GF 100.15

TEST CERTIFICATE

Particle Size Distribution

Tested in Accordance with: BS 1377-2: 1990

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

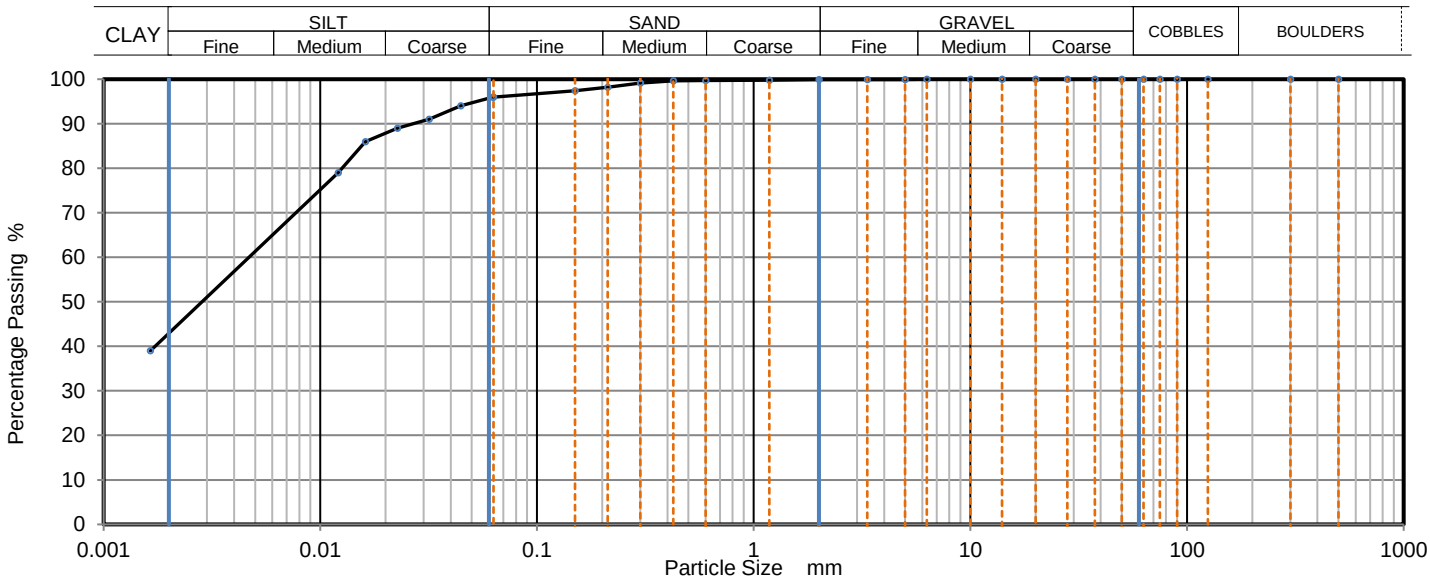
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Client:	Hydrock Consultants Ltd	Client Reference:	C10042
Client Address:	4 Lakeside, Festival Park, Stoke on Trent, ST1 5RY	Job Number:	20-85152
		Date Sampled:	Not Given
		Date Received:	04/02/2020
Contact:	Jason Bradley	Date Tested:	10/02/2020
Site Address:	Islington Wharf	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1433761	Depth Top [m]:	19.00
Hole No.:	BH01	Depth Base [m]:	19.45
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Brown slightly sandy very clayey SILT		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100	0.0625	96
300	100	0.0446	94
125	100	0.0318	91
90	100	0.0227	89
75	100	0.0162	86
63	100	0.0121	79
50	100	0.0016	39
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100	Particle density	(assumed)
1.18	100	2.65	Mg/m3
0.6	100		
0.425	100		
0.3	99		
0.212	98		
0.15	97		
0.063	96		

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	0.10
Sand	3.80
Silt	52.80
Clay	43.30

Grading Analysis		
D100	mm	6.3
D60	mm	0.00466
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Note: Tested in Accordance with BS1377:Part 2:1990, clauses 9.2 and 9.5

Remarks:

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Signed: Dariusz Piotrowski
PL Geotechnical Laboratory Manager
for and on behalf of i2 Analytical Ltd

Date Reported: 20/02/2020

GF 100.15

TEST CERTIFICATE

Particle Size Distribution

Tested in Accordance with: BS 1377-2: 1990

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

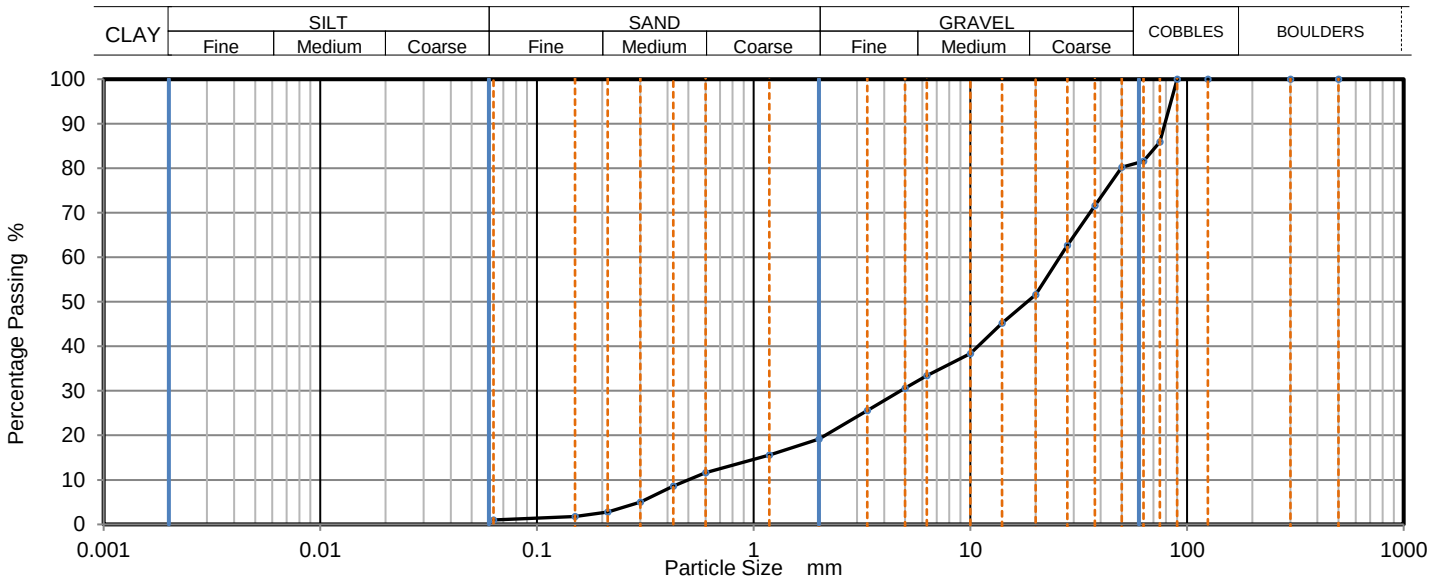
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Client:	Hydrock Consultants Ltd	Client Reference:	C10042
Client Address:	4 Lakeside, Festival Park, Stoke on Trent, ST1 5RY	Job Number:	20-85152
		Date Sampled:	Not Given
		Date Received:	04/02/2020
Contact:	Jason Bradley	Date Tested:	10/02/2020
Site Address:	Islington Wharf	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1433762	Depth Top [m]:	22.00
Hole No.:	BH01	Depth Base [m]:	22.45
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Brown slightly sandy GRAVEL with cobbles		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
125	100		
90	100		
75	86		
63	82		
50	80		
37.5	72		
28	63		
20	52		
14	45		
10	38		
6.3	33		
5	31		
3.35	26		
2	19		
1.18	16		
0.6	12		
0.425	9		
0.3	5		
0.212	3		
0.15	2		
0.063	1		

Sample Proportions	% dry mass
Very coarse	18.40
Gravel	62.40
Sand	18.00
Fines <0.063mm	1.20

Grading Analysis		
D100	mm	90
D60	mm	25.8
D30	mm	4.78
D10	mm	0.5
Uniformity Coefficient		52
Curvature Coefficient		1.8

Note: Tested in Accordance with BS1377:Part 2:1990, clause 9.2

Remarks: The material submitted - fails to meet the minimum mass requirements as stated in BS1377 Part 2 Table 3

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Signed: Dariusz Piotrowski
PL Geotechnical Laboratory Manager
for and on behalf of i2 Analytical Ltd

Date Reported: 20/02/2020

GF 100.15

TEST CERTIFICATE

Particle Size Distribution

Tested in Accordance with: BS 1377-2: 1990

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

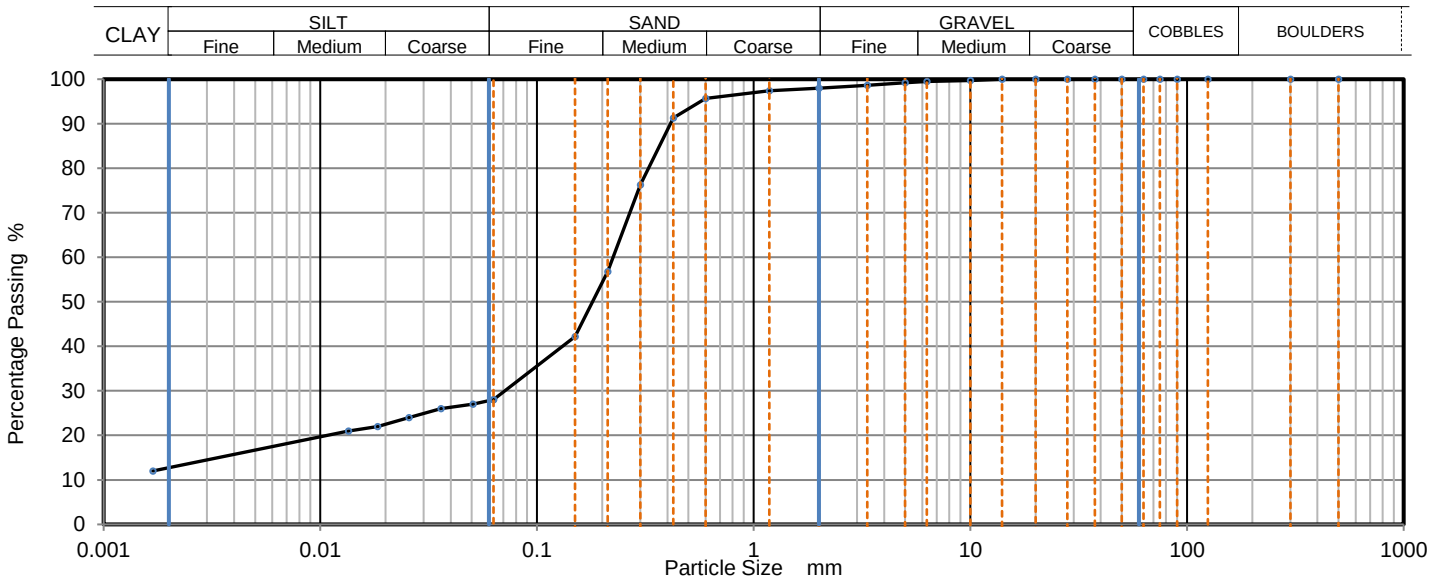
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Client:	Hydrock Consultants Ltd	Client Reference:	C10042
Client Address:	4 Lakeside, Festival Park, Stoke on Trent, ST1 5RY	Job Number:	20-85152
		Date Sampled:	Not Given
		Date Received:	04/02/2020
Contact:	Jason Bradley	Date Tested:	10/02/2020
Site Address:	Islington Wharf	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1433768	Depth Top [m]:	14.00
Hole No.:	BH02	Depth Base [m]:	14.45
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Brown clayey silty SAND		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100	0.0630	28
300	100	0.0507	27
125	100	0.0361	26
90	100	0.0257	24
75	100	0.0184	22
63	100	0.0135	21
50	100	0.0017	12
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	99		
3.35	99		
2	98	Particle density	(assumed)
1.18	97	2.65	Mg/m3
0.6	96		
0.425	91		
0.3	76		
0.212	57		
0.15	42		
0.063	28		

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	2.00
Sand	69.70
Silt	16.00
Clay	12.30

Grading Analysis		
D100	mm	14
D60	mm	0.224
D30	mm	0.0701
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Note: Tested in Accordance with BS1377:Part 2:1990, clauses 9.2 and 9.5

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Date Reported: 20/02/2020

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Particle Size Distribution

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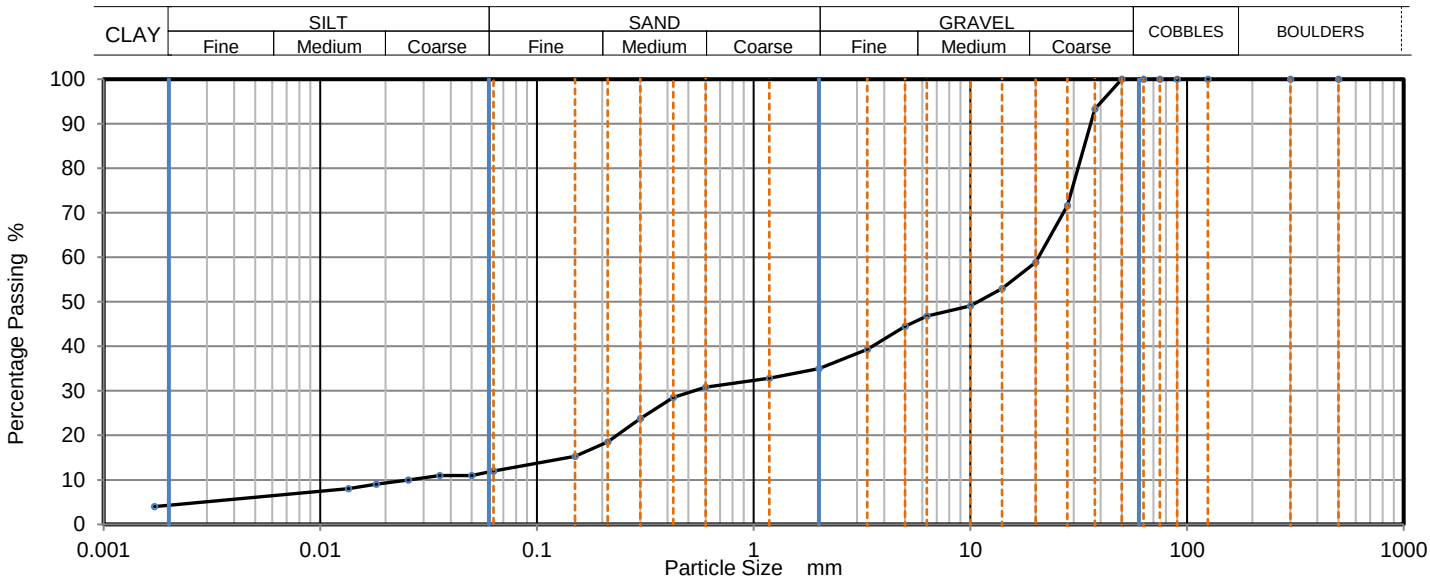
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Client:	Hydrock Consultants Ltd	Client Reference:	C10042
Client Address:	4 Lakeside, Festival Park, Stoke on Trent, ST1 5RY	Job Number:	20-85152
		Date Sampled:	Not Given
		Date Received:	04/02/2020
Contact:	Jason Bradley	Date Tested:	10/02/2020
Site Address:	Islington Wharf	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1433769	Depth Top [m]:	17.00
Hole No.:	BH02	Depth Base [m]:	17.45
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Brown slightly clayey sandy GRAVEL		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100	0.0630	12
300	100	0.0500	11
125	100	0.0356	11
90	100	0.0255	10
75	100	0.0181	9
63	100	0.0135	8
50	100	0.0017	4
37.5	93		
28	72		
20	59		
14	53		
10	49		
6.3	47		
5	45		
3.35	39		
2	35	Particle density	(assumed)
1.18	33	2.65	Mg/m3
0.6	31		
0.425	29		
0.3	24		
0.212	19		
0.15	15		
0.063	12		

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	65.00
Sand	23.00
Silt	8.20
Clay	3.80

Grading Analysis		
D100	mm	50
D60	mm	20.6
D30	mm	0.534
D10	mm	0.0301
Uniformity Coefficient		680
Curvature Coefficient		0.46

Note: Tested in Accordance with BS1377:Part 2:1990, clauses 9.2 and 9.5

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Signed: Dariusz Piotrowski
PL Geotechnical Laboratory Manager
for and on behalf of i2 Analytical Ltd

Date Reported: 20/02/2020

GF 100.15

TEST CERTIFICATE

Particle Size Distribution

Tested in Accordance with: BS 1377-2: 1990

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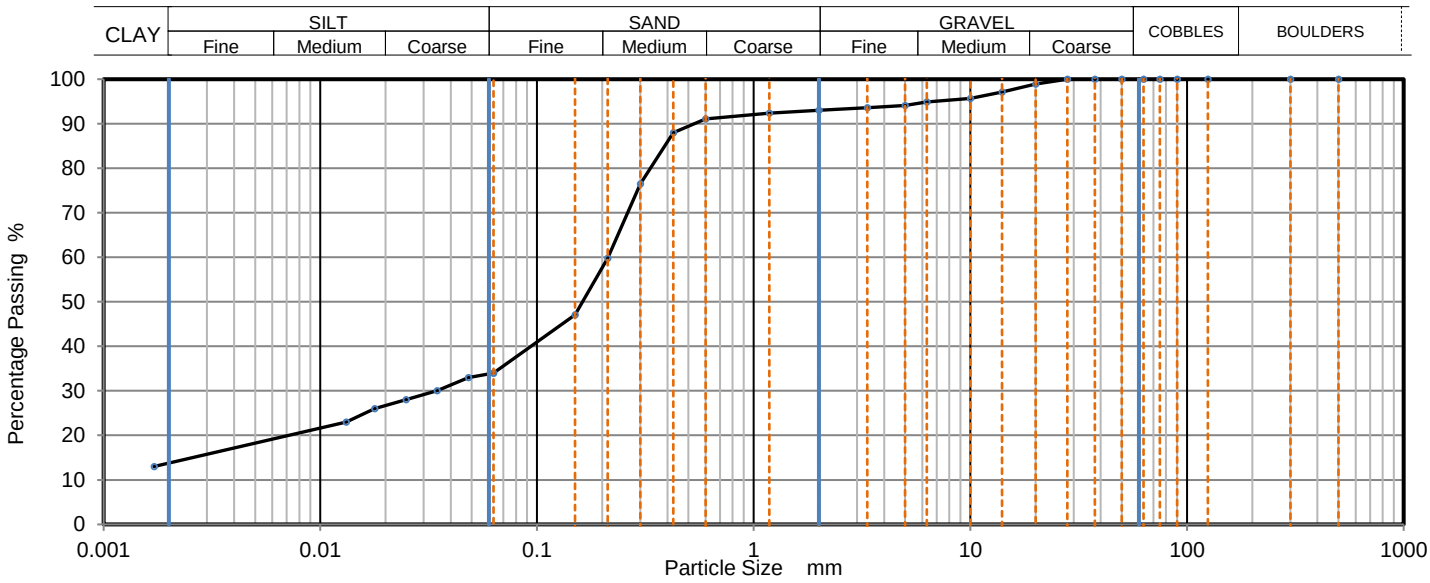
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Client:	Hydrock Consultants Ltd	Client Reference:	C10042
Client Address:	4 Lakeside, Festival Park, Stoke on Trent, ST1 5RY	Job Number:	20-85152
		Date Sampled:	Not Given
		Date Received:	04/02/2020
Contact:	Jason Bradley	Date Tested:	10/02/2020
Site Address:	Islington Wharf	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1433774	Depth Top [m]:	14.80
Hole No.:	BH03	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Brown slightly gravelly clayey silty SAND		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100	0.0630	34
300	100	0.0482	33
125	100	0.0346	30
90	100	0.0248	28
75	100	0.0178	26
63	100	0.0132	23
50	100	0.0017	13
37.5	100		
28	100		
20	99		
14	97		
10	96		
6.3	95		
5	94		
3.35	94		
2	93	Particle density	(assumed)
1.18	92	2.65	Mg/m3
0.6	91		
0.425	88		
0.3	77		
0.212	60		
0.15	47		
0.063	34		

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	7.00
Sand	59.10
Silt	20.20
Clay	13.70

Grading Analysis		
D100	mm	28
D60	mm	0.213
D30	mm	0.0327
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Note: Tested in Accordance with BS1377:Part 2:1990, clauses 9.2 and 9.5

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PL Geotechnical Laboratory Manager
for and on behalf of i2 Analytical Ltd

Date Reported: 20/02/2020

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TEST CERTIFICATE

Particle Size Distribution

Tested in Accordance with: BS 1377-2: 1990

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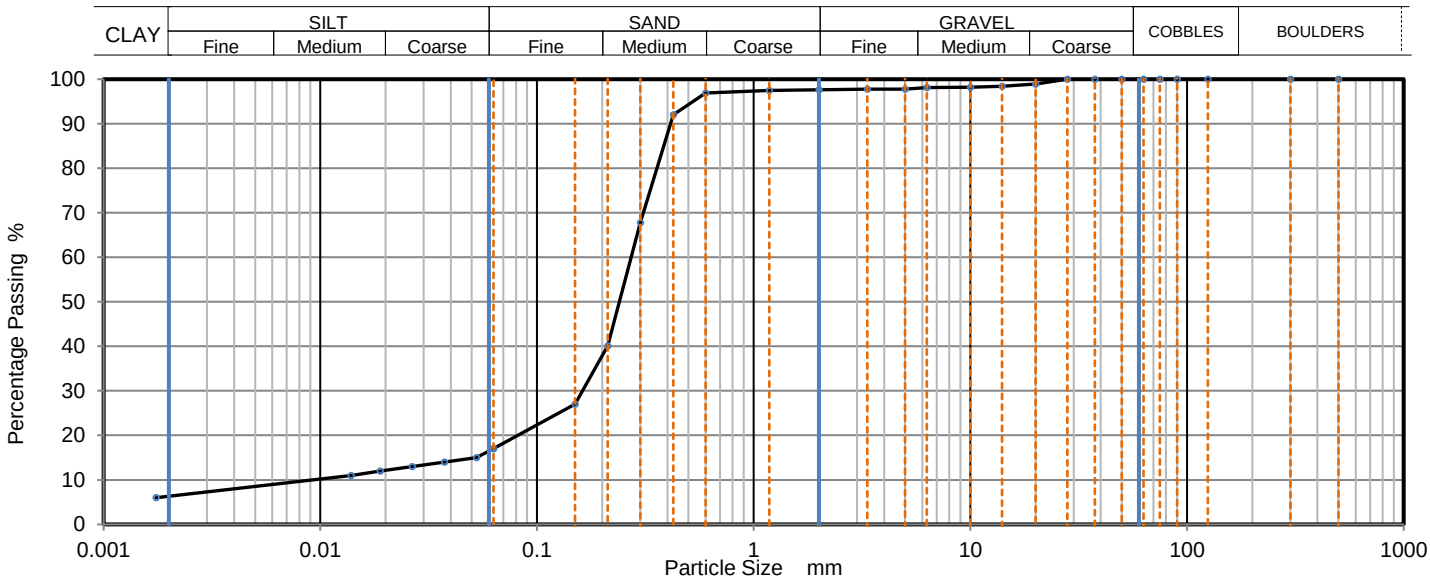
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Client:	Hydrock Consultants Ltd	Client Reference:	C10042
Client Address:	4 Lakeside, Festival Park, Stoke on Trent, ST1 5RY	Job Number:	20-85152
		Date Sampled:	Not Given
		Date Received:	04/02/2020
Contact:	Jason Bradley	Date Tested:	10/02/2020
Site Address:	Islington Wharf	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1433775	Depth Top [m]:	16.00
Hole No.:	BH03	Depth Base [m]:	16.45
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Brown slightly clayey SAND		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100	0.0630	17
300	100	0.0525	15
125	100	0.0373	14
90	100	0.0266	13
75	100	0.0189	12
63	100	0.0139	11
50	100	0.0017	6
37.5	100		
28	100		
20	99		
14	98		
10	98		
6.3	98		
5	98		
3.35	98		
2	98	Particle density	(assumed)
1.18	98	2.65	Mg/m3
0.6	97		
0.425	92		
0.3	68		
0.212	40		
0.15	27		
0.063	17		

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	2.40
Sand	80.80
Silt	10.50
Clay	6.30

Grading Analysis		
D100	mm	28
D60	mm	0.272
D30	mm	0.162
D10	mm	0.00963
Uniformity Coefficient		28
Curvature Coefficient		10

Note: Tested in Accordance with BS1377:Part 2:1990, clauses 9.2 and 9.5

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Signed: Dariusz Piotrowski
PL Geotechnical Laboratory Manager
for and on behalf of i2 Analytical Ltd

Date Reported: 20/02/2020

GF 100.15

TEST CERTIFICATE

Particle Size Distribution

Tested in Accordance with: BS 1377-2: 1990

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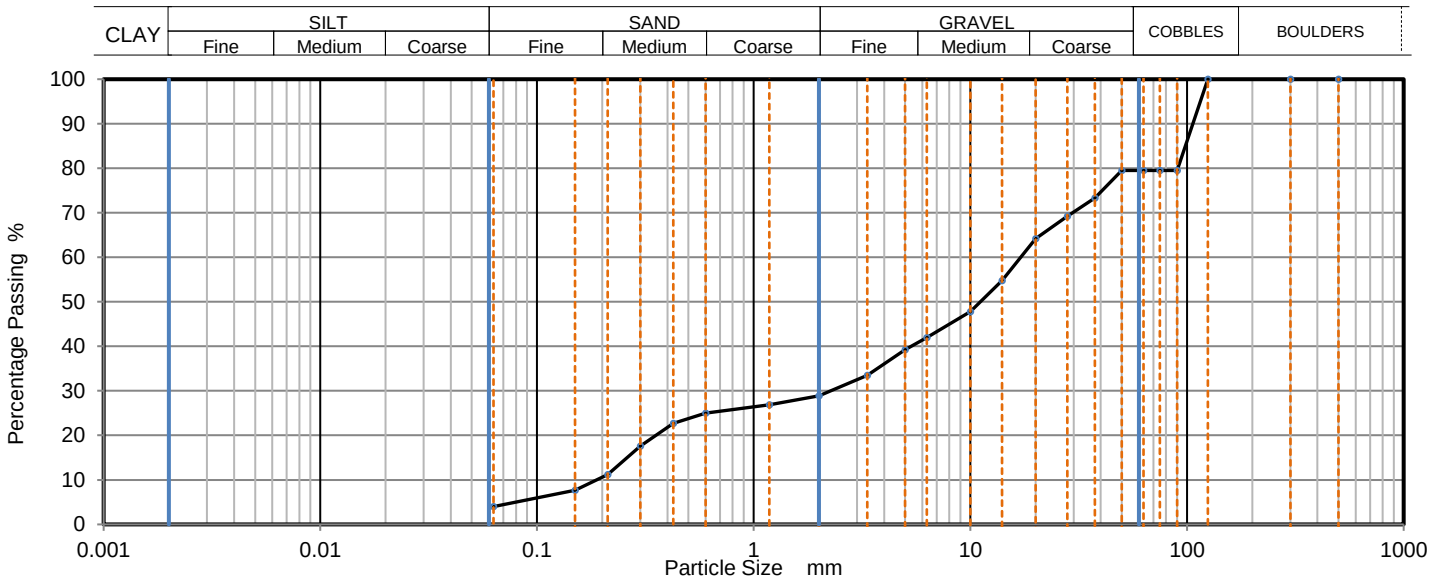
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Client:	Hydrock Consultants Ltd	Client Reference:	C10042
Client Address:	4 Lakeside, Festival Park, Stoke on Trent, ST1 5RY	Job Number:	20-85152
		Date Sampled:	Not Given
		Date Received:	04/02/2020
Contact:	Jason Bradley	Date Tested:	10/02/2020
Site Address:	Islington Wharf	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1433776	Depth Top [m]:	17.00
Hole No.:	BH03	Depth Base [m]:	17.45
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Brown slightly clayey sandy GRAVEL with cobbles		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
125	100		
90	80		
75	80		
63	80		
50	80		
37.5	73		
28	69		
20	64		
14	55		
10	48		
6.3	42		
5	39		
3.35	34		
2	29		
1.18	27		
0.6	25		
0.425	23		
0.3	18		
0.212	11		
0.15	8		
0.063	5		

Sample Proportions	% dry mass
Very coarse	20.50
Gravel	50.60
Sand	24.00
Fines <0.063mm	4.90

Grading Analysis		
D100	mm	125
D60	mm	17
D30	mm	2.26
D10	mm	0.188
Uniformity Coefficient		91
Curvature Coefficient		1.6

Note: Tested in Accordance with BS1377:Part 2:1990, clause 9.2

Remarks: The material submitted - fails to meet the minimum mass requirements as stated in BS1377 Part 2 Table 3

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Signed: Dariusz Piotrowski
PL Geotechnical Laboratory Manager
for and on behalf of i2 Analytical Ltd

Date Reported: 20/02/2020

GF 100.15

TEST CERTIFICATE

Particle Size Distribution

Tested in Accordance with: BS 1377-2: 1990

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

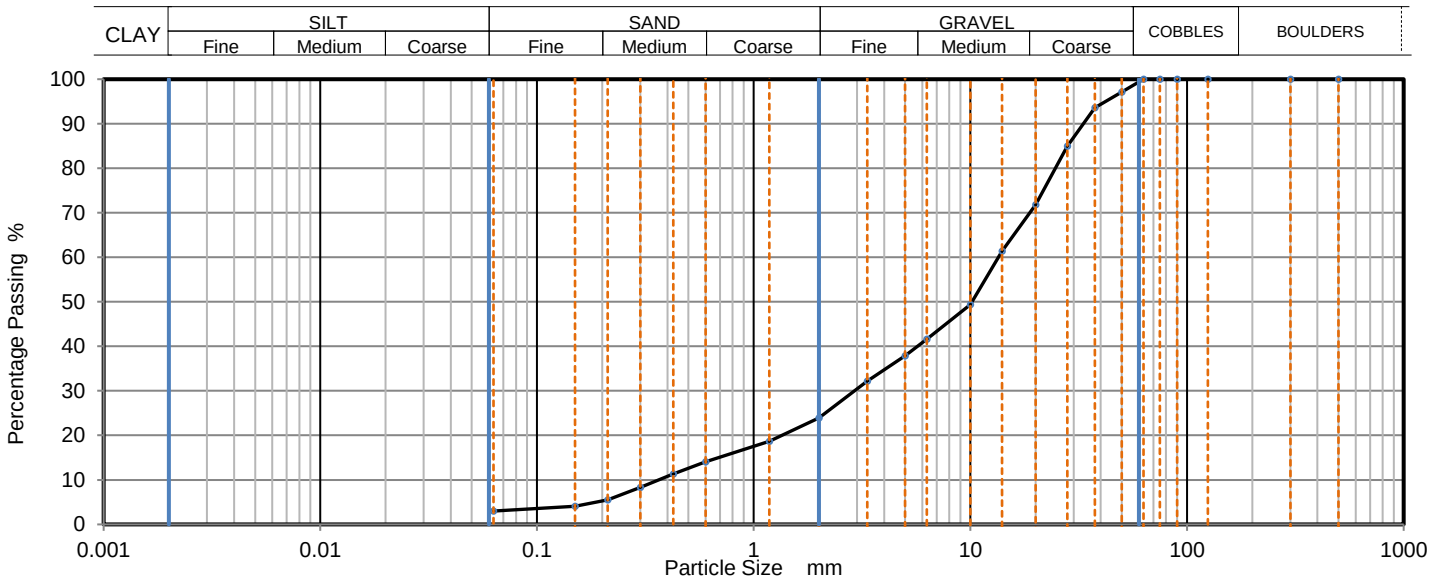
4041

Client:	Hydrock Consultants Ltd	Client Reference:	C10042
Client Address:	4 Lakeside, Festival Park, Stoke on Trent, ST1 5RY	Job Number:	20-85152
		Date Sampled:	Not Given
		Date Received:	04/02/2020
Contact:	Jason Bradley	Date Tested:	10/02/2020
Site Address:	Islington Wharf	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1433777	Depth Top [m]:	21.00
Hole No.:	BH03	Depth Base [m]:	21.45
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Brown sandy GRAVEL		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
125	100		
90	100		
75	100		
63	100		
50	97		
37.5	94		
28	85		
20	72		
14	61		
10	49		
6.3	42		
5	38		
3.35	32		
2	24		
1.18	19		
0.6	14		
0.425	11		
0.3	8		
0.212	6		
0.15	4		
0.063	3		

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	76.10
Sand	20.70
Fines <0.063mm	3.20

Grading Analysis		
D100	mm	63
D60	mm	13.5
D30	mm	2.93
D10	mm	0.365
Uniformity Coefficient		37
Curvature Coefficient		1.7

Note: Tested in Accordance with BS1377:Part 2:1990, clause 9.2

Remarks:

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Signed: Dariusz Piotrowski
PL Geotechnical Laboratory Manager
for and on behalf of i2 Analytical Ltd

Date Reported: 20/02/2020

GF 100.15

TEST CERTIFICATE

Particle Size Distribution

Tested in Accordance with: BS 1377-2: 1990

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

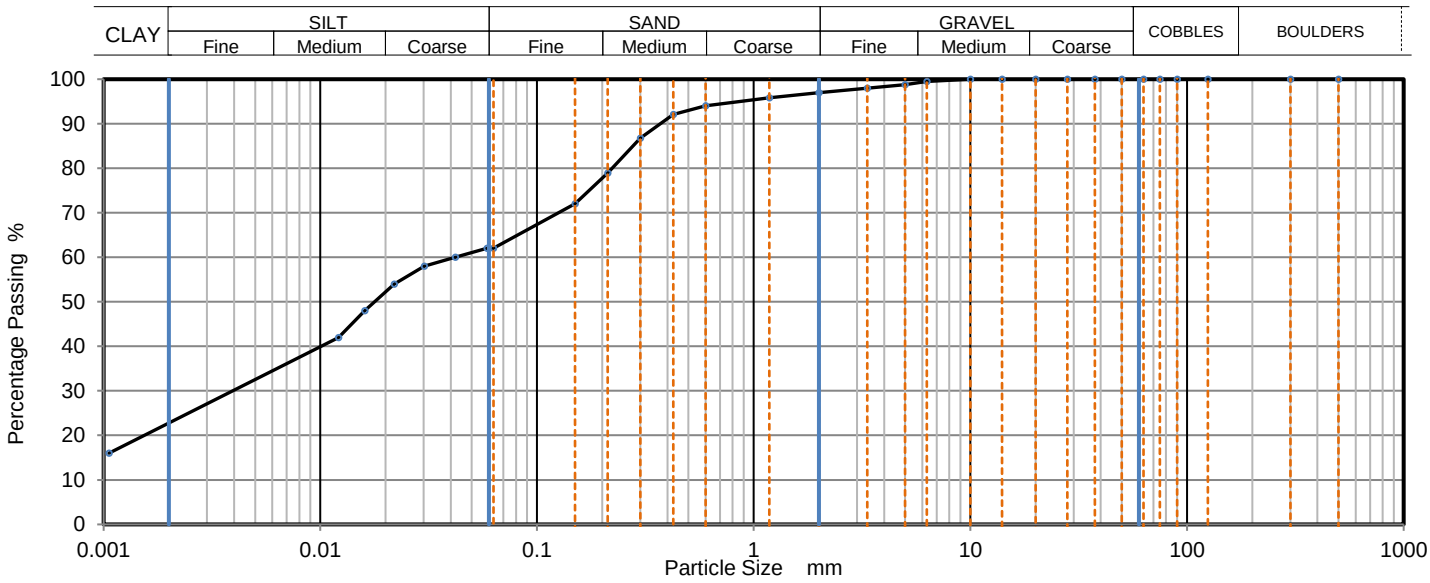
4041

Client:	Hydrock Consultants Ltd	Client Reference:	C10042
Client Address:	4 Lakeside, Festival Park, Stoke on Trent, ST1 5RY	Job Number:	20-85152
		Date Sampled:	Not Given
		Date Received:	04/02/2020
Contact:	Jason Bradley	Date Tested:	14/02/2020
Site Address:	Islington Wharf	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1433780	Depth Top [m]:	11.00
Hole No.:	BH04	Depth Base [m]:	11.45
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Brown slightly gravelly clayey very sandy SILT		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100	0.0588	62
300	100	0.0420	60
125	100	0.0302	58
90	100	0.0219	54
75	100	0.0160	48
63	100	0.0121	42
50	100	0.0011	16
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	99		
3.35	98		
2	97	Particle density	(assumed)
1.18	96	2.65	Mg/m3
0.6	94		
0.425	92		
0.3	87		
0.212	79		
0.15	72		
0.063	62		

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	3.00
Sand	35.20
Silt	39.00
Clay	22.80

Grading Analysis		
D100	mm	10
D60	mm	0.0397
D30	mm	0.00399
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Note: Tested in Accordance with BS1377:Part 2:1990, clauses 9.2 and 9.5

Remarks:

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Signed: Dariusz Piotrowski
PL Geotechnical Laboratory Manager
for and on behalf of i2 Analytical Ltd

Date Reported: 20/02/2020

GF 100.15

TEST CERTIFICATE

Particle Size Distribution

Tested in Accordance with: BS 1377-2: 1990

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

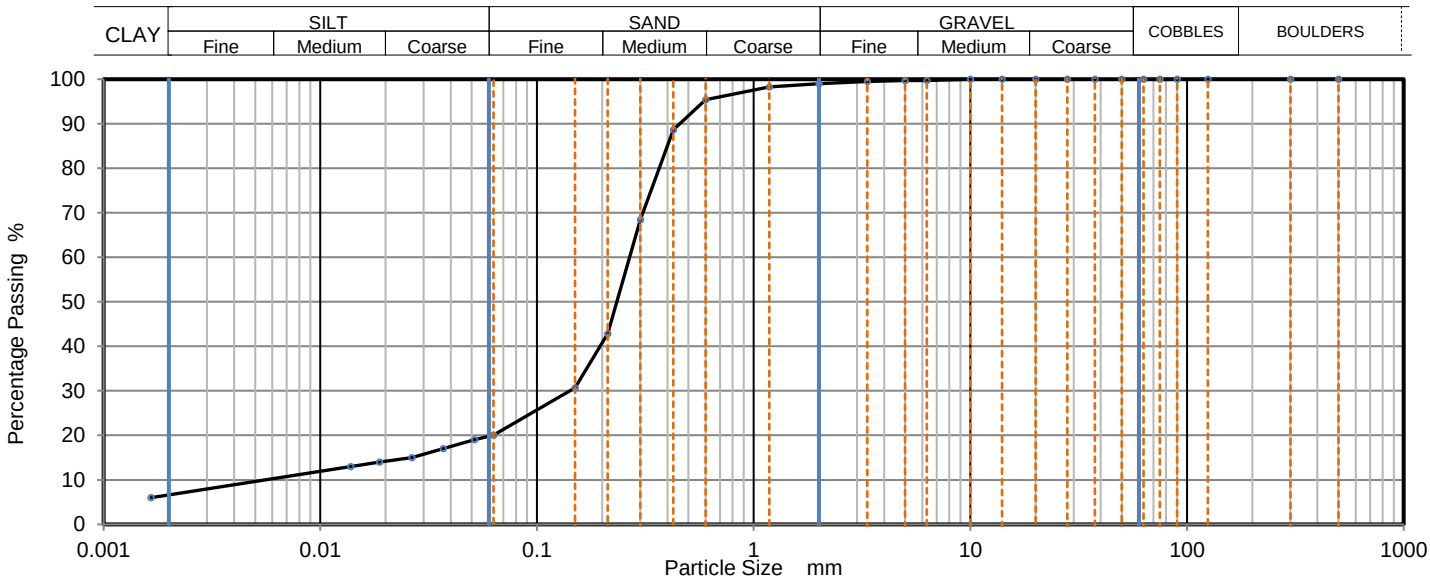
4041

Client:	Hydrock Consultants Ltd	Client Reference:	C10042
Client Address:	4 Lakeside, Festival Park, Stoke on Trent, ST1 5RY	Job Number:	20-85152
		Date Sampled:	Not Given
		Date Received:	04/02/2020
Contact:	Jason Bradley	Date Tested:	10/02/2020
Site Address:	Islington Wharf	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1433782	Depth Top [m]:	15.70
Hole No.:	BH04	Depth Base [m]:	16.00
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Brown slightly clayey silty SAND		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100	0.0630	20
300	100	0.0515	19
125	100	0.0369	17
90	100	0.0264	15
75	100	0.0188	14
63	100	0.0138	13
50	100	0.0017	6
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	99	Particle density	(assumed)
1.18	98	2.65	Mg/m3
0.6	95		
0.425	89		
0.3	68		
0.212	43		
0.15	31		
0.063	20		

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	1.00
Sand	79.10
Silt	13.10
Clay	6.80

Grading Analysis		
D100	mm	10
D60	mm	0.268
D30	mm	0.142
D10	mm	0.0058
Uniformity Coefficient		46
Curvature Coefficient		13

Note: Tested in Accordance with BS1377:Part 2:1990, clauses 9.2 and 9.5

Remarks:

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Signed: Dariusz Piotrowski
PL Geotechnical Laboratory Manager
for and on behalf of i2 Analytical Ltd

Date Reported: 20/02/2020

GF 100.15

TEST CERTIFICATE

Particle Size Distribution

Tested in Accordance with: BS 1377-2: 1990

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Client: Hydrock Consultants Ltd
Client Address: 4 Lakeside, Festival Park, Stoke on Trent, ST1 5RY
Contact: Jason Bradley
Site Address: Islington Wharf

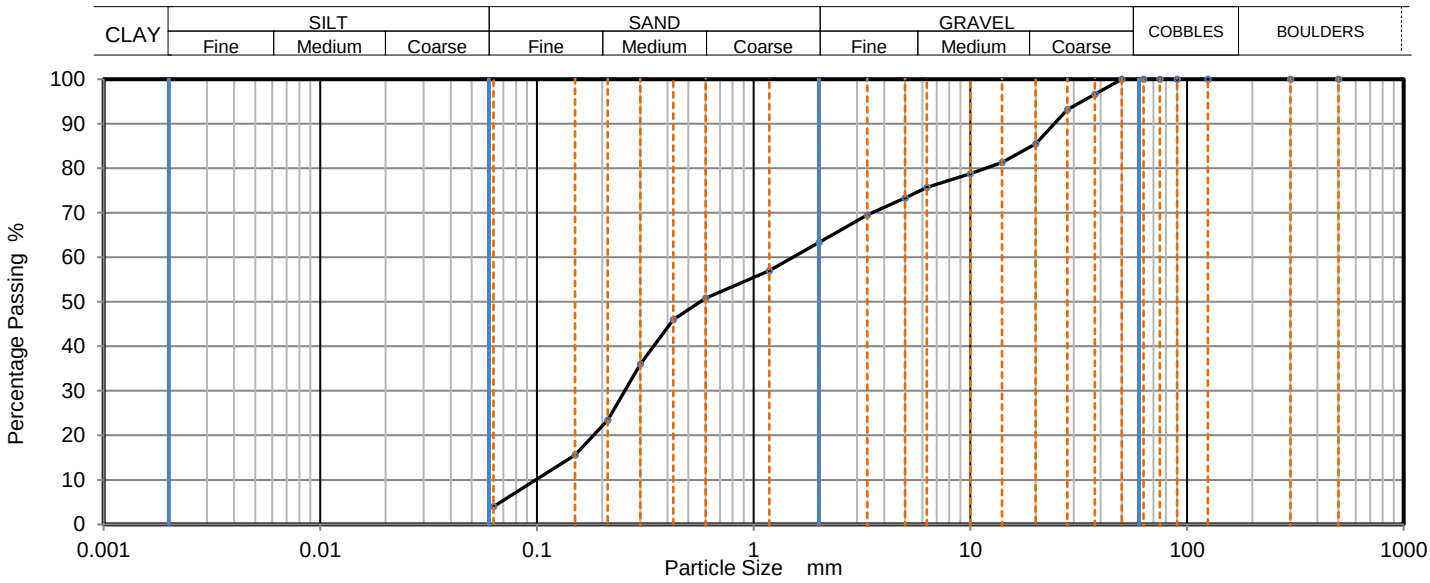
Client Reference: C10042
Job Number: 20-85152
Date Sampled: Not Given
Date Received: 04/02/2020
Date Tested: 10/02/2020
Sampled By: Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference: 1433783
Hole No.: BH04
Sample Reference: Not Given
Sample Description: Brown slightly clayey very gravelly SAND

Depth Top [m]: 18.00
Depth Base [m]: 18.45
Sample Type: B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	97		
28	93		
20	86		
14	81		
10	79		
6.3	76		
5	73		
3.35	70		
2	63		
1.18	57		
0.6	51		
0.425	46		
0.3	36		
0.212	23		
0.15	16		
0.063	5		

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	36.70
Sand	58.40
Fines <0.063mm	4.80

Grading Analysis		
D100	mm	50
D60	mm	1.52
D30	mm	0.254
D10	mm	0.0956
Uniformity Coefficient		16
Curvature Coefficient		0.45

Note: Tested in Accordance with BS1377:Part 2:1990, clause 9.2

Remarks:

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PL Geotechnical Laboratory Manager
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Date Reported: 20/02/2020

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TEST CERTIFICATE

Particle Size Distribution

Tested in Accordance with: BS 1377-2: 1990

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Brackmills Industrial Estate
Northampton NN4 7EB

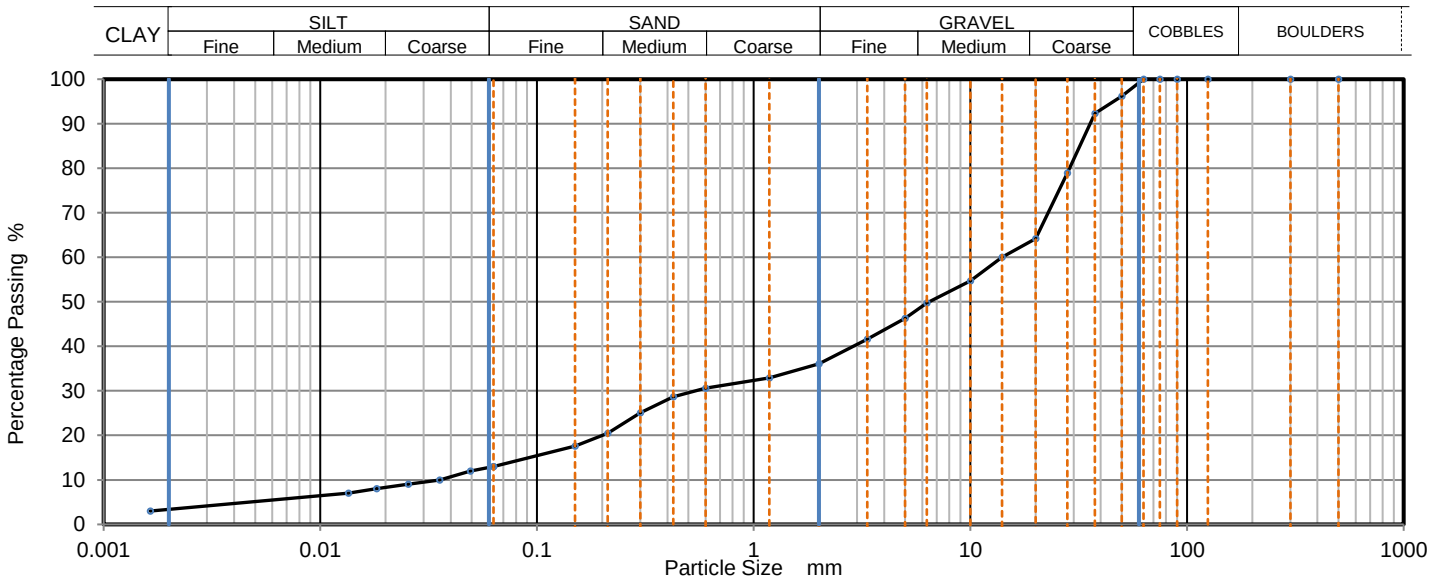
4041

Client:	Hydrock Consultants Ltd	Client Reference:	C10042
Client Address:	4 Lakeside, Festival Park, Stoke on Trent, ST1 5RY	Job Number:	20-85152
		Date Sampled:	Not Given
		Date Received:	04/02/2020
Contact:	Jason Bradley	Date Tested:	10/02/2020
Site Address:	Islington Wharf	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1433784	Depth Top [m]:	20.00
Hole No.:	BH04	Depth Base [m]:	20.45
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Brown slightly clayey sandy GRAVEL		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100	0.0630	13
300	100	0.0493	12
125	100	0.0355	10
90	100	0.0254	9
75	100	0.0182	8
63	100	0.0135	7
50	96	0.0016	3
37.5	92		
28	79		
20	64		
14	60		
10	55		
6.3	50		
5	46		
3.35	42		
2	36	Particle density	(assumed)
1.18	33	2.65	Mg/m3
0.6	31		
0.425	29		
0.3	25		
0.212	21		
0.15	18		
0.063	13		

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	63.90
Sand	23.20
Silt	9.10
Clay	3.80

Grading Analysis		
D100	mm	63
D60	mm	14
D30	mm	0.537
D10	mm	0.0309
Uniformity Coefficient		450
Curvature Coefficient		0.67

Note: Tested in Accordance with BS1377:Part 2:1990, clauses 9.2 and 9.5

Remarks: The material submitted - fails to meet the minimum mass requirements as stated in BS1377 Part 2 Table 3

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Signed: Dariusz Piotrowski
PL Geotechnical Laboratory Manager
for and on behalf of i2 Analytical Ltd

Date Reported: 20/02/2020

GF 100.15

TEST CERTIFICATE

Particle Size Distribution

Tested in Accordance with: BS 1377-2: 1990

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

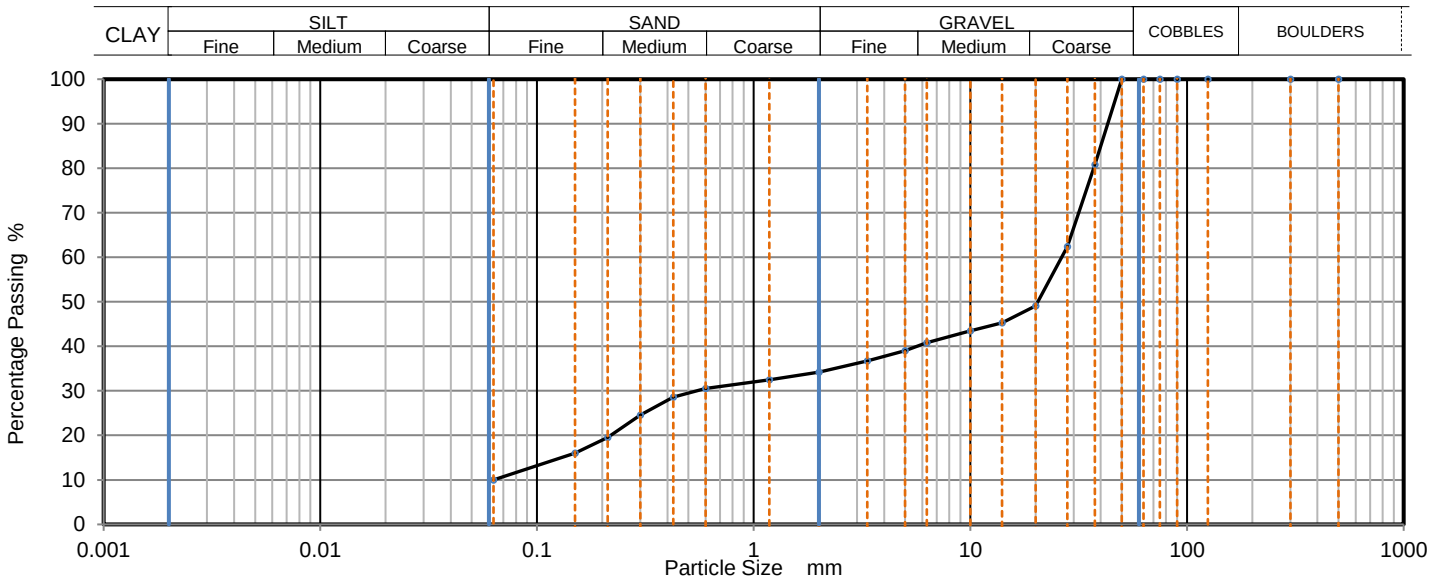
4041

Client:	Hydrock Consultants Ltd	Client Reference:	C10042
Client Address:	4 Lakeside, Festival Park, Stoke on Trent, ST1 5RY	Job Number:	20-85152
		Date Sampled:	Not Given
		Date Received:	29/01/2020
Contact:	Jason Bradley	Date Tested:	15/02/2020
Site Address:	Islington Wharf	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1435751	Depth Top [m]:	19.00
Hole No.:	BH04	Depth Base [m]:	19.45
Sample Reference:	Not given	Sample Type:	D
Sample Description:	Dark brown slightly clayey sandy GRAVEL		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	81		
28	62		
20	49		
14	45		
10	44		
6.3	41		
5	39		
3.35	37		
2	34		
1.18	33		
0.6	31		
0.425	29		
0.3	25		
0.212	20		
0.15	16		
0.063	10		

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	65.80
Sand	23.80
Fines <0.063mm	10.40

Grading Analysis		
D100	mm	50
D60	mm	26.3
D30	mm	0.55
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Note: Tested in Accordance with BS1377:Part 2:1990, clause 9.2

Remarks: The material submitted - fails to meet the minimum mass requirements as stated in BS1377 Part 2 Table 3

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Signed: Dariusz Piotrowski
PL Geotechnical Laboratory Manager
for and on behalf of i2 Analytical Ltd

Date Reported: 20/02/2020

GF 100.15

TEST CERTIFICATE

Particle Size Distribution

Tested in Accordance with: BS 1377-2: 1990

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

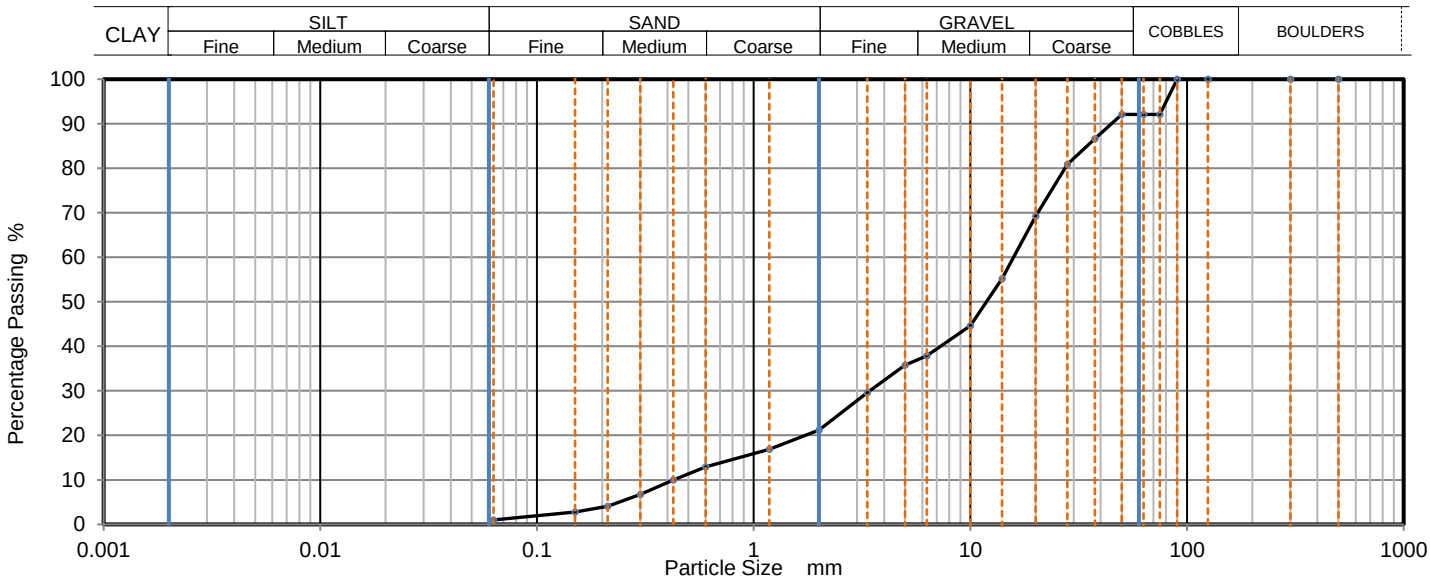
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Client:	Hydrock Consultants Ltd	Client Reference:	C10042
Client Address:	4 Lakeside, Festival Park, Stoke on Trent, ST1 5RY	Job Number:	20-85152
		Date Sampled:	Not Given
		Date Received:	29/01/2020
Contact:	Jason Bradley	Date Tested:	10/02/2020
Site Address:	Islington Wharf	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1435752	Depth Top [m]:	21.00
Hole No.:	BH01	Depth Base [m]:	21.45
Sample Reference:		Sample Type:	B
Sample Description:	Brown sandy GRAVEL with cobbles		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
125	100		
90	100		
75	92		
63	92		
50	92		
37.5	87		
28	81		
20	69		
14	55		
10	45		
6.3	38		
5	36		
3.35	30		
2	21		
1.18	17		
0.6	13		
0.425	10		
0.3	7		
0.212	4		
0.15	3		
0.063	2		

Sample Proportions	% dry mass
Very coarse	7.90
Gravel	70.90
Sand	19.30
Fines <0.063mm	1.90

Grading Analysis		
D100	mm	90
D60	mm	15.8
D30	mm	3.43
D10	mm	0.423
Uniformity Coefficient		37
Curvature Coefficient		1.8

Note: Tested in Accordance with BS1377:Part 2:1990, clause 9.2

Remarks: The material submitted - fails to meet the minimum mass requirements as stated in BS1377 Part 2 Table 3

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Signed: Dariusz Piotrowski
PL Geotechnical Laboratory Manager
for and on behalf of i2 Analytical Ltd

Date Reported: 20/02/2020

GF 100.15

SUMMARY REPORT

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

Summary of Undrained Shear Strength Using Hand Vane Apparatus Test Results

Tested in Accordance with: In-house Method G074
Guideline for Hand Held Shear Vane Test, New Zealand
Geotechnical Society INC, August 2001

Client: Hydrock Consultants Ltd
Client Address: 4 Lakeside, Festival Park, Stoke on Trent, ST1 5RY
Contact: Jason Bradley
Site Address: Islington Wharf

Client Reference: C10042
Job Number: 20-85152
Date Sampled: Not Given
Date Received: 04/02/2020
Date Tested: 14/02/2020
Sampled By: Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks	Shear Vane Reading 1	Shear Vane Reading 2	Shear Vane Reading 3	Shear Vane Reading 4	Shear Vane Reading Average	Tv						
		Reference	Depth Top m	Depth Base m	Type			kPa	kPa	kPa	kPa	kPa	kPa						
1433754	BH01	Not Given	4.00	4.45	U	Brown slightly gravelly sandy CLAY		>130	>130	>130	>130	>130							
1433756	BH01	Not Given	8.00	8.45	U	Brown slightly gravelly very sandy CLAY		104	112	104	106	107							
1433764	BH02	Not Given	6.00	6.45	U	Brown slightly gravelly sandy CLAY		102	104	102	106	104							
1433766	BH02	Not Given	10.00	10.45	U	Brown slightly gravelly very sandy CLAY		92	116	94	84	97							
1433770	BH03	Not Given	4.00	4.45	U	Brown slightly gravelly sandy CLAY		>130	>130	>130	>130	>130							
1433773	BH03	Not Given	10.00	10.45	U	Brown slightly gravelly slightly sandy CLAY		78	60	80	68	72							
1433778	BH04	Not Given	7.00	7.45	U	Brown slightly sandy CLAY		90	102	94	96	96							
1433780	BH04	Not Given	11.00	11.45	U	Brown slightly gravelly clayey very sandy SILT		90	88	84	92	89							

Note: UTP - Unable To Penetrate

Comments:

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Signed: Dariusz Piotrowski
PL Geotechnical Laboratory Manager
for and on behalf of i2 Analytical Ltd

Date Reported: 20/02/2020

GF 150.11

TEST CERTIFICATE

One Dimensional Consolidation Test

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

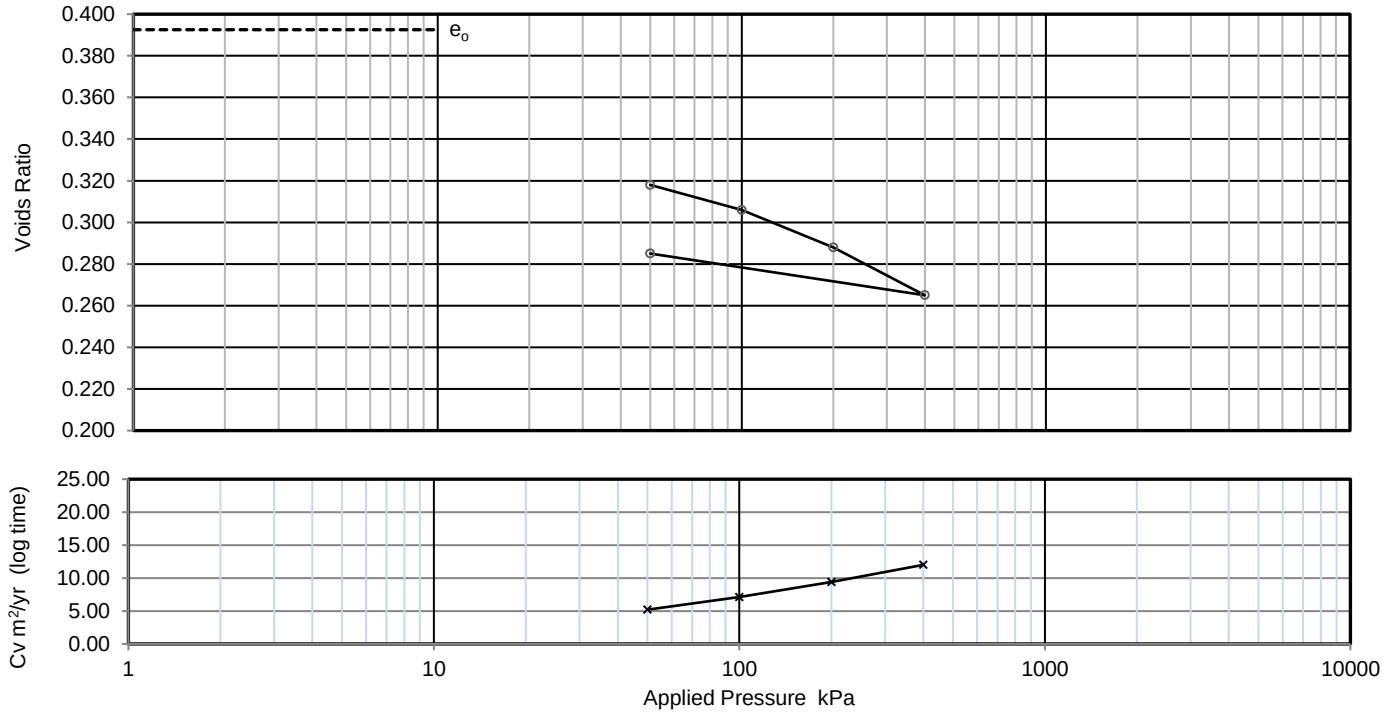
Tested in Accordance with: BS 1377-5: 1990: Clause 3

Client:	Hydrock Consultants Ltd	Client Reference:	C10042
Client Address:	4 Lakeside, Festival Park, Stoke on Trent, ST1 5RY	Job Number:	20-85152
		Date Sampled:	Not Given
		Date Received:	04/02/2020
Contact:	Jason Bradley	Date Tested:	12/02/2020
Site Address:	Islington Wharf	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1433754	Depth Top [m]:	4.00
Hole No.:	BH01	Depth Base [m]:	4.45
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Brown slightly gravelly sandy CLAY		



Applied Pressure kPa	Voids ratio	Mv m2/MN	Cv (t50, log) m2/yr	Cv (t90, root m2/yr	Csec
0	0.393	-	-	-	-
50	0.318	1	5.2	3.3	0.00043
100	0.306	0.19	7.1	6.6	0.00057
200	0.288	0.13	9.4	7.9	0.00064
400	0.265	0.091	12	9.5	0.0011
50	0.285	0.036			

Preparation

Index tests

Orientation of the sample	Vertical		
Particle density	assumed	2.65	Mg/m3
Liquid limit	N/A		%
Plastic limit	N/A		%

Specimen details	Initial	Final	
Diameter	50.00	-	mm
Height	20.10	18.55	mm
Moisture Content	16	17	%
Bulk density	2.21	2.42	Mg/m3
Dry density	1.90	2.06	Mg/m3
Voids Ratio	0.393	0.285	
Saturation	110	161	%
Avg. temperature for test	22.0		°C
Swelling Pressure	Not measured		kPa
Settlement on saturation			%

Note: Cv corrected to 20°C

Remarks:

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Signed: Dariusz Piotrowski
PL Geotechnical Laboratory Manager
for and on behalf of i2 Analytical Ltd

Date Reported: 20/02/2020

GF 172.13

TEST CERTIFICATE

One Dimensional Consolidation Test

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

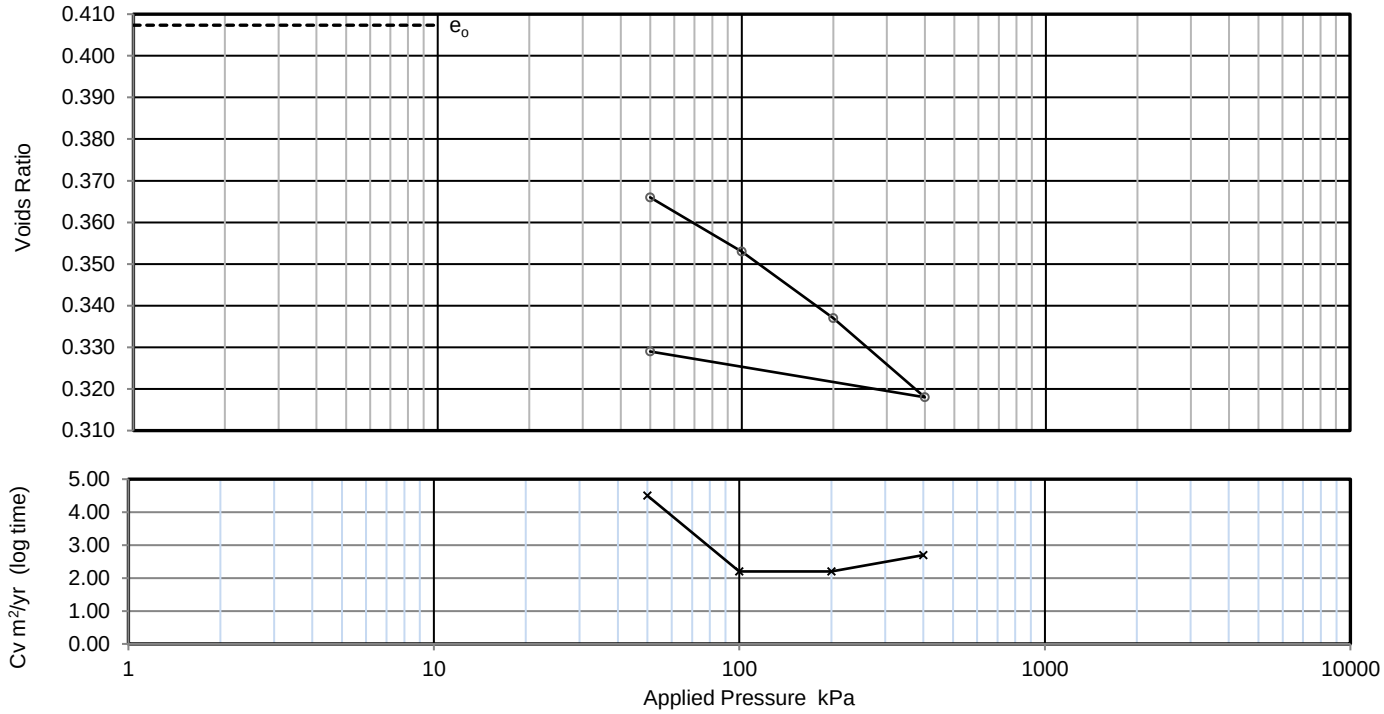
Tested in Accordance with: BS 1377-5: 1990: Clause 3

Client:	Hydrock Consultants Ltd	Client Reference:	C10042
Client Address:	4 Lakeside, Festival Park, Stoke on Trent, ST1 5RY	Job Number:	20-85152
		Date Sampled:	Not Given
		Date Received:	04/02/2020
Contact:	Jason Bradley	Date Tested:	13/02/2020
Site Address:	Islington Wharf	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1433756	Depth Top [m]:	8.00
Hole No.:	BH01	Depth Base [m]:	8.45
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Brown slightly gravelly very sandy CLAY		



Applied Pressure kPa	Voids ratio	Mv m2/MN	Cv (t50, log) m2/yr	Cv (t90, root m2/yr	Csec
0	0.407	-	-	-	-
50	0.366	0.59	4.5	3.5	0.00062
100	0.353	0.19	2.2	2.5	0.00064
200	0.337	0.12	2.2	2	0.00094
400	0.318	0.071	2.7	2	0.0014
50	0.329	0.024			

Preparation

Index tests

Orientation of the sample	Vertical		
Particle density	assumed	2.65	Mg/m3
Liquid limit	N/A		%
Plastic limit	N/A		%

Specimen details	Initial	Final	
Diameter	50.00	-	mm
Height	20.10	18.98	mm
Moisture Content	17	17	%
Bulk density	2.21	2.33	Mg/m3
Dry density	1.88	1.99	Mg/m3
Voids Ratio	0.407	0.329	
Saturation	113	134	%
Avg. temperature for test	22.0		°C
Swelling Pressure	Not measured		kPa
Settlement on saturation			%

Note: Cv corrected to 20°C

Remarks:

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Signed: Dariusz Piotrowski
PL Geotechnical Laboratory Manager
for and on behalf of i2 Analytical Ltd

Date Reported: 20/02/2020

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TEST CERTIFICATE

One Dimensional Consolidation Test

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

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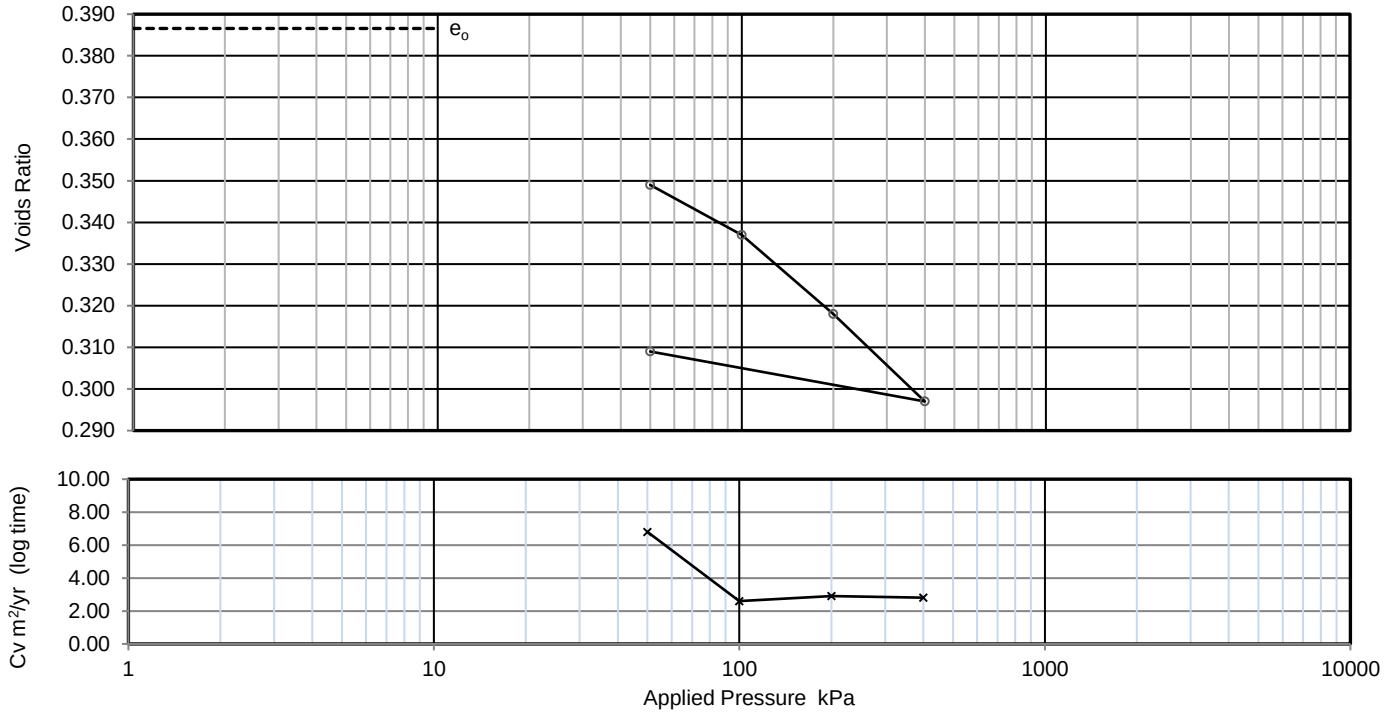
Tested in Accordance with: BS 1377-5: 1990: Clause 3

Client:	Hydrock Consultants Ltd	Client Reference:	C10042
Client Address:	4 Lakeside, Festival Park, Stoke on Trent, ST1 5RY	Job Number:	20-85152
		Date Sampled:	Not Given
		Date Received:	04/02/2020
Contact:	Jason Bradley	Date Tested:	12/02/2020
Site Address:	Islington Wharf	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1433764	Depth Top [m]:	6.00
Hole No.:	BH02	Depth Base [m]:	6.45
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Brown slightly gravelly sandy CLAY		



Applied Pressure kPa	Voids ratio	Mv m2/MN	Cv (t50, log) m2/yr	Cv (t90, root m2/yr	Csec
0	0.387	-	-	-	-
50	0.349	0.55	6.8	5.9	0.00062
100	0.337	0.18	2.6	2.5	0.00064
200	0.318	0.14	2.9	2.3	0.00064
400	0.297	0.082	2.8	1.9	0.0011
50	0.309	0.028			

Preparation

Index tests

Orientation of the sample	Vertical		
Particle density	assumed	2.65	Mg/m3
Liquid limit	N/A		%
Plastic limit	N/A		%

Specimen details	Initial	Final	
Diameter	50.04	-	mm
Height	20.06	18.95	mm
Moisture Content	16	16	%
Bulk density	2.22	2.35	Mg/m3
Dry density	1.91	2.02	Mg/m3
Voids Ratio	0.387	0.309	
Saturation	111	138	%
Avg. temperature for test	22.0		°C
Swelling Pressure	Not measured		kPa
Settlement on saturation			%

Note: Cv corrected to 20°C

Remarks:

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Signed: Dariusz Piotrowski
PL Geotechnical Laboratory Manager
for and on behalf of i2 Analytical Ltd

Date Reported: 20/02/2020

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TEST CERTIFICATE

One Dimensional Consolidation Test

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

UKAS TESTING 4041

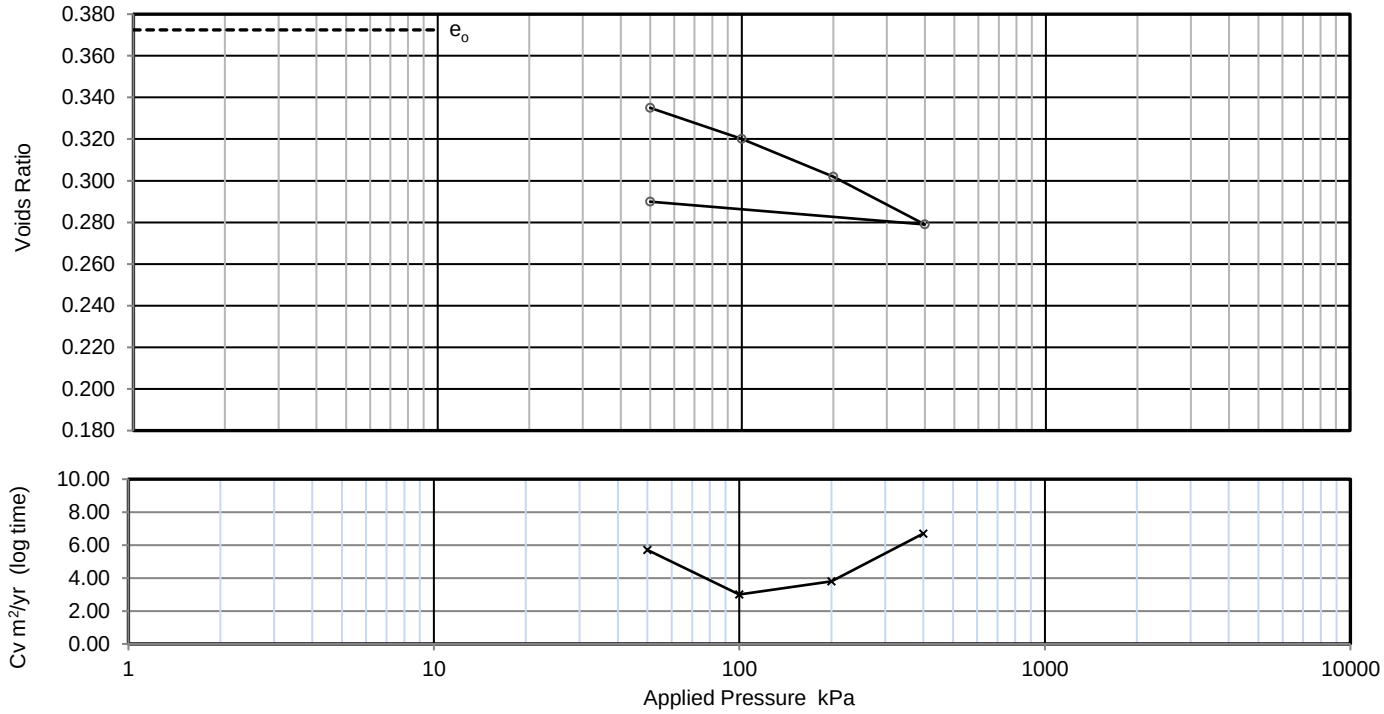
Tested in Accordance with: BS 1377-5: 1990: Clause 3

Client:	Hydrock Consultants Ltd	Client Reference:	C10042
Client Address:	4 Lakeside, Festival Park, Stoke on Trent, ST1 5RY	Job Number:	20-85152
		Date Sampled:	Not Given
		Date Received:	04/02/2020
Contact:	Jason Bradley	Date Tested:	12/02/2020
Site Address:	Islington Wharf	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1433766	Depth Top [m]:	10.00
Hole No.:	BH02	Depth Base [m]:	10.45
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Brown slightly gravelly very sandy CLAY		



Applied Pressure kPa	Voids ratio	Mv m2/MN	Cv (t50, log) m2/yr	Cv (t90, root m2/yr	Csec
0	0.372	-	-	-	-
50	0.335	0.55	5.7	5.3	0.00064
100	0.320	0.21	3	2.5	0.001
200	0.302	0.14	3.8	3.4	0.00094
400	0.279	0.091	6.7	2.9	0.0013
50	0.290	0.026			

Preparation

Index tests

Orientation of the sample	Vertical		
Particle density	assumed	2.65	Mg/m3
Liquid limit	N/A		%
Plastic limit	N/A		%

Specimen details	Initial	Final	
Diameter	50.02	-	mm
Height	20.06	18.86	mm
Moisture Content	16	15	%
Bulk density	2.24	2.37	Mg/m3
Dry density	1.93	2.05	Mg/m3
Voids Ratio	0.372	0.290	
Saturation	115	138	%
Avg. temperature for test	22.0		°C
Swelling Pressure	Not measured		kPa
Settlement on saturation			%

Note: Cv corrected to 20°C

Remarks:

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Signed: Dariusz Piotrowski
PL Geotechnical Laboratory Manager
for and on behalf of i2 Analytical Ltd

Date Reported: 20/02/2020

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TEST CERTIFICATE

One Dimensional Consolidation Test

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

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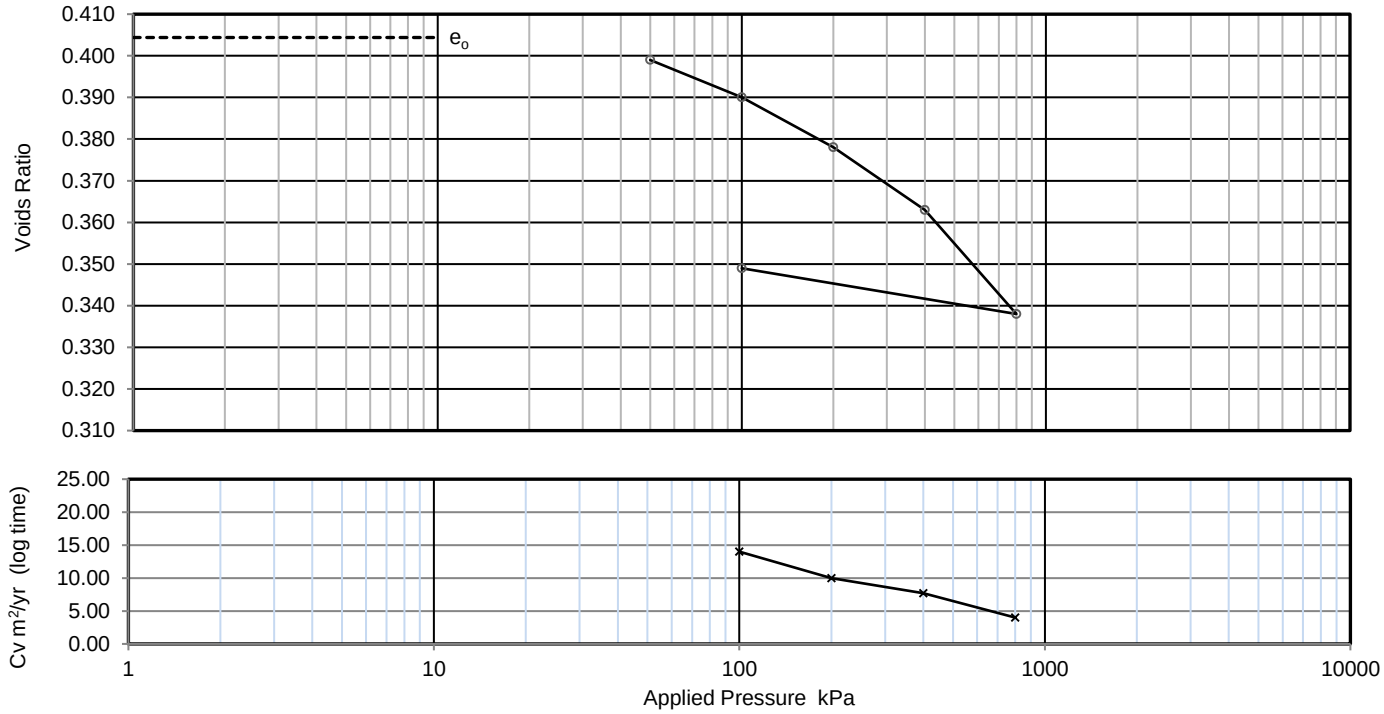
Tested in Accordance with: BS 1377-5: 1990: Clause 3

Client:	Hydrock Consultants Ltd	Client Reference:	C10042
Client Address:	4 Lakeside, Festival Park, Stoke on Trent, ST1 5RY	Job Number:	20-85152
		Date Sampled:	Not Given
		Date Received:	04/02/2020
Contact:	Jason Bradley	Date Tested:	12/02/2020
Site Address:	Islington Wharf	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1433770	Depth Top [m]:	4.00
Hole No.:	BH03	Depth Base [m]:	4.45
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Brown slightly gravelly sandy CLAY		



Applied Pressure kPa	Voids ratio	Mv m2/MN	Cv (t50, log) m2/yr	Cv (t90, root m2/yr	Csec
0	0.404	-	-	-	-
50	0.399	0.076	N/A	N/A	N/A
100	0.390	0.13	14	9.1	0.0004
200	0.378	0.085	10	8.4	0.00063
400	0.363	0.056	7.7	8.8	0.00063
800	0.338	0.045	4	2.4	0.0011
100	0.349	0.011			

Preparation

Index tests

Orientation of the sample	Vertical		
Particle density	assumed	2.65	Mg/m3
Liquid limit	N/A		%
Plastic limit	N/A		%

Specimen details	Initial	Final	
Diameter	50.00	-	mm
Height	20.29	19.49	mm
Moisture Content	16	16	%
Bulk density	2.18	2.27	Mg/m3
Dry density	1.89	1.96	Mg/m3
Voids Ratio	0.404	0.349	
Saturation	103	118	%
Avg. temperature for test	22.0		°C
Swelling Pressure	Not measured		kPa
Settlement on saturation			%

Note: Cv corrected to 20°C

Remarks: swelling - stage 1

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Signed: Dariusz Piotrowski
PL Geotechnical Laboratory Manager
for and on behalf of i2 Analytical Ltd

Date Reported: 20/02/2020

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TEST CERTIFICATE

One Dimensional Consolidation Test

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

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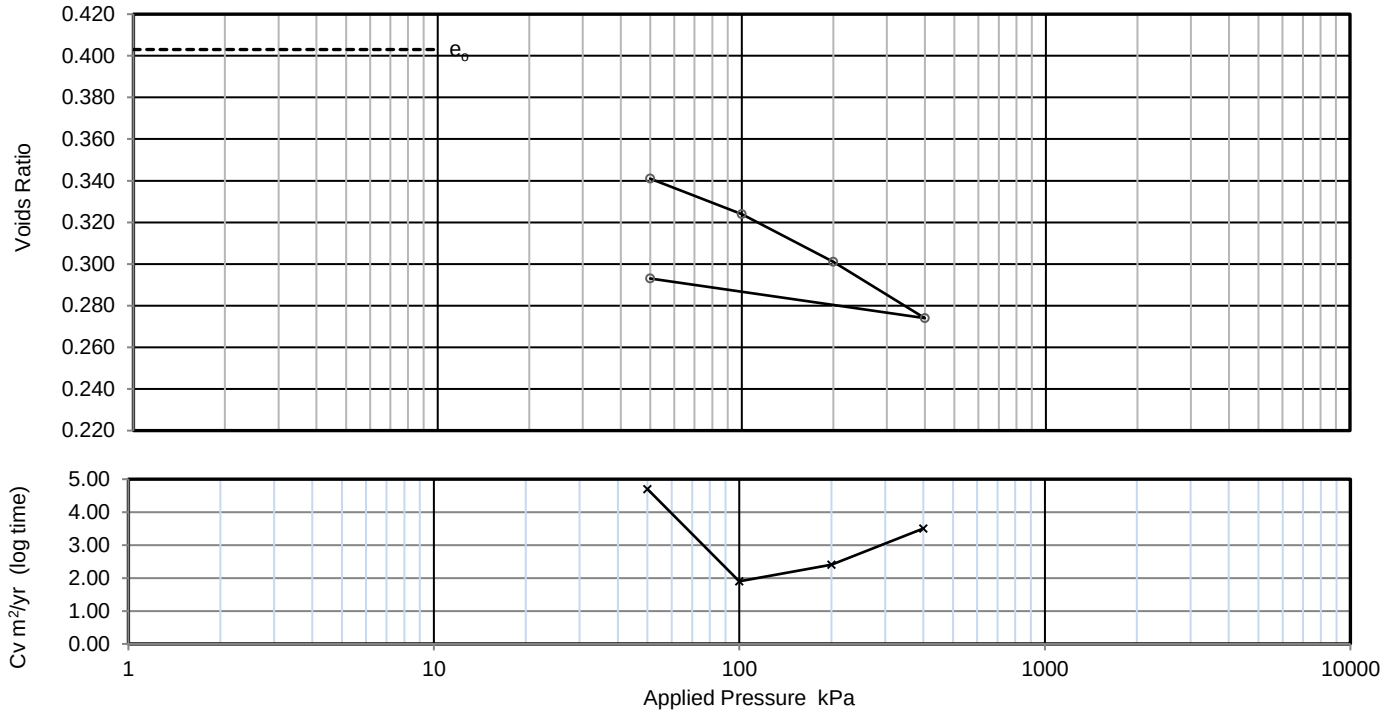
Tested in Accordance with: BS 1377-5: 1990: Clause 3

Client:	Hydrock Consultants Ltd	Client Reference:	C10042
Client Address:	4 Lakeside, Festival Park, Stoke on Trent, ST1 5RY	Job Number:	20-85152
		Date Sampled:	Not Given
		Date Received:	04/02/2020
Contact:	Jason Bradley	Date Tested:	12/02/2020
Site Address:	Islington Wharf	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1433773	Depth Top [m]:	10.00
Hole No.:	BH03	Depth Base [m]:	10.45
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Brown slightly gravelly slightly sandy CLAY		



Applied Pressure kPa	Voids ratio	Mv m2/MN	Cv (t50, log) m2/yr	Cv (t90, root m2/yr	Csec
0	0.403	-	-	-	-
50	0.341	0.89	4.7	2.7	0.00063
100	0.324	0.25	1.9	1.2	0.00063
200	0.301	0.17	2.4	2.2	0.00063
400	0.274	0.1	3.5	2.2	0.0013
50	0.293	0.041			

Preparation

Index tests

Orientation of the sample	Vertical		
Particle density	assumed	2.65	Mg/m3
Liquid limit	N/A		%
Plastic limit	N/A		%

Specimen details	Initial	Final	
Diameter	50.00	-	mm
Height	20.30	18.71	mm
Moisture Content	17	16	%
Bulk density	2.20	2.39	Mg/m3
Dry density	1.89	2.05	Mg/m3
Voids Ratio	0.403	0.293	
Saturation	109	148	%
Avg. temperature for test	22.0		°C
Swelling Pressure	Not measured		kPa
Settlement on saturation			%

Note: Cv corrected to 20°C

Remarks:

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Signed: Dariusz Piotrowski
PL Geotechnical Laboratory Manager
for and on behalf of i2 Analytical Ltd

Date Reported: 20/02/2020

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TEST CERTIFICATE

One Dimensional Consolidation Test

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

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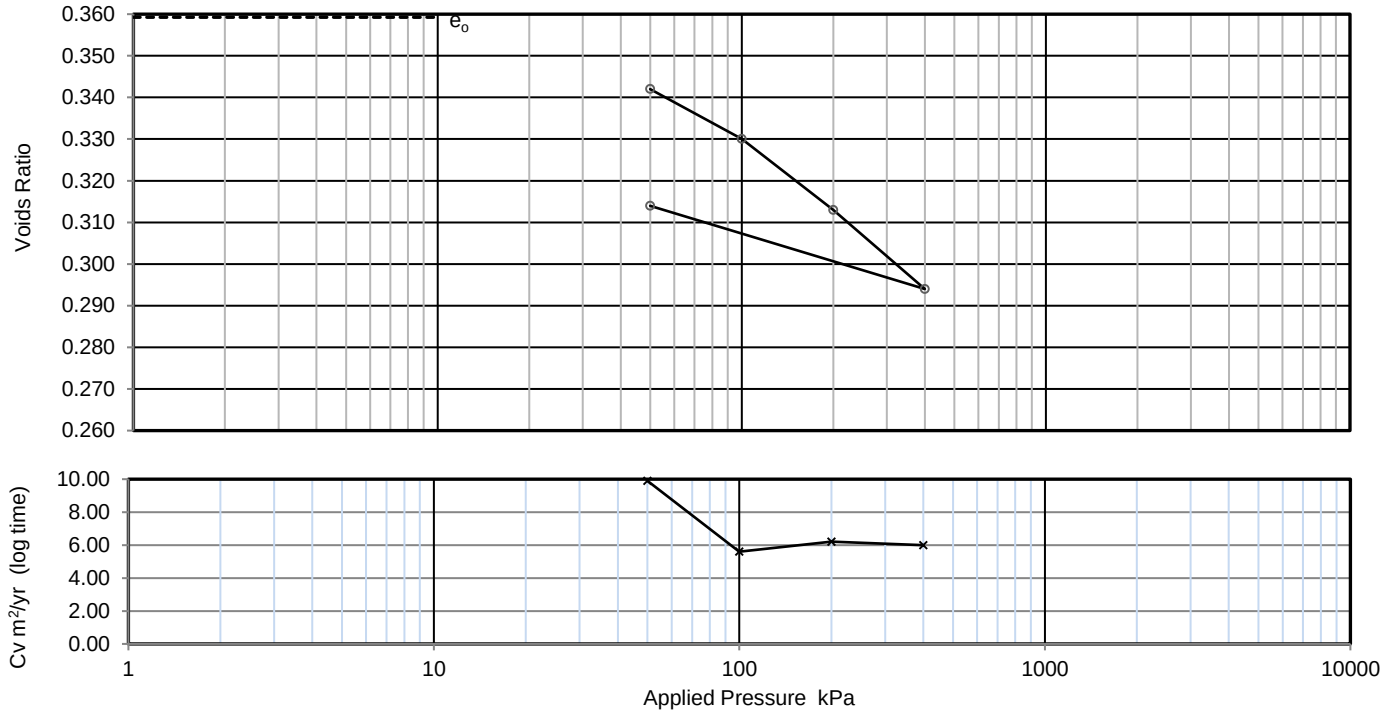
Tested in Accordance with: BS 1377-5: 1990: Clause 3

Client:	Hydrock Consultants Ltd	Client Reference:	C10042
Client Address:	4 Lakeside, Festival Park, Stoke on Trent, ST1 5RY	Job Number:	20-85152
		Date Sampled:	Not Given
		Date Received:	04/02/2020
Contact:	Jason Bradley	Date Tested:	12/02/2020
Site Address:	Islington Wharf	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1433778	Depth Top [m]:	7.00
Hole No.:	BH04	Depth Base [m]:	7.45
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Brown slightly sandy CLAY		



Applied Pressure kPa	Voids ratio	Mv m2/MN	Cv (t50, log) m2/yr	Cv (t90, root m2/yr	Csec
0	0.359	-	-	-	-
50	0.342	0.25	9.9	9.2	0.0006
100	0.330	0.18	5.6	4	0.00064
200	0.313	0.13	6.2	5.7	0.00064
400	0.294	0.075	6	4.3	0.00062
50	0.314	0.045			

Preparation

Index tests

Orientation of the sample	Vertical		
Particle density	assumed	2.65	Mg/m3
Liquid limit	N/A		%
Plastic limit	N/A		%

Specimen details	Initial	Final	
Diameter	50.00	-	mm
Height	20.10	19.43	mm
Moisture Content	16	15	%
Bulk density	2.26	2.33	Mg/m3
Dry density	1.95	2.02	Mg/m3
Voids Ratio	0.359	0.314	
Saturation	116	131	%
Avg. temperature for test	22.0		°C
Swelling Pressure	Not measured		kPa
Settlement on saturation			%

Note: Cv corrected to 20°C

Remarks:

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Signed: Dariusz Piotrowski
PL Geotechnical Laboratory Manager
for and on behalf of i2 Analytical Ltd

Date Reported: 20/02/2020

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TEST CERTIFICATE

One Dimensional Consolidation Test

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Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

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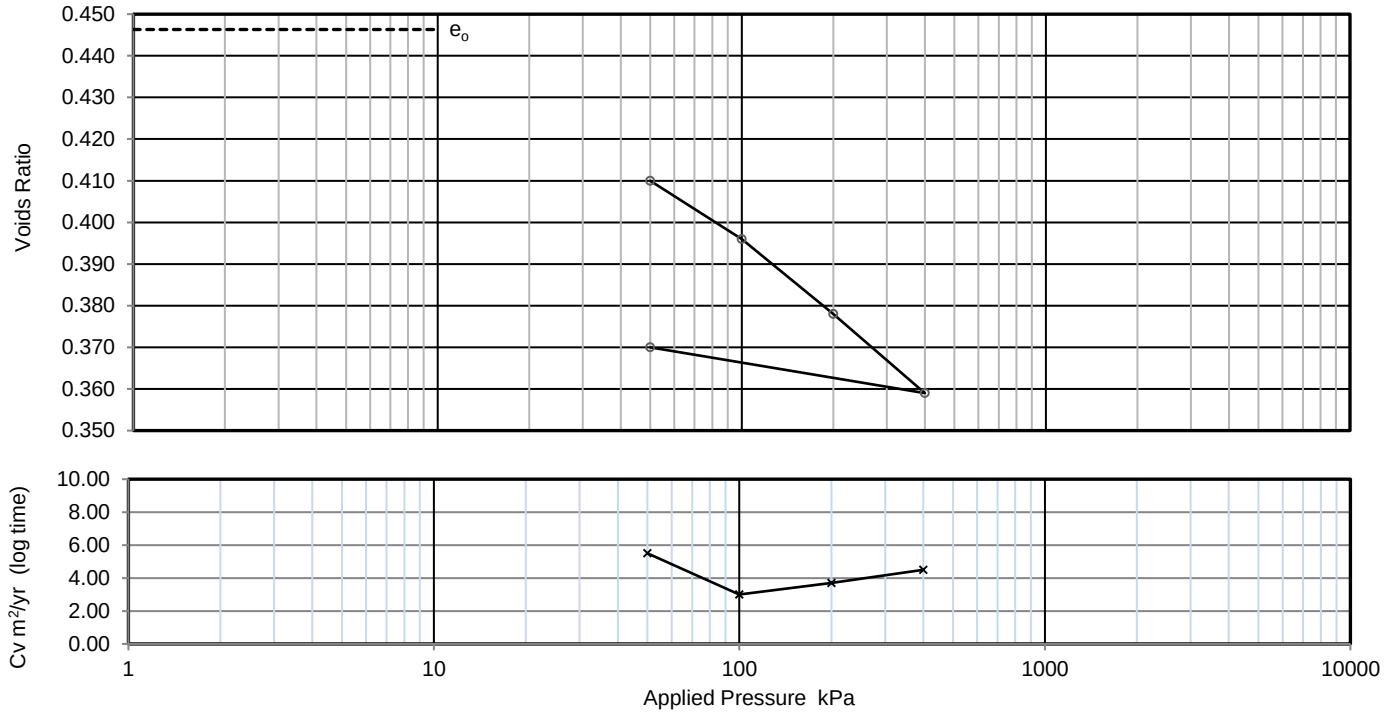
Tested in Accordance with: BS 1377-5: 1990: Clause 3

Client:	Hydrock Consultants Ltd	Client Reference:	C10042
Client Address:	4 Lakeside, Festival Park, Stoke on Trent, ST1 5RY	Job Number:	20-85152
		Date Sampled:	Not Given
		Date Received:	04/02/2020
Contact:	Jason Bradley	Date Tested:	12/02/2020
Site Address:	Islington Wharf	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1433780	Depth Top [m]:	11.00
Hole No.:	BH04	Depth Base [m]:	11.45
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Brown slightly gravelly clayey very sandy SILT		



Applied Pressure kPa	Voids ratio	Mv m2/MN	Cv (t50, log) m2/yr	Cv (t90, root m2/yr	Csec
0	0.446	-	-	-	-
50	0.410	0.51	5.5	4.9	0.00063
100	0.396	0.2	3	3.5	0.00063
200	0.378	0.12	3.7	2.1	0.0011
400	0.359	0.071	4.5	2.4	0.0013
50	0.370	0.023			

Preparation

Index tests

Orientation of the sample	Vertical		
Particle density	assumed	2.65	Mg/m3
Liquid limit	N/A		%
Plastic limit	N/A		%

Specimen details	Initial	Final	
Diameter	50.08	-	mm
Height	20.32	19.24	mm
Moisture Content	18	17	%
Bulk density	2.15	2.26	Mg/m3
Dry density	1.83	1.93	Mg/m3
Voids Ratio	0.446	0.370	
Saturation	104	120	%
Avg. temperature for test	22.0		°C
Swelling Pressure	Not measured		kPa
Settlement on saturation			%

Note: Cv corrected to 20°C

Remarks:

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Signed: Dariusz Piotrowski
PL Geotechnical Laboratory Manager
for and on behalf of i2 Analytical Ltd

Date Reported: 20/02/2020

GF 172.13

TEST CERTIFICATE

Unconsolidated Undrained

Triaxial Compression

Tested in Accordance with:
BS 1377-7: 1990: Clause 8

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

UKAS TESTING 4041

Environmental Science

Client:	Hydrock Consultants Ltd	Client Reference:	C10042
Client Address:	4 Lakeside, Festival Park, Stoke on Trent, ST1 5RY	Job Number:	20-85152
		Date Sampled:	Not Given
		Date Received:	04/02/2020
Contact:	Jason Bradley	Date Tested:	12/02/2020
Site Address:	Islington Wharf	Sampled By:	Not Given

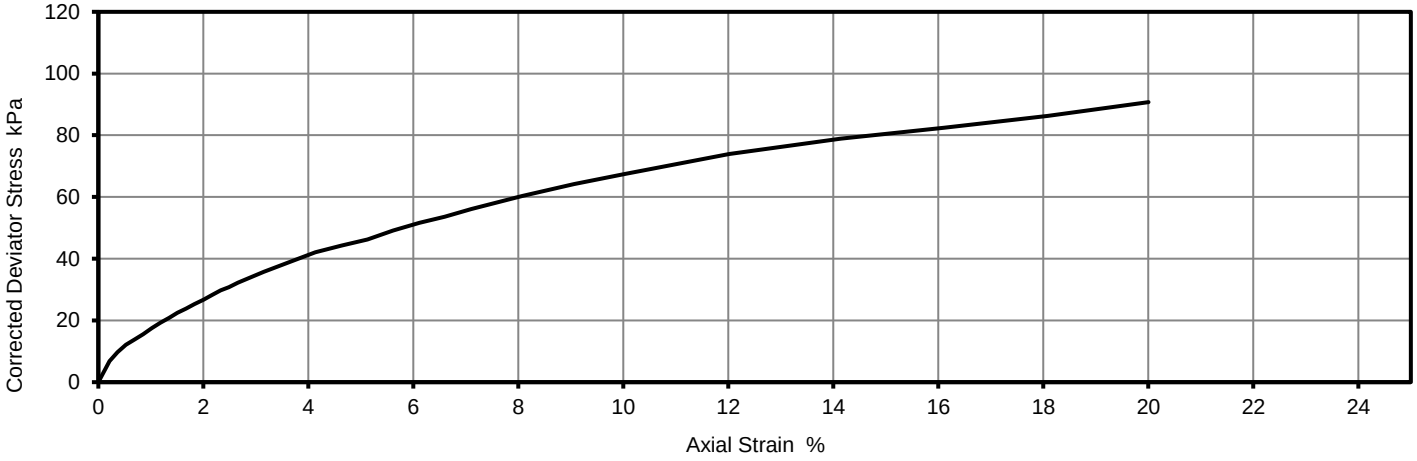
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

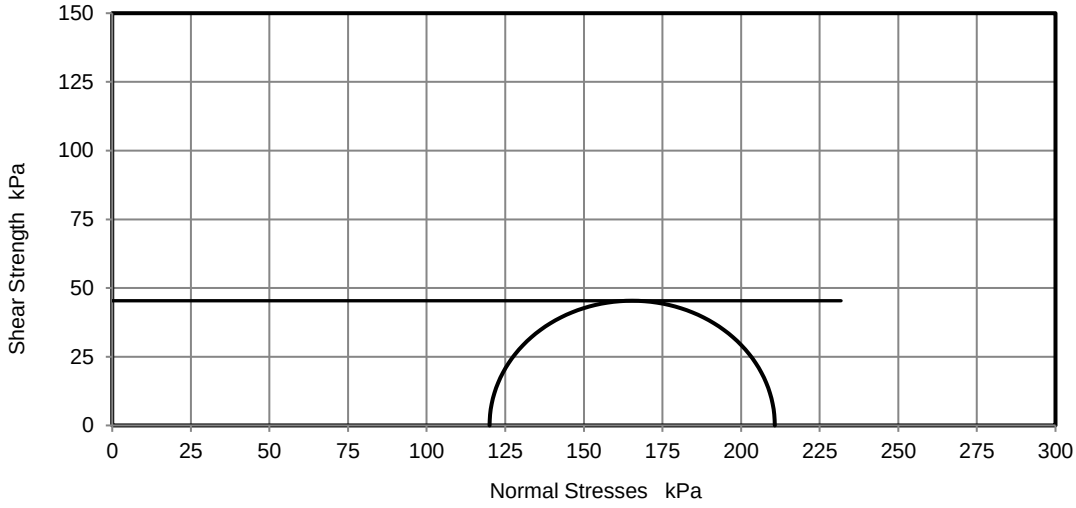
Laboratory Reference:	1433755	Depth Top [m]:	6.00
Hole No.:	BH01	Depth Base [m]:	6.45
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Brown slightly gravelly sandy CLAY		

Test Number	1		Rate of Strain	2.00	%/min	
Length	195.62	mm	Cell Pressure	120	kPa	
Diameter	99.30	mm	Axial Strain at failure	20.0	%	
Bulk Density	2.28	Mg/m3	Deviator Stress, (σ1 - σ3)f	91	kPa	
Moisture Content	20	%	Undrained Shear Strength, cu	45	kPa	½(σ1 - σ3)f
Dry Density	1.90	Mg/m3	Mode of Failure	Plastic		
Membrane Correction	1.20	kPa	Membrane thickness	0.31	mm	

Deviator Stress v Axial Strain

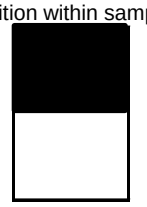


Mohr Circles





Position within sample



Note: Deviator stress corrected for area change and membrane effects. Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

Remarks:

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Signed: Dariusz Piotrowski
PL Geotechnical Laboratory Manager
for and on behalf of i2 Analytical Ltd

Date Reported: 20/02/2020

GF 184.9

TEST CERTIFICATE

Unconsolidated Undrained

Triaxial Compression

Tested in Accordance with:
BS 1377-7: 1990: Clause 8

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

UKAS TESTING 4041

Environmental Science

Client:	Hydrock Consultants Ltd	Client Reference:	C10042
Client Address:	4 Lakeside, Festival Park, Stoke on Trent, ST1 5RY	Job Number:	20-85152
		Date Sampled:	Not Given
		Date Received:	04/02/2020
Contact:	Jason Bradley	Date Tested:	12/02/2020
Site Address:	Islington Wharf	Sampled By:	Not Given

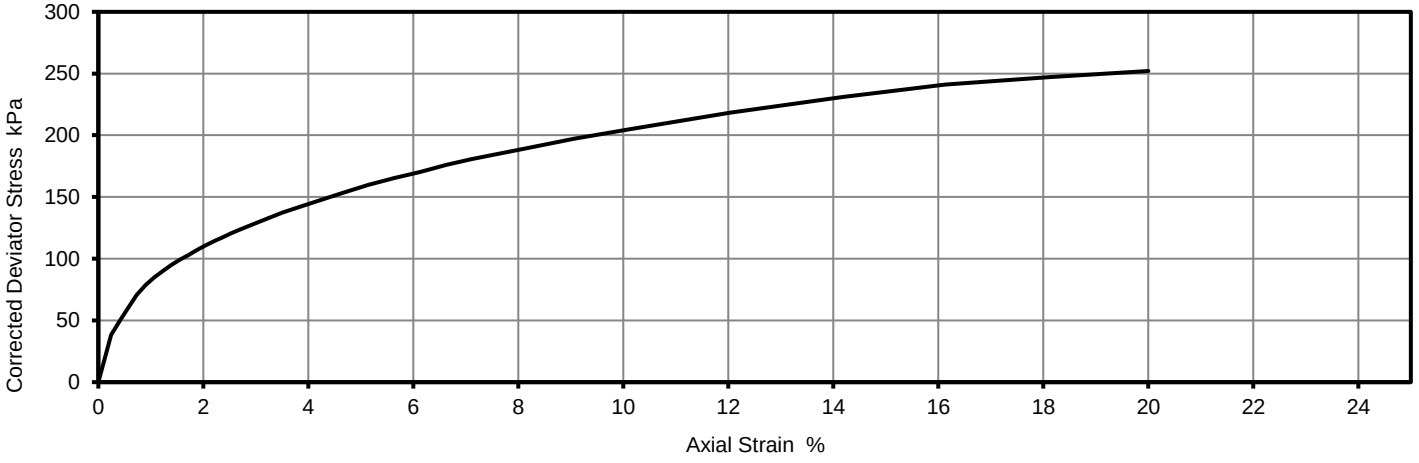
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

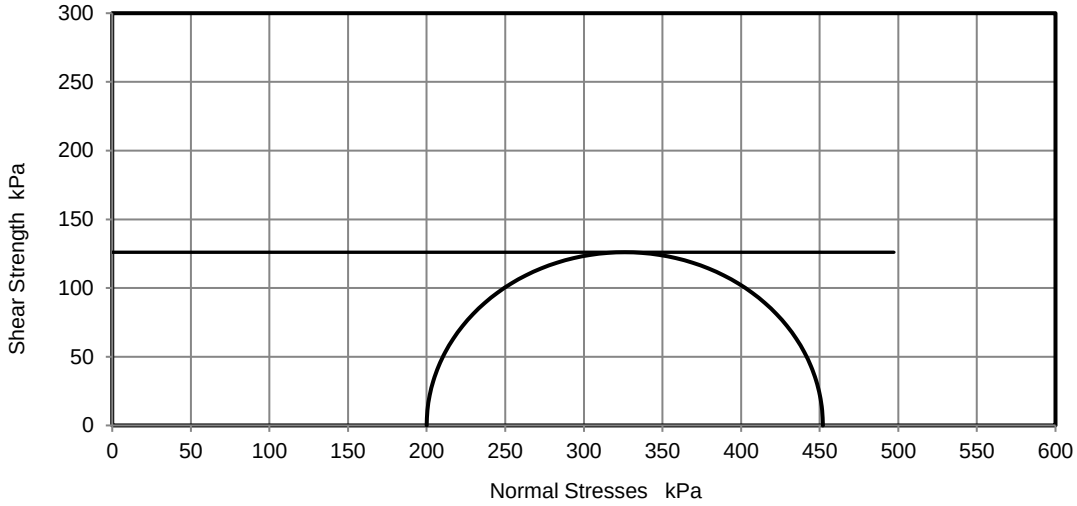
Laboratory Reference:	1433757	Depth Top [m]:	10.00
Hole No.:	BH01	Depth Base [m]:	10.45
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Brown slightly gravelly sandy CLAY		

Test Number	1		Rate of Strain	2.00	%/min	
Length	186.60	mm	Cell Pressure	200	kPa	
Diameter	102.06	mm	Axial Strain at failure	20.0	%	
Bulk Density	2.18	Mg/m3	Deviator Stress, (σ1 - σ3)f	252	kPa	
Moisture Content	19	%	Undrained Shear Strength, cu	126	kPa	½(σ1 - σ3)f
Dry Density	1.83	Mg/m3	Mode of Failure	Compound		
Membrane Correction	1.02	kPa	Membrane thickness	0.27	mm	

Deviator Stress v Axial Strain

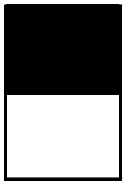


Mohr Circles





Position within sample



Note: Deviator stress corrected for area change and membrane effects. Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

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Signed: Dariusz Piotrowski
PL Geotechnical Laboratory Manager
for and on behalf of i2 Analytical Ltd

Date Reported: 20/02/2020

GF 184.9

TEST CERTIFICATE

Unconsolidated Undrained

Triaxial Compression

Tested in Accordance with:
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i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

UKAS TESTING 4041

Environmental Science

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Client Address:	4 Lakeside, Festival Park, Stoke on Trent, ST1 5RY	Job Number:	20-85152
		Date Sampled:	Not Given
		Date Received:	04/02/2020
Contact:	Jason Bradley	Date Tested:	12/02/2020
Site Address:	Islington Wharf	Sampled By:	Not Given

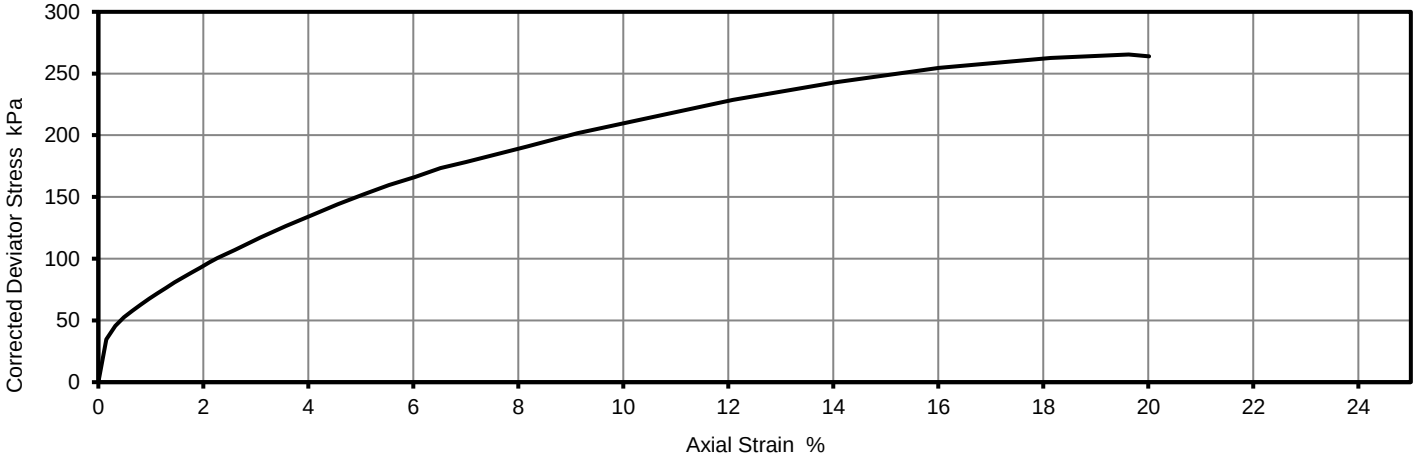
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

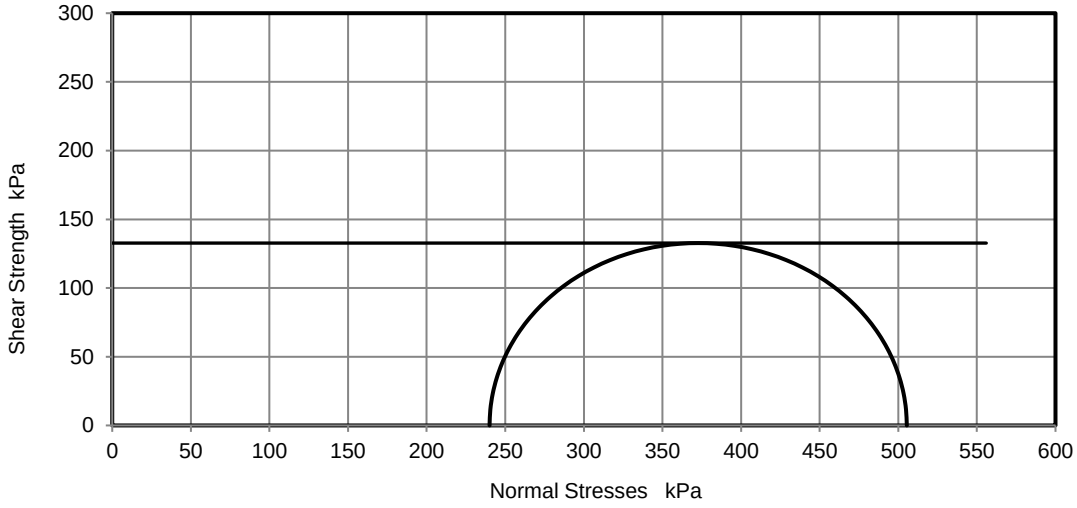
Laboratory Reference:	1433758	Depth Top [m]:	12.00
Hole No.:	BH01	Depth Base [m]:	12.45
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Brown slightly gravelly sandy CLAY		

Test Number	1		Rate of Strain	2.00	%/min	
Length	193.51	mm	Cell Pressure	240	kPa	
Diameter	102.31	mm	Axial Strain at failure	19.6	%	
Bulk Density	2.20	Mg/m3	Deviator Stress, (σ1 - σ3)f	265	kPa	
Moisture Content	16	%	Undrained Shear Strength, cu	133	kPa	½(σ1 - σ3)f
Dry Density	1.89	Mg/m3	Mode of Failure	Compound		
Membrane Correction	0.78	kPa	Membrane thickness	0.21	mm	

Deviator Stress v Axial Strain

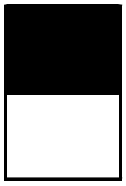


Mohr Circles





Position within sample



Note: Deviator stress corrected for area change and membrane effects. Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

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PL Geotechnical Laboratory Manager
for and on behalf of i2 Analytical Ltd

Date Reported: 20/02/2020

GF 184.9

TEST CERTIFICATE

Unconsolidated Undrained

Triaxial Compression

Tested in Accordance with:
BS 1377-7: 1990: Clause 8

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

UKAS TESTING 4041

Environmental Science

Client:	Hydrock Consultants Ltd	Client Reference:	C10042
Client Address:	4 Lakeside, Festival Park, Stoke on Trent, ST1 5RY	Job Number:	20-85152
		Date Sampled:	Not Given
		Date Received:	04/02/2020
Contact:	Jason Bradley	Date Tested:	12/02/2020
Site Address:	Islington Wharf	Sampled By:	Not Given

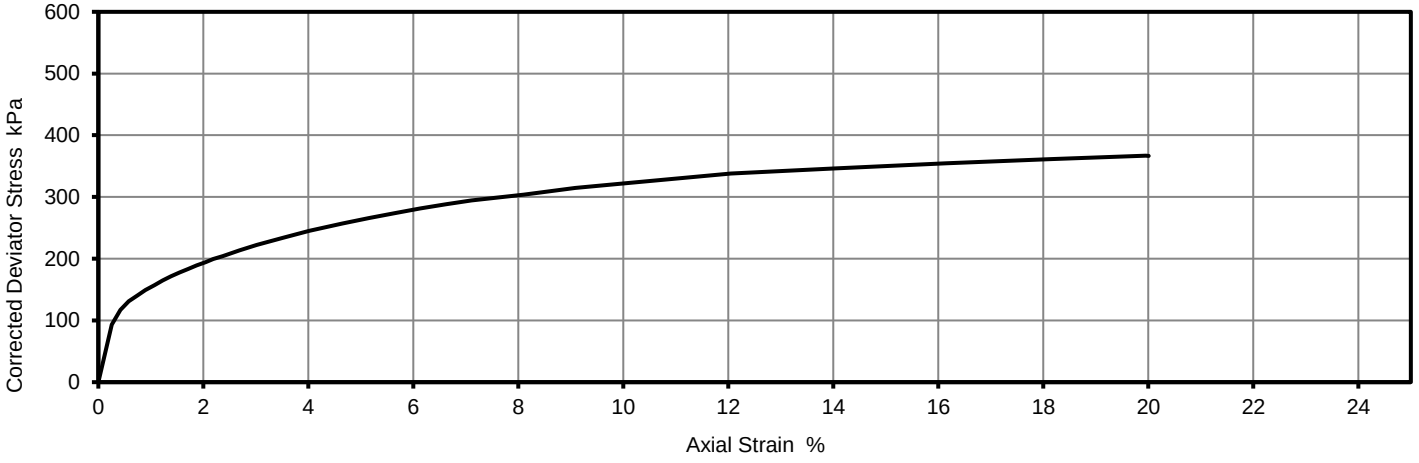
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

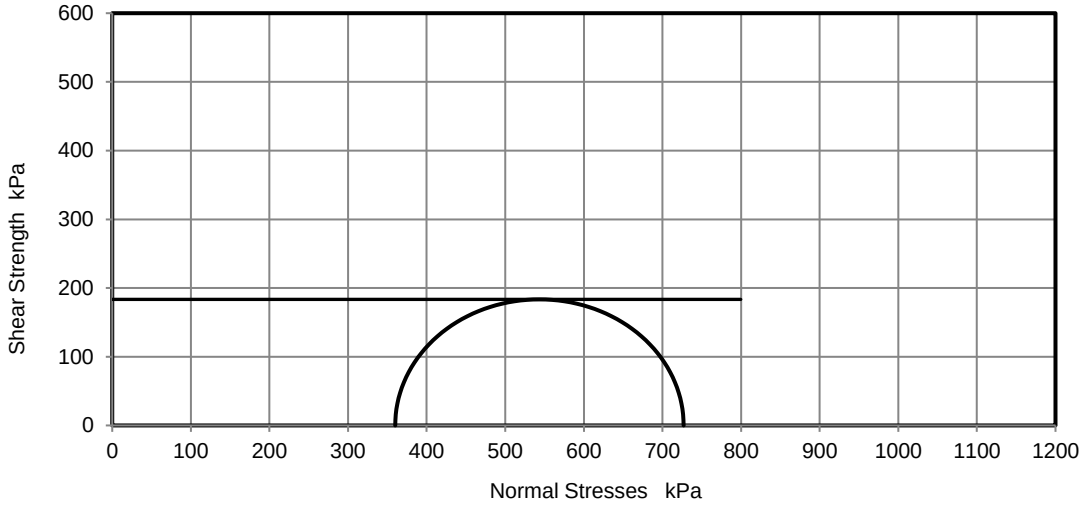
Laboratory Reference:	1433760	Depth Top [m]:	18.00
Hole No.:	BH01	Depth Base [m]:	18.45
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Brown slightly sandy CLAY		

Test Number	1		Rate of Strain	2.00	%/min	
Length	195.33	mm	Cell Pressure	360	kPa	
Diameter	102.75	mm	Axial Strain at failure	20.0	%	
Bulk Density	2.11	Mg/m3	Deviator Stress, (σ1 - σ3)f	367	kPa	
Moisture Content	20	%	Undrained Shear Strength, cu	183	kPa	½(σ1 - σ3)f
Dry Density	1.76	Mg/m3	Mode of Failure	Compound		
Membrane Correction	0.78	kPa	Membrane thickness	0.21	mm	

Deviator Stress v Axial Strain

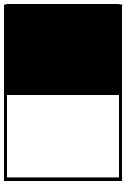


Mohr Circles





Position within sample



Note: Deviator stress corrected for area change and membrane effects. Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

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PL Geotechnical Laboratory Manager
for and on behalf of i2 Analytical Ltd

Date Reported: 20/02/2020

GF 184.9

TEST CERTIFICATE

Unconsolidated Undrained

Triaxial Compression

Tested in Accordance with:
BS 1377-7: 1990: Clause 8

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Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

UKAS TESTING 4041

Environmental Science

Client:	Hydrock Consultants Ltd	Client Reference:	C10042
Client Address:	4 Lakeside, Festival Park, Stoke on Trent, ST1 5RY	Job Number:	20-85152
		Date Sampled:	Not Given
		Date Received:	04/02/2020
Contact:	Jason Bradley	Date Tested:	12/02/2020
Site Address:	Islington Wharf	Sampled By:	Not Given

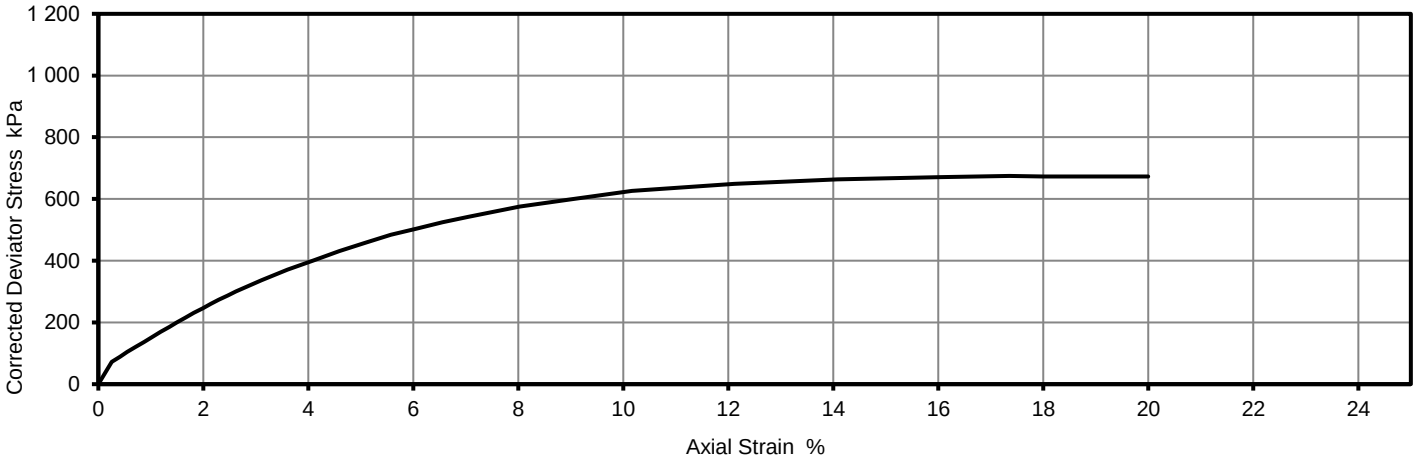
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

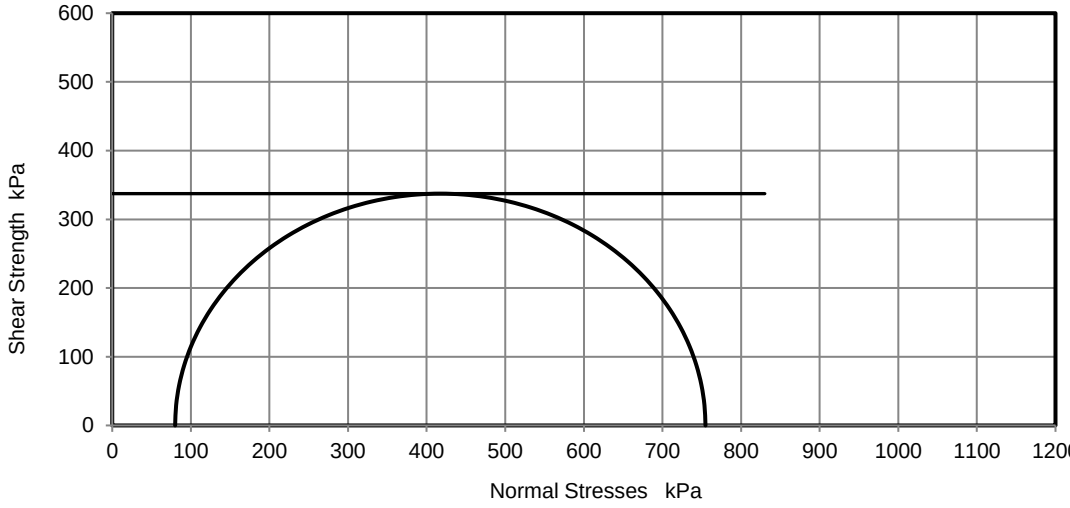
Laboratory Reference:	1433763	Depth Top [m]:	4.00
Hole No.:	BH02	Depth Base [m]:	4.45
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Brown slightly gravelly sandy CLAY		

Test Number	1		Rate of Strain	2.00	%/min	
Length	189.43	mm	Cell Pressure	80	kPa	
Diameter	101.83	mm	Axial Strain at failure	17.4	%	
Bulk Density	2.20	Mg/m3	Deviator Stress, (σ1 - σ3)f	675	kPa	
Moisture Content	17	%	Undrained Shear Strength, cu	337	kPa	½(σ1 - σ3)f
Dry Density	1.87	Mg/m3	Mode of Failure	Compound		
Membrane Correction	0.77	kPa	Membrane thickness	0.23	mm	

Deviator Stress v Axial Strain

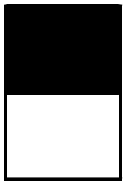


Mohr Circles





Position within sample



Note: Deviator stress corrected for area change and membrane effects. Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

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PL Geotechnical Laboratory Manager
for and on behalf of i2 Analytical Ltd

Date Reported: 20/02/2020

GF 184.9

TEST CERTIFICATE

Unconsolidated Undrained

Triaxial Compression

Tested in Accordance with:
BS 1377-7: 1990: Clause 8

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

UKAS TESTING 4041

Environmental Science

Client:	Hydrock Consultants Ltd	Client Reference:	C10042
Client Address:	4 Lakeside, Festival Park, Stoke on Trent, ST1 5RY	Job Number:	20-85152
		Date Sampled:	Not Given
		Date Received:	04/02/2020
Contact:	Jason Bradley	Date Tested:	12/02/2020
Site Address:	Islington Wharf	Sampled By:	Not Given

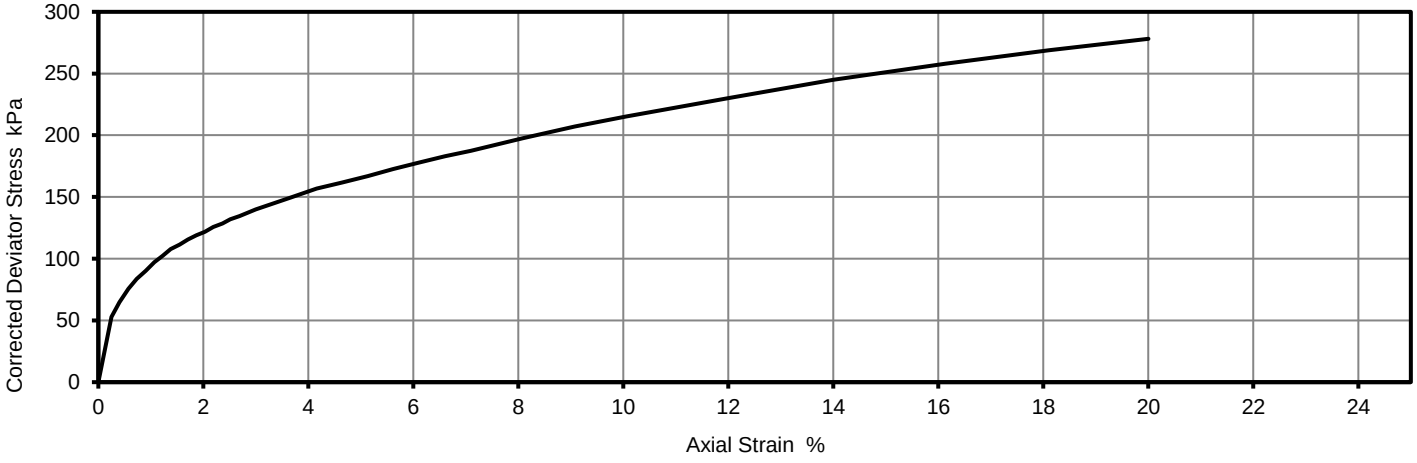
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

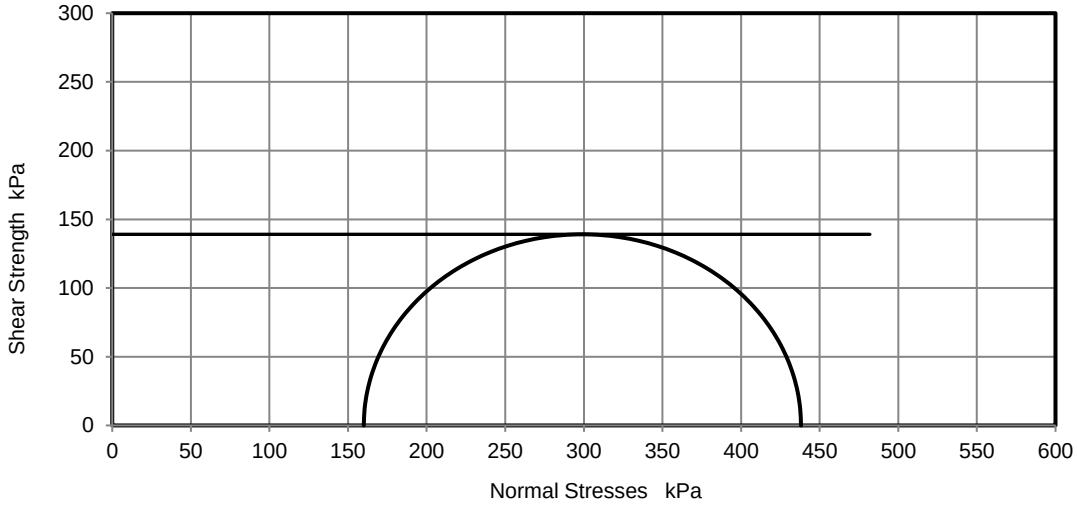
Laboratory Reference:	1433765	Depth Top [m]:	8.00
Hole No.:	BH02	Depth Base [m]:	8.45
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Brown slightly gravelly very sandy CLAY		

Test Number	1		Rate of Strain	2.00	%/min	
Length	136.29	mm	Cell Pressure	160	kPa	
Diameter	69.68	mm	Axial Strain at failure	20.0	%	
Bulk Density	2.22	Mg/m3	Deviator Stress, (σ1 - σ3)f	278	kPa	
Moisture Content	14	%	Undrained Shear Strength, cu	139	kPa	½(σ1 - σ3)f
Dry Density	1.94	Mg/m3	Mode of Failure	Compound		
Membrane Correction	1.32	kPa	Membrane thickness	0.24	mm	

Deviator Stress v Axial Strain

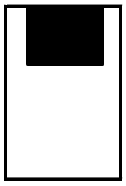


Mohr Circles





Position within sample



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PL Geotechnical Laboratory Manager
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Date Reported: 20/02/2020

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TEST CERTIFICATE

Unconsolidated Undrained

Triaxial Compression

Tested in Accordance with:
BS 1377-7: 1990: Clause 8

i2 Analytical Ltd
Unit 8 Harrowden Road
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Northampton NN4 7EB

UKAS TESTING 4041

Environmental Science

Client:	Hydrock Consultants Ltd	Client Reference:	C10042
Client Address:	4 Lakeside, Festival Park, Stoke on Trent, ST1 5RY	Job Number:	20-85152
		Date Sampled:	Not Given
		Date Received:	04/02/2020
Contact:	Jason Bradley	Date Tested:	12/02/2020
Site Address:	Islington Wharf	Sampled By:	Not Given

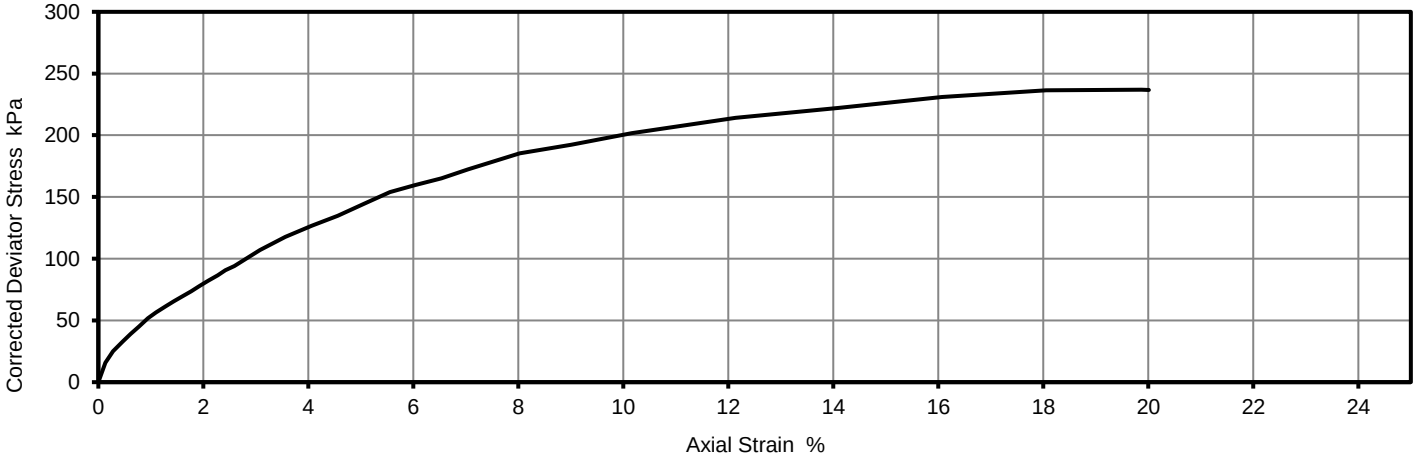
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

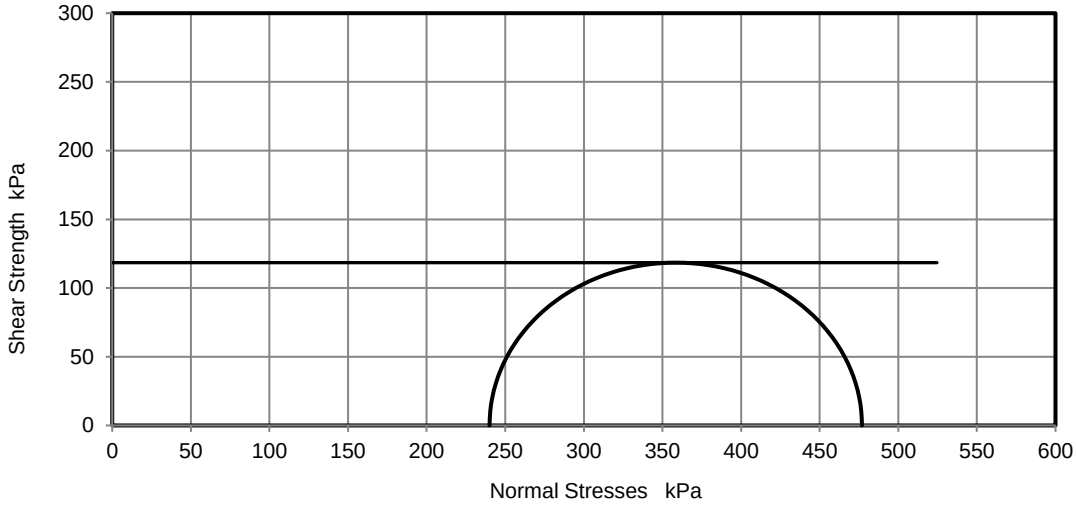
Laboratory Reference:	1433767	Depth Top [m]:	12.00
Hole No.:	BH02	Depth Base [m]:	12.45
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Brown slightly gravelly sandy CLAY		

Test Number	1		Rate of Strain	2.00	%/min	
Length	196.35	mm	Cell Pressure	240	kPa	
Diameter	100.81	mm	Axial Strain at failure	19.9	%	
Bulk Density	2.23	Mg/m3	Deviator Stress, (σ1 - σ3)f	237	kPa	
Moisture Content	17	%	Undrained Shear Strength, cu	118	kPa	½(σ1 - σ3)f
Dry Density	1.90	Mg/m3	Mode of Failure	Compound		
Membrane Correction	0.83	kPa	Membrane thickness	0.22	mm	

Deviator Stress v Axial Strain

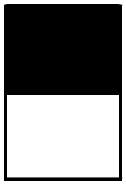


Mohr Circles





Position within sample



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Date Reported: 20/02/2020

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TEST CERTIFICATE

Unconsolidated Undrained

Triaxial Compression

Tested in Accordance with:
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i2 Analytical Ltd
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UKAS TESTING 4041

Environmental Science

Client:	Hydrock Consultants Ltd	Client Reference:	C10042
Client Address:	4 Lakeside, Festival Park, Stoke on Trent, ST1 5RY	Job Number:	20-85152
		Date Sampled:	Not Given
		Date Received:	04/02/2020
Contact:	Jason Bradley	Date Tested:	12/02/2020
Site Address:	Islington Wharf	Sampled By:	Not Given

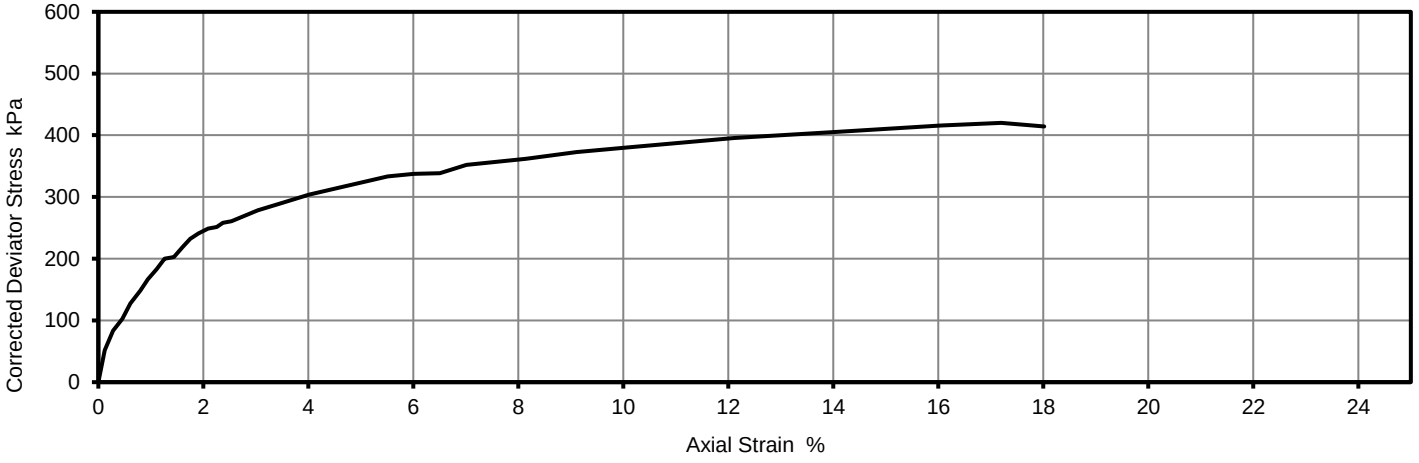
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

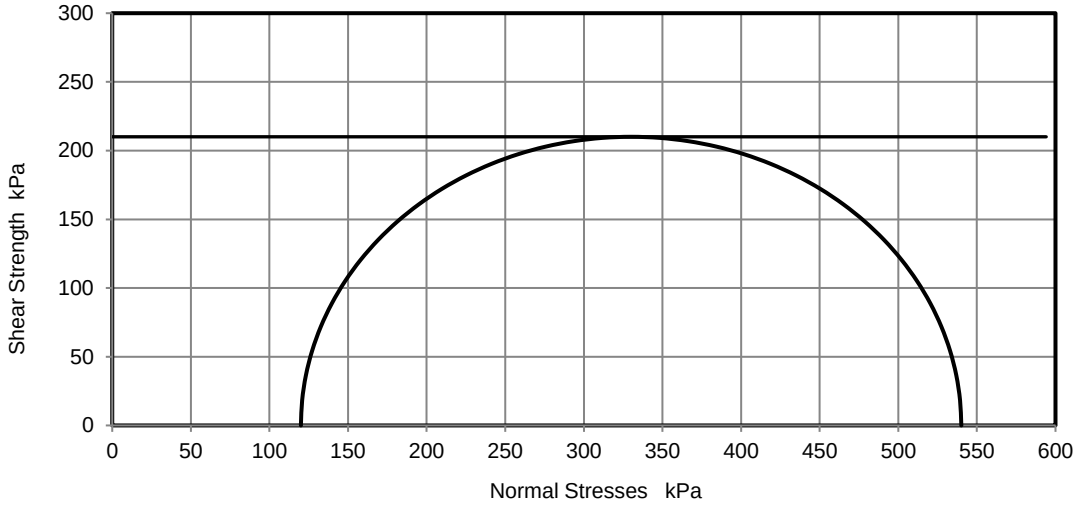
Laboratory Reference:	1433771	Depth Top [m]:	6.00
Hole No.:	BH03	Depth Base [m]:	6.45
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Brown slightly gravelly sandy CLAY		

Test Number	1		Rate of Strain	2.00	%/min	
Length	96.52	mm	Cell Pressure	120	kPa	
Diameter	49.58	mm	Axial Strain at failure	17.2	%	
Bulk Density	2.18	Mg/m3	Deviator Stress, (σ1 - σ3)f	420	kPa	
Moisture Content	16	%	Undrained Shear Strength, cu	210	kPa	½(σ1 - σ3)f
Dry Density	1.88	Mg/m3	Mode of Failure	Compound		
Membrane Correction	1.44	kPa	Membrane thickness	0.21	mm	

Deviator Stress v Axial Strain

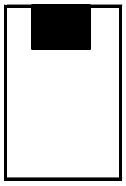


Mohr Circles





Position within sample



Note: Deviator stress corrected for area change and membrane effects. Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

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Date Reported: 20/02/2020

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TEST CERTIFICATE

Unconsolidated Undrained

Triaxial Compression

Tested in Accordance with:
BS 1377-7: 1990: Clause 8

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

UKAS TESTING 4041

Environmental Science

Client:	Hydrock Consultants Ltd	Client Reference:	C10042
Client Address:	4 Lakeside, Festival Park, Stoke on Trent, ST1 5RY	Job Number:	20-85152
		Date Sampled:	Not Given
		Date Received:	04/02/2020
Contact:	Jason Bradley	Date Tested:	10/02/2020
Site Address:	Islington Wharf	Sampled By:	Not Given

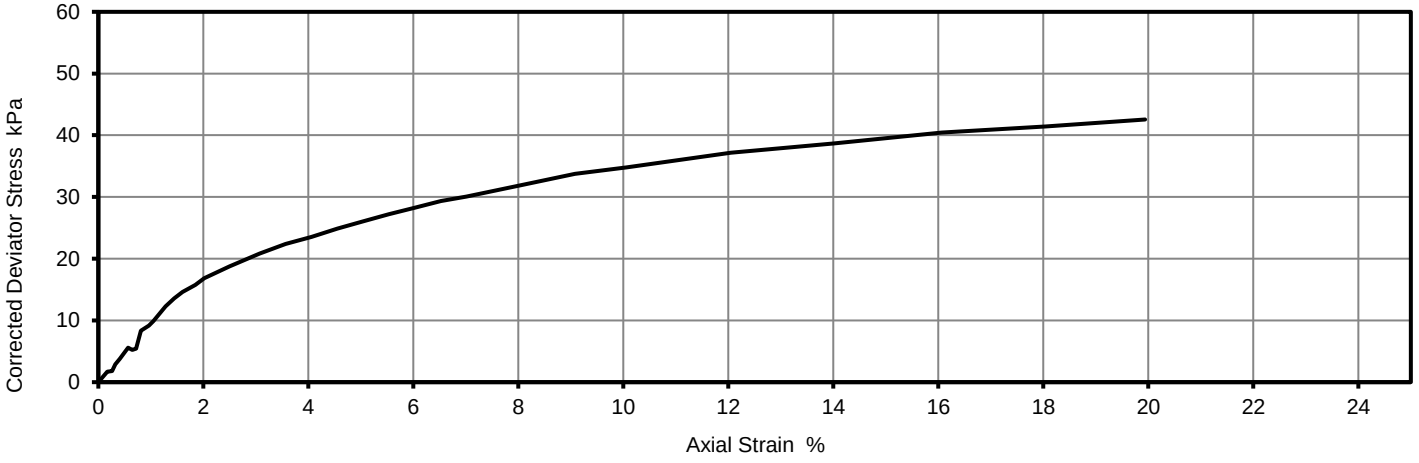
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

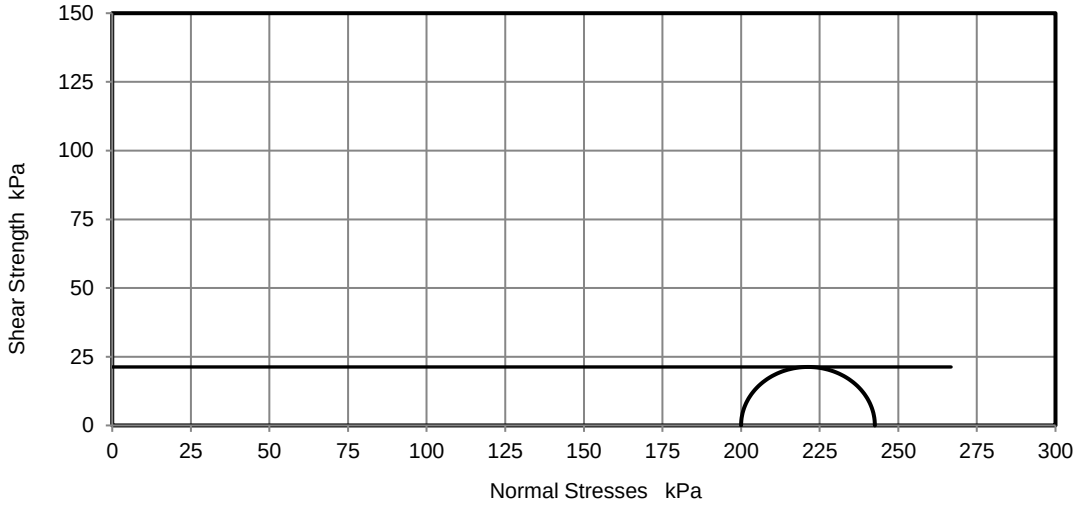
Laboratory Reference:	1433779	Depth Top [m]:	9.00
Hole No.:	BH04	Depth Base [m]:	9.45
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Brown slightly gravelly vey sandy CLAY		

Test Number	1		Rate of Strain	1.00	%/min	
Length	191.94	mm	Cell Pressure	200	kPa	
Diameter	101.92	mm	Axial Strain at failure	19.9	%	
Bulk Density	2.11	Mg/m3	Deviator Stress, (σ1 - σ3)f	43	kPa	
Moisture Content	18	%	Undrained Shear Strength, cu	21	kPa	½(σ1 - σ3)f
Dry Density	1.78	Mg/m3	Mode of Failure	Compound		
Membrane Correction	0.83	kPa	Membrane thickness	0.22	mm	

Deviator Stress v Axial Strain

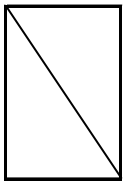


Mohr Circles





Position within sample



Note: Deviator stress corrected for area change and membrane effects. Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

Remarks: Recompacted at NMC using 2.5kg (light) rammer

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Signed: Dariusz Piotrowski
PL Geotechnical Laboratory Manager
for and on behalf of i2 Analytical Ltd

Date Reported: 20/02/2020

GF 184.9

TEST CERTIFICATE

Unconsolidated Undrained

Triaxial Compression

Tested in Accordance with:
BS 1377-7: 1990: Clause 8

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

UKAS TESTING 4041

Environmental Science

Client:	Hydrock Consultants Ltd	Client Reference:	C10042
Client Address:	4 Lakeside, Festival Park, Stoke on Trent, ST1 5RY	Job Number:	20-85152
		Date Sampled:	Not Given
		Date Received:	04/02/2020
Contact:	Jason Bradley	Date Tested:	12/02/2020
Site Address:	Islington Wharf	Sampled By:	Not Given

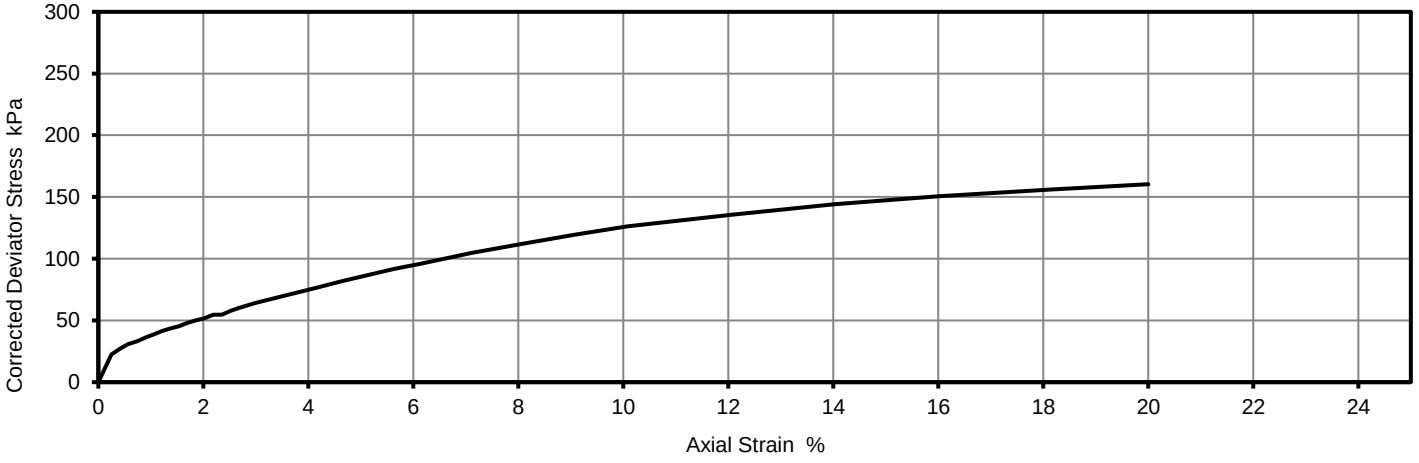
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

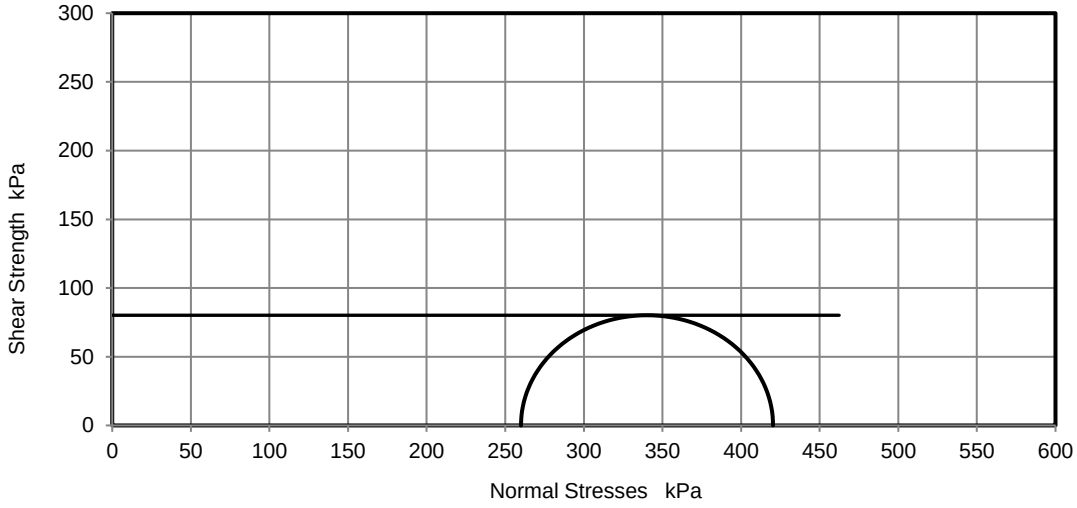
Laboratory Reference:	1433781	Depth Top [m]:	13.00
Hole No.:	BH04	Depth Base [m]:	13.45
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Brown sandy gravelly sandy CLAY		

Test Number	1		Rate of Strain	2.00	%/min	
Length	199.00	mm	Cell Pressure	260	kPa	
Diameter	101.36	mm	Axial Strain at failure	20.0	%	
Bulk Density	2.18	Mg/m3	Deviator Stress, (σ1 - σ3)f	160	kPa	
Moisture Content	18	%	Undrained Shear Strength, cu	80	kPa	½(σ1 - σ3)f
Dry Density	1.86	Mg/m3	Mode of Failure	Compound		
Membrane Correction	0.87	kPa	Membrane thickness	0.23	mm	

Deviator Stress v Axial Strain

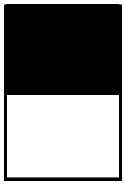


Mohr Circles





Position within sample



Note: Deviator stress corrected for area change and membrane effects. Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

Remarks:

"Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation. This report may not be reproduced other than in full without the prior written approval of the issuing laboratory. The results included within the report are representative of the samples submitted for analysis. Any assessment of compliance with specifications based ttical results in a report take in to account no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request."

Signed:

Dariusz Piotrowski
PL Geotechnical Laboratory Manager
for and on behalf of i2 Analytical Ltd

Date Reported: 20/02/2020

GF 184.9

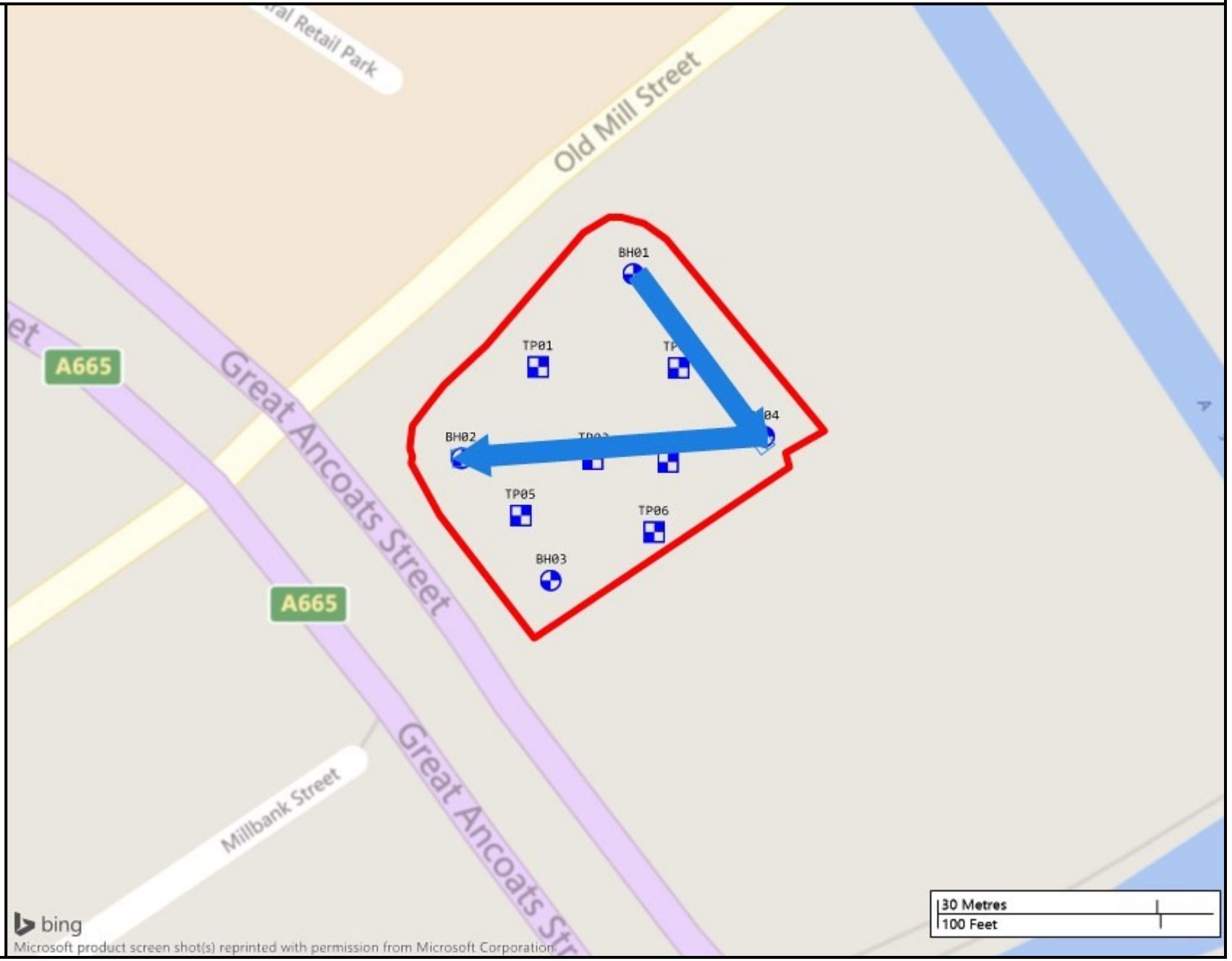
Geotechnical Plots

Project Id:	C-10042-C	Title:	Site Plan
Project Title:	Islington Wharf Phase 4	Scale:	1:750
Location:	Great Ancoats Street / Old Mill Street, Manchester, M4 6DN	Engineer:	JB
Client:	Waterside Places	Contractor:	

Hydrock

Legend Key

- Sections - Section line 1
- Sections - Section line A
- Sections - Section line B
- Sections - Section line B
- Locations By Type - Empty
- Locations By Type - CP
- Locations By Type - TP
- Project Bounds - Project Bounds



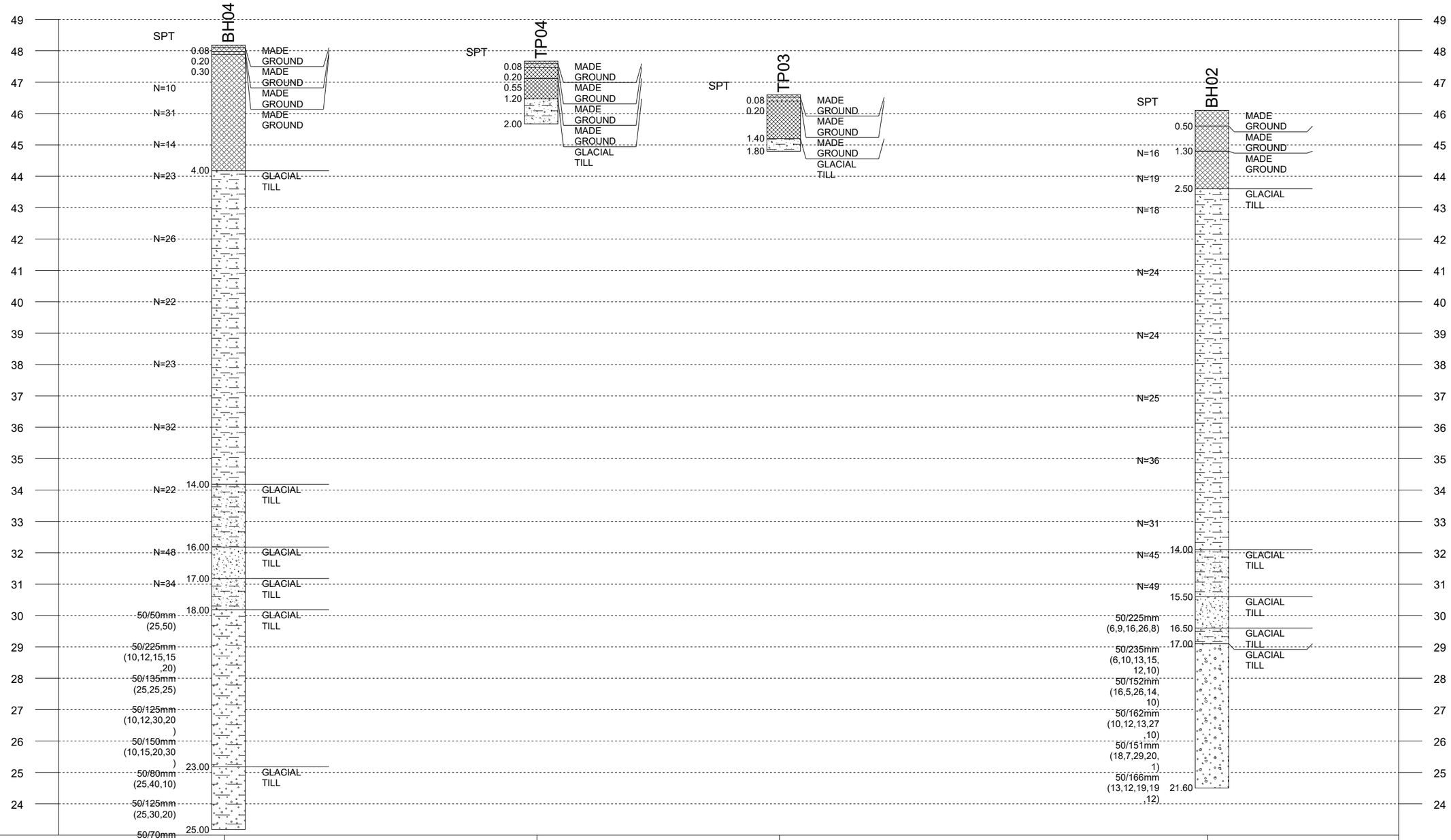
Project No: C-10042-C
Location: Great Ancoats Street / Old Mill Street, Manchester, M4 6DN
Client: Muse Developments

Title: Islington Wharf Phase 4

Engineer: JB

Scale
Vertical: 1:133
Horizontal: 1:177

Hydrock



Legend Key

- MADE GROUND
- Bituminous Material
- Sandy gravelly CLAY
- Gravelly CLAY
- Gravelly SAND
- Clayey GRAVEL
- Cobbly GRAVEL

23.00

Chainage (m)	0.37	13.63	23.92	42.09	
Offset (m)	0.18	2.72	1.60	0.15	
Elevation (mAOD)	48.18	47.67	46.60	46.10	

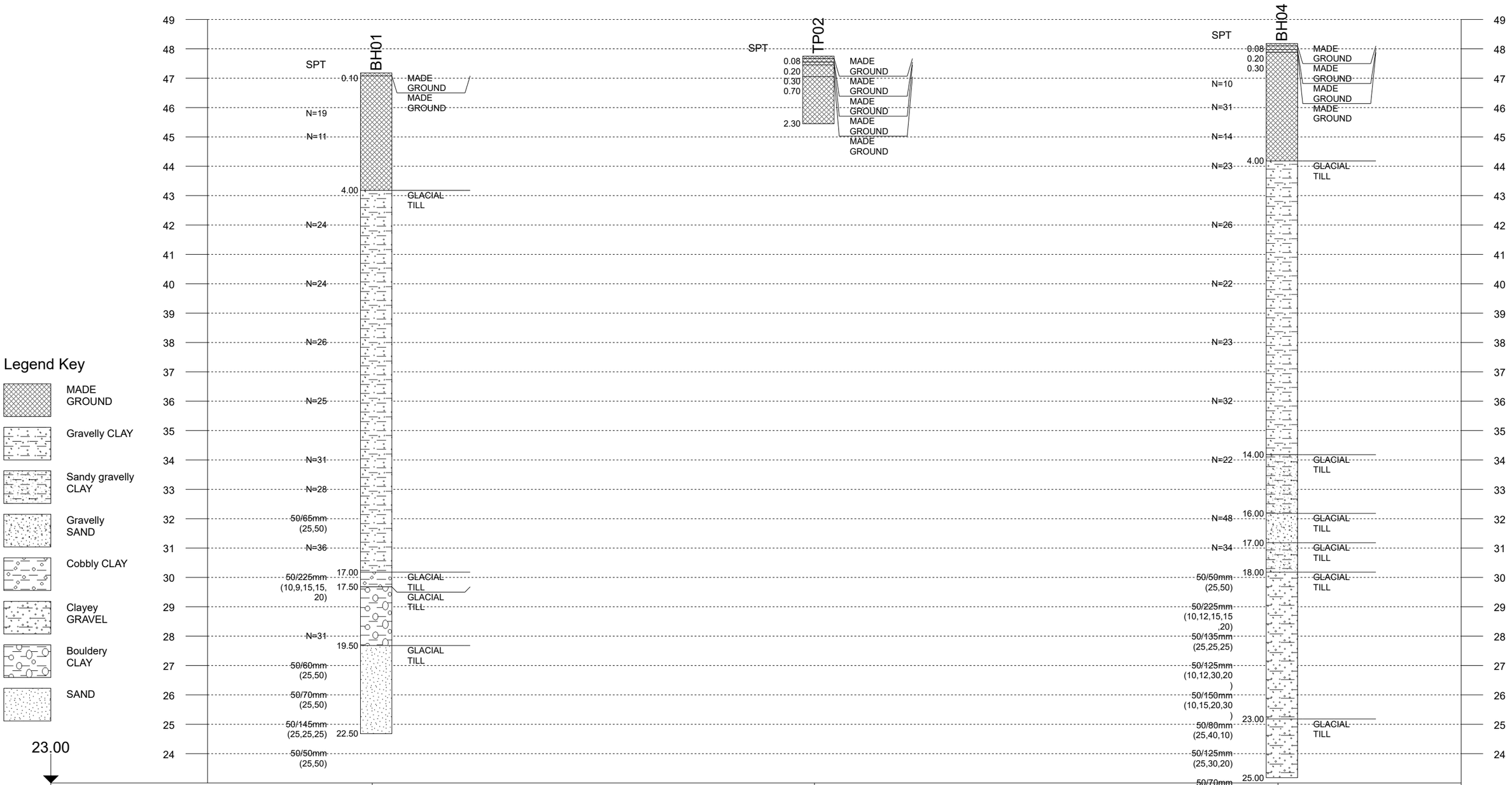
Project No: C-10042-C
Location: Great Ancoats Street / Old Mill Street, Manchester, M4 6DN
Client: Muse Developments

Title: Islington Wharf Phase 4

Engineer: JB

Scale
Vertical: 1:133
Horizontal: 1:123

Hydrock



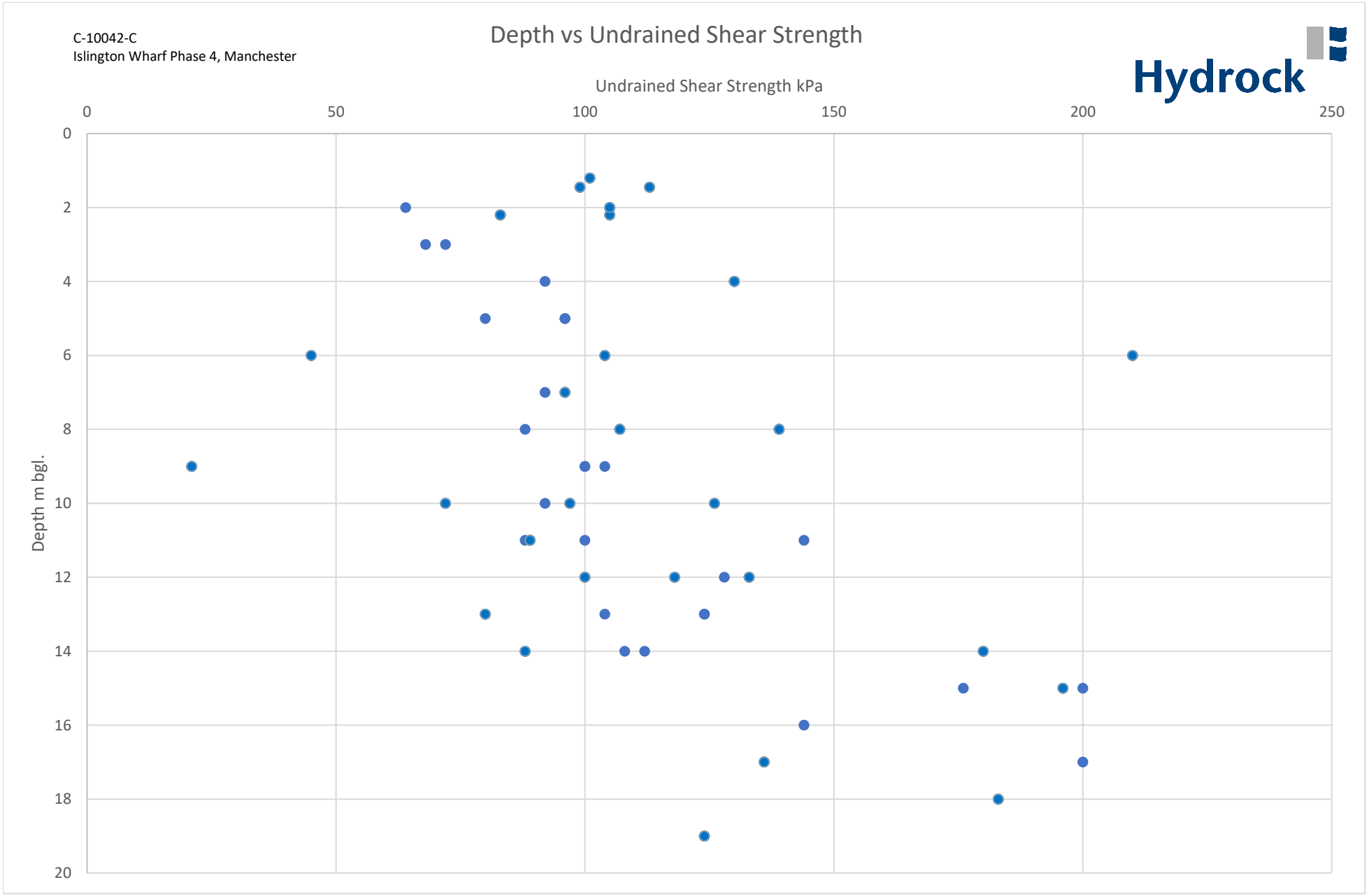
Legend Key

- MADE GROUND
- Gravelly CLAY
- Sandy gravelly CLAY
- Gravelly SAND
- Cobbly CLAY
- Clayey GRAVEL
- Bouldery CLAY
- SAND

23.00

Chainage (m)	0.56	14.50	29.10
Offset (m)	0.02	2.94	0.74
Elevation (mAOD)	47.18	47.75	48.18

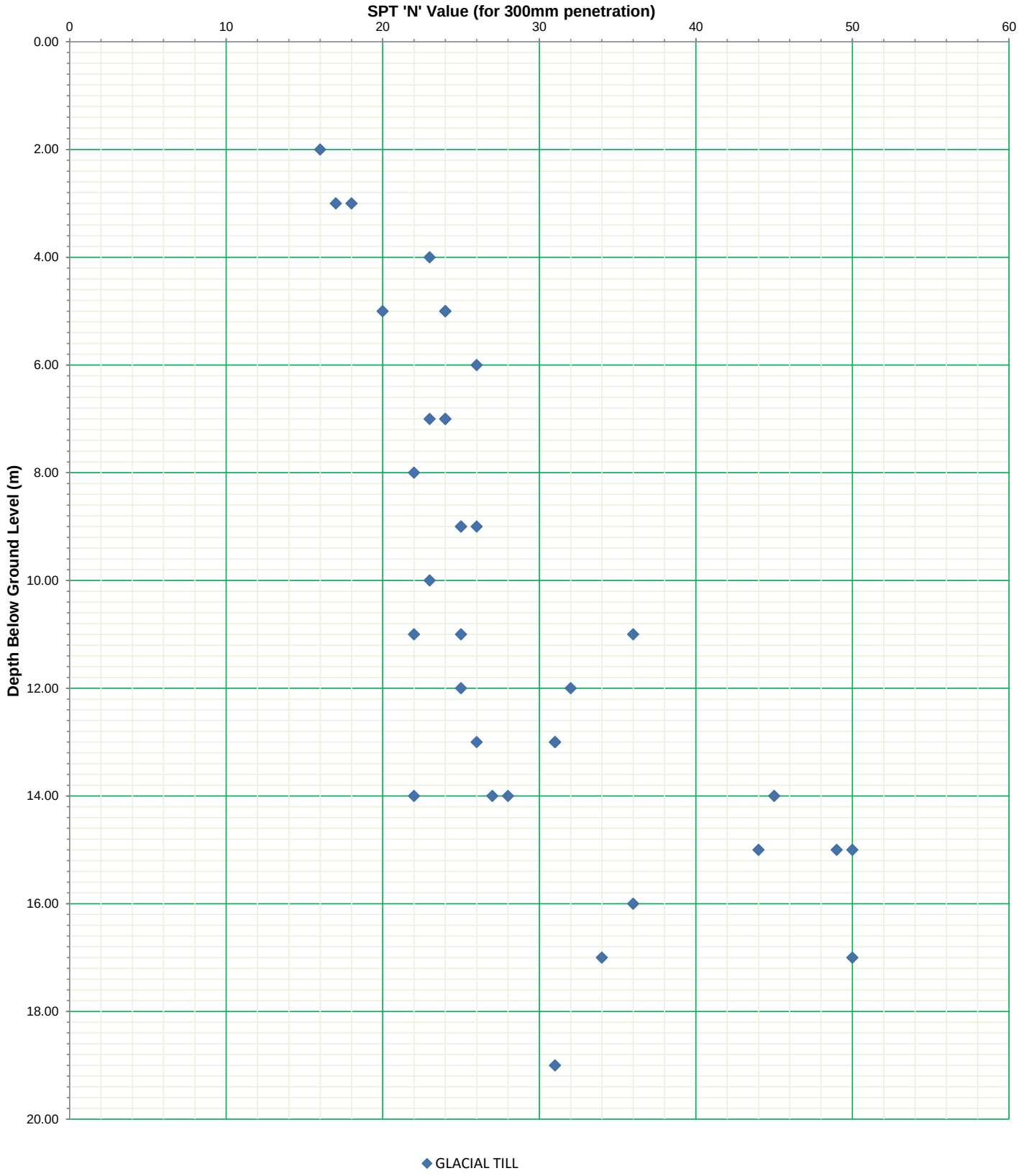
C-12703-C Bengal Street



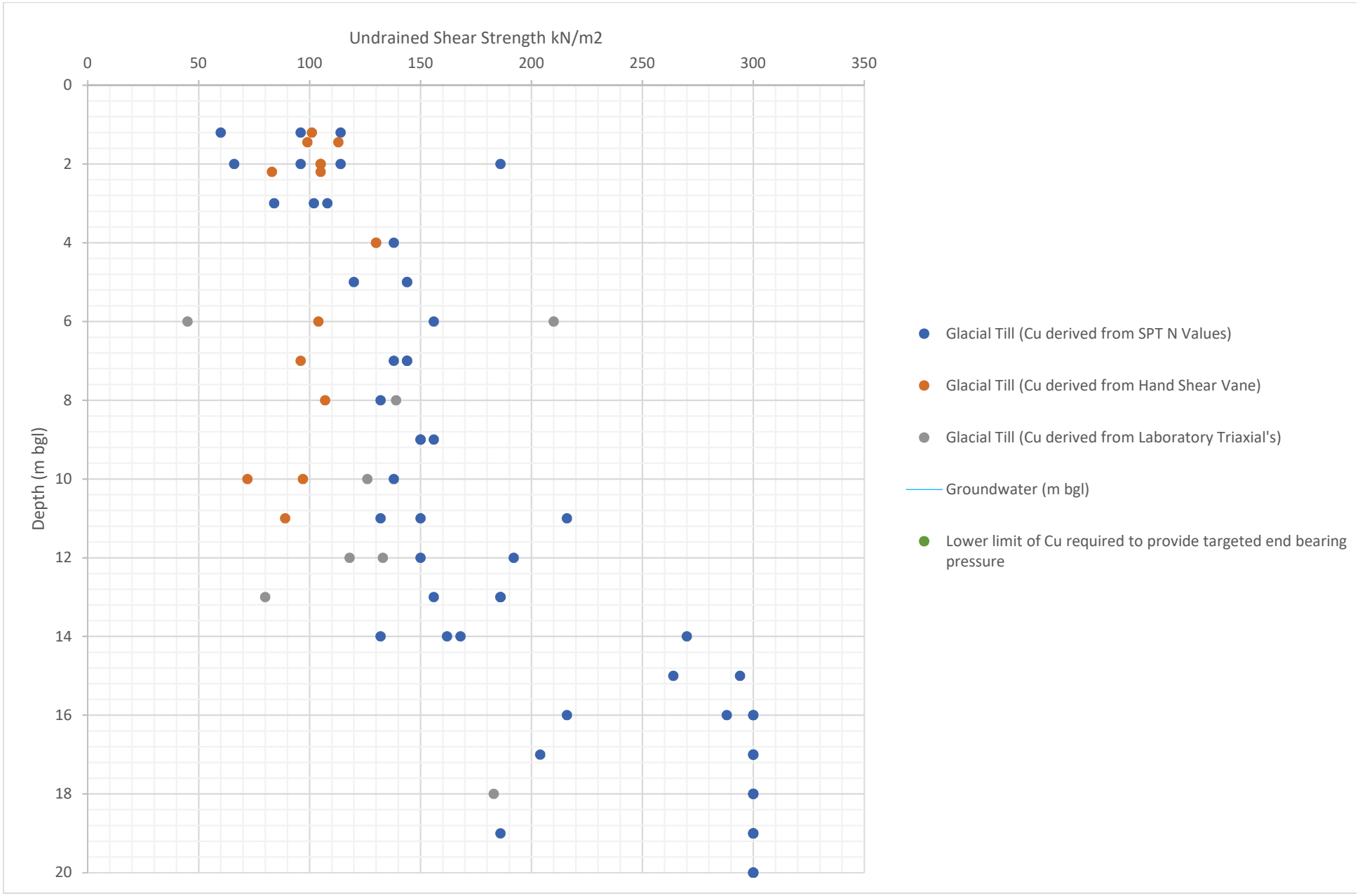
Hydrock

SPT 'N' VALUES vs DEPTH COHESIVE NATURAL STRATA

Site:	Client:	Contract No.	C-10042-C
Islington Wharf Phase 4	Muse Developments	All Data	



Template Version	1	Template Date	10/07/2019


Undrained Shear Strength kN/m2
0
50
100
150
200
250
300
350
Depth (m bgl)
0
2
4
6
8
10
12
14
16
18
20
Glacial Till (Cu derived from SPT N Values)
Glacial Till (Cu derived from Hand Shear Vane)
Glacial Till (Cu derived from Laboratory Triaxial's)
Groundwater (m bgl)
Lower limit of Cu required to provide targeted end bearing pressure

Client	Location or material to which this assessment applies
Waterside Places	Made Ground
Project	
Islington Wharf Phase 4	
Job number	
C-10042	

Concrete in aggressive ground

After BRE Special Digest 1, 2005

Soil data

	(Adjusted) water soluble sulfate (mg/l)	Total potential sulfate (%)	Water soluble magnesium (mg/l)
Number of tests	3	3	3
No. tests in 20% data set	1	1	1
No. tests with suspected pyrite		0	
Maximum value	464.15	0.3	25
Mean of highest two values	394	0	15
Mean of highest 20%			
Characteristic Value	**464.15**	**0.3**	**25**
			Mg not required
	[no pyrite]	**[pyrite suspected]**	
DS Class	**DS-1**	**DS-2**	

If pyrite suspected, DS Class limited to **DS-2**

Is pyrite assumed to be present? **No** **Adopted DS Class =** **DS-1**

Water data

	(Adjusted) soluble sulfate (mg/l)	Soluble magnesium (mg/l)
Characteristic Value (Maximum Level)	0	0 **Mg not required**
DS Class		

pH data

	Soil	Water
Number of tests	3	2
No. tests in 20% data set	1	0
Lowest pH	8.3	12.0
Mean of lowest 20%	8.3	
Characteristic value	**8.3**	**12.0**
Design value	**8.3**	

Number of soil pH results less than 5.5 0

DS Class design value

Based on higher of soil and water data **DS-1**

ACEC Class design value

Brownfield

Mobile groundwater **AC-1**

Client	Location or material to which this assessment applies
Waterside Places	Upper Glacial Till (Cohesive)
Project	
Islington Wharf Phase 4	
Job number	
C-10042	

Concrete in aggressive ground

After BRE Special Digest 1, 2005

Soil data

	(Adjusted) water soluble sulfate (mg/l)	Total potential sulfate (%)	Water soluble magnesium (mg/l)
Number of tests	3	3	3
No. tests in 20% data set	1	1	1
No. tests with suspected pyrite		0	
Maximum value	137.57	0.1	24
Mean of highest two values	111	0	21
Mean of highest 20%			
Characteristic Value	**137.57**	**0.1**	**24**

	[no pyrite]	**[pyrite suspected]**
DS Class	**DS-1**	**DS-1**

If pyrite suspected, DS Class limited to **DS-1**

Is pyrite assumed to be present? **No** **Adopted DS Class =** **DS-1**

Water data

	(Adjusted) soluble sulfate (mg/l)	Soluble magnesium (mg/l)
Characteristic Value (Maximum Level)	0	0

DS Class

pH data

	Soil	Water
Number of tests	3	2
No. tests in 20% data set	1	0
Lowest pH	8.2	12.0
Mean of lowest 20%	8.2	
Characteristic value	**8.2**	**12.0**

Design value **8.2**

Number of soil pH results less than 5.5 0

DS Class design value

Based on higher of soil and water data **DS-1**

ACEC Class design value

Natural ground

Mobile groundwater **AC-1 ***

* increase to AC-2z in flowing water (pure or with >15mg/l carbon dioxide)

Appendix E

Site Monitoring Data and Ground Gas Risk Assessment

Ground Gas Risk Assessment

Hydrock

Site: Islington Wharf Phase 4
Job number: C-10042
Client: Waterside Places

Gas analyser: GFM 435 SERIES
Equipment check OK: Y
Service in date: Y
Calibration check OK: Y
Name of person monitoring: See Notes.

Notes on site conditions:

Date	Operator	Weather Conditions
03/02/2020	Enitial	Overcast, dry
17/02/2020	Enitial	Overcast, dry
26/02/2020	Enitial	Dry
06/03/2020	Enitial	Dry
20/03/2020	Enitial	Dry
05/06/2020	Enitial	Overcast, rain

Notes: LEL = lower explosive limit = 5%v/v. * where the flow is less than the limit of detection of the instrument, the detection limit is reported (Highlighted in **blue**). GSVs are rounded to 3 places.

Monitoring round		Borehole details					Pressure and flow					Gas concentrations											GSV		Local conditions
													CH_4 (%v/v)		CH_4 (%LEL)		CO_2 (%v/v)		O_2 (%v/v)		Other Gases				
Date	Time	Borehole	Single or dual gas tap	Response zone depth (m)	Depth to water or depth of hole if dry (m)	D denotes dry hole	Atmospheric pressure (hPa)	Atm pressure falling / rising / steady	Relative BH pressure (hPa)	Gas flow* (l/hr)	Gas flow* (absolute value) (l/hr)	VOC (as ppm using PID)	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	CO (PPM)	H_2S (PPM)	Gas Screening Value (CH_4) (l/hr)	Gas Screening Value (CO_2) (l/hr)	Notes on condition of borehole and surrounding ground
							Max. individual values:				**0.5**			**8.2**		**0.0**		**15.5**		**20.3**				**0.008**	**0.078**	
							Min. individual values:				0.1			0.0		0.0		0.1		4.1				0.000	0.000	**Summary statistics for this monitoring period.**
							Worst-case GSVs based on max. individual flow and max. individual conc. over the duration of this table:																**0.041**	**0.0775**	
03/02/20	AM	BH01	S	16.77	3.41		1005		-0.1	0.1	0.1	ND	0.0	0.0	0.0	0.0	0.2	0.2	19.4	19.4	1.0	1	0.000	0.000	Base of hole: 16.77m. Groundwater sampled.
03/02/20	AM	BH02	S	2.65	1.50		1005		0.0	0.1	0.1	ND	0.0	0.0	0.0	0.0	0.5	0.5	19.6	19.6	ND	ND	0.000	0.001	Base of hole: 2.65m. Groundwater sampled.
03/02/20	AM	BH03	S	25.59	21.55		1005		-2.4	0.1	0.1	ND	0.0	0.0	0.0	0.0	0.1	0.1	20.3	20.3	ND	ND	0.000	0.000	Base of hole: 25.59m. Groundwater sampled.
03/02/20	AM	BH04	S	4.15	3.39		1005		0.0	0.1	0.1	ND	0.0	0.0	0.0	0.0	0.1	0.1	20.1	20.1	ND	ND	0.000	0.000	Base of hole: 4.15m. Groundwater sampled.
17/02/20	AM	BH01	S	16.76	3.47		995		0.1	0.1	0.1	NR	0.0	0.0	0.0	0.0	0.5	0.5	19.4	19.4	1.0	ND	0.000	0.001	Base of hole: 16.76m
17/02/20	AM	BH02	S	2.65	1.53		995		0.1	0.1	0.1	NR	0.0	0.0	0.0	0.0	0.3	0.3	20.0	20.0	ND	ND	0.000	0.000	Base of hole: 2.65m
17/02/20	AM	BH03	S	25.35	21.45		995		-2.0	0.1	0.1	NR	0.0	0.0	0.0	0.0	2.5	2.5	17.9	17.9	ND	ND	0.000	0.003	Base of hole: 25.35m (silty).
17/02/20	AM	BH04	S	4.13	3.37		995		0.1	0.1	0.1	NR	0.0	0.0	0.0	0.0	0.8	0.8	20.1	20.1	ND	ND	0.000	0.001	Base of hole: 4.13m
26/02/20	AM	BH01	S	16.78	3.33		988		0.3	0.1	0.1	NR	0.0	0.0	0.0	0.0	0.4	0.4	19.0	19.0	ND	1	0.000	0.000	Base of hole: 16.78m
26/02/20	AM	BH02	S	2.66	1.23		988		0.5	0.1	0.1	NR	0.0	0.0	0.0	0.0	0.5	0.5	19.1	19.1	ND	ND	0.000	0.001	Base of hole: 2.66m
26/02/20	AM	BH03	S	25.39	21.40		988		1.1	0.1	0.1	NR	0.0	0.0	0.0	0.0	2.6	2.5	17.4	17.4	ND	ND	0.000	0.003	Base of hole: 25.39m (silty).
26/02/20	AM	BH04	S	4.13	3.01		988		1.5	0.2	0.2	NR	0.0	0.0	0.0	0.0	1.0	1.0	19.6	19.6	ND	ND	0.000	0.002	Base of hole: 4.13m.
06/03/20	AM	BH01	S																						No access - skip on top of hole
06/03/20	AM	BH02	S	2.65	1.59		999		0.1	0.1	0.1	NR	0.0	0.0	0.0	0.0	0.2	0.2	20.1	20.1	ND	ND	0.000	0.000	Base of hole: 2.65m
06/03/20	AM	BH03	S	25.13	21.39		998		-1.6	0.1	0.1	NR	0.0	0.0	0.0	0.0	3.9	3.9	16.3	16.3	ND	ND	0.000	0.004	Base of hole: 25.13m (silty).
06/03/20	AM	BH04	S	4.13	3.35		998		-0.3	0.1	0.1	NR	0.0	0.0	0.0	0.0	0.2	0.2	20.2	20.2	ND	ND	0.000	0.000	Base of hole: 4.13m.
20/03/20	PM	BH01	S																						No access - skip on top of hole
20/03/20	PM	BH02	S	2.65	1.55		1027		-0.1	0.1	0.1	NR	0.0	0.0	0.0	0.0	0.2	0.1	20.2	20.2	ND	ND	0.000	0.000	Base of hole: 2.65m
20/03/20	PM	BH03	S	25.06	21.44		1027		-1.5	0.1	0.1	NR	0.0	0.0	0.0	0.0	0.1	0.1	20.1	20.1	ND	ND	0.000	0.000	Base of hole: 25.06m (silty).
20/03/20	PM	BH04	S	4.13	3.37		1027		-0.1	0.1	0.1	NR	0.0	0.0	0.0	0.0	0.9	0.9	18.6	18.6	ND	ND	0.000	0.001	Base of hole: 4.13m.
05/06/20	PM	BH01	S	16.77	4.59		992		0.3	0.1	0.1	NR	8.2	8.2	0	0	2.8	2.7	16.8	16.8	1.0	2	0.008	0.003	Base of hole 16.77. Accessible now skip moved
05/06/20	PM	BH02	S	2.65	1.80		992		1.0	0.1	0.1	NR	0.0	0.0	0	0	0.4	0.4	19.4	19.4	0.0	1	0.000	0.000	Base of hole: 2.65m
05/06/20	PM	BH03	S	25.05	21.33		992		0.5	0.5	0.5	NR	0.0	0.0	0	0	15.5	15.5	4.1	4.1	0.0	0	0.000	0.078	Base of hole: 25.05m
05/06/20	PM	BH04	S	4.13	3.37		992		1.0	0.1	0.1	NR	0.0	0.0	0	0	0.1	0.1	20.0	20.0	0.0	0	0.000	0.000	Base of hole: 4.13m.

Appendix F

Contamination Test Results and Statistical Analysis

Contamination Test Results

Jason Bradley
Hydrock Consultants Ltd
4 Lakeside
Festival Park
Stoke on Trent
ST1 5RY

t: 01782 261919
f: 01782 262020
e: stoke@hydrock.com

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 20-83860

Replaces Analytical Report Number : 20-83860, issue no. 1

Additional analysis undertaken.

Project / Site name:	Islington Wharf, Phase 4	**Samples received on:**	29/01/2020
Your job number:	C-10042-C	**Samples instructed on:**	30/01/2020
Your order number:	POP035184	**Analysis completed by:**	12/02/2020
Report Issue Number:	2	**Report issued on:**	12/02/2020
Samples Analysed:	1 bulk sample - 5 soil samples		

Signed:

Zina Abdul Razzak
Senior Quality Specialist

For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 20-83860

Project / Site name: Islington Wharf, Phase 4
Your Order No: POP035184

Lab Sample Number				1426465	1426466	1426467	1426468	1426469
Sample Reference				BH02	BH04	TP05	TP03	TP06
Sample Number				01	02	01	01	01
Depth (m)				0.70	1.50-2.00	0.40	0.60	0.30
Date Sampled				28/01/2020	28/01/2020	29/01/2020	29/01/2020	29/01/2020
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	9.8	18	26	20	13
Total mass of sample received	kg	0.001	NONE	0.55	0.57	0.46	0.51	0.50
Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	Chrysotile	-	-	Chrysotile	-
Asbestos in Soil	Type	N/A	ISO 17025	Detected	Not-detected	Not-detected	Detected	Not-detected
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	< 0.001	-	-	< 0.001	-
Asbestos Quantification Total	%	0.001	ISO 17025	< 0.001	-	-	< 0.001	-
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	9.7	9.2	8.3	7.9	9.4
Free Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1	< 1
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.16	0.17	0.11	0.19	1.7
Fraction Organic Carbon (FOC)	N/A	0.001	MCERTS	0.023	0.030	0.040	0.032	0.0086
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	0.89	0.37	< 0.05	1.7	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	0.48	< 0.05	0.66	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	1.1	0.92	0.47	5.5	0.24
Fluorene	mg/kg	0.05	MCERTS	0.88	0.99	0.29	4.6	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	6.5	10	3.7	38	1.8
Anthracene	mg/kg	0.05	MCERTS	1.6	2.3	0.90	9.0	0.51
Fluoranthene	mg/kg	0.05	MCERTS	10	25	7.2	53	3.8
Pyrene	mg/kg	0.05	MCERTS	9.5	26	7.0	48	3.7
Benzo(a)anthracene	mg/kg	0.05	MCERTS	4.6	16	4.0	27	2.1
Chrysene	mg/kg	0.05	MCERTS	3.4	11	2.6	17	1.4
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	5.4	16	4.3	27	2.0
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	1.3	4.7	1.1	5.8	0.90
Benzo(a)pyrene	mg/kg	0.05	MCERTS	3.9	13	3.1	20	1.8
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	1.9	6.6	1.6	9.0	0.85
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.58	2.2	0.52	2.9	0.26
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	2.2	7.1	1.7	9.5	0.94
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	53.9	144	38.4	279	20.2
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	8.7	22	32	24	8.3
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	0.60	1.0	1.8	1.3	0.80
Boron (water soluble)	mg/kg	0.2	MCERTS	0.4	0.4	1.3	0.9	2.5
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	1.3	1.4	1.3	0.6	0.4
Chromium (hexavalent)	mg/kg	1.2	MCERTS	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Chromium (III)	mg/kg	1	NONE	20	28	27	25	20
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	20	28	27	26	20
Copper (aqua regia extractable)	mg/kg	1	MCERTS	79	150	190	200	40
Lead (aqua regia extractable)	mg/kg	1	MCERTS	180	740	770	1000	100
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	1.5	2.6	4.0	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	19	26	34	32	18
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	27	32	45	36	23
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	290	450	570	270	130

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Analytical Report Number: 20-83860

Project / Site name: Islington Wharf, Phase 4
Your Order No: POP035184

Lab Sample Number				1426465	1426466	1426467	1426468	1426469
Sample Reference				BH02	BH04	TP05	TP03	TP06
Sample Number				01	02	01	01	01
Depth (m)				0.70	1.50-2.00	0.40	0.60	0.30
Date Sampled				28/01/2020	28/01/2020	29/01/2020	29/01/2020	29/01/2020
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Monoaromatics & Oxygenates								
Benzene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	-	-
Toluene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	-	-
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	-	-
p & m-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	-	-
o-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	< 1.0	-	-	-
Petroleum Hydrocarbons								
TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	< 0.001	< 0.001	-	-	-
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001	-	-	-
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001	-	-	-
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	6.1	7.4	-	-	-
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	54	47	-	-	-
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	84	99	-	-	-
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	540	220	-	-	-
TPH-CWG - Aliphatic > EC35 - EC44	mg/kg	8.4	NONE	170	46	-	-	-
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	< 0.001	< 0.001	-	-	-
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001	-	-	-
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001	-	-	-
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	3.1	-	-	-
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	34	41	-	-	-
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	200	250	-	-	-
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	1300	540	-	-	-
TPH-CWG - Aromatic > EC35 - EC44	mg/kg	8.4	NONE	770	240	-	-	-

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Your Order No: POP035184

Lab Sample Number				1426465	1426466	1426467	1426468	1426469
Sample Reference				BH02	BH04	TP05	TP03	TP06
Sample Number				01	02	01	01	01
Depth (m)				0.70	1.50-2.00	0.40	0.60	0.30
Date Sampled				28/01/2020	28/01/2020	29/01/2020	29/01/2020	29/01/2020
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
VOCs								
Chloromethane	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
Chloroethane	µg/kg	1	NONE	-	< 1.0	-	-	-
Bromomethane	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
Vinyl Chloride	µg/kg	1	NONE	-	< 1.0	-	-	-
Trichlorofluoromethane	µg/kg	1	NONE	-	< 1.0	-	-	-
1,1-Dichloroethene	µg/kg	1	NONE	-	< 1.0	-	-	-
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,1-Dichloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
2,2-Dichloropropane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Trichloromethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,1,1-Trichloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,2-Dichloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,1-Dichloropropene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Trans-1,2-dichloroethene	µg/kg	1	NONE	-	< 1.0	-	-	-
Benzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Tetrachloromethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,2-Dichloropropane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Trichloroethene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Dibromomethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Bromodichloromethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
Toluene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,1,2-Trichloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,3-Dichloropropane	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
Dibromochloromethane	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
Tetrachloroethene	µg/kg	1	NONE	-	< 1.0	-	-	-
1,2-Dibromoethane	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
Chlorobenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Ethylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
p & m-Xylene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Styrene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Tribromomethane	µg/kg	1	NONE	-	< 1.0	-	-	-
o-Xylene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Isopropylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Bromobenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
n-Propylbenzene	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
2-Chlorotoluene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
4-Chlorotoluene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
tert-Butylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
sec-Butylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
p-Isopropyltoluene	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
1,2-Dichlorobenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,4-Dichlorobenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Butylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Hexachlorobutadiene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	-	< 1.0	-	-	-

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Analytical Report Number: 20-83860

Project / Site name: Islington Wharf, Phase 4
Your Order No: POP035184

Lab Sample Number				1426465	1426466	1426467	1426468	1426469
Sample Reference				BH02	BH04	TP05	TP03	TP06
Sample Number				01	02	01	01	01
Depth (m)				0.70	1.50-2.00	0.40	0.60	0.30
Date Sampled				28/01/2020	28/01/2020	29/01/2020	29/01/2020	29/01/2020
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
VOCs TICs								
VOCs TICs Compound Name		N/A	NONE	-	ND	-	-	-
VOC % Match	%	N/A	NONE	-	0	-	-	-

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Lab Sample Number				1426465	1426466	1426467	1426468	1426469
Sample Reference				BH02	BH04	TP05	TP03	TP06
Sample Number				01	02	01	01	01
Depth (m)				0.70	1.50-2.00	0.40	0.60	0.30
Date Sampled				28/01/2020	28/01/2020	29/01/2020	29/01/2020	29/01/2020
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
SVOCs								
Aniline	mg/kg	0.1	NONE	-	< 0.1	-	-	-
Phenol	mg/kg	0.2	ISO 17025	-	< 0.2	-	-	-
2-Chlorophenol	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
Bis(2-chloroethyl)ether	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
1,3-Dichlorobenzene	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
1,2-Dichlorobenzene	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
1,4-Dichlorobenzene	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
Bis(2-chloroisopropyl)ether	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
2-Methylphenol	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
Hexachloroethane	mg/kg	0.05	MCERTS	-	< 0.05	-	-	-
Nitrobenzene	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
4-Methylphenol	mg/kg	0.2	NONE	-	< 0.2	-	-	-
Isophorone	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
2-Nitrophenol	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
2,4-Dimethylphenol	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
Bis(2-chloroethoxy)methane	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
1,2,4-Trichlorobenzene	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
Naphthalene	mg/kg	0.05	MCERTS	-	0.37	-	-	-
2,4-Dichlorophenol	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
4-Chloroaniline	mg/kg	0.1	NONE	-	< 0.1	-	-	-
Hexachlorobutadiene	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
4-Chloro-3-methylphenol	mg/kg	0.1	NONE	-	< 0.1	-	-	-
2,4,6-Trichlorophenol	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
2,4,5-Trichlorophenol	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
2-Methylnaphthalene	mg/kg	0.1	NONE	-	0.5	-	-	-
2-Chloronaphthalene	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
Dimethylphthalate	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
2,6-Dinitrotoluene	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
Acenaphthylene	mg/kg	0.05	MCERTS	-	0.48	-	-	-
Acenaphthene	mg/kg	0.05	MCERTS	-	0.92	-	-	-
2,4-Dinitrotoluene	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
Dibenzofuran	mg/kg	0.2	MCERTS	-	0.4	-	-	-
4-Chlorophenyl phenyl ether	mg/kg	0.3	ISO 17025	-	< 0.3	-	-	-
Diethyl phthalate	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
4-Nitroaniline	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
Fluorene	mg/kg	0.05	MCERTS	-	0.99	-	-	-
Azobenzene	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
Bromophenyl phenyl ether	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
Hexachlorobenzene	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
Phenanthrene	mg/kg	0.05	MCERTS	-	10	-	-	-
Anthracene	mg/kg	0.05	MCERTS	-	2.3	-	-	-
Carbazole	mg/kg	0.3	MCERTS	-	0.7	-	-	-
Dibutyl phthalate	mg/kg	0.2	MCERTS	-	6.9	-	-	-
Anthraquinone	mg/kg	0.3	MCERTS	-	1.9	-	-	-
Fluoranthene	mg/kg	0.05	MCERTS	-	25	-	-	-
Pyrene	mg/kg	0.05	MCERTS	-	26	-	-	-
Butyl benzyl phthalate	mg/kg	0.3	ISO 17025	-	< 0.3	-	-	-
Benzo(a)anthracene	mg/kg	0.05	MCERTS	-	16	-	-	-
Chrysene	mg/kg	0.05	MCERTS	-	11	-	-	-
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	-	16	-	-	-
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	-	4.7	-	-	-
Benzo(a)pyrene	mg/kg	0.05	MCERTS	-	13	-	-	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	-	6.6	-	-	-
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	-	2.2	-	-	-
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	-	7.1	-	-	-

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Analytical Report Number: 20-83860

Project / Site name: Islington Wharf, Phase 4
Your Order No: POP035184

Lab Sample Number				1426465	1426466	1426467	1426468	1426469
Sample Reference				BH02	BH04	TP05	TP03	TP06
Sample Number				01	02	01	01	01
Depth (m)				0.70	1.50-2.00	0.40	0.60	0.30
Date Sampled				28/01/2020	28/01/2020	29/01/2020	29/01/2020	29/01/2020
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
SVOCs TICs								
SVOCs TICs Compound Name		N/A	NONE	-	1(2H)-Phenanthrenone, 3,4,9,10-tetrahydro-7-methoxy-	-	-	-
SVOC % Match	%	N/A	NONE	-	98	-	-	-
SVOCs TICs Compound Name		N/A	NONE	-	Dibenz(a,e)aceanthrylene	-	-	-
SVOC % Match	%	N/A	NONE	-	98	-	-	-
SVOCs TICs Compound Name		N/A	NONE	-	1-(2-Aminobenzylidene)-1,2,3,4-tetrahydroacridine N-oxide	-	-	-
SVOC % Match	%	N/A	NONE	-	98	-	-	-
SVOCs TICs Compound Name		N/A	NONE	-	Naphthalene, 2,6-dimethyl-	-	-	-
SVOC % Match	%	N/A	NONE	-	97	-	-	-
SVOCs TICs Compound Name		N/A	NONE	-	Z-11,13-Tetradecadien-1-ol acetate	-	-	-
SVOC % Match	%	N/A	NONE	-	97	-	-	-
SVOCs TICs Compound Name		N/A	NONE	-	Cyclodecacyclooctadecene, 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18-octadecahydro-	-	-	-
SVOC % Match	%	N/A	NONE	-	97	-	-	-
SVOCs TICs Compound Name		N/A	NONE	-	Naphthalene, 1,4,5-trimethyl-	-	-	-
SVOC % Match	%	N/A	NONE	-	96	-	-	-
SVOCs TICs Compound Name		N/A	NONE	-	3-[(2-Methyl-5-nitro-phenylimino)-methyl]-phenol	-	-	-
SVOC % Match	%	N/A	NONE	-	96	-	-	-
SVOCs TICs Compound Name		N/A	NONE	-	Perylene	-	-	-
SVOC % Match	%	N/A	NONE	-	96	-	-	-
SVOCs TICs Compound Name		N/A	NONE	-	Phenanthrene, 1-methyl-	-	-	-
SVOC % Match	%	N/A	NONE	-	95	-	-	-

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Analytical Report Number: 20-83860
Project / Site name: Islington Wharf, Phase 4
Your Order No: POP035087

Certificate of Analysis - Asbestos Quantification

Methods:

Qualitative Analysis

The samples were analysed qualitatively for asbestos by polarising light and dispersion staining as described by the Health and Safety Executive in HSG 248.

Quantitative Analysis

The analysis was carried out using our documented in-house method A006 based on HSE Contract Research Report No: 83/1996: Development and Validation of an analytical method to determine the amount of asbestos in soils and loose aggregates (Davies et al, 1996) and HSG 248. Our method includes initial examination of the entire representative sample, then fractionation and detailed analysis of each fraction, with quantification by hand picking and weighing.

The limit of detection (reporting limit) of this method is 0.001 %.

The method has been validated using samples of at least 100 g, results for samples smaller than this should be interpreted with caution.

Both Qualitative and Quantitative Analyses are UKAS accredited.

Sample Number	Sample ID	Sample Depth (m)	Sample Weight (g)	Asbestos Containing Material Types Detected (ACM)	PLM Results	Asbestos by hand picking/weighing (%)	Total % Asbestos in Sample
1426465	BH02	0.70	126	Loose Fibres	**Chrysotile**	< 0.001	**< 0.001**
1426468	TP03	0.60	144	Loose Fibres	**Chrysotile**	< 0.001	**< 0.001**

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.

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The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 20-83860

Project / Site name: Islington Wharf, Phase 4

Lab Sample Number				1426470				
Sample Reference				TP05				
Sample Number				01				
Depth (m)				0.40				
Date Sampled				29/01/2020				
Time Taken				None Supplied				
Analytical Parameter (Bulk Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Asbestos Identification	Type	N/A	ISO 17025	Chrysotile-Hard/Cement Type Material				

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Analytical Report Number : 20-83860

Project / Site name: Islington Wharf, Phase 4

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

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

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1426465	BH02	01	0.70	Brown clay and sand with gravel.
1426466	BH04	02	1.50-2.00	Brown clay and sand with gravel.
1426467	TP05	01	0.40	Brown clay and sand with gravel and rubble.
1426468	TP03	01	0.60	brown clay and sand with clinker.
1426469	TP06	01	0.30	Brown clay and sand with gravel.

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Analytical Report Number : 20-83860

Project / Site name: Islington Wharf, Phase 4

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Asbestos identification in Bulks	Asbestos Identification in bulk material with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	W	ISO 17025
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Asbestos Quantification - Gravimetric	Asbestos quantification by gravimetric method - in house method based on references.	HSE Report No: 83/1996, HSG 248, HSG 264 & SCA Blue Book (draft).	A006-PL	D	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
Cr (III) in soil	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Fraction of Organic Carbon in soil	Determination of fraction of organic carbon in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
Free cyanide in soil	Determination of free cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Hexavalent chromium in soil (Lower Level)	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Semi-volatile organic compounds in soil	Determination of semi-volatile organic compounds in soil by extraction in dichloromethane and hexane followed by GC-MS.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS

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Analytical Report Number : 20-83860

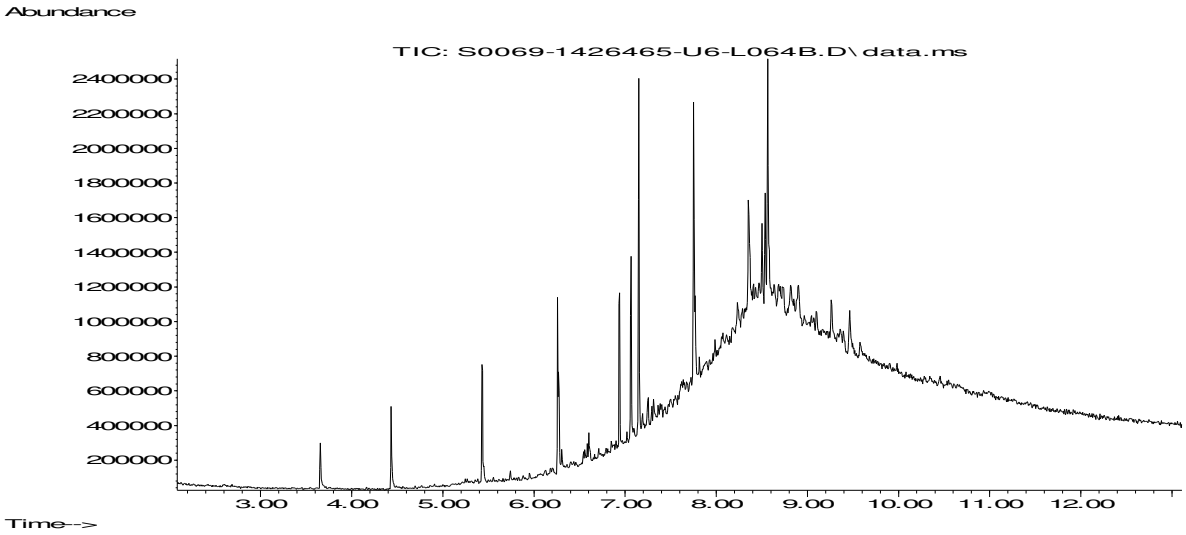
Project / Site name: Islington Wharf, Phase 4

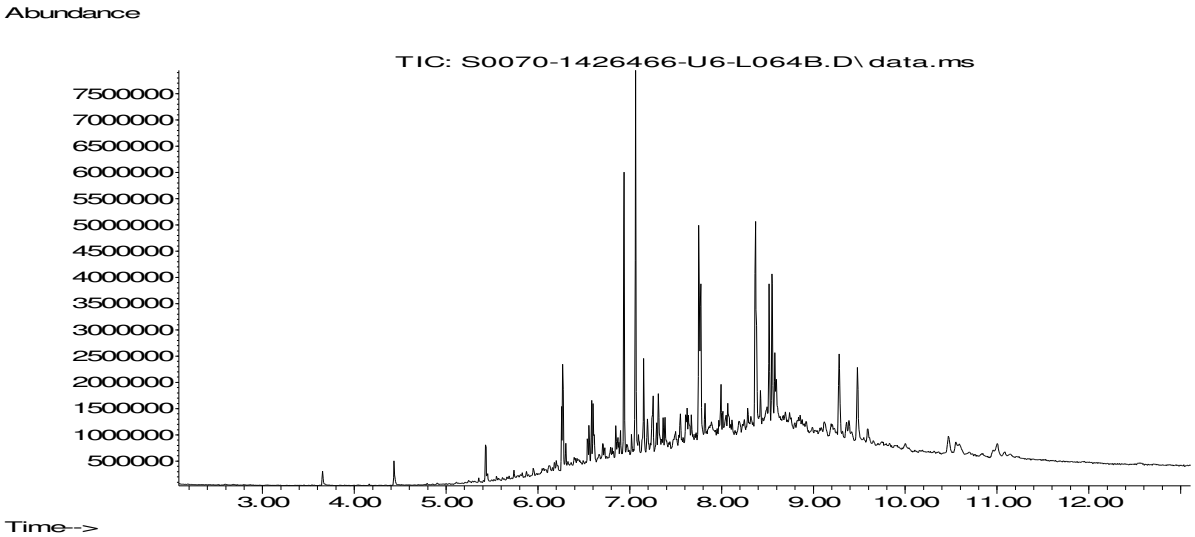
Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Tentatively identified compounds (SVOC) in soil	Determination of semi-volatile organic compounds total ion count in soil by extraction with dichloromethane and hexane followed by GC-MS followed by a full library scan.	In-house method based on USEPA 8270	L064-PL	D	NONE
Tentatively identified compounds (VOC) in soil	Determination of volatile organic compounds total ion count in soil by headspace GC-MS followed by a full library scan.	In-house method based on USEPA8260	L073-PL	W	NONE
TPH Chromatogram in Soil	TPH Chromatogram in Soil.	In-house method	L064-PL	D	NONE
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	NONE
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-PL	W	MCERTS
Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

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Abundance
TIC: S0069-1426465-U6-L064B.D\ data.ms
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2200000
2000000
1800000
1600000
1400000
1200000
1000000
800000
600000
400000
200000
3.00
4.00
5.00
6.00
7.00
8.00
9.00
10.00
11.00
12.00
Time-->


Abundance
TIC: S0070-1426466-U6-L064B.D\ data.ms
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5500000
5000000
4500000
4000000
3500000
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1500000
1000000
500000
3.00
4.00
5.00
6.00
7.00
8.00
9.00
10.00
11.00
12.00
Time-->

Jason Bradley
Hydrock Consultants Ltd
4 Lakeside
Festival Park
Stoke on Trent
ST1 5RY

t: 01782 261919
f: 01782 262020
e: stoke@hydrock.com

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 20-84382

Replaces Analytical Report Number : 20-84382, issue no. 1

Additional analysis undertaken.

Project / Site name:	Islington Wharf, Phase 4	**Samples received on:**	31/01/2020
Your job number:	C-10042-C	**Samples instructed on:**	31/01/2020
Your order number:		**Analysis completed by:**	17/02/2020
Report Issue Number:	2	**Report issued on:**	18/02/2020
Samples Analysed:	1 bulk sample - 5 soil samples		

Signed:

Zina Abdul Razzak
Senior Quality Specialist

For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.

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Analytical Report Number: 20-84382

Project / Site name: Islington Wharf, Phase 4

Lab Sample Number				1429564	1429565	1429566	1429567	1429568
Sample Reference				TP04	TP02	TP01	BH03	BH01
Sample Number				02	01	01	01	01
Depth (m)				0.55	0.70-0.80	0.40	0.70-1.00	0.50-1.20
Date Sampled				29/01/2020	29/01/2020	29/01/2020	31/01/2020	30/01/2020
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	17	13	17	15	9.7
Total mass of sample received	kg	0.001	NONE	0.46	0.49	0.50	0.49	0.45
Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	-	Chrysotile	-	-
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Detected	Not-detected	Not-detected
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	-	-	< 0.001	-	-
Asbestos Quantification Total	%	0.001	ISO 17025	-	-	< 0.001	-	-
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	7.8	8.1	8.3	8.7	10.3
Free Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1	< 1
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.47	0.15	0.065	0.30	0.22
Fraction Organic Carbon (FOC)	N/A	0.001	MCERTS	0.026	0.026	0.025	0.0094	0.010
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	3.9	0.78	0.39	0.22	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	15	2.1	0.29	0.56	0.37
Fluorene	mg/kg	0.05	MCERTS	12	1.4	0.22	0.51	0.31
Phenanthrene	mg/kg	0.05	MCERTS	41	13	3.1	3.6	2.8
Anthracene	mg/kg	0.05	MCERTS	13	3.1	0.79	0.68	0.63
Fluoranthene	mg/kg	0.05	MCERTS	51	24	8.4	4.1	5.4
Pyrene	mg/kg	0.05	MCERTS	53	21	7.7	3.8	5.4
Benzo(a)anthracene	mg/kg	0.05	MCERTS	31	14	5.1	2.3	3.4
Chrysene	mg/kg	0.05	MCERTS	20	11	3.8	1.7	2.6
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	16	12	3.9	1.3	2.7
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	21	7.4	1.7	1.7	1.4
Benzo(a)pyrene	mg/kg	0.05	MCERTS	26	14	4.3	1.7	2.8
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	9.4	6.7	2.3	0.85	1.3
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	3.1	1.7	0.57	0.24	0.38
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	12	8.0	2.7	1.0	1.7
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	328	140	45.2	24.3	31.1
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	24	270	26	10	13
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	2.1	1.9	1.6	1.3	0.59
Boron (water soluble)	mg/kg	0.2	MCERTS	2.3	1.2	0.7	1.6	0.9
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	0.9	< 0.2	0.7
Chromium (hexavalent)	mg/kg	1.2	MCERTS	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Chromium (III)	mg/kg	1	NONE	23	100	23	32	22
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	23	100	24	32	22
Copper (aqua regia extractable)	mg/kg	1	MCERTS	100	420	110	42	64
Lead (aqua regia extractable)	mg/kg	1	MCERTS	220	3400	340	95	380
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	0.9	3.4	1.4	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	38	120	34	33	17
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	6.8	< 1.0	2.7	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	42	68	47	32	20
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	110	640	440	110	160

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Analytical Report Number: 20-84382

Project / Site name: Islington Wharf, Phase 4

Lab Sample Number				1429564	1429565	1429566	1429567	1429568
Sample Reference				TP04	TP02	TP01	BH03	BH01
Sample Number				02	01	01	01	01
Depth (m)				0.55	0.70-0.80	0.40	0.70-1.00	0.50-1.20
Date Sampled				29/01/2020	29/01/2020	29/01/2020	31/01/2020	30/01/2020
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Monoaromatics & Oxygenates								
Benzene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
Toluene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
p & m-xylene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
o-xylene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	-	-	-	-
Petroleum Hydrocarbons								
TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	< 0.001	-	-	-	-
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	< 0.001	-	-	-	-
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	-	-	-	-
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	1.7	-	-	-	-
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	7.4	-	-	-	-
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	18	-	-	-	-
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	29	-	-	-	-
TPH-CWG - Aliphatic > EC35 - EC44	mg/kg	8.4	NONE	< 8.4	-	-	-	-
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	< 0.001	-	-	-	-
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	< 0.001	-	-	-	-
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	-	-	-	-
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	4.9	-	-	-	-
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	38	-	-	-	-
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	180	-	-	-	-
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	200	-	-	-	-
TPH-CWG - Aromatic > EC35 - EC44	mg/kg	8.4	NONE	< 8.4	-	-	-	-

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Analytical Report Number: 20-84382

Project / Site name: Islington Wharf, Phase 4

Lab Sample Number				1429564	1429565	1429566	1429567	1429568
Sample Reference				TP04	TP02	TP01	BH03	BH01
Sample Number				02	01	01	01	01
Depth (m)				0.55	0.70-0.80	0.40	0.70-1.00	0.50-1.20
Date Sampled				29/01/2020	29/01/2020	29/01/2020	31/01/2020	30/01/2020
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
VOCs								
Chloromethane	µg/kg	1	ISO 17025	< 1.0	-	-	-	-
Chloroethane	µg/kg	1	NONE	< 1.0	-	-	-	-
Bromomethane	µg/kg	1	ISO 17025	< 1.0	-	-	-	-
Vinyl Chloride	µg/kg	1	NONE	< 1.0	-	-	-	-
Trichlorofluoromethane	µg/kg	1	NONE	< 1.0	-	-	-	-
1,1-Dichloroethene	µg/kg	1	NONE	< 1.0	-	-	-	-
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	< 1.0	-	-	-	-
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	-	-	-	-
1,1-Dichloroethane	µg/kg	1	MCERTS	< 1.0	-	-	-	-
2,2-Dichloropropane	µg/kg	1	MCERTS	< 1.0	-	-	-	-
Trichloromethane	µg/kg	1	MCERTS	< 1.0	-	-	-	-
1,1,1-Trichloroethane	µg/kg	1	MCERTS	< 1.0	-	-	-	-
1,2-Dichloroethane	µg/kg	1	MCERTS	< 1.0	-	-	-	-
1,1-Dichloropropene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
Trans-1,2-dichloroethene	µg/kg	1	NONE	< 1.0	-	-	-	-
Benzene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
Tetrachloromethane	µg/kg	1	MCERTS	< 1.0	-	-	-	-
1,2-Dichloropropane	µg/kg	1	MCERTS	< 1.0	-	-	-	-
Trichloroethene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
Dibromomethane	µg/kg	1	MCERTS	< 1.0	-	-	-	-
Bromodichloromethane	µg/kg	1	MCERTS	< 1.0	-	-	-	-
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	< 1.0	-	-	-	-
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	< 1.0	-	-	-	-
Toluene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
1,1,2-Trichloroethane	µg/kg	1	MCERTS	< 1.0	-	-	-	-
1,3-Dichloropropane	µg/kg	1	ISO 17025	< 1.0	-	-	-	-
Dibromochloromethane	µg/kg	1	ISO 17025	< 1.0	-	-	-	-
Tetrachloroethene	µg/kg	1	NONE	< 1.0	-	-	-	-
1,2-Dibromoethane	µg/kg	1	ISO 17025	< 1.0	-	-	-	-
Chlorobenzene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	< 1.0	-	-	-	-
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
p & m-Xylene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
Styrene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
Tribromomethane	µg/kg	1	NONE	< 1.0	-	-	-	-
o-Xylene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	< 1.0	-	-	-	-
Isopropylbenzene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
Bromobenzene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
n-Propylbenzene	µg/kg	1	ISO 17025	< 1.0	-	-	-	-
2-Chlorotoluene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
4-Chlorotoluene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	< 1.0	-	-	-	-
tert-Butylbenzene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	< 1.0	-	-	-	-
sec-Butylbenzene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	< 1.0	-	-	-	-
p-Isopropyltoluene	µg/kg	1	ISO 17025	< 1.0	-	-	-	-
1,2-Dichlorobenzene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
1,4-Dichlorobenzene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
Butylbenzene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	< 1.0	-	-	-	-
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
Hexachlorobutadiene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	< 1.0	-	-	-	-

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Analytical Report Number: 20-84382

Project / Site name: Islington Wharf, Phase 4

Lab Sample Number				1429564	1429565	1429566	1429567	1429568
Sample Reference				TP04	TP02	TP01	BH03	BH01
Sample Number				02	01	01	01	01
Depth (m)				0.55	0.70-0.80	0.40	0.70-1.00	0.50-1.20
Date Sampled				29/01/2020	29/01/2020	29/01/2020	31/01/2020	30/01/2020
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
VOCs TICs								
VOCs TICs Compound Name		N/A	NONE	ND	-	-	-	-
VOC % Match	%	N/A	NONE	0	-	-	-	-

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Analytical Report Number: 20-84382

Project / Site name: Islington Wharf, Phase 4

Lab Sample Number				1429564	1429565	1429566	1429567	1429568
Sample Reference				TP04	TP02	TP01	BH03	BH01
Sample Number				02	01	01	01	01
Depth (m)				0.55	0.70-0.80	0.40	0.70-1.00	0.50-1.20
Date Sampled				29/01/2020	29/01/2020	29/01/2020	31/01/2020	30/01/2020
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
SVOCs								
Aniline	mg/kg	0.1	NONE	< 0.1	-	-	-	-
Phenol	mg/kg	0.2	ISO 17025	< 0.2	-	-	-	-
2-Chlorophenol	mg/kg	0.1	MCERTS	< 0.1	-	-	-	-
Bis(2-chloroethyl)ether	mg/kg	0.2	MCERTS	< 0.2	-	-	-	-
1,3-Dichlorobenzene	mg/kg	0.2	MCERTS	< 0.2	-	-	-	-
1,2-Dichlorobenzene	mg/kg	0.1	MCERTS	< 0.1	-	-	-	-
1,4-Dichlorobenzene	mg/kg	0.2	MCERTS	< 0.2	-	-	-	-
Bis(2-chloroisopropyl)ether	mg/kg	0.1	MCERTS	< 0.1	-	-	-	-
2-Methylphenol	mg/kg	0.3	MCERTS	< 0.3	-	-	-	-
Hexachloroethane	mg/kg	0.05	MCERTS	< 0.05	-	-	-	-
Nitrobenzene	mg/kg	0.3	MCERTS	< 0.3	-	-	-	-
4-Methylphenol	mg/kg	0.2	NONE	< 0.2	-	-	-	-
Isophorone	mg/kg	0.2	MCERTS	< 0.2	-	-	-	-
2-Nitrophenol	mg/kg	0.3	MCERTS	< 0.3	-	-	-	-
2,4-Dimethylphenol	mg/kg	0.3	MCERTS	< 0.3	-	-	-	-
Bis(2-chloroethoxy)methane	mg/kg	0.3	MCERTS	< 0.3	-	-	-	-
1,2,4-Trichlorobenzene	mg/kg	0.3	MCERTS	< 0.3	-	-	-	-
Naphthalene	mg/kg	0.05	MCERTS	3.9	-	-	-	-
2,4-Dichlorophenol	mg/kg	0.3	MCERTS	< 0.3	-	-	-	-
4-Chloroaniline	mg/kg	0.1	NONE	< 0.1	-	-	-	-
Hexachlorobutadiene	mg/kg	0.1	MCERTS	< 0.1	-	-	-	-
4-Chloro-3-methylphenol	mg/kg	0.1	NONE	< 0.1	-	-	-	-
2,4,6-Trichlorophenol	mg/kg	0.1	MCERTS	< 0.1	-	-	-	-
2,4,5-Trichlorophenol	mg/kg	0.2	MCERTS	< 0.2	-	-	-	-
2-Methylnaphthalene	mg/kg	0.1	NONE	3.0	-	-	-	-
2-Chloronaphthalene	mg/kg	0.1	MCERTS	< 0.1	-	-	-	-
Dimethylphthalate	mg/kg	0.1	MCERTS	< 0.1	-	-	-	-
2,6-Dinitrotoluene	mg/kg	0.1	MCERTS	< 0.1	-	-	-	-
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	-	-	-	-
Acenaphthene	mg/kg	0.05	MCERTS	15	-	-	-	-
2,4-Dinitrotoluene	mg/kg	0.2	MCERTS	< 0.2	-	-	-	-
Dibenzofuran	mg/kg	0.2	MCERTS	5.2	-	-	-	-
4-Chlorophenyl phenyl ether	mg/kg	0.3	ISO 17025	< 0.3	-	-	-	-
Diethyl phthalate	mg/kg	0.2	MCERTS	< 0.2	-	-	-	-
4-Nitroaniline	mg/kg	0.2	MCERTS	< 0.2	-	-	-	-
Fluorene	mg/kg	0.05	MCERTS	12	-	-	-	-
Azobenzene	mg/kg	0.3	MCERTS	< 0.3	-	-	-	-
Bromophenyl phenyl ether	mg/kg	0.2	MCERTS	< 0.2	-	-	-	-
Hexachlorobenzene	mg/kg	0.3	MCERTS	< 0.3	-	-	-	-
Phenanthrene	mg/kg	0.05	MCERTS	41	-	-	-	-
Anthracene	mg/kg	0.05	MCERTS	13	-	-	-	-
Carbazole	mg/kg	0.3	MCERTS	2.5	-	-	-	-
Dibutyl phthalate	mg/kg	0.2	MCERTS	< 0.2	-	-	-	-
Anthraquinone	mg/kg	0.3	MCERTS	< 0.3	-	-	-	-
Fluoranthene	mg/kg	0.05	MCERTS	51	-	-	-	-
Pyrene	mg/kg	0.05	MCERTS	53	-	-	-	-
Butyl benzyl phthalate	mg/kg	0.3	ISO 17025	< 0.3	-	-	-	-
Benzo(a)anthracene	mg/kg	0.05	MCERTS	31	-	-	-	-
Chrysene	mg/kg	0.05	MCERTS	20	-	-	-	-
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	16	-	-	-	-
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	21	-	-	-	-
Benzo(a)pyrene	mg/kg	0.05	MCERTS	26	-	-	-	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	9.4	-	-	-	-
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	3.1	-	-	-	-
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	12	-	-	-	-

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Analytical Report Number: 20-84382

Project / Site name: Islington Wharf, Phase 4

Lab Sample Number				1429564	1429565	1429566	1429567	1429568
Sample Reference				TP04	TP02	TP01	BH03	BH01
Sample Number				02	01	01	01	01
Depth (m)				0.55	0.70-0.80	0.40	0.70-1.00	0.50-1.20
Date Sampled				29/01/2020	29/01/2020	29/01/2020	31/01/2020	30/01/2020
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
SVOCs TICs								
SVOCs TICs Compound Name		N/A	NONE	Naphthalene, 2,3,6-trimethyl-	-	-	-	-
SVOC % Match	%	N/A	NONE	98	-	-	-	-
SVOCs TICs Compound Name		N/A	NONE	Triphenylene	-	-	-	-
SVOC % Match	%	N/A	NONE	98	-	-	-	-
SVOCs TICs Compound Name		N/A	NONE	Dibenz(a,e)aceanthrylene	-	-	-	-
SVOC % Match	%	N/A	NONE	98	-	-	-	-
SVOCs TICs Compound Name		N/A	NONE	dihydro-4,7-dimethyl-	-	-	-	-
SVOC % Match	%	N/A	NONE	97	-	-	-	-
SVOCs TICs Compound Name		N/A	NONE	Naphthalene, 2,3-dimethyl-	-	-	-	-
SVOC % Match	%	N/A	NONE	97	-	-	-	-
SVOCs TICs Compound Name		N/A	NONE	Phenanthrene, 2-methyl-	-	-	-	-
SVOC % Match	%	N/A	NONE	97	-	-	-	-
SVOCs TICs Compound Name		N/A	NONE	Naphthalene, 1-ethyl-	-	-	-	-
SVOC % Match	%	N/A	NONE	96	-	-	-	-
SVOCs TICs Compound Name		N/A	NONE	Naphthalene, 2,6-dimethyl-	-	-	-	-
SVOC % Match	%	N/A	NONE	96	-	-	-	-
SVOCs TICs Compound Name		N/A	NONE	Naphthalene, 1,4-dimethyl-	-	-	-	-
SVOC % Match	%	N/A	NONE	96	-	-	-	-
SVOCs TICs Compound Name		N/A	NONE	Naphthalene, 1,6,7-trimethyl-	-	-	-	-
SVOC % Match	%	N/A	NONE	96	-	-	-	-

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Analytical Report Number: 20-84382
Project / Site name: Islington Wharf, Phase 4
Your Order No:

Certificate of Analysis - Asbestos Quantification

Methods:

Qualitative Analysis

The samples were analysed qualitatively for asbestos by polarising light and dispersion staining as described by the Health and Safety Executive in HSG 248.

Quantitative Analysis

The analysis was carried out using our documented in-house method A006 based on HSE Contract Research Report No: 83/1996: Development and Validation of an analytical method to determine the amount of asbestos in soils and loose aggregates (Davies et al, 1996) and HSG 248. Our method includes initial examination of the entire representative sample, then fractionation and detailed analysis of each fraction, with quantification by hand picking and weighing.

The limit of detection (reporting limit) of this method is 0.001 %.

The method has been validated using samples of at least 100 g, results for samples smaller than this should be interpreted with caution.

Both Qualitative and Quantitative Analyses are UKAS accredited.

Sample Number	Sample ID	Sample Depth (m)	Sample Weight (g)	Asbestos Containing Material Types Detected (ACM)	PLM Results	Asbestos by hand picking/weighing (%)	Total % Asbestos in Sample
1429566	TP01	0.40	104	Loose Fibres	**Chrysotile**	< 0.001	**< 0.001**

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.

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Analytical Report Number: 20-84382

Project / Site name: Islington Wharf, Phase 4

Lab Sample Number				1429570				
Sample Reference				TP01				
Sample Number				01				
Depth (m)				0.80				
Date Sampled				29/01/2020				
Time Taken				None Supplied				
Analytical Parameter (Bulk Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Asbestos Identification	Type	N/A	ISO 17025	No Asbestos Detected				

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Analytical Report Number : 20-84382

Project / Site name: Islington Wharf, Phase 4

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

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

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1429564	TP04	02	0.55	Black loam and clay with gravel.
1429565	TP02	01	0.70-0.80	Black loam and sand with gravel.
1429566	TP01	01	0.40	Black loam and sand with gravel.
1429567	BH03	01	0.70-1.00	Brown clay and sand with gravel.
1429568	BH01	01	0.50-1.20	Brown loam and sand with gravel and brick.

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Analytical Report Number : 20-84382

Project / Site name: Islington Wharf, Phase 4

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Asbestos identification in Bulks	Asbestos Identification in bulk material with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	W	ISO 17025
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Asbestos Quantification - Gravimetric	Asbestos quantification by gravimetric method - in house method based on references.	HSE Report No: 83/1996, HSG 248, HSG 264 & SCA Blue Book (draft).	A006-PL	D	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
Cr (III) in soil	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Fraction of Organic Carbon in soil	Determination of fraction of organic carbon in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
Free cyanide in soil	Determination of free cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Hexavalent chromium in soil (Lower Level)	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Semi-volatile organic compounds in soil	Determination of semi-volatile organic compounds in soil by extraction in dichloromethane and hexane followed by GC-MS.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS

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Analytical Report Number : 20-84382

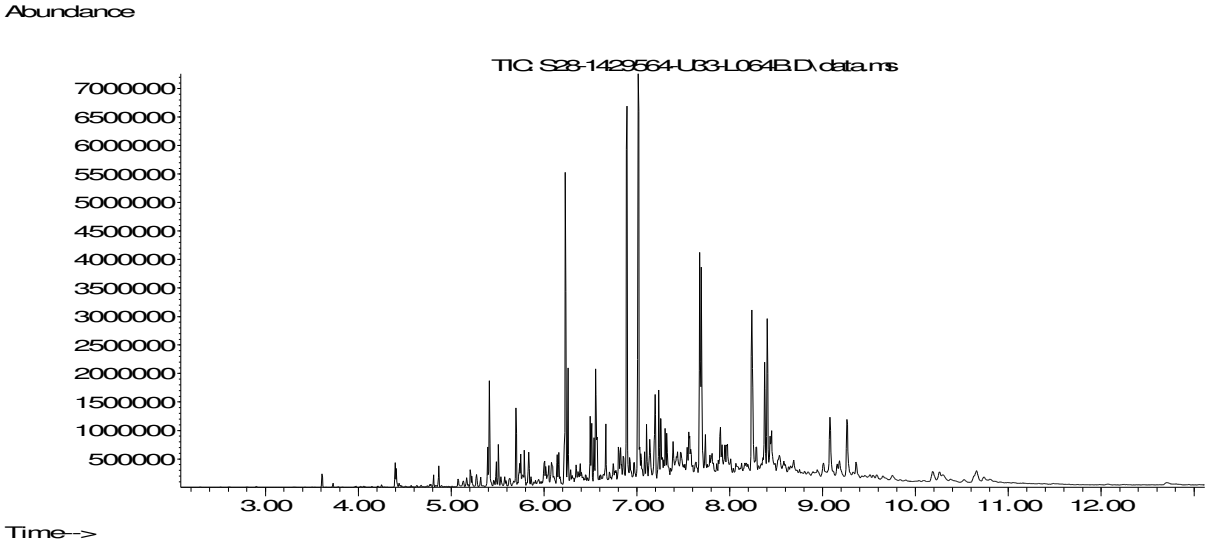
Project / Site name: Islington Wharf, Phase 4

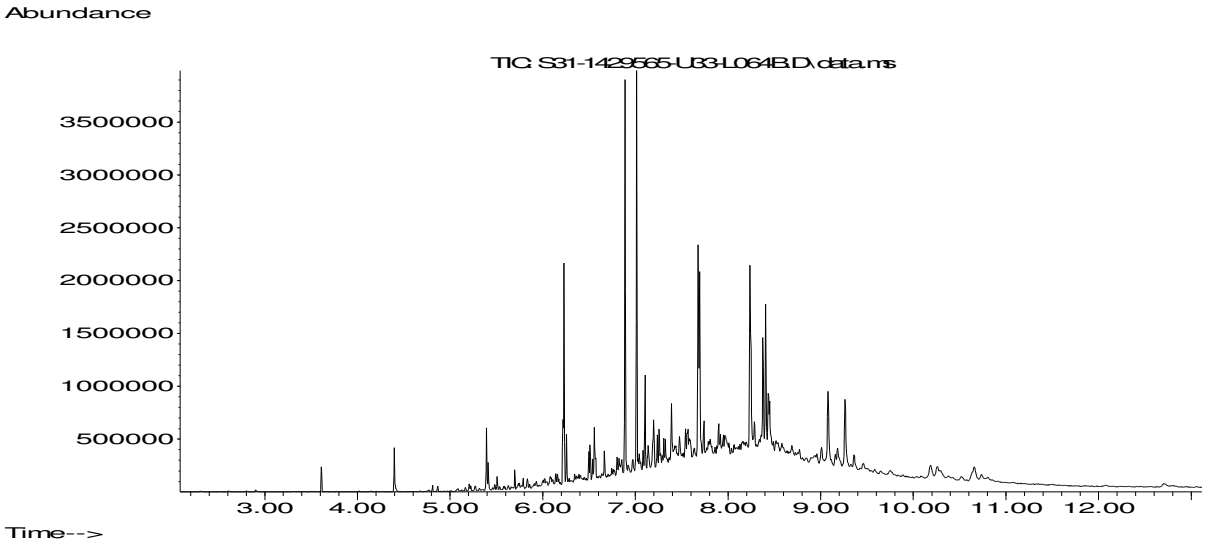
Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

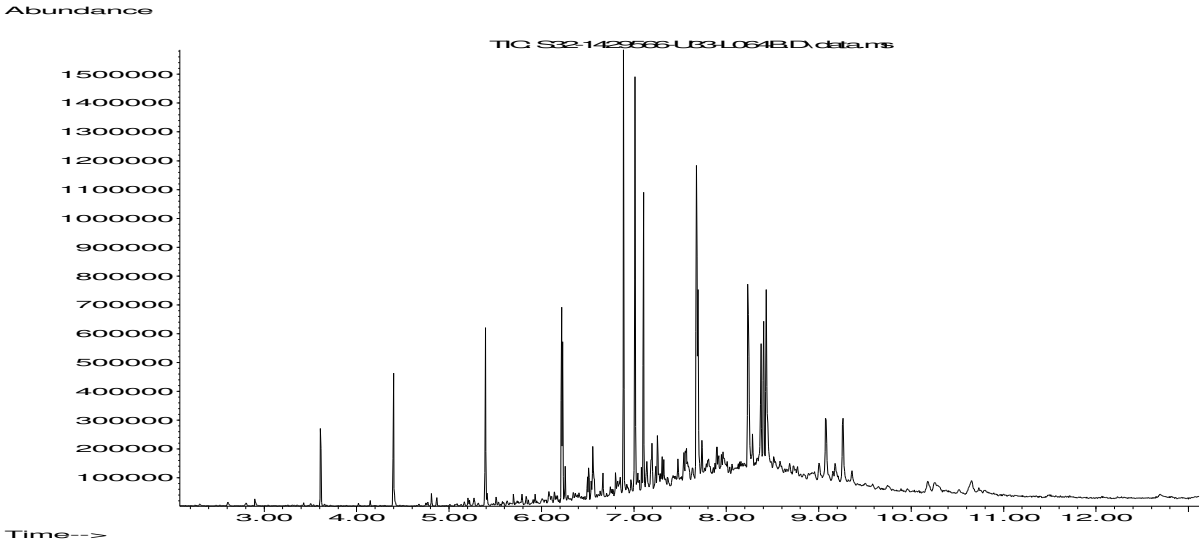
Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Tentatively identified compounds (SVOC) in soil	Determination of semi-volatile organic compounds total ion count in soil by extraction with dichloromethane and hexane followed by GC-MS followed by a full library scan.	In-house method based on USEPA 8270	L064-PL	D	NONE
Tentatively identified compounds (VOC) in soil	Determination of volatile organic compounds total ion count in soil by headspace GC-MS followed by a full library scan.	In-house method based on USEPA8260	L073-PL	W	NONE
TPH Chromatogram in Soil	TPH Chromatogram in Soil.	In-house method	L064-PL	D	NONE
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	NONE
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-PL	W	MCERTS
Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS

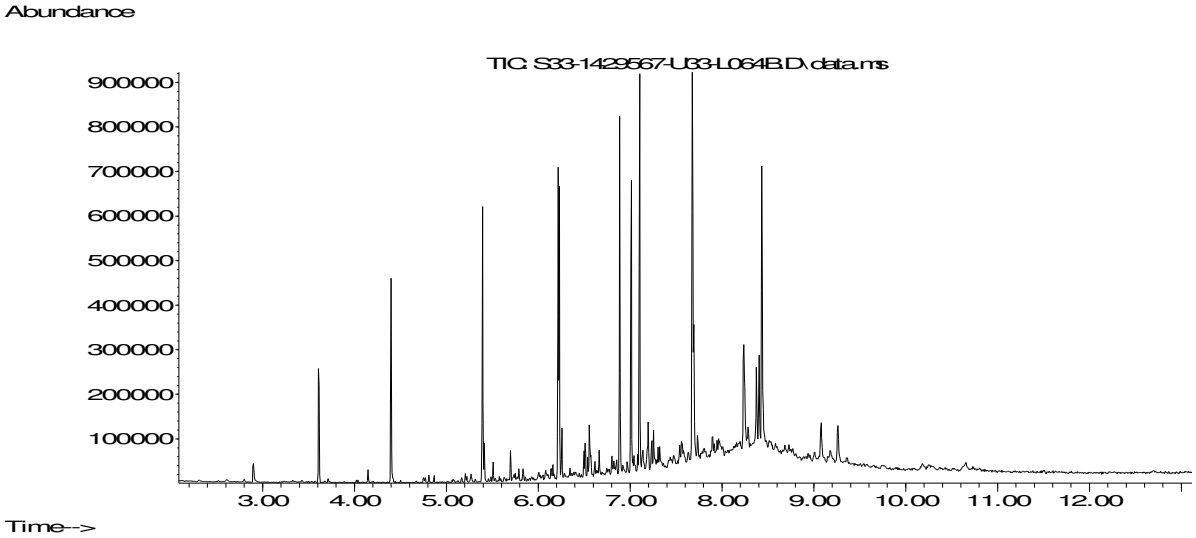
For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

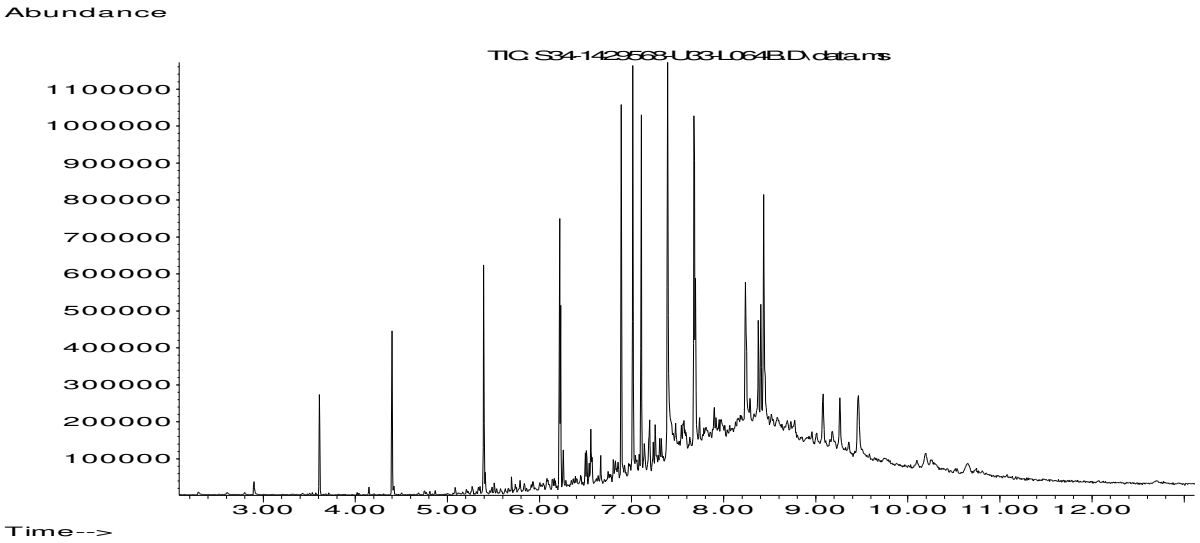
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Abundance
TIC: S28-1429564-UB3-L064B.D\data.ms
7000000
6500000
6000000
5500000
5000000
4500000
4000000
3500000
3000000
2500000
2000000
1500000
1000000
500000
3.00
4.00
5.00
6.00
7.00
8.00
9.00
10.00
11.00
12.00
Time-->


Abundance
TIC: S31-1429565-UB3-L064B.D\data.ms
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2000000
1500000
1000000
500000
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4.00
5.00
6.00
7.00
8.00
9.00
10.00
11.00
12.00
Time-->


Abundance
TIC: S32-1429666-UB3-L064B.D\data.ms
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1300000
1200000
1100000
1000000
900000
800000
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400000
300000
200000
100000
3.00
4.00
5.00
6.00
7.00
8.00
9.00
10.00
11.00
12.00
Time-->


Abundance
TIC: S33-1429567-U33-L064B.D\data.ms
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800000
700000
600000
500000
400000
300000
200000
100000
3.00
4.00
5.00
6.00
7.00
8.00
9.00
10.00
11.00
12.00
Time-->


Abundance
TIC: S34-1429568-U83-L064B.D\data.ms
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900000
800000
700000
600000
500000
400000
300000
200000
100000
3.00
4.00
5.00
6.00
7.00
8.00
9.00
10.00
11.00
12.00
Time-->

Jason Bradley
Hydrock Consultants Ltd
4 Lakeside
Festival Park
Stoke on Trent
ST1 5RY

t: 01782 261919
f: 01782 262020
e: stoke@hydrock.com

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 20-84973

Project / Site name:	Islington Wharf, Phase 4	**Samples received on:**	05/02/2020
Your job number:	C-10042-C	**Samples instructed on:**	05/02/2020
Your order number:	POP035118	**Analysis completed by:**	18/02/2020
Report Issue Number:	1	**Report issued on:**	18/02/2020
Samples Analysed:	1 10:1 WAC sample		

Signed:

Zina Abdul Razzak
Senior Quality Specialist

For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.

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i2 Analytical
7 Woodshots Meadow
Croxley Green Business Park
Watford, WD18 8YS

Telephone: 01923 225404
Fax: 01923 237404
email:reception@i2analytical.com

Waste Acceptance Criteria Analytical Results

Report No:	**20-84973**						
					Client:	**HYDROCK**	
Location	**Islington Wharf, Phase 4**						
Lab Reference (Sample Number)	1432697 / 1432698				**Landfill Waste Acceptance Criteria Limits**		
Sampling Date	29/01/2020				Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID	TP05 02						
Depth (m)	0.20-0.40						
Solid Waste Analysis							
TOC (%)**	2.7				3%	5%	6%
Loss on Ignition (%) **	10.1				--	--	10%
BTEX (µg/kg) **	< 10				6000	--	--
Sum of PCBs (mg/kg) **	< 0.007				1	--	--
Mineral Oil (mg/kg)	56				500	--	--
Total PAH (WAC-17) (mg/kg)	340				100	--	--
pH (units)**	7.2				--	>6	--
Acid Neutralisation Capacity (mol / kg)	2.7				--	To be evaluated	To be evaluated
Eluate Analysis (BS EN 12457 - 2 preparation utilising end over end leaching procedure)	10:1 mg/l			10:1 mg/kg	Limit values for compliance leaching test using BS EN 12457-2 at L/S 10 l/kg (mg/kg)		
Arsenic *	0.0047			0.0390	0.5	2	25
Barium *	0.0398			0.330	20	100	300
Cadmium *	< 0.0001			< 0.0008	0.04	1	5
Chromium *	< 0.0004			< 0.0040	0.5	10	70
Copper *	0.0022			0.018	2	50	100
Mercury *	< 0.0005			< 0.0050	0.01	0.2	2
Molybdenum *	0.0229			0.190	0.5	10	30
Nickel *	< 0.0003			< 0.0030	0.4	10	40
Lead *	< 0.0010			< 0.010	0.5	10	50
Antimony *	< 0.0017			< 0.017	0.06	0.7	5
Selenium *	< 0.0040			< 0.040	0.1	0.5	7
Zinc *	0.0027			0.023	4	50	200
Chloride *	2.0			17	800	15000	25000
Fluoride	0.82			6.8	10	150	500
Sulphate *	94			780	1000	20000	50000
TDS*	200			1700	4000	60000	100000
Phenol Index (Monohydric Phenols) *	< 0.010			< 0.10	1	-	-
DOC	3.97			32.9	500	800	1000
Leach Test Information							
Stone Content (%)	< 0.1						
Sample Mass (kg)	0.48						
Dry Matter (%)	82						
Moisture (%)	18						

Results are expressed on a dry weight basis, after correction for moisture content where applicable.
*= UKAS accredited (liquid eluate analysis only)
Stated limits are for guidance only and i2 cannot be held responsible for any discrepancies with current legislation
** = MCERTS accredited

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes as defined by the Waste (England and Wales) Regulations 2011 (as amended) and EA Guidance WM3.
This analysis is only applicable for landfill acceptance criteria (The Environmental Permitting (England and Wales) Regulations) and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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Analytical Report Number : 20-84973

Project / Site name: Islington Wharf, Phase 4

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

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

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1432697	TP05	02	0.20-0.40	Brown loam and clay with gravel and vegetation.

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Analytical Report Number : 20-84973

Project / Site name: Islington Wharf, Phase 4

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Acid neutralisation capacity of soil	Determination of acid neutralisation capacity by addition of acid or alkali followed by electronic probe.	In-house method based on Guidance an Sampling and Testing of Wastes to Meet Landfill Waste Acceptance""	L046-PL	W	NONE
BS EN 12457-2 (10:1) Leachate Prep	10:1 (as recieved, moisture adjusted) end over end extraction with water for 24 hours. Eluate filtered prior to analysis.	In-house method based on BSEN12457-2.	L043-PL	W	NONE
BTEX in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
Chloride 10:1 WAC	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260.	L082-PL	W	ISO 17025
Dissolved organic carbon 10:1 WAC	Determination of dissolved inorganic carbon in leachate by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE
Fluoride 10:1 WAC	Determination of fluoride in leachate by 1:1ratio with a buffer solution followed by Ion Selective Electrode.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Loss on ignition of soil @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace.	In house method.	L047-PL	D	MCERTS
Metals in leachate by ICP-OES	Determination of metals in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil""	L039-PL	W	ISO 17025
Mineral Oil (Soil) C10 - C40	Determination of mineral oil fraction extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L076-PL	D	NONE
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols 10:1 WAC	Determination of phenols in leachate by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080-PL	W	ISO 17025
PCB's By GC-MS in soil	Determination of PCB by extraction with acetone and hexane followed by GC-MS.	In-house method based on USEPA 8082	L027-PL	D	MCERTS
pH in soil	Determination of pH in soil by addition of water followed by electrometric measurement.	In house method.	L005-PL	W	MCERTS
Speciated WAC-17 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270. MCERTS accredited except Coronene.	L064-PL	D	NONE
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Sulphate 10:1 WAC	Determination of sulphate in leachate by ICP-OES	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil""	L039-PL	W	ISO 17025
Total dissolved solids 10:1 WAC	Determination of total dissolved solids in water by electrometric measurement.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L004-PL	W	ISO 17025

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Analytical Report Number : 20-84973

Project / Site name: Islington Wharf, Phase 4

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

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Jason Bradley
Hydrock Consultants Ltd
4 Lakeside
Festival Park
Stoke on Trent
ST1 5RY

t: 01782 261919
f: 01782 262020
e: stoke@hydrock.com

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 20-85123

Project / Site name:	Islington Wharf, Phase 4	**Samples received on:**	05/02/2020
Your job number:	C-10042-C	**Samples instructed on:**	05/02/2020
Your order number:	POP035118	**Analysis completed by:**	18/02/2020
Report Issue Number:	1	**Report issued on:**	18/02/2020
Samples Analysed:	4 water samples		

Signed:

Zina Abdul Razzak
Senior Quality Specialist

For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.

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Analytical Report Number: 20-85123

Project / Site name: Islington Wharf, Phase 4

Your Order No: POP035118

Lab Sample Number				1433605	1433606	1433607	1433608	
Sample Reference				BH01	BH02	BH03	BH04	
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	
Date Sampled				03/02/2020	03/02/2020	03/02/2020	03/02/2020	
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
General Inorganics								
pH	pH Units	N/A	ISO 17025	8.8	7.8	7.2	7.7	
Electrical Conductivity at 20 °C	µS/cm	10	ISO 17025	610	530	1000	1300	
Total Cyanide (Low Level 1 µg/l)	µg/l	1	ISO 17025	7.7	3.4	3.4	62	
Free Cyanide (Low Level 1 µg/l)	µg/l	1	ISO 17025	2	2	2	3	
Sulphate as SO_4	µg/l	45	ISO 17025	110000	41400	145000	495000	
Chloride	mg/l	0.15	ISO 17025	38	15	49	55	
Fluoride	µg/l	50	ISO 17025	420	76	90	350	
Ammoniacal Nitrogen as N	µg/l	15	ISO 17025	17000	82	1000	71	
Ammonia as NH_3	µg/l	15	ISO 17025	21000	99	1300	87	
Ammonium as NH_4	µg/l	15	ISO 17025	22000	100	1300	92	
Dissolved Organic Carbon (DOC)	mg/l	0.1	NONE	49.7	46.8	23.9	33.0	
Nitrate as N	mg/l	0.01	ISO 17025	0.64	1.31	0.85	6.30	
Nitrate as NO_3	mg/l	0.05	ISO 17025	2.83	5.81	3.79	27.9	
Nitrite as N	µg/l	1	ISO 17025	17	17	49	160	
Nitrite as NO_2	µg/l	5	ISO 17025	55	57	160	530	
Hardness - Total	mgCaCO3/l	1	ISO 17025	126	1690	410	479	
Bromate by IC	mg/l	0.002	NONE	< 0.002	< 0.002	< 0.002	< 0.002	
Total Phenols								
Total Phenols (monohydric)	µg/l	1	ISO 17025	65	11	4.5	2.9	
Speciated PAHs								
Naphthalene	µg/l	0.01	ISO 17025	< 0.01	0.93	< 0.01	< 0.01	
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	2.16	< 0.01	< 0.01	
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	1.69	< 0.01	< 0.01	
Fluorene	µg/l	0.01	ISO 17025	< 0.01	1.32	< 0.01	< 0.01	
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	15.8	< 0.01	< 0.01	
Anthracene	µg/l	0.01	ISO 17025	< 0.01	4.27	< 0.01	< 0.01	
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	42.0	< 0.01	< 0.01	
Pyrene	µg/l	0.01	ISO 17025	< 0.01	46.3	< 0.01	< 0.01	
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	23.1	< 0.01	< 0.01	
Chrysene	µg/l	0.01	ISO 17025	< 0.01	23.2	< 0.01	< 0.01	
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	29.7	< 0.01	< 0.01	
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	14.4	< 0.01	< 0.01	
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	27.1	< 0.01	< 0.01	
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	14.9	< 0.01	< 0.01	
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	3.32	< 0.01	< 0.01	
Benzo(ghi)perylene	µg/l	0.001	NONE	< 0.001	19	< 0.001	< 0.001	
PAH Sums								
Sum of Benzo(b)fluoranthene & Benzo(k)fluoranthene	µg/l	0.02	NONE	< 0.02	44	< 0.02	< 0.02	
Sum of Benzo(ghi)perylene & Indeno(1,2,3-cd)pyrene	µg/l	0.002	NONE	< 0.002	33.6	< 0.002	< 0.002	
Sum of Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(ghi)perylene & Indeno(1,2,3-cd)pyrene	µg/l	0.022	NONE	< 0.022	78	< 0.022	< 0.022	
Total PAH								
Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16	269	< 0.16	< 0.16	

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Analytical Report Number: 20-85123

Project / Site name: Islington Wharf, Phase 4

Your Order No: POP035118

Lab Sample Number				1433605	1433606	1433607	1433608	
Sample Reference				BH01	BH02	BH03	BH04	
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	
Date Sampled				03/02/2020	03/02/2020	03/02/2020	03/02/2020	
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Aluminium (dissolved)	mg/l	0.001	ISO 17025	0.101	13.6	0.0481	0.176	
Antimony (dissolved)	µg/l	0.4	ISO 17025	6.6	0.9	0.4	1.7	
Arsenic (dissolved)	µg/l	0.15	ISO 17025	5.30	11.0	0.41	1.05	
Barium (dissolved)	µg/l	0.06	ISO 17025	28	2100	44	130	
Boron (dissolved)	µg/l	10	ISO 17025	43	40	190	540	
Cadmium (dissolved)	µg/l	0.02	ISO 17025	0.03	3.0	0.17	0.03	
Calcium (dissolved)	mg/l	0.012	ISO 17025	44	640	130	160	
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0	< 5.0	< 5.0	
Chromium (III)	µg/l	1	NONE	3.0	12	< 1.0	1.1	
Chromium (dissolved)	µg/l	0.2	ISO 17025	3.0	12	0.6	1.1	
Cobalt (dissolved)	µg/l	0.2	ISO 17025	1.3	92	3.4	0.8	
Copper (dissolved)	µg/l	0.5	ISO 17025	9.0	180	6.1	4.6	
Iron (dissolved)	mg/l	0.004	ISO 17025	0.096	6.4	0.025	0.038	
Lead (dissolved)	µg/l	0.2	ISO 17025	4.3	1300	1.1	2.8	
Magnesium (dissolved)	mg/l	0.005	ISO 17025	4.1	24	23	16	
Manganese (dissolved)	µg/l	0.05	ISO 17025	48	15000	3700	99	
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05	< 0.05	< 0.05	< 0.05	
Nickel (dissolved)	µg/l	0.5	ISO 17025	3.4	140	8.6	3.1	
Selenium (dissolved)	µg/l	0.6	ISO 17025	9.1	7.0	< 0.6	68	
Silver (dissolved)	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
Sodium (dissolved)	mg/l	0.01	ISO 17025	29	64	27	76	
Tin (dissolved)	µg/l	0.2	ISO 17025	1.5	< 0.20	5.4	0.54	
Vanadium (dissolved)	µg/l	0.2	ISO 17025	13	170	< 0.2	1.0	
Zinc (dissolved)	µg/l	0.5	ISO 17025	7.7	390	38	10	
Monoaromatics & Oxygenates								
Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0	-	< 1.0	
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0	-	< 1.0	
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	-	< 1.0	
p & m-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	-	< 1.0	
o-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	-	< 1.0	
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0	-	< 1.0	
Petroleum Hydrocarbons								
TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0	< 1.0	-	< 1.0	
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0	-	< 1.0	
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0	-	< 1.0	
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10	< 10	-	< 10	
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10	< 10	-	< 10	
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10	< 10	-	< 10	
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10	< 10	-	< 10	
TPH-CWG - Aliphatic >C16 - C35	µg/l	10	NONE	< 10	< 10	-	< 10	
TPH-CWG - Aliphatic >C35 - C44	µg/l	10	NONE	< 10	< 10	-	< 10	
TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0	< 1.0	-	< 1.0	
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0	-	< 1.0	
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0	-	< 1.0	
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10	< 10	-	< 10	
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10	100	-	< 10	
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10	120	-	< 10	
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10	230	-	< 10	
TPH-CWG - Aromatic >C35 - C44	µg/l	10	NONE	< 10	< 10	-	< 10	

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Analytical Report Number: 20-85123

Project / Site name: Islington Wharf, Phase 4

Your Order No: POP035118

Lab Sample Number				1433605	1433606	1433607	1433608	
Sample Reference				BH01	BH02	BH03	BH04	
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	
Date Sampled				03/02/2020	03/02/2020	03/02/2020	03/02/2020	
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
VOCs								
Chloromethane	µg/l	1	ISO 17025	< 1.0	-	-	< 1.0	
Chloroethane	µg/l	1	ISO 17025	< 1.0	-	-	< 1.0	
Bromomethane	µg/l	1	ISO 17025	< 1.0	-	-	< 1.0	
Vinyl Chloride	µg/l	1	NONE	< 1.0	-	-	< 1.0	
Trichlorofluoromethane	µg/l	1	NONE	< 1.0	-	-	< 1.0	
1,1-Dichloroethene	µg/l	1	ISO 17025	< 1.0	-	-	< 1.0	
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	1	ISO 17025	< 1.0	-	-	< 1.0	
Cis-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	-	-	< 1.0	
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	-	-	< 1.0	
1,1-Dichloroethane	µg/l	1	ISO 17025	< 1.0	-	-	< 1.0	
2,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	-	-	< 1.0	
Trichloromethane	µg/l	1	ISO 17025	< 1.0	-	-	< 1.0	
1,1,1-Trichloroethane	µg/l	1	ISO 17025	< 1.0	-	-	< 1.0	
1,2-Dichloroethane	µg/l	1	ISO 17025	< 1.0	-	-	< 1.0	
1,1-Dichloropropene	µg/l	1	ISO 17025	< 1.0	-	-	< 1.0	
Trans-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	-	-	< 1.0	
Benzene	µg/l	1	ISO 17025	< 1.0	-	-	< 1.0	
Tetrachloromethane	µg/l	1	ISO 17025	< 1.0	-	-	< 1.0	
1,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	-	-	< 1.0	
Trichloroethene	µg/l	1	ISO 17025	< 1.0	-	-	< 1.0	
Dibromomethane	µg/l	1	ISO 17025	< 1.0	-	-	< 1.0	
Bromodichloromethane	µg/l	1	ISO 17025	< 1.0	-	-	< 1.0	
Cis-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	-	-	< 1.0	
Trans-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	-	-	< 1.0	
Toluene	µg/l	1	ISO 17025	< 1.0	-	-	< 1.0	
1,1,2-Trichloroethane	µg/l	1	ISO 17025	< 1.0	-	-	< 1.0	
1,3-Dichloropropane	µg/l	1	ISO 17025	< 1.0	-	-	< 1.0	
Dibromochloromethane	µg/l	1	ISO 17025	< 1.0	-	-	< 1.0	
Tetrachloroethene	µg/l	1	ISO 17025	< 1.0	-	-	< 1.0	
1,2-Dibromoethane	µg/l	1	ISO 17025	< 1.0	-	-	< 1.0	
Chlorobenzene	µg/l	1	ISO 17025	< 1.0	-	-	< 1.0	
1,1,1,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	-	-	< 1.0	
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	-	-	< 1.0	
p & m-Xylene	µg/l	1	ISO 17025	< 1.0	-	-	< 1.0	
Styrene	µg/l	1	ISO 17025	< 1.0	-	-	< 1.0	
Tribromomethane	µg/l	1	ISO 17025	< 1.0	-	-	< 1.0	
o-Xylene	µg/l	1	ISO 17025	< 1.0	-	-	< 1.0	
1,1,2,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	-	-	< 1.0	
Isopropylbenzene	µg/l	1	ISO 17025	< 1.0	-	-	< 1.0	
Bromobenzene	µg/l	1	ISO 17025	< 1.0	-	-	< 1.0	
n-Propylbenzene	µg/l	1	ISO 17025	< 1.0	-	-	< 1.0	
2-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	-	-	< 1.0	
4-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	-	-	< 1.0	
1,3,5-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	-	-	< 1.0	
tert-Butylbenzene	µg/l	1	ISO 17025	< 1.0	-	-	< 1.0	
1,2,4-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	-	-	< 1.0	
sec-Butylbenzene	µg/l	1	ISO 17025	< 1.0	-	-	< 1.0	
1,3-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	-	-	< 1.0	
p-Isopropyltoluene	µg/l	1	ISO 17025	< 1.0	-	-	< 1.0	
1,2-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	-	-	< 1.0	
1,4-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	-	-	< 1.0	
Butylbenzene	µg/l	1	ISO 17025	< 1.0	-	-	< 1.0	
1,2-Dibromo-3-chloropropane	µg/l	1	ISO 17025	< 1.0	-	-	< 1.0	
1,2,4-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	-	-	< 1.0	
Hexachlorobutadiene	µg/l	1	ISO 17025	< 1.0	-	-	< 1.0	
1,2,3-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	-	-	< 1.0	

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Analytical Report Number: 20-85123

Project / Site name: Islington Wharf, Phase 4

Your Order No: POP035118

Lab Sample Number				1433605	1433606	1433607	1433608	
Sample Reference				BH01	BH02	BH03	BH04	
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	
Date Sampled				03/02/2020	03/02/2020	03/02/2020	03/02/2020	
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
VOCs TICs								
VOCs TICs Compound Name		10	NONE	ND	-	-	ND	
VOC % Match	%	10	NONE	0	-	-	0	

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Analytical Report Number: 20-85123

Project / Site name: Islington Wharf, Phase 4

Your Order No: POP035118

Lab Sample Number				1433605	1433606	1433607	1433608	
Sample Reference				BH01	BH02	BH03	BH04	
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	
Date Sampled				03/02/2020	03/02/2020	03/02/2020	03/02/2020	
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
SVOCs								
Aniline	µg/l	0.05	NONE	< 0.05	-	-	< 0.05	
Phenol	µg/l	0.05	NONE	25	-	-	< 0.05	
2-Chlorophenol	µg/l	0.05	NONE	< 0.05	-	-	< 0.05	
Bis(2-chloroethyl)ether	µg/l	0.05	NONE	< 0.05	-	-	< 0.05	
1,3-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	-	-	< 0.05	
1,2-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	-	-	< 0.05	
1,4-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	-	-	< 0.05	
Bis(2-chloroisopropyl)ether	µg/l	0.05	NONE	< 0.05	-	-	< 0.05	
2-Methylphenol	µg/l	0.05	NONE	< 0.05	-	-	< 0.05	
Hexachloroethane	µg/l	0.05	NONE	< 0.05	-	-	< 0.05	
Nitrobenzene	µg/l	0.05	NONE	< 0.05	-	-	< 0.05	
4-Methylphenol	µg/l	0.05	NONE	64	-	-	< 0.05	
Isophorone	µg/l	0.05	NONE	< 0.05	-	-	< 0.05	
2-Nitrophenol	µg/l	0.05	NONE	< 0.05	-	-	< 0.05	
2,4-Dimethylphenol	µg/l	0.05	NONE	< 0.05	-	-	< 0.05	
Bis(2-chloroethoxy)methane	µg/l	0.05	NONE	< 0.05	-	-	< 0.05	
1,2,4-Trichlorobenzene	µg/l	0.05	NONE	< 0.05	-	-	< 0.05	
Naphthalene	µg/l	0.01	ISO 17025	< 0.01	-	-	< 0.01	
2,4-Dichlorophenol	µg/l	0.05	NONE	< 0.05	-	-	< 0.05	
4-Chloroaniline	µg/l	0.05	NONE	< 0.05	-	-	< 0.05	
Hexachlorobutadiene	µg/l	0.05	NONE	< 0.05	-	-	< 0.05	
4-Chloro-3-methylphenol	µg/l	0.05	NONE	< 0.05	-	-	< 0.05	
2,4,6-Trichlorophenol	µg/l	0.05	NONE	< 0.05	-	-	< 0.05	
2,4,5-Trichlorophenol	µg/l	0.05	NONE	< 0.05	-	-	< 0.05	
2-Methylnaphthalene	µg/l	0.05	NONE	< 0.05	-	-	< 0.05	
2-Chloronaphthalene	µg/l	0.05	NONE	< 0.05	-	-	< 0.05	
Dimethylphthalate	µg/l	0.05	NONE	< 0.05	-	-	< 0.05	
2,6-Dinitrotoluene	µg/l	0.05	NONE	< 0.05	-	-	< 0.05	
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	-	-	< 0.01	
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	-	-	< 0.01	
2,4-Dinitrotoluene	µg/l	0.05	NONE	< 0.05	-	-	< 0.05	
Dibenzofuran	µg/l	0.05	NONE	< 0.05	-	-	< 0.05	
4-Chlorophenyl phenyl ether	µg/l	0.05	NONE	< 0.05	-	-	< 0.05	
Diethyl phthalate	µg/l	0.05	NONE	< 0.05	-	-	< 0.05	
4-Nitroaniline	µg/l	0.05	NONE	< 0.05	-	-	< 0.05	
Fluorene	µg/l	0.01	ISO 17025	< 0.01	-	-	< 0.01	
Azobenzene	µg/l	0.05	NONE	< 0.05	-	-	< 0.05	
Bromophenyl phenyl ether	µg/l	0.05	NONE	< 0.05	-	-	< 0.05	
Hexachlorobenzene	µg/l	0.05	NONE	< 0.05	-	-	< 0.05	
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	-	-	< 0.01	
Anthracene	µg/l	0.01	ISO 17025	< 0.01	-	-	< 0.01	
Carbazole	µg/l	0.05	NONE	< 0.05	-	-	< 0.05	
Dibutyl phthalate	µg/l	0.05	NONE	< 0.05	-	-	< 0.05	
Anthraquinone	µg/l	0.05	NONE	< 0.05	-	-	< 0.05	
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	-	-	< 0.01	
Pyrene	µg/l	0.01	ISO 17025	< 0.01	-	-	< 0.01	
Butyl benzyl phthalate	µg/l	0.05	NONE	< 0.05	-	-	< 0.05	
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	-	-	< 0.01	
Chrysene	µg/l	0.01	ISO 17025	< 0.01	-	-	< 0.01	
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	-	-	< 0.01	
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	-	-	< 0.01	
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	-	-	< 0.01	
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	-	-	< 0.01	
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	-	-	< 0.01	
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	-	-	< 0.01	

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Analytical Report Number: 20-85123

Project / Site name: Islington Wharf, Phase 4

Your Order No: POP035118

Lab Sample Number				1433605	1433606	1433607	1433608	
Sample Reference				BH01	BH02	BH03	BH04	
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	
Date Sampled				03/02/2020	03/02/2020	03/02/2020	03/02/2020	
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
SVOCs TICs								
SVOCs TICs Compound Name		N/A	NONE	Caffeine	-	-	ND	
SVOC % Match	%	N/A	NONE	96	-	-	0	
SVOCs TICs Compound Name		N/A	NONE	Indole	-	-	-	
SVOC % Match	%	N/A	NONE	95	-	-	-	
SVOCs TICs Compound Name		N/A	NONE	Chloroxylenol	-	-	-	
SVOC % Match	%	N/A	NONE	94	-	-	-	
SVOCs TICs Compound Name		N/A	NONE	Cyclopentaneaceti c acid, 3-oxo-2-pentyl-, methyl ester	-	-	-	
SVOC % Match	%	N/A	NONE	94	-	-	-	
SVOCs TICs Compound Name		N/A	NONE	Benzyl Alcohol	-	-	-	
SVOC % Match	%	N/A	NONE	93	-	-	-	
SVOCs TICs Compound Name		N/A	NONE	Phenylethyl Alcohol	-	-	-	
SVOC % Match	%	N/A	NONE	93	-	-	-	
SVOCs TICs Compound Name		N/A	NONE	Pyridine, 2-(1-methyl-2-pyrrolidinyl)-	-	-	-	
SVOC % Match	%	N/A	NONE	93	-	-	-	
SVOCs TICs Compound Name		N/A	NONE	trans-2,3-Epoxydecane	-	-	-	
SVOC % Match	%	N/A	NONE	93	-	-	-	
SVOCs TICs Compound Name		N/A	NONE	Cyclohexanol, 5-methyl-2-(1-methylethyl)-, (1.alpha.,2.beta.,5.alpha.)-(.+/-.)-	-	-	-	
SVOC % Match	%	N/A	NONE	91	-	-	-	
SVOCs TICs Compound Name		N/A	NONE	3-Cyclohexene-1-methanol, .alpha.,.alpha.,4-trimethyl-, (S)-	-	-	-	
SVOC % Match	%	N/A	NONE	91	-	-	-	

U/S = Unsuitable Sample I/S = Insufficient Sample

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Analytical Report Number : 20-85123

Project / Site name: Islington Wharf, Phase 4

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Ammonia as NH3 in water	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the colorimetric salicylate/nitroprusside method. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Ammoniacal Nitrogen as N in water	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the discrete analyser (colorimetric) salicylate/nitroprusside method. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Ammonium as NH4 in water	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the colorimetric salicylate/nitroprusside method. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Boron in water	Determination of boron in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM	L039-PL	W	ISO 17025
Bromate in Water	Determination of bromate in waters based on ion chromatography. Accredited matrices GW, PW, SW.	In house method based on Standard Methods for the Analysis of Water and Waste Water, method 4500	L008-PL	W	NONE
BTEX and MTBE in water (Monoaromatics)	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Chloride in water	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260. Accredited matrices: SW, PW, GW.	L082-PL	W	ISO 17025
Cr (III) in water	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Dissolved Organic Carbon in water	Determination of dissolved inorganic carbon in water by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE
Electrical conductivity at 20oC of water	Determination of electrical conductivity in water by electrometric measurement. Accredited Matrices SW, GW, PW	In-house method	L031-PL	W	ISO 17025
Fluoride in water	Determination of fluoride in water by 1:1 ratio with a buffer solution followed by Ion Selective Electrode. Accredited matrices: SW, PW, GW.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Free cyanide (low level) in water	Determination of free cyanide by distillation followed by colorimetry.Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW.	L080-PL	W	ISO 17025
Low level total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Monohydric phenols in water - LOW LEVEL 1 ug/l	Determination of phenols in water by continuous flow analyser. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	ISO 17025

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Analytical Report Number : 20-85123

Project / Site name: Islington Wharf, Phase 4

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Nitrate as N in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewatern & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrate in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW	In-house method based on Examination of Water and Wastewatern & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrite as N in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Nitrite in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry).Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In house method.	L099-PL	W	ISO 17025
Semi-volatile organic compounds in water	Determination of semi-volatile organic compounds in leachate by extraction in dichloromethane followed by GC-MS.	In-house method based on USEPA 8270	L102B-PL	W	NONE
Speciated EPA-16 PAHs in water	Determination of PAH compounds in water by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards. Accredited matrices: SW PW GW	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
Speciated EPA-16 PAHs in water (LOW LEVEL Dets)	Determination of PAH compounds in water by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270 (low level)	L102B-PL	W	NONE
Specific PAH sums in water	Determination of PAH compounds in water by extraction in hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L070-PL	W	NONE
Sulphate in water	Determination of sulphate in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW, PrW.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Tentatively identified compounds (SVOC) in water	Determination of semi-volatile organic compounds total ion count in water by extraction with hexane followed by GC-MS followed by a full library scan.	In-house method based on USEPA 8270	L070-PL	W	NONE
Tentatively identified compounds (VOC) in water	Determination of volatile organic compounds total ion count in water by headspace GC-MS followed by a full library scan.	In-house method based on USEPA8260	L073B-PL	W	NONE
Total Hardness of water	Determination of hardness in waters by calculation from calcium and magnesium. Accredited Matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045-PL	W	ISO 17025
TPH Chromatogram in Water	TPH Chromatogram in Water.	In-house method	L070-PL	W	NONE
TPH in (Water)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding.	L070-PL	W	NONE
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-PL	W	NONE
Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025

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Analytical Report Number : 20-85123

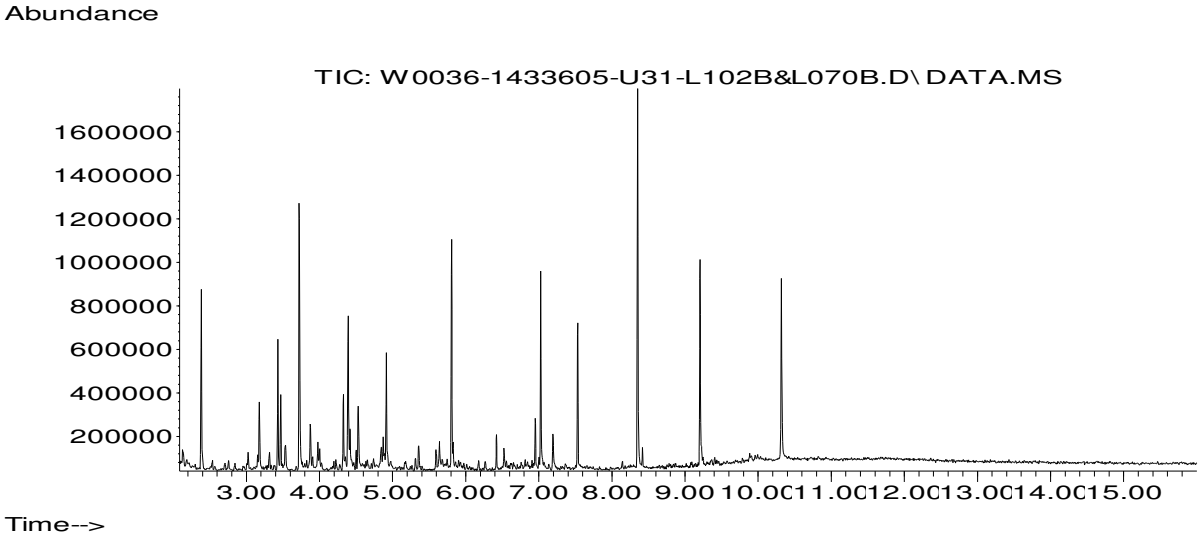
Project / Site name: Islington Wharf, Phase 4

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

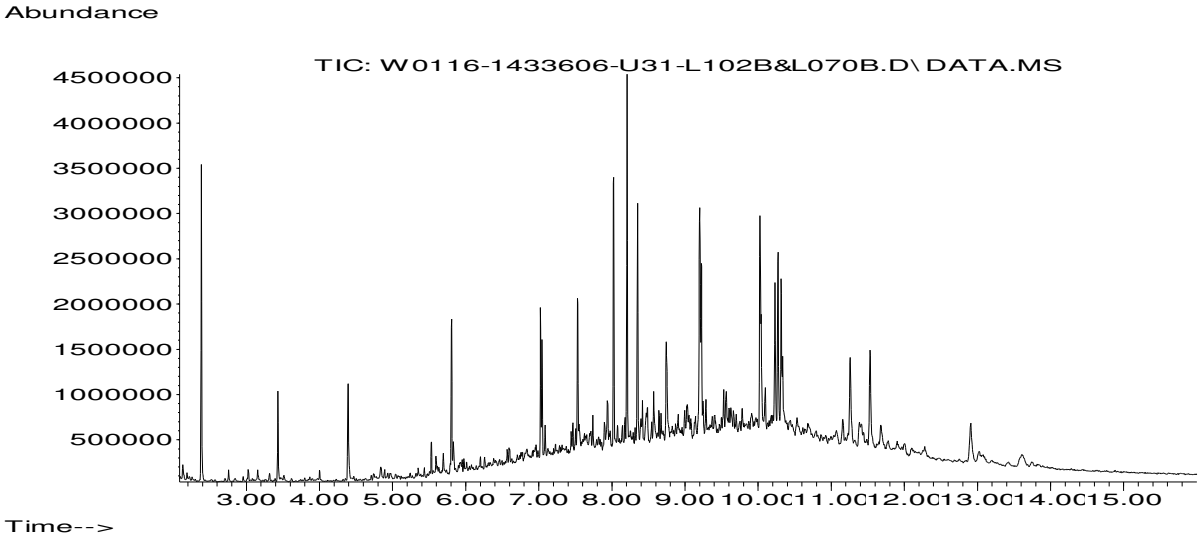
Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

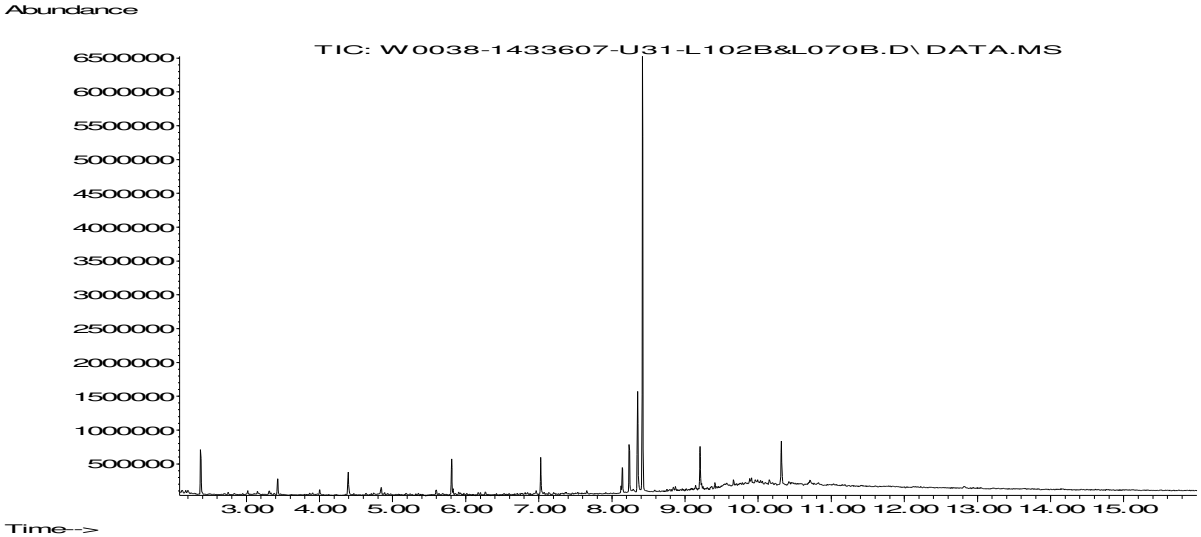
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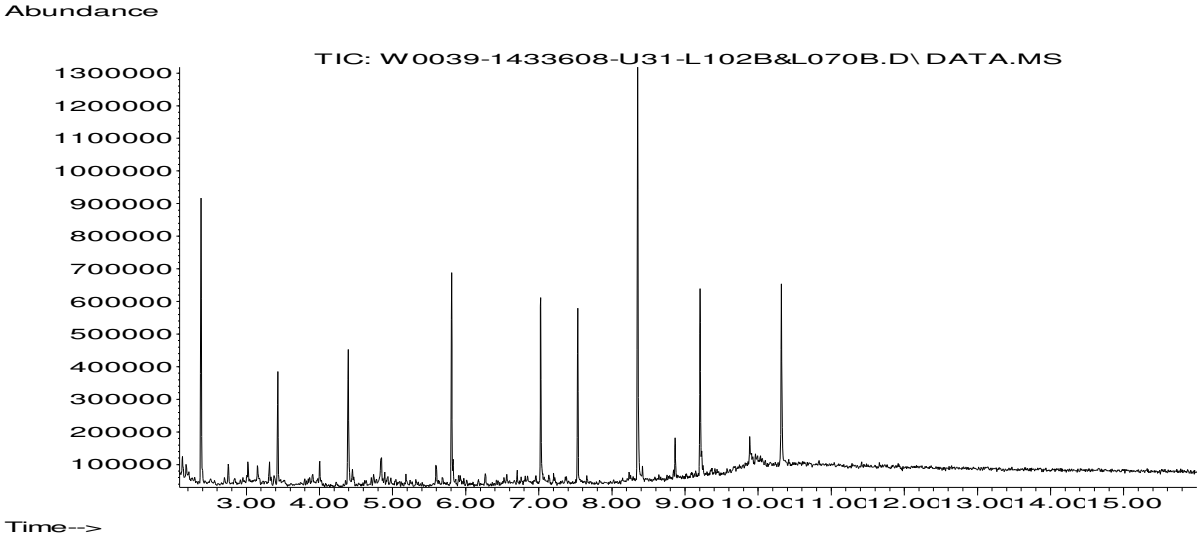
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Statistical Analysis

Assessment of Chemicals of Potential Concern to Human Health

All values in mg/kg unless otherwise stated

Chemical of Potential Concern	Lab. RL	No. Samples	Min. Value	Max. Value	No. Samples > or = GAC	GAC	US_{95}	Result of Significance Test	MG BH02 0.70	MG BH04 1.50-2.00	MG TP04 0.55												
Aliphatics EC5-EC6	0.001	3	0.001	0.001	0	42	0.001	#DIV/0!	0.001	0.001	0.001												
Aliphatics >EC6-EC8	0.001	3	0.001	0.001	0	100	0.001	#DIV/0!	0.001	0.001	0.001												
Aliphatics >EC8-EC10	0.001	3	0.001	0.001	0	27	0.001	#DIV/0!	0.001	0.001	0.001												
Aliphatics >EC10-EC12	1	3	1.7	7.4	0	48	12.58617	POTENTIALLY SUITABLE FOR USE	6.1	7.4	1.7												
Aliphatics >EC12-EC16	2	3	7.4	54	2	24	99.38857	FURTHER ASSESSMENT REQUIRED	54	47	7.4												
Aliphatics >EC16-EC35	10	3	47	624	0	65000	1056.622	POTENTIALLY SUITABLE FOR USE	624	319	47												
Aliphatics >EC35-EC44	8.4	3	8.4	170	0	65000	287.6633	POTENTIALLY SUITABLE FOR USE	170	46	8.4												
Aromatics EC5-EC7	0.001	3	0.001	0.001	0	73	0.001	#DIV/0!	0.001	0.001	0.001												
Aromatics >EC7-EC8	0.001	3	0.001	0.001	0	130	0.001	#DIV/0!	0.001	0.001	0.001												
Aromatics >EC8-EC10	0.001	3	0.001	0.001	0	35	0.001	#DIV/0!	0.001	0.001	0.001												
Aromatics >EC10-EC12	1	3	1	4.9	0	75	7.91347	POTENTIALLY SUITABLE FOR USE	1	3.1	4.9												
Aromatics >EC12-EC16	2	3	34	41	0	150	46.50695	POTENTIALLY SUITABLE FOR USE	34	41	38												
Aromatics >EC16-EC21	10	3	180	250	0	260	300.7606	FURTHER ASSESSMENT REQUIRED	200	250	180												
Aromatics >EC21-EC35	10	3	200	1300	1	1100	2097.726	FURTHER ASSESSMENT REQUIRED	1300	540	200												
Aromatics >EC35-EC44	8.4	3	8.4	770	0	1100	1322.254	FURTHER ASSESSMENT REQUIRED	770	240	8.4												

ADDITIVITY CHECK

HAZARD QUOTIENTS FOR EACH FRACTION

Aliphatics EC5-EC6	0.000	0.000	0.000	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Aliphatics >EC6-EC8	0.000	0.000	0.000	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Considered additive: Aliphatics >EC8-EC10	0.000	0.000	0.000	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Considered additive: Aliphatics >EC10-EC12	0.127	0.154	0.035	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Considered additive: Aliphatics >EC12-EC16	2.250	1.958	0.308	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Aliphatics >EC16-EC35	0.010	0.005	0.001	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Aliphatics >EC35-EC44	0.003	0.001	0.000	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Aromatics EC5-EC7	0.000	0.000	0.000	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Aromatics >EC7-EC8	0.000	0.000	0.000	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Considered additive: Aromatics >EC8-EC10	0.000	0.000	0.000	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Considered additive: Aromatics >EC10-EC12	0.013	0.041	0.065	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Considered additive: Aromatics >EC12-EC16	0.227	0.273	0.253	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Aromatics >EC16-EC21	0.769	0.962	0.692	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Considered additive: Aromatics >EC21-EC35	1.182	0.491	0.182	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Aromatics >EC35-EC44	0.700	0.218	0.008	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Hazard Index for ali>C8-C16	**2.377**	**2.113**	**0.344**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**
Hazard Index for aro>C8-C16	**0.240**	**0.315**	**0.319**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**
Hazard Index for aro>C16-C35	**1.951**	**1.452**	**0.874**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**

Hazard Index table - HI or HQ greater than 1 highlighted with yellow shading.

Risk parameter: **Human health - residential with plant uptake (1%SOM)**
Data set: TPH Level 2 - Made Ground
Client: Waterside Places
Site: Islington Wharf, Phase 4
Job no.: C-10042
Lab. report no(s).: 20-83860-1

Legend: Main table values in blue are at or below the laboratory reporting limit (where a single value is indicated) and are considered as being at the detection limit for the purposes of statistical analysis, as a conservative estimate.
Main table alues in red are equal to, or greater than, the generic assessment criterion (GAC).
MG denotes Made Ground
NAT denotes natural ground

Assessment of Chemicals of Potential Concern to Human Health

All values in mg/kg unless otherwise stated								Soil Type								
								Location & Depth								
Chemical of Potential Concern	**Lab. RL**	**No. Samples**	**Min. Value**	**Max. Value**	**No. Samples > or = GAC**	**GAC**	**US_{95}**	**Result of Significance Test**								
Aliphatics EC5-EC6	0.001	3	0.001	0.001	0	42	0.001	#DIV/0!								
Aliphatics >EC6-EC8	0.001	3	0.001	0.001	0	100	0.001	#DIV/0!								
Aliphatics >EC8-EC10	0.001	3	0.001	0.001	0	27	0.001	#DIV/0!								
Aliphatics >EC10-EC12	1	3	1.7	7.4	0	48	12.58617	POTENTIALLY SUITABLE FOR USE								
Aliphatics >EC12-EC16	2	3	7.4	54	2	24	99.38857	FURTHER ASSESSMENT REQUIRED								
Aliphatics >EC16-EC35	10	3	47	624	0	65000	1056.622	POTENTIALLY SUITABLE FOR USE								
Aliphatics >EC35-EC44	8.4	3	8.4	170	0	65000	287.6633	POTENTIALLY SUITABLE FOR USE								
Aromatics EC5-EC7	0.001	3	0.001	0.001	0	73	0.001	#DIV/0!								
Aromatics >EC7-EC8	0.001	3	0.001	0.001	0	130	0.001	#DIV/0!								
Aromatics >EC8-EC10	0.001	3	0.001	0.001	0	35	0.001	#DIV/0!								
Aromatics >EC10-EC12	1	3	1	4.9	0	75	7.91347	POTENTIALLY SUITABLE FOR USE								
Aromatics >EC12-EC16	2	3	34	41	0	150	46.50695	POTENTIALLY SUITABLE FOR USE								
Aromatics >EC16-EC21	10	3	180	250	0	260	300.7606	FURTHER ASSESSMENT REQUIRED								
Aromatics >EC21-EC35	10	3	200	1300	1	1100	2097.726	FURTHER ASSESSMENT REQUIRED								
Aromatics >EC35-EC44	8.4	3	8.4	770	0	1100	1322.254	FURTHER ASSESSMENT REQUIRED								
								ADDITIVITY CHECK								
								Aliphatics EC5-EC6	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
								Aliphatics >EC6-EC8	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
								Aliphatics >EC8-EC10	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
								Considered additive: Aliphatics >EC10-EC12	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
								Aliphatics >EC12-EC16	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
								Aliphatics >EC16-EC35	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
								Aliphatics >EC35-EC44	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
								Aromatics EC5-EC7	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
								Aromatics >EC7-EC8	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
								Aromatics >EC8-EC10	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
								Considered additive: Aromatics >EC10-EC12	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
								Aromatics >EC12-EC16	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
								Aromatics >EC16-EC21	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
								Considered additive: Aromatics >EC21-EC35	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
								Aromatics >EC35-EC44	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
								Hazard Index for ali>C8-C16	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**
								Hazard Index for aro>C8-C16	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**
								Hazard Index for aro>C16-C35	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**

Risk parameter: **Human health - residential with plant uptake (1%SOM)**
Data set: TPH Level 2 - Made Ground
Client: Waterside Places
Site: Islington Wharf, Phase 4
Job no.: C-10042
Lab. report no(s).: 20-83860-1

Assessment of Chemicals of Potential Concern to Human Health

All values in mg/kg unless otherwise stated

Chemical of Potential Concern	Lab. RL	No. Samples	Min. Value	Max. Value	No. Samples > or = GAC	GAC	US_{95}	Result of Significance Test	MG BH02 0.70	MG BH04 1.50-2.00	MG TP05 0.40	MG TP03 0.60	MG TP06 0.30	MG TP04 0.55	MG TP02 0.70-0.80	MG TP01 0.40	MG BH03 0.70-1.00	MG BH01 0.50-1.20
Arsenic	1	10	8.3	270	1	40	153.9711	FURTHER ASSESSMENT REQUIRED	8.7	22	32	24	8.3	24	270	26	10	13
Beryllium	0.06	10	0.59	2.1	0	73	2.050542	POTENTIALLY SUITABLE FOR USE	0.6	1	1.8	1.3	0.8	2.1	1.9	1.6	1.3	0.59
Boron	0.2	10	0.4	2.5	0	11000	2.224378	POTENTIALLY SUITABLE FOR USE	0.4	0.4	1.3	0.9	2.5	2.3	1.2	0.7	1.6	0.9
Cadmium	0.2	10	0.2	1.4	0	87	1.385366	POTENTIALLY SUITABLE FOR USE	1.3	1.4	1.3	0.6	0.4	0.2	0.2	0.9	0.2	0.7
Chromium (III)	1	10	20	100	0	890	65.34442	POTENTIALLY SUITABLE FOR USE	20	28	27	25	20	23	100	23	32	22
Chromium (VI)	1.2	10	1.2	1.2	0	6.1	1.2	POTENTIALLY SUITABLE FOR USE	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Copper	1	10	40	420	0	7300	296.1627	POTENTIALLY SUITABLE FOR USE	79	150	190	200	40	100	420	110	42	64
Lead	1	10	95	3400	6	310	2088.963	FURTHER ASSESSMENT REQUIRED	180	740	770	1000	100	220	3400	340	95	380
Mercury, inorganic	0.3	10	0.3	4	0	240	3.406029	POTENTIALLY SUITABLE FOR USE	0.3	1.5	2.6	4	0.3	0.9	3.4	1.4	0.3	0.3
Nickel	1	10	17	120	0	180	78.60253	POTENTIALLY SUITABLE FOR USE	19	26	34	32	18	38	120	34	33	17
Selenium	1	10	1	6.8	0	600	4.304934	POTENTIALLY SUITABLE FOR USE	1	1	1	1	1	1	6.8	1	2.7	1
Vanadium	1	10	20	68	0	1200	56.62036	POTENTIALLY SUITABLE FOR USE	27	32	45	36	23	42	68	47	32	20
Zinc	1	10	110	640	0	40000	588.6645	POTENTIALLY SUITABLE FOR USE	290	450	570	270	130	110	640	440	110	160
Cyanide (free)	1	10	1	1	0	800	1	#DIV/0!	1	1	1	1	1	1	1	1	1	1
Phenol (total)	1	10	1	1	0	1300	1	#DIV/0!	1	1	1	1	1	1	1	1	1	1
Acenaphthene	0.05	10	0.24	15	0	4700	9.023838	POTENTIALLY SUITABLE FOR USE	1.1	0.92	0.47	5.5	0.24	15	2.1	0.29	0.56	0.37
Acenaphthylene	0.05	10	0.05	0.66	0	4600	0.461901	POTENTIALLY SUITABLE FOR USE	0.05	0.48	0.05	0.66	0.05	0.05	0.05	0.05	0.05	0.05
Anthracene	0.05	10	0.51	13	0	35000	9.142353	POTENTIALLY SUITABLE FOR USE	1.6	2.3	0.9	9	0.51	13	3.1	0.79	0.68	0.63
Benz(a)anthracene	0.05	10	2.1	31	4	7.8	25.68113	FURTHER ASSESSMENT REQUIRED	4.6	16	4	27	2.1	31	14	5.1	2.3	3.4
Benzo(a)pyrene	0.05	10	1.7	26	10	1.6	21.02195	FURTHER ASSESSMENT REQUIRED	3.9	13	3.1	20	1.8	26	14	4.3	1.7	2.8
Benzo(b)fluoranthene	0.05	10	1.3	27	4	11	20.6867	FURTHER ASSESSMENT REQUIRED	5.4	16	4.3	27	2	16	12	3.9	1.3	2.7
Benzo(ghi)perylene	0.05	10	0.94	12	0	72	10.29498	POTENTIALLY SUITABLE FOR USE	2.2	7.1	1.7	9.5	0.94	12	8	2.7	1	1.7
Benzo(k)fluoranthene	0.05	10	0.9	21	1	16	13.1997	POTENTIALLY SUITABLE FOR USE	1.3	4.7	1.1	5.8	0.9	21	7.4	1.7	1.7	1.4
Chrysene	0.05	10	1.4	20	2	16	16.87254	FURTHER ASSESSMENT REQUIRED	3.4	11	2.6	17	1.4	20	11	3.8	1.7	2.6
Dibenz(a,h)anthracene	0.05	10	0.24	3.1	4	1.4	2.800206	FURTHER ASSESSMENT REQUIRED	0.58	2.2	0.52	2.9	0.26	3.1	1.7	0.57	0.24	0.38
Fluoranthene	0.05	10	3.8	53	0	1600	45.23367	POTENTIALLY SUITABLE FOR USE	10	25	7.2	53	3.8	51	24	8.4	4.1	5.4
Fluorene	0.05	10	0.05	12	0	3800	7.247035	POTENTIALLY SUITABLE FOR USE	0.88	0.99	0.29	4.6	0.05	12	1.4	0.22	0.51	0.31
Indeno(1,2,3,cd)pyrene	0.05	10	0.85	9.4	4	6.6	8.834536	FURTHER ASSESSMENT REQUIRED	1.9	6.6	1.6	9	0.85	9.4	6.7	2.3	0.85	1.3
Naphthalene	0.05	10	0.05	3.9	0	5.6	2.483578	POTENTIALLY SUITABLE FOR USE	0.89	0.37	0.05	1.7	0.05	3.9	0.78	0.39	0.22	0.05
Phenanthrene	0.05	10	1.8	41	0	1500	32.68818	POTENTIALLY SUITABLE FOR USE	6.5	10	3.7	38	1.8	41	13	3.1	3.6	2.8
Pyrene	0.05	10	3.7	53	0	3800	43.93141	POTENTIALLY SUITABLE FOR USE	9.5	26	7	48	3.7	53	21	7.7	3.8	5.4
Asbestos identified	Y/N								Y	N	N	Y	N	N	N	Y	N	N
FOC (dimensionless)	0.001	**(mean)**							0.023	0.03	0.04	0.032	0.0086	0.026	0.026	0.025	0.0094	0.01
SOM (calculated)	3.97%	**(mean)**							3.97%	5.17%	6.90%	5.52%	1.48%	4.48%	4.48%	4.31%	1.62%	1.72%
pH (su)	0.0	**(mean)**							9.7	9.2	8.3	7.9	9.4	7.8	8.1	8.3	8.7	10.3

Risk parameter: Human health - residential without plant uptake (2.5%SOM)
Data set: Hydrock suite - Made Ground
Client: Waterside Places
Site: Islington Wharf, Phase 4
Job no.: C-10042
Lab. report no(s).: 20-83860-1

Legend: Values in blue are at or below the laboratory reporting limit (where a single value is indicated) and are considered as being at the detection limit for the purposes of statistical analysis, as a conservative estimate.
Values in red are equal to, or greater than, the generic assessment criterion (GAC).
MG denotes Made Ground
NAT denotes natural ground

Assessment of Chemicals of Potential Concern to Human Health

All values in mg/kg unless otherwise stated								Soil Type									
								Location & Depth									
Chemical of Potential Concern	**Lab. RL**	**No. Samples**	**Min. Value**	**Max. Value**	**No. Samples > or = GAC**	**GAC**	**US_{95}**	**Result of Significance Test**									
Arsenic	1	10	8.3	270	1	40	153.9711	FURTHER ASSESSMENT REQUIRED									
Beryllium	0.06	10	0.59	2.1	0	73	2.050542	POTENTIALLY SUITABLE FOR USE									
Boron	0.2	10	0.4	2.5	0	11000	2.224378	POTENTIALLY SUITABLE FOR USE									
Cadmium	0.2	10	0.2	1.4	0	87	1.385366	POTENTIALLY SUITABLE FOR USE									
Chromium (III)	1	10	20	100	0	890	65.34442	POTENTIALLY SUITABLE FOR USE									
Chromium (VI)	1.2	10	1.2	1.2	0	6.1	1.2	POTENTIALLY SUITABLE FOR USE									
Copper	1	10	40	420	0	7300	296.1627	POTENTIALLY SUITABLE FOR USE									
Lead	1	10	95	3400	6	310	2088.963	FURTHER ASSESSMENT REQUIRED									
Mercury, inorganic	0.3	10	0.3	4	0	240	3.406029	POTENTIALLY SUITABLE FOR USE									
Nickel	1	10	17	120	0	180	78.60253	POTENTIALLY SUITABLE FOR USE									
Selenium	1	10	1	6.8	0	600	4.304934	POTENTIALLY SUITABLE FOR USE									
Vanadium	1	10	20	68	0	1200	56.62036	POTENTIALLY SUITABLE FOR USE									
Zinc	1	10	110	640	0	40000	588.6645	POTENTIALLY SUITABLE FOR USE									
Cyanide (free)	1	10	1	1	0	800	1	#DIV/0!									
Phenol (total)	1	10	1	1	0	1300	1	#DIV/0!									
Acenaphthene	0.05	10	0.24	15	0	4700	9.023838	POTENTIALLY SUITABLE FOR USE									
Acenaphthylene	0.05	10	0.05	0.66	0	4600	0.461901	POTENTIALLY SUITABLE FOR USE									
Anthracene	0.05	10	0.51	13	0	35000	9.142353	POTENTIALLY SUITABLE FOR USE									
Benz(a)anthracene	0.05	10	2.1	31	4	7.8	25.68113	FURTHER ASSESSMENT REQUIRED									
Benzo(a)pyrene	0.05	10	1.7	26	10	1.6	21.02195	FURTHER ASSESSMENT REQUIRED									
Benzo(b)fluoranthene	0.05	10	1.3	27	4	11	20.6867	FURTHER ASSESSMENT REQUIRED									
Benzo(ghi)perylene	0.05	10	0.94	12	0	72	10.29498	POTENTIALLY SUITABLE FOR USE									
Benzo(k)fluoranthene	0.05	10	0.9	21	1	16	13.1997	POTENTIALLY SUITABLE FOR USE									
Chrysene	0.05	10	1.4	20	2	16	16.87254	FURTHER ASSESSMENT REQUIRED									
Dibenz(a,h)anthracene	0.05	10	0.24	3.1	4	1.4	2.800206	FURTHER ASSESSMENT REQUIRED									
Fluoranthene	0.05	10	3.8	53	0	1600	45.23367	POTENTIALLY SUITABLE FOR USE									
Fluorene	0.05	10	0.05	12	0	3800	7.247035	POTENTIALLY SUITABLE FOR USE									
Indeno(1,2,3,cd)pyrene	0.05	10	0.85	9.4	4	6.6	8.834536	FURTHER ASSESSMENT REQUIRED									
Naphthalene	0.05	10	0.05	3.9	0	5.6	2.483578	POTENTIALLY SUITABLE FOR USE									
Phenanthrene	0.05	10	1.8	41	0	1500	32.68818	POTENTIALLY SUITABLE FOR USE									
Pyrene	0.05	10	3.7	53	0	3800	43.93141	POTENTIALLY SUITABLE FOR USE									
Asbestos identified	Y/N																
FOC (dimensionless)	0.001	**(mean)**															
SOM (calculated)	3.97%	**(mean)**															
pH (su)	0.0	**(mean)**															

Risk parameter: **Human health - residential without plant uptake (2.5%SOM)**
Data set: Hydrock suite - Made Ground
Client: Waterside Places
Site: Islington Wharf, Phase 4
Job no.: C-10042
Lab. report no(s).: 20-83860-1

Appendix G

Waste Assessment

HazWasteOnline™ Assessment

Hydrock

HazWasteOnline™

Waste Classification Report

CDNVZ-KVW9B-VS7ZX

Job name

C-10042

Description/Comments

Project

Islington Wharf Phase 4

Site

Manchester

Related Documents

#	Name	Description
None		

Waste Stream Template

Hydrock Standard plus Cresol (ammended Lead)

Classified by

Name:
Sarah Hey
Date:
04 Mar 2020 16:16 GMT
Telephone:
01454 619533

Company:
Hydrock Group Limited
Over Court Barns
Over Lane, Almondsbury
Bristol
BS32 4DF

HazWasteOnline™ Training Record:

Course	Date
Hazardous Waste Classification	07 Feb 2018
Advanced Hazardous Waste Classification	08 Feb 2018

Report

Created by: Sarah Hey
Created date: 04 Mar 2020 16:16 GMT

Job summary

#	Sample Name	Depth [m]	Classification Result	Hazard properties	Page
1	BH02	0.70	Hazardous	HP 3(i), HP 7, HP 11	3
2	BH04	1.50-2.00	Hazardous	HP 3(i), HP 7, HP 11	6
3	TP05	0.40	Non Hazardous		9
4	TP03	0.60	Non Hazardous		11
5	TP06	0.30	Non Hazardous		13
6	TP04	0.55	Non Hazardous		15
7	TP02	0.70-0.80	Hazardous	HP 10, HP 14	18
8	TP01	0.40	Non Hazardous		21
9	BH03	0.70-1.00	Non Hazardous		23
10	BH01	0.50-1.20	Non Hazardous		25

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Classification of sample: BH02

Hazardous Waste
Classified as **17 05 03 ***
in the List of Waste

Sample details

Sample Name:	LoW Code:	
BH02	Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:		
0.70 m	Entry:	17 05 03 * (Soil and stones containing hazardous substances)
Moisture content:		
9.8% (no correction)		

Hazard properties

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

Force this Hazardous property to hazardous because Samples that are not wet are unlikely to be hazardous.

Hazard Statements hit:

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

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.199%)

HP 7: Carcinogenic "waste which induces cancer or increases its incidence"

Hazard Statements hit:

Carc. 1B; H350 "May cause cancer [state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard]."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.199%)

HP 11: Mutagenic "waste which may cause a mutation, that is a permanent change in the amount or structure of the genetic material in a cell"

Hazard Statements hit:

Muta. 1B; H340 "May cause genetic defects [state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard]."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.199%)

Determinands

Moisture content: 9.8% No 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		acenaphthene		201-469-6	83-32-9		1.1 mg/kg		1.1 mg/kg	0.00011 %		
2		acenaphthylene		205-917-1	208-96-8		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		**<LOD**
3		anthracene		204-371-1	120-12-7		1.6 mg/kg		1.6 mg/kg	0.00016 %		

#		Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
4		arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		8.7	mg/kg	1.32	11.487	mg/kg	0.00115 %		
5		benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		4.6	mg/kg		4.6	mg/kg	0.00046 %		
6		benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		3.9	mg/kg		3.9	mg/kg	0.00039 %		
7		benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		5.4	mg/kg		5.4	mg/kg	0.00054 %		
8		benzo[ghi]perylene		205-883-8	191-24-2		2.2	mg/kg		2.2	mg/kg	0.00022 %		
9		benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		1.3	mg/kg		1.3	mg/kg	0.00013 %		
10		beryllium { beryllium oxide }	004-003-00-8	215-133-1	1304-56-9		0.6	mg/kg	2.775	1.665	mg/kg	0.000167 %		
11		boron { boron tribromide/trichloride/trifluoride (combined) }			10294-33-4, 10294-34-5, 7637-07-2		0.4	mg/kg	13.43	5.372	mg/kg	0.000537 %		
12		cadmium { cadmium sulfide }	048-010-00-4	215-147-8	1306-23-6	1	1.3	mg/kg	1.285	1.671	mg/kg	0.00013 %		
13		chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		20	mg/kg	1.462	29.231	mg/kg	0.00292 %		
14		chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<1.2	mg/kg	1.923	<2.308	mg/kg	<0.000231 %		<LOD
15		chrysene	601-048-00-0	205-923-4	218-01-9		3.4	mg/kg		3.4	mg/kg	0.00034 %		
16		copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		79	mg/kg	1.126	88.945	mg/kg	0.00889 %		
17		cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				<1	mg/kg	1.884	<1.884	mg/kg	<0.000188 %		<LOD
18		dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3		0.58	mg/kg		0.58	mg/kg	0.000058 %		
19		ethylbenzene	601-023-00-4	202-849-4	100-41-4		<0.001	mg/kg		<0.001	mg/kg	<0.0000001 %		<LOD
20		fluoranthene		205-912-4	206-44-0		10	mg/kg		10	mg/kg	0.001 %		
21		fluorene		201-695-5	86-73-7		0.88	mg/kg		0.88	mg/kg	0.000088 %		
22		indeno[123-cd]pyrene		205-893-2	193-39-5		1.9	mg/kg		1.9	mg/kg	0.00019 %		
23		lead { lead compounds with the exception of those specified elsewhere in this Annex }	082-001-00-6			1	180	mg/kg		180	mg/kg	0.018 %		
24		mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.3	mg/kg	1.353	<0.406	mg/kg	<0.0000406 %		<LOD
25		naphthalene	601-052-00-2	202-049-5	91-20-3		0.89	mg/kg		0.89	mg/kg	0.000089 %		
26		nickel { nickel dihydroxide }	028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]		19	mg/kg	1.579	30.01	mg/kg	0.003 %		
27		pH			PH		9.7	pH		9.7	pH	9.7 pH		
28		phenanthrene		201-581-5	85-01-8		6.5	mg/kg		6.5	mg/kg	0.00065 %		

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
29		phenol				<1	mg/kg		<1	mg/kg	<0.0001 %		<**LOD**
		604-001-00-2	203-632-7	108-95-2									
30		pyrene				9.5	mg/kg		9.5	mg/kg	0.00095 %		
			204-927-3	129-00-0									
31		toluene				<0.001	mg/kg		<0.001	mg/kg	<0.0000001 %		<**LOD**
		601-021-00-3	203-625-9	108-88-3									
32		TPH (C6 to C40) petroleum group				1989.1	mg/kg		1989.1	mg/kg	0.199 %		
				TPH									
33		zinc { zinc oxide }				290	mg/kg	1.245	360.967	mg/kg	0.0361 %		
		030-013-00-7	215-222-5	1314-13-2									
34		asbestos				10	mg/kg		10	mg/kg	0.001 %		
		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:	0.277 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Hazardous result
	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
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: BH04

Hazardous Waste
Classified as **17 05 03 ***
in the List of Waste

Sample details

Sample Name:
BH04
Sample Depth:
1.50-2.00 m
Moisture content:
18%
(no correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 03 * (Soil and stones containing hazardous substances)

Hazard properties

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

Force this Hazardous property to hazardous because Samples that are not wet are unlikely to be hazardous.

Hazard Statements hit:

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

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.149%)

HP 7: Carcinogenic "waste which induces cancer or increases its incidence"

Hazard Statements hit:

Carc. 1B; H350 "May cause cancer [state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard]."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.149%)

HP 11: Mutagenic "waste which may cause a mutation, that is a permanent change in the amount or structure of the genetic material in a cell"

Hazard Statements hit:

Muta. 1B; H340 "May cause genetic defects [state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard]."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.149%)

Determinands

Moisture content: 18% No 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		acenaphthene				0.92 mg/kg		0.92 mg/kg	0.000092 %		
			201-469-6	83-32-9							
2		acenaphthylene				0.48 mg/kg		0.48 mg/kg	0.000048 %		
			205-917-1	208-96-8							
3		anthracene				2.3 mg/kg		2.3 mg/kg	0.00023 %		
			204-371-1	120-12-7							

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
4		arsenic { arsenic trioxide }				22	mg/kg	1.32	29.047	mg/kg	0.0029 %		
		033-003-00-0	215-481-4	1327-53-3									
5		benzo[a]anthracene				16	mg/kg		16	mg/kg	0.0016 %		
		601-033-00-9	200-280-6	56-55-3									
6		benzo[a]pyrene; benzo[def]chrysene				13	mg/kg		13	mg/kg	0.0013 %		
		601-032-00-3	200-028-5	50-32-8									
7		benzo[b]fluoranthene				16	mg/kg		16	mg/kg	0.0016 %		
		601-034-00-4	205-911-9	205-99-2									
8		benzo[ghi]perylene				7.1	mg/kg		7.1	mg/kg	0.00071 %		
			205-883-8	191-24-2									
9		benzo[k]fluoranthene				4.7	mg/kg		4.7	mg/kg	0.00047 %		
		601-036-00-5	205-916-6	207-08-9									
10		beryllium { beryllium oxide }				1	mg/kg	2.775	2.775	mg/kg	0.000278 %		
		004-003-00-8	215-133-1	1304-56-9									
11		boron { boron tribromide/trichloride/trifluoride (combined) }				0.4	mg/kg	13.43	5.372	mg/kg	0.000537 %		
				10294-33-4, 10294-34-5, 7637-07-2									
12		cadmium { cadmium sulfide }			1	1.4	mg/kg	1.285	1.799	mg/kg	0.00014 %		
		048-010-00-4	215-147-8	1306-23-6									
13		chromium in chromium(III) compounds { chromium(III) oxide }				28	mg/kg	1.462	40.924	mg/kg	0.00409 %		
			215-160-9	1308-38-9									
14		chromium in chromium(VI) compounds { chromium(VI) oxide }				<1.2	mg/kg	1.923	<2.308	mg/kg	<0.000231 %		**<LOD**
		024-001-00-0	215-607-8	1333-82-0									
15		chrysene				11	mg/kg		11	mg/kg	0.0011 %		
		601-048-00-0	205-923-4	218-01-9									
16		copper { dicopper oxide; copper (I) oxide }				150	mg/kg	1.126	168.883	mg/kg	0.0169 %		
		029-002-00-X	215-270-7	1317-39-1									
17		cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }				<1	mg/kg	1.884	<1.884	mg/kg	<0.000188 %		**<LOD**
		006-007-00-5											
18		dibenz[a,h]anthracene				2.2	mg/kg		2.2	mg/kg	0.00022 %		
		601-041-00-2	200-181-8	53-70-3									
19		ethylbenzene				<0.001	mg/kg		<0.001	mg/kg	<0.0000001 %		**<LOD**
		601-023-00-4	202-849-4	100-41-4									
20		fluoranthene				25	mg/kg		25	mg/kg	0.0025 %		
			205-912-4	206-44-0									
21		fluorene				0.99	mg/kg		0.99	mg/kg	0.000099 %		
			201-695-5	86-73-7									
22		indeno[123-cd]pyrene				6.6	mg/kg		6.6	mg/kg	0.00066 %		
			205-893-2	193-39-5									
23		lead { lead compounds with the exception of those specified elsewhere in this Annex }			1	740	mg/kg		740	mg/kg	0.074 %		
		082-001-00-6											
24		mercury { mercury dichloride }				1.5	mg/kg	1.353	2.03	mg/kg	0.000203 %		
		080-010-00-X	231-299-8	7487-94-7									
25		naphthalene				0.37	mg/kg		0.37	mg/kg	0.000037 %		
		601-052-00-2	202-049-5	91-20-3									
26		nickel { nickel dihydroxide }				26	mg/kg	1.579	41.067	mg/kg	0.00411 %		
		028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]									
27		pH				9.2	pH		9.2	pH	9.2 pH		
				PH									
28		phenanthrene				10	mg/kg		10	mg/kg	0.001 %		
			201-581-5	85-01-8									

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
29		phenol				<1	mg/kg		<1	mg/kg	<0.0001 %		<**LOD**
		604-001-00-2	203-632-7	108-95-2									
30		pyrene				26	mg/kg		26	mg/kg	0.0026 %		
			204-927-3	129-00-0									
31		toluene				<0.001	mg/kg		<0.001	mg/kg	<0.0000001 %		<**LOD**
		601-021-00-3	203-625-9	108-88-3									
32		TPH (C6 to C40) petroleum group				1493.5	mg/kg		1493.5	mg/kg	0.149 %		
				TPH									
33		zinc { zinc oxide }				450	mg/kg	1.245	560.121	mg/kg	0.056 %		
		030-013-00-7	215-222-5	1314-13-2									
										Total:	0.323 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Hazardous result
	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
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP05

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

Sample details

Sample Name:
TP05
Sample Depth:
0.40 m
Moisture content:
26%
(no 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: 26% No 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		acenaphthene		201-469-6	83-32-9		0.47	mg/kg		0.47	mg/kg	0.000047 %		
2		acenaphthylene		205-917-1	208-96-8		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<**LOD**
3		anthracene		204-371-1	120-12-7		0.9	mg/kg		0.9	mg/kg	0.00009 %		
4		arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		32	mg/kg	1.32	42.25	mg/kg	0.00423 %		
5		benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		4	mg/kg		4	mg/kg	0.0004 %		
6		benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		3.1	mg/kg		3.1	mg/kg	0.00031 %		
7		benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		4.3	mg/kg		4.3	mg/kg	0.00043 %		
8		benzo[ghi]perylene		205-883-8	191-24-2		1.7	mg/kg		1.7	mg/kg	0.00017 %		
9		benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		1.1	mg/kg		1.1	mg/kg	0.00011 %		
10		beryllium { beryllium oxide }	004-003-00-8	215-133-1	1304-56-9		1.8	mg/kg	2.775	4.996	mg/kg	0.0005 %		
11		boron { boron tribromide/trichloride/trifluoride (combined) }			10294-33-4, 10294-34-5, 7637-07-2		1.3	mg/kg	13.43	17.459	mg/kg	0.00175 %		
12		cadmium { cadmium sulfide }	048-010-00-4	215-147-8	1306-23-6	1	1.3	mg/kg	1.285	1.671	mg/kg	0.00013 %		
13		chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		27	mg/kg	1.462	39.462	mg/kg	0.00395 %		

#		Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
14		chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<1.2	mg/kg	1.923	<2.308	mg/kg	<0.000231 %		<LOD
15		chrysene	601-048-00-0	205-923-4	218-01-9		2.6	mg/kg		2.6	mg/kg	0.00026 %		
16		copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		190	mg/kg	1.126	213.919	mg/kg	0.0214 %		
17		cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				<1	mg/kg	1.884	<1.884	mg/kg	<0.000188 %		<LOD
18		dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3		0.52	mg/kg		0.52	mg/kg	0.000052 %		
19		fluoranthene		205-912-4	206-44-0		7.2	mg/kg		7.2	mg/kg	0.00072 %		
20		fluorene		201-695-5	86-73-7		0.29	mg/kg		0.29	mg/kg	0.000029 %		
21		indeno[123-cd]pyrene		205-893-2	193-39-5		1.6	mg/kg		1.6	mg/kg	0.00016 %		
22		lead { lead compounds with the exception of those specified elsewhere in this Annex }	082-001-00-6			1	770	mg/kg		770	mg/kg	0.077 %		
23		mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		2.6	mg/kg	1.353	3.519	mg/kg	0.000352 %		
24		naphthalene	601-052-00-2	202-049-5	91-20-3		0.05	mg/kg		0.05	mg/kg	0.000005 %		
25		nickel { nickel dihydroxide }	028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]		34	mg/kg	1.579	53.703	mg/kg	0.00537 %		
26		pH			PH		8.3	pH		8.3	pH	8.3 pH		
27		phenanthrene		201-581-5	85-01-8		3.7	mg/kg		3.7	mg/kg	0.00037 %		
28		phenol	604-001-00-2	203-632-7	108-95-2		<1	mg/kg		<1	mg/kg	<0.0001 %		<LOD
29		pyrene		204-927-3	129-00-0		7	mg/kg		7	mg/kg	0.0007 %		
30		zinc { zinc oxide }	030-013-00-7	215-222-5	1314-13-2		570	mg/kg	1.245	709.487	mg/kg	0.0709 %		
											Total:	0.19 %		

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
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP03

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

Sample details

Sample Name:
TP03
Sample Depth:
0.60 m
Moisture content:
20%
(no 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: 20% No 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		acenaphthene		201-469-6	83-32-9		5.5	mg/kg		5.5	mg/kg	0.00055 %		
2		acenaphthylene		205-917-1	208-96-8		0.66	mg/kg		0.66	mg/kg	0.000066 %		
3		anthracene		204-371-1	120-12-7		9	mg/kg		9	mg/kg	0.0009 %		
4		arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		24	mg/kg	1.32	31.688	mg/kg	0.00317 %		
5		benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		27	mg/kg		27	mg/kg	0.0027 %		
6		benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		20	mg/kg		20	mg/kg	0.002 %		
7		benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		27	mg/kg		27	mg/kg	0.0027 %		
8		benzo[ghi]perylene		205-883-8	191-24-2		9.5	mg/kg		9.5	mg/kg	0.00095 %		
9		benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		5.8	mg/kg		5.8	mg/kg	0.00058 %		
10		beryllium { beryllium oxide }	004-003-00-8	215-133-1	1304-56-9		1.3	mg/kg	2.775	3.608	mg/kg	0.000361 %		
11		boron { boron tribromide/trichloride/trifluoride (combined) }			10294-33-4, 10294-34-5, 7637-07-2		0.9	mg/kg	13.43	12.087	mg/kg	0.00121 %		
12		cadmium { cadmium sulfide }	048-010-00-4	215-147-8	1306-23-6	1	0.6	mg/kg	1.285	0.771	mg/kg	0.00006 %		
13		chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		25	mg/kg	1.462	36.539	mg/kg	0.00365 %		

#		Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
14		chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<1.2	mg/kg	1.923	<2.308	mg/kg	<0.000231 %		<LOD
15		chrysene	601-048-00-0	205-923-4	218-01-9		17	mg/kg		17	mg/kg	0.0017 %		
16		copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		200	mg/kg	1.126	225.178	mg/kg	0.0225 %		
17		cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				<1	mg/kg	1.884	<1.884	mg/kg	<0.000188 %		<LOD
18		dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3		2.9	mg/kg		2.9	mg/kg	0.00029 %		
19		fluoranthene		205-912-4	206-44-0		53	mg/kg		53	mg/kg	0.0053 %		
20		fluorene		201-695-5	86-73-7		4.6	mg/kg		4.6	mg/kg	0.00046 %		
21		indeno[123-cd]pyrene		205-893-2	193-39-5		9	mg/kg		9	mg/kg	0.0009 %		
22		lead { lead compounds with the exception of those specified elsewhere in this Annex }	082-001-00-6			1	1000	mg/kg		1000	mg/kg	0.1 %		
23		mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		4	mg/kg	1.353	5.414	mg/kg	0.000541 %		
24		naphthalene	601-052-00-2	202-049-5	91-20-3		1.7	mg/kg		1.7	mg/kg	0.00017 %		
25		nickel { nickel dihydroxide }	028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]		32	mg/kg	1.579	50.544	mg/kg	0.00505 %		
26		pH			PH		7.9	pH		7.9	pH	7.9 pH		
27		phenanthrene		201-581-5	85-01-8		38	mg/kg		38	mg/kg	0.0038 %		
28		phenol	604-001-00-2	203-632-7	108-95-2		<1	mg/kg		<1	mg/kg	<0.0001 %		<LOD
29		pyrene		204-927-3	129-00-0		48	mg/kg		48	mg/kg	0.0048 %		
30		zinc { zinc oxide }	030-013-00-7	215-222-5	1314-13-2		270	mg/kg	1.245	336.073	mg/kg	0.0336 %		
31		asbestos	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		10	mg/kg		10	mg/kg	0.001 %		
											Total:	0.2 %		

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
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP06

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

Sample details

Sample Name:
TP06
Sample Depth:
0.30 m
Moisture content:
13%
(no 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% No 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	acenaphthene		201-469-6	83-32-9		0.24 mg/kg		0.24 mg/kg	0.000024 %		
2	acenaphthylene		205-917-1	208-96-8		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
3	anthracene		204-371-1	120-12-7		0.51 mg/kg		0.51 mg/kg	0.000051 %		
4	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		8.3 mg/kg	1.32	10.959 mg/kg	0.0011 %		
5	benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		2.1 mg/kg		2.1 mg/kg	0.00021 %		
6	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		1.8 mg/kg		1.8 mg/kg	0.00018 %		
7	benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		2 mg/kg		2 mg/kg	0.0002 %		
8	benzo[ghi]perylene		205-883-8	191-24-2		0.94 mg/kg		0.94 mg/kg	0.000094 %		
9	benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		0.9 mg/kg		0.9 mg/kg	0.00009 %		
10	beryllium { beryllium oxide }	004-003-00-8	215-133-1	1304-56-9		0.8 mg/kg	2.775	2.22 mg/kg	0.000222 %		
11	boron { boron tribromide/trichloride/trifluoride (combined) }			10294-33-4, 10294-34-5, 7637-07-2		2.5 mg/kg	13.43	33.575 mg/kg	0.00336 %		
12	cadmium { cadmium sulfide }	048-010-00-4	215-147-8	1306-23-6	1	0.4 mg/kg	1.285	0.514 mg/kg	0.00004 %		
13	chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		20 mg/kg	1.462	29.231 mg/kg	0.00292 %		

#		Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
14		chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<1.2	mg/kg	1.923	<2.308	mg/kg	<0.000231 %		<LOD
15		chrysene	601-048-00-0	205-923-4	218-01-9		1.4	mg/kg		1.4	mg/kg	0.00014 %		
16		copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		40	mg/kg	1.126	45.036	mg/kg	0.0045 %		
17		cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				<1	mg/kg	1.884	<1.884	mg/kg	<0.000188 %		<LOD
18		dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3		0.26	mg/kg		0.26	mg/kg	0.000026 %		
19		fluoranthene		205-912-4	206-44-0		3.8	mg/kg		3.8	mg/kg	0.00038 %		
20		fluorene		201-695-5	86-73-7		0.05	mg/kg		0.05	mg/kg	0.000005 %		
21		indeno[123-cd]pyrene		205-893-2	193-39-5		0.85	mg/kg		0.85	mg/kg	0.000085 %		
22		lead { lead compounds with the exception of those specified elsewhere in this Annex }	082-001-00-6			1	100	mg/kg		100	mg/kg	0.01 %		
23		mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.3	mg/kg	1.353	<0.406	mg/kg	<0.0000406 %		<LOD
24		naphthalene	601-052-00-2	202-049-5	91-20-3		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
25		nickel { nickel dihydroxide }	028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]		18	mg/kg	1.579	28.431	mg/kg	0.00284 %		
26		pH			PH		9.4	pH		9.4	pH	9.4 pH		
27		phenanthrene		201-581-5	85-01-8		1.8	mg/kg		1.8	mg/kg	0.00018 %		
28		phenol	604-001-00-2	203-632-7	108-95-2		<1	mg/kg		<1	mg/kg	<0.0001 %		<LOD
29		pyrene		204-927-3	129-00-0		3.7	mg/kg		3.7	mg/kg	0.00037 %		
30		zinc { zinc oxide }	030-013-00-7	215-222-5	1314-13-2		130	mg/kg	1.245	161.813	mg/kg	0.0162 %		
											Total:	0.0438 %		

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
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP04

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

Sample details

Sample Name:
TP04
Sample Depth:
0.55 m
Moisture content:
17%
(no 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: 17% No 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		acenaphthene		201-469-6	83-32-9		15	mg/kg		15	mg/kg	0.0015 %		
2		acenaphthylene		205-917-1	208-96-8		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<**LOD**
3		anthracene		204-371-1	120-12-7		13	mg/kg		13	mg/kg	0.0013 %		
4		arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		24	mg/kg	1.32	31.688	mg/kg	0.00317 %		
5		benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		31	mg/kg		31	mg/kg	0.0031 %		
6		benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		26	mg/kg		26	mg/kg	0.0026 %		
7		benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		16	mg/kg		16	mg/kg	0.0016 %		
8		benzo[ghi]perylene		205-883-8	191-24-2		12	mg/kg		12	mg/kg	0.0012 %		
9		benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		21	mg/kg		21	mg/kg	0.0021 %		
10		beryllium { beryllium oxide }	004-003-00-8	215-133-1	1304-56-9		2.1	mg/kg	2.775	5.828	mg/kg	0.000583 %		
11		boron { boron tribromide/trichloride/trifluoride (combined) }			10294-33-4, 10294-34-5, 7637-07-2		2.3	mg/kg	13.43	30.889	mg/kg	0.00309 %		
12		cadmium { cadmium sulfide }	048-010-00-4	215-147-8	1306-23-6	1	<0.2	mg/kg	1.285	<0.257	mg/kg	<0.00002 %		<**LOD**
13		chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		23	mg/kg	1.462	33.616	mg/kg	0.00336 %		

#		Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
14		chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<1.2	mg/kg	1.923	<2.308	mg/kg	<0.000231 %		<LOD
15		chrysene	601-048-00-0	205-923-4	218-01-9		20	mg/kg		20	mg/kg	0.002 %		
16		copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		100	mg/kg	1.126	112.589	mg/kg	0.0113 %		
17		cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				<1	mg/kg	1.884	<1.884	mg/kg	<0.000188 %		<LOD
18		dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3		3.1	mg/kg		3.1	mg/kg	0.00031 %		
19		ethylbenzene	601-023-00-4	202-849-4	100-41-4		<0.001	mg/kg		<0.001	mg/kg	<0.0000001 %		<LOD
20		fluoranthene		205-912-4	206-44-0		51	mg/kg		51	mg/kg	0.0051 %		
21		fluorene		201-695-5	86-73-7		12	mg/kg		12	mg/kg	0.0012 %		
22		indeno[123-cd]pyrene		205-893-2	193-39-5		9.4	mg/kg		9.4	mg/kg	0.00094 %		
23		lead { lead compounds with the exception of those specified elsewhere in this Annex }	082-001-00-6			1	220	mg/kg		220	mg/kg	0.022 %		
24		mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.9	mg/kg	1.353	1.218	mg/kg	0.000122 %		
25		naphthalene	601-052-00-2	202-049-5	91-20-3		3.9	mg/kg		3.9	mg/kg	0.00039 %		
26		nickel { nickel dihydroxide }	028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]		38	mg/kg	1.579	60.021	mg/kg	0.006 %		
27		pH			PH		7.8	pH		7.8	pH	7.8 pH		
28		phenanthrene		201-581-5	85-01-8		41	mg/kg		41	mg/kg	0.0041 %		
29		phenol	604-001-00-2	203-632-7	108-95-2		<1	mg/kg		<1	mg/kg	<0.0001 %		<LOD
30		pyrene		204-927-3	129-00-0		53	mg/kg		53	mg/kg	0.0053 %		
31		toluene	601-021-00-3	203-625-9	108-88-3		<0.001	mg/kg		<0.001	mg/kg	<0.0000001 %		<LOD
32		TPH (C6 to C40) petroleum group			TPH		495.8	mg/kg		495.8	mg/kg	0.0496 %		
33		zinc { zinc oxide }	030-013-00-7	215-222-5	1314-13-2		110	mg/kg	1.245	136.919	mg/kg	0.0137 %		
											Total:	0.146 %		

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
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

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

Force this Hazardous property to non hazardous because Samples that are not wet are unlikely to be hazardous.

Hazard Statements hit:

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

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.0496%)

Classification of sample: TP02

Hazardous Waste
Classified as **17 05 03 ***
in the List of Waste

Sample details

Sample Name:
TP02
Sample Depth:
0.70-0.80 m
Moisture content:
13%
(no correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 03 * (Soil and stones containing hazardous substances)

Hazard properties

HP 10: Toxic for reproduction "waste which has adverse effects on sexual function and fertility in adult males and females, as well as developmental toxicity in the offspring"

Hazard Statements hit:

Repr. 1A; H360Df "May damage the unborn child. Suspected of damaging fertility."

Because of determinand:

lead compounds with the exception of those specified elsewhere in this Annex: (Note 1 conc.: 0.34%)

HP 14: Ecotoxic "waste which presents or may present immediate or delayed risks for one or more sectors of the environment"

Hazard Statements hit:

Aquatic Chronic 1; H410 "Very toxic to aquatic life with long lasting effects."

Because of determinand:

lead compounds with the exception of those specified elsewhere in this Annex: (Note 1 conc.: 0.34%)

Determinands

Moisture content: 13% No 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	acenaphthene		201-469-6	83-32-9		2.1 mg/kg		2.1 mg/kg	0.00021 %		
2	acenaphthylene		205-917-1	208-96-8		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<**LOD**
3	anthracene		204-371-1	120-12-7		3.1 mg/kg		3.1 mg/kg	0.00031 %		
4	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		270 mg/kg	1.32	356.488 mg/kg	0.0356 %		
5	benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		14 mg/kg		14 mg/kg	0.0014 %		
6	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		14 mg/kg		14 mg/kg	0.0014 %		
7	benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		12 mg/kg		12 mg/kg	0.0012 %		
8	benzo[ghi]perylene		205-883-8	191-24-2		8 mg/kg		8 mg/kg	0.0008 %		
9	benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		7.4 mg/kg		7.4 mg/kg	0.00074 %		

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
10		beryllium { beryllium oxide }				1.9	mg/kg	2.775	5.273	mg/kg	0.000527 %		
		004-003-00-8	215-133-1	1304-56-9									
11		boron { boron tribromide/trichloride/trifluoride (combined) }				1.2	mg/kg	13.43	16.116	mg/kg	0.00161 %		
				10294-33-4, 10294-34-5, 7637-07-2									
12		cadmium { cadmium sulfide }			1	<0.2	mg/kg	1.285	<0.257	mg/kg	<0.00002 %		<**LOD**
		048-010-00-4	215-147-8	1306-23-6									
13		chromium in chromium(III) compounds { chromium(III) oxide }				100	mg/kg	1.462	146.156	mg/kg	0.0146 %		
			215-160-9	1308-38-9									
14		chromium in chromium(VI) compounds { chromium(VI) oxide }				<1.2	mg/kg	1.923	<2.308	mg/kg	<0.000231 %		<**LOD**
		024-001-00-0	215-607-8	1333-82-0									
15		chrysene				11	mg/kg		11	mg/kg	0.0011 %		
		601-048-00-0	205-923-4	218-01-9									
16		copper { dicopper oxide; copper (I) oxide }				420	mg/kg	1.126	472.873	mg/kg	0.0473 %		
		029-002-00-X	215-270-7	1317-39-1									
17		cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }				<1	mg/kg	1.884	<1.884	mg/kg	<0.000188 %		<**LOD**
		006-007-00-5											
18		dibenz[a,h]anthracene				1.7	mg/kg		1.7	mg/kg	0.00017 %		
		601-041-00-2	200-181-8	53-70-3									
19		fluoranthene				24	mg/kg		24	mg/kg	0.0024 %		
			205-912-4	206-44-0									
20		fluorene				1.4	mg/kg		1.4	mg/kg	0.00014 %		
			201-695-5	86-73-7									
21		indeno[123-cd]pyrene				6.7	mg/kg		6.7	mg/kg	0.00067 %		
			205-893-2	193-39-5									
22		lead { lead compounds with the exception of those specified elsewhere in this Annex }			1	3400	mg/kg		3400	mg/kg	0.34 %		
		082-001-00-6											
23		mercury { mercury dichloride }				3.4	mg/kg	1.353	4.602	mg/kg	0.00046 %		
		080-010-00-X	231-299-8	7487-94-7									
24		naphthalene				0.78	mg/kg		0.78	mg/kg	0.000078 %		
		601-052-00-2	202-049-5	91-20-3									
25		nickel { nickel dihydroxide }				120	mg/kg	1.579	189.54	mg/kg	0.019 %		
		028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]									
26		pH				8.1	pH		8.1	pH	8.1 pH		
				PH									
27		phenanthrene				13	mg/kg		13	mg/kg	0.0013 %		
			201-581-5	85-01-8									
28		phenol				<1	mg/kg		<1	mg/kg	<0.0001 %		<**LOD**
		604-001-00-2	203-632-7	108-95-2									
29		pyrene				21	mg/kg		21	mg/kg	0.0021 %		
			204-927-3	129-00-0									
30		zinc { zinc oxide }				640	mg/kg	1.245	796.617	mg/kg	0.0797 %		
		030-013-00-7	215-222-5	1314-13-2									
										Total:	0.553 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Hazardous result
	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
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP01

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

Sample details

Sample Name:
TP01
Sample Depth:
0.40 m
Moisture content:
17%
(no 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: 17% No 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		acenaphthene		201-469-6	83-32-9		0.29	mg/kg		0.29	mg/kg	0.000029 %		
2		acenaphthylene		205-917-1	208-96-8		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
3		anthracene		204-371-1	120-12-7		0.79	mg/kg		0.79	mg/kg	0.000079 %		
4		arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		26	mg/kg	1.32	34.328	mg/kg	0.00343 %		
5		benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		5.1	mg/kg		5.1	mg/kg	0.00051 %		
6		benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		4.3	mg/kg		4.3	mg/kg	0.00043 %		
7		benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		3.9	mg/kg		3.9	mg/kg	0.00039 %		
8		benzo[ghi]perylene		205-883-8	191-24-2		2.7	mg/kg		2.7	mg/kg	0.00027 %		
9		benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		1.7	mg/kg		1.7	mg/kg	0.00017 %		
10		beryllium { beryllium oxide }	004-003-00-8	215-133-1	1304-56-9		1.6	mg/kg	2.775	4.441	mg/kg	0.000444 %		
11		boron { boron tribromide/trichloride/trifluoride (combined) }			10294-33-4, 10294-34-5, 7637-07-2		0.7	mg/kg	13.43	9.401	mg/kg	0.00094 %		
12		cadmium { cadmium sulfide }	048-010-00-4	215-147-8	1306-23-6	1	0.9	mg/kg	1.285	1.157	mg/kg	0.00009 %		
13		chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		23	mg/kg	1.462	33.616	mg/kg	0.00336 %		

#		Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
14		chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<1.2	mg/kg	1.923	<2.308	mg/kg	<0.000231 %		<LOD
15		chrysene	601-048-00-0	205-923-4	218-01-9		3.8	mg/kg		3.8	mg/kg	0.00038 %		
16		copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		110	mg/kg	1.126	123.848	mg/kg	0.0124 %		
17		cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				<1	mg/kg	1.884	<1.884	mg/kg	<0.000188 %		<LOD
18		dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3		0.57	mg/kg		0.57	mg/kg	0.000057 %		
19		fluoranthene		205-912-4	206-44-0		8.4	mg/kg		8.4	mg/kg	0.00084 %		
20		fluorene		201-695-5	86-73-7		0.22	mg/kg		0.22	mg/kg	0.000022 %		
21		indeno[123-cd]pyrene		205-893-2	193-39-5		2.3	mg/kg		2.3	mg/kg	0.00023 %		
22		lead { lead compounds with the exception of those specified elsewhere in this Annex }	082-001-00-6			1	340	mg/kg		340	mg/kg	0.034 %		
23		mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		1.4	mg/kg	1.353	1.895	mg/kg	0.000189 %		
24		naphthalene	601-052-00-2	202-049-5	91-20-3		0.39	mg/kg		0.39	mg/kg	0.000039 %		
25		nickel { nickel dihydroxide }	028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]		34	mg/kg	1.579	53.703	mg/kg	0.00537 %		
26		pH			PH		8.3	pH		8.3	pH	8.3 pH		
27		phenanthrene		201-581-5	85-01-8		3.1	mg/kg		3.1	mg/kg	0.00031 %		
28		phenol	604-001-00-2	203-632-7	108-95-2		<1	mg/kg		<1	mg/kg	<0.0001 %		<LOD
29		pyrene		204-927-3	129-00-0		7.7	mg/kg		7.7	mg/kg	0.00077 %		
30		zinc { zinc oxide }	030-013-00-7	215-222-5	1314-13-2		440	mg/kg	1.245	547.674	mg/kg	0.0548 %		
31		asbestos	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		10	mg/kg		10	mg/kg	0.001 %		
											Total:	0.121 %		

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
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: BH03

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

Sample details

Sample Name:
BH03
Sample Depth:
0.70-1.00 m
Moisture content:
15%
(no 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% No 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		acenaphthene		201-469-6	83-32-9		0.56	mg/kg		0.56	mg/kg	0.000056 %		
2		acenaphthylene		205-917-1	208-96-8		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<**LOD**
3		anthracene		204-371-1	120-12-7		0.68	mg/kg		0.68	mg/kg	0.000068 %		
4		arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		10	mg/kg	1.32	13.203	mg/kg	0.00132 %		
5		benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		2.3	mg/kg		2.3	mg/kg	0.00023 %		
6		benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		1.7	mg/kg		1.7	mg/kg	0.00017 %		
7		benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		1.3	mg/kg		1.3	mg/kg	0.00013 %		
8		benzo[ghi]perylene		205-883-8	191-24-2		1	mg/kg		1	mg/kg	0.0001 %		
9		benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		1.7	mg/kg		1.7	mg/kg	0.00017 %		
10		beryllium { beryllium oxide }	004-003-00-8	215-133-1	1304-56-9		1.3	mg/kg	2.775	3.608	mg/kg	0.000361 %		
11		boron { boron tribromide/trichloride/trifluoride (combined) }			10294-33-4, 10294-34-5, 7637-07-2		1.6	mg/kg	13.43	21.488	mg/kg	0.00215 %		
12		cadmium { cadmium sulfide }	048-010-00-4	215-147-8	1306-23-6	1	<0.2	mg/kg	1.285	<0.257	mg/kg	<0.00002 %		<**LOD**
13		chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		32	mg/kg	1.462	46.77	mg/kg	0.00468 %		

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
14		chromium in chromium(VI) compounds { chromium(VI) oxide }				<1.2	mg/kg	1.923	<2.308	mg/kg	<0.000231 %		<LOD
		024-001-00-0	215-607-8	1333-82-0									
15		chrysene				1.7	mg/kg		1.7	mg/kg	0.00017 %		
		601-048-00-0	205-923-4	218-01-9									
16		copper { dicopper oxide; copper (I) oxide }				42	mg/kg	1.126	47.287	mg/kg	0.00473 %		
		029-002-00-X	215-270-7	1317-39-1									
17		cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }				<1	mg/kg	1.884	<1.884	mg/kg	<0.000188 %		<LOD
		006-007-00-5											
18		dibenz[a,h]anthracene				0.24	mg/kg		0.24	mg/kg	0.000024 %		
		601-041-00-2	200-181-8	53-70-3									
19		fluoranthene				4.1	mg/kg		4.1	mg/kg	0.00041 %		
			205-912-4	206-44-0									
20		fluorene				0.51	mg/kg		0.51	mg/kg	0.000051 %		
			201-695-5	86-73-7									
21		indeno[123-cd]pyrene				0.85	mg/kg		0.85	mg/kg	0.000085 %		
			205-893-2	193-39-5									
22		lead { lead compounds with the exception of those specified elsewhere in this Annex }			1	95	mg/kg		95	mg/kg	0.0095 %		
		082-001-00-6											
23		mercury { mercury dichloride }				<0.3	mg/kg	1.353	<0.406	mg/kg	<0.0000406 %		<LOD
		080-010-00-X	231-299-8	7487-94-7									
24		naphthalene				0.22	mg/kg		0.22	mg/kg	0.000022 %		
		601-052-00-2	202-049-5	91-20-3									
25		nickel { nickel dihydroxide }				33	mg/kg	1.579	52.123	mg/kg	0.00521 %		
		028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]									
26		pH				8.7	pH		8.7	pH	8.7 pH		
				PH									
27		phenanthrene				3.6	mg/kg		3.6	mg/kg	0.00036 %		
			201-581-5	85-01-8									
28		phenol				<1	mg/kg		<1	mg/kg	<0.0001 %		<LOD
		604-001-00-2	203-632-7	108-95-2									
29		pyrene				3.8	mg/kg		3.8	mg/kg	0.00038 %		
			204-927-3	129-00-0									
30		zinc { zinc oxide }				110	mg/kg	1.245	136.919	mg/kg	0.0137 %		
		030-013-00-7	215-222-5	1314-13-2									
										Total:	0.0447 %		

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
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: BH01

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

Sample details

Sample Name:
BH01
Sample Depth:
0.50-1.20 m
Moisture content:
9.7%
(no 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: 9.7% No 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		acenaphthene		201-469-6	83-32-9		0.37	mg/kg		0.37	mg/kg	0.000037 %		
2		acenaphthylene		205-917-1	208-96-8		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
3		anthracene		204-371-1	120-12-7		0.63	mg/kg		0.63	mg/kg	0.000063 %		
4		arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		13	mg/kg	1.32	17.164	mg/kg	0.00172 %		
5		benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		3.4	mg/kg		3.4	mg/kg	0.00034 %		
6		benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		2.8	mg/kg		2.8	mg/kg	0.00028 %		
7		benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		2.7	mg/kg		2.7	mg/kg	0.00027 %		
8		benzo[ghi]perylene		205-883-8	191-24-2		1.7	mg/kg		1.7	mg/kg	0.00017 %		
9		benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		1.4	mg/kg		1.4	mg/kg	0.00014 %		
10		beryllium { beryllium oxide }	004-003-00-8	215-133-1	1304-56-9		0.59	mg/kg	2.775	1.637	mg/kg	0.000164 %		
11		boron { boron tribromide/trichloride/trifluoride (combined) }			10294-33-4, 10294-34-5, 7637-07-2		0.9	mg/kg	13.43	12.087	mg/kg	0.00121 %		
12		cadmium { cadmium sulfide }	048-010-00-4	215-147-8	1306-23-6	1	0.7	mg/kg	1.285	0.9	mg/kg	0.00007 %		
13		chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		22	mg/kg	1.462	32.154	mg/kg	0.00322 %		

#		Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
14		chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<1.2	mg/kg	1.923	<2.308	mg/kg	<0.000231 %		<LOD
15		chrysene	601-048-00-0	205-923-4	218-01-9		2.6	mg/kg		2.6	mg/kg	0.00026 %		
16		copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		64	mg/kg	1.126	72.057	mg/kg	0.00721 %		
17		cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				<1	mg/kg	1.884	<1.884	mg/kg	<0.000188 %		<LOD
18		dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3		0.38	mg/kg		0.38	mg/kg	0.000038 %		
19		fluoranthene		205-912-4	206-44-0		5.4	mg/kg		5.4	mg/kg	0.00054 %		
20		fluorene		201-695-5	86-73-7		0.31	mg/kg		0.31	mg/kg	0.000031 %		
21		indeno[123-cd]pyrene		205-893-2	193-39-5		1.3	mg/kg		1.3	mg/kg	0.00013 %		
22		lead { lead compounds with the exception of those specified elsewhere in this Annex }	082-001-00-6			1	380	mg/kg		380	mg/kg	0.038 %		
23		mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.3	mg/kg	1.353	<0.406	mg/kg	<0.0000406 %		<LOD
24		naphthalene	601-052-00-2	202-049-5	91-20-3		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
25		nickel { nickel dihydroxide }	028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]		17	mg/kg	1.579	26.851	mg/kg	0.00269 %		
26		pH			PH		10.3	pH		10.3	pH	10.3 pH		
27		phenanthrene		201-581-5	85-01-8		2.8	mg/kg		2.8	mg/kg	0.00028 %		
28		phenol	604-001-00-2	203-632-7	108-95-2		<1	mg/kg		<1	mg/kg	<0.0001 %		<LOD
29		pyrene		204-927-3	129-00-0		5.4	mg/kg		5.4	mg/kg	0.00054 %		
30		zinc { zinc oxide }	030-013-00-7	215-222-5	1314-13-2		160	mg/kg	1.245	199.154	mg/kg	0.0199 %		
											Total:	0.0779 %		

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
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Appendix A: Classifier defined and non CLP determinands

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

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

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

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

boron tribromide/trichloride/trifluoride (combined) (CAS Number: 10294-33-4, 10294-34-5, 7637-07-2)

Conversion factor: 13.43
Description/Comments: Combines the hazard statements and the average of the conversion factors for boron tribromide, boron trichloride and boron trifluoride
Data source: N/A
Data source date: 06 Aug 2015
Hazard Statements: Skin Corr. 1B H314 , Skin Corr. 1A H314 , Acute Tox. 2 H300 , Acute Tox. 2 H330 , EUH014

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

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

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

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

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

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

lead compounds with the exception of those specified elsewhere in this Annex

CLP index number: 082-001-00-6
Description/Comments: Least-worst case: Lead REACH Consortium considers some lead compounds Carcinogenic category 2B
Data source: Regulation 1272/2008/EC - Classification, labelling and packaging of substances and mixtures. (CLP)
Additional Hazard Statement(s): Carc. 2 H351
Reason for additional Hazards Statement(s):
03 Jun 2015 - Carc. 2 H351 hazard statement sourced from: IARC Group 2A (Sup 7, 87) 2006; Lead REACH Consortium www.reach-lead.eu/substanceinformation.html. Review date 29/09/2015

pH (CAS Number: PH)

Description/Comments: Appendix C4
Data source: WM3 1st Edition 2015
Data source date: 25 May 2015
Hazard Statements: None.

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

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

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

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

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

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

Appendix B: Rationale for selection of metal species

arsenic {arsenic trioxide}

Worst case species based on hazard statements

beryllium {beryllium oxide}

Worst case species based on hazard statements

boron {boron tribromide/trichloride/trifluoride (combined)}

Worst case species based on hazard statements

cadmium {cadmium sulfide}

Worst case species based on hazard statements

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

Worst case species based on hazard statements

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

Worst case species based on hazard statements

copper {dicopper oxide; copper (I) oxide}

Most likely common species

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

Worst case species

lead {lead compounds with the exception of those specified elsewhere in this Annex}

Worst case species based on hazard statements

mercury {mercury dichloride}

Worst case species based on hazard statements

nickel {nickel dihydroxide}

Worst case species based on hazard statements

zinc {zinc oxide}

Worst case species based on hazard statements

Appendix C: Version

HazWasteOnline Classification Engine: WM3 1st Edition v1.1, May 2018
HazWasteOnline Classification Engine Version: 2020.52.4178.8324 (21 Feb 2020)
HazWasteOnline Database: 2020.52.4178.8324 (21 Feb 2020)

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

WAC Data

Jason Bradley
Hydrock Consultants Ltd
4 Lakeside
Festival Park
Stoke on Trent
ST1 5RY

t: 01782 261919
f: 01782 262020
e: JasonBradley@hydrock.com

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 20-83861

Project / Site name:	Islington Wharf, Phase 4	**Samples received on:**	29/01/2020
Your job number:	C-10042-C	**Samples instructed on:**	30/01/2020
Your order number:		**Analysis completed by:**	05/02/2020
Report Issue Number:	1	**Report issued on:**	05/02/2020
Samples Analysed:	10:1 WAC sample		

Signed: Karolina Marek

Karolina Marek
Technical Reviewer (Reporting Team)

For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.

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The results included within the report are representative of the samples submitted for analysis.

i2 Analytical
7 Woodshots Meadow
Croxley Green Business Park
Watford, WD18 8YS

Telephone: 01923 225404
Fax: 01923 237404
email:reception@i2analytical.com

Waste Acceptance Criteria Analytical Results

Report No:	**20-83861**						
					Client:	**HYDROCK**	
Location	**Islington Wharf, Phase 4**						
Lab Reference (Sample Number)	1426474 / 1426475				**Landfill Waste Acceptance Criteria Limits**		
Sampling Date	29/01/2020				Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID	BH04 01						
Depth (m)	0.50						
Solid Waste Analysis							
TOC (%)**	3.1				3%	5%	6%
Loss on Ignition (%) **	6.2				--	--	10%
BTEX (µg/kg) **	< 10				6000	--	--
Sum of PCBs (mg/kg) **	0.38				1	--	--
Mineral Oil (mg/kg)	460				500	--	--
Total PAH (WAC-17) (mg/kg)	1100				100	--	--
pH (units)**	9.1				--	>6	--
Acid Neutralisation Capacity (mol / kg)	15				--	To be evaluated	To be evaluated
Eluate Analysis	10:1			10:1	Limit values for compliance leaching test		
(BS EN 12457 - 2 preparation utilising end over end leaching procedure)	mg/l			mg/kg	using BS EN 12457-2 at L/S 10 l/kg (mg/kg)		
Arsenic *	0.149			1.29	0.5	2	25
Barium *	0.0246			0.213	20	100	300
Cadmium *	< 0.0001			< 0.0008	0.04	1	5
Chromium *	0.013			0.11	0.5	10	70
Copper *	0.044			0.38	2	50	100
Mercury *	< 0.0005			< 0.0050	0.01	0.2	2
Molybdenum *	0.127			1.10	0.5	10	30
Nickel *	0.0091			0.079	0.4	10	40
Lead *	0.0055			0.048	0.5	10	50
Antimony *	0.075			0.65	0.06	0.7	5
Selenium *	0.0072			0.062	0.1	0.5	7
Zinc *	0.0037			0.032	4	50	200
Chloride *	3.3			28	800	15000	25000
Fluoride	1.4			12	10	150	500
Sulphate *	110			960	1000	20000	50000
TDS*	200			1700	4000	60000	100000
Phenol Index (Monohydric Phenols) *	< 0.010			< 0.10	1	-	-
DOC	11.7			101	500	800	1000
Leach Test Information							
Stone Content (%)	< 0.1						
Sample Mass (kg)	0.53						
Dry Matter (%)	84						
Moisture (%)	16						

Results are expressed on a dry weight basis, after correction for moisture content where applicable.
*= UKAS accredited (liquid eluate analysis only)
Stated limits are for guidance only and i2 cannot be held responsible for any discrepancies with current legislation
** = MCERTS accredited

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes as defined by the Waste (England and Wales) Regulations 2011 (as amended) and EA Guidance WM3.
This analysis is only applicable for landfill acceptance criteria (The Environmental Permitting (England and Wales) Regulations) and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number : 20-83861

Project / Site name: Islington Wharf, Phase 4

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

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

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1426474	BH04	01	0.50	Brown clay and sand with gravel.

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Analytical Report Number : 20-83861

Project / Site name: Islington Wharf, Phase 4

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Acid neutralisation capacity of soil	Determination of acid neutralisation capacity by addition of acid or alkali followed by electronic probe.	In-house method based on Guidance an Sampling and Testing of Wastes to Meet Landfill Waste Acceptance""	L046-PL	W	NONE
BS EN 12457-2 (10:1) Leachate Prep	10:1 (as recieved, moisture adjusted) end over end extraction with water for 24 hours. Eluate filtered prior to analysis.	In-house method based on BSEN12457-2.	L043-PL	W	NONE
BTEX in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
Chloride 10:1 WAC	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260.	L082-PL	W	ISO 17025
Dissolved organic carbon 10:1 WAC	Determination of dissolved inorganic carbon in leachate by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE
Fluoride 10:1 WAC	Determination of fluoride in leachate by 1:1ratio with a buffer solution followed by Ion Selective Electrode.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Loss on ignition of soil @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace.	In house method.	L047-PL	D	MCERTS
Metals in leachate by ICP-OES	Determination of metals in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil""	L039-PL	W	ISO 17025
Mineral Oil (Soil) C10 - C40	Determination of mineral oil fraction extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L076-PL	D	NONE
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols 10:1 WAC	Determination of phenols in leachate by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080-PL	W	ISO 17025
PCB's By GC-MS in soil	Determination of PCB by extraction with acetone and hexane followed by GC-MS.	In-house method based on USEPA 8082	L027-PL	D	MCERTS
pH in soil	Determination of pH in soil by addition of water followed by electrometric measurement.	In house method.	L005-PL	W	MCERTS
Speciated WAC-17 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270. MCERTS accredited except Coronene.	L064-PL	D	NONE
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Sulphate 10:1 WAC	Determination of sulphate in leachate by ICP-OES	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil""	L039-PL	W	ISO 17025
Total dissolved solids 10:1 WAC	Determination of total dissolved solids in water by electrometric measurement.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L004-PL	W	ISO 17025

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Analytical Report Number : 20-83861

Project / Site name: Islington Wharf, Phase 4

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

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Jason Bradley
Hydrock Consultants Ltd
4 Lakeside
Festival Park
Stoke on Trent
ST1 5RY

t: 01782 261919
f: 01782 262020
e: stoke@hydrock.com

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 20-84973

Project / Site name:	Islington Wharf, Phase 4	**Samples received on:**	05/02/2020
Your job number:	C-10042-C	**Samples instructed on:**	05/02/2020
Your order number:	POP035118	**Analysis completed by:**	18/02/2020
Report Issue Number:	1	**Report issued on:**	18/02/2020
Samples Analysed:	1 10:1 WAC sample		

Signed:

Zina Abdul Razzak
Senior Quality Specialist

For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.

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i2 Analytical
7 Woodshots Meadow
Croxley Green Business Park
Watford, WD18 8YS

Telephone: 01923 225404
Fax: 01923 237404
email:reception@i2analytical.com

Waste Acceptance Criteria Analytical Results

Report No:	**20-84973**						
					Client:	**HYDROCK**	
Location	**Islington Wharf, Phase 4**						
Lab Reference (Sample Number)	1432697 / 1432698				**Landfill Waste Acceptance Criteria Limits**		
Sampling Date	29/01/2020				Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID	TP05 02						
Depth (m)	0.20-0.40						
Solid Waste Analysis							
TOC (%)**	2.7				3%	5%	6%
Loss on Ignition (%) **	10.1				--	--	10%
BTEX (µg/kg) **	< 10				6000	--	--
Sum of PCBs (mg/kg) **	< 0.007				1	--	--
Mineral Oil (mg/kg)	56				500	--	--
Total PAH (WAC-17) (mg/kg)	340				100	--	--
pH (units)**	7.2				--	>6	--
Acid Neutralisation Capacity (mol / kg)	2.7				--	To be evaluated	To be evaluated
Eluate Analysis (BS EN 12457 - 2 preparation utilising end over end leaching procedure)	10:1 mg/l			10:1 mg/kg	Limit values for compliance leaching test using BS EN 12457-2 at L/S 10 l/kg (mg/kg)		
Arsenic *	0.0047			0.0390	0.5	2	25
Barium *	0.0398			0.330	20	100	300
Cadmium *	< 0.0001			< 0.0008	0.04	1	5
Chromium *	< 0.0004			< 0.0040	0.5	10	70
Copper *	0.0022			0.018	2	50	100
Mercury *	< 0.0005			< 0.0050	0.01	0.2	2
Molybdenum *	0.0229			0.190	0.5	10	30
Nickel *	< 0.0003			< 0.0030	0.4	10	40
Lead *	< 0.0010			< 0.010	0.5	10	50
Antimony *	< 0.0017			< 0.017	0.06	0.7	5
Selenium *	< 0.0040			< 0.040	0.1	0.5	7
Zinc *	0.0027			0.023	4	50	200
Chloride *	2.0			17	800	15000	25000
Fluoride	0.82			6.8	10	150	500
Sulphate *	94			780	1000	20000	50000
TDS*	200			1700	4000	60000	100000
Phenol Index (Monohydric Phenols) *	< 0.010			< 0.10	1	-	-
DOC	3.97			32.9	500	800	1000
Leach Test Information							
Stone Content (%)	< 0.1						
Sample Mass (kg)	0.48						
Dry Matter (%)	82						
Moisture (%)	18						

Results are expressed on a dry weight basis, after correction for moisture content where applicable.
*= UKAS accredited (liquid eluate analysis only)
Stated limits are for guidance only and i2 cannot be held responsible for any discrepancies with current legislation
** = MCERTS accredited

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes as defined by the Waste (England and Wales) Regulations 2011 (as amended) and EA Guidance WM3.
This analysis is only applicable for landfill acceptance criteria (The Environmental Permitting (England and Wales) Regulations) and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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Analytical Report Number : 20-84973

Project / Site name: Islington Wharf, Phase 4

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

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

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1432697	TP05	02	0.20-0.40	Brown loam and clay with gravel and vegetation.

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Analytical Report Number : 20-84973

Project / Site name: Islington Wharf, Phase 4

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Acid neutralisation capacity of soil	Determination of acid neutralisation capacity by addition of acid or alkali followed by electronic probe.	In-house method based on Guidance an Sampling and Testing of Wastes to Meet Landfill Waste Acceptance""	L046-PL	W	NONE
BS EN 12457-2 (10:1) Leachate Prep	10:1 (as recieved, moisture adjusted) end over end extraction with water for 24 hours. Eluate filtered prior to analysis.	In-house method based on BSEN12457-2.	L043-PL	W	NONE
BTEX in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
Chloride 10:1 WAC	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260.	L082-PL	W	ISO 17025
Dissolved organic carbon 10:1 WAC	Determination of dissolved inorganic carbon in leachate by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE
Fluoride 10:1 WAC	Determination of fluoride in leachate by 1:1ratio with a buffer solution followed by Ion Selective Electrode.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Loss on ignition of soil @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace.	In house method.	L047-PL	D	MCERTS
Metals in leachate by ICP-OES	Determination of metals in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil""	L039-PL	W	ISO 17025
Mineral Oil (Soil) C10 - C40	Determination of mineral oil fraction extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L076-PL	D	NONE
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols 10:1 WAC	Determination of phenols in leachate by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080-PL	W	ISO 17025
PCB's By GC-MS in soil	Determination of PCB by extraction with acetone and hexane followed by GC-MS.	In-house method based on USEPA 8082	L027-PL	D	MCERTS
pH in soil	Determination of pH in soil by addition of water followed by electrometric measurement.	In house method.	L005-PL	W	MCERTS
Speciated WAC-17 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270. MCERTS accredited except Coronene.	L064-PL	D	NONE
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Sulphate 10:1 WAC	Determination of sulphate in leachate by ICP-OES	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil""	L039-PL	W	ISO 17025
Total dissolved solids 10:1 WAC	Determination of total dissolved solids in water by electrometric measurement.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L004-PL	W	ISO 17025

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The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number : 20-84973

Project / Site name: Islington Wharf, Phase 4

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

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The results included within the report are representative of the samples submitted for analysis.

Appendix H

Preliminary Geotechnical Risk Register

Geotechnical Hazard Identification – Desk Study Stage

Potential geotechnical hazards have been assessed in accordance with the general requirements of ICE/DETR Document 'Managing Geotechnical Risk' and the HE documents HD 41/15 and CD 622. The following pages set out the identified geotechnical risks and hazards which are associated with the proposed development and establish the approach which is to be taken to manage the risks including the geotechnical input and analysis.

Table J.1 is a preliminary assessment of possible geotechnical hazards at the site at Desk Study stage. This information is used to assist with ground investigation design.

Table J.1: Possible geotechnical hazards

Hazard	Comment	Hazard status based on desk study	
		Could be present and / or affect site (i.e. Plausible)	Unlikely to be present and/or affect site
Uncontrolled Made Ground (variable strength and compressibility).	Variable Made Ground expected.	✔	-
Soft / loose compressible ground (low strength and high settlement potential).	Potential for loose Made Ground and low strength natural deposits.	✔	-
Shrink swell of the clay fraction of soils under the influence of vegetation.	Glacial Till across the site although no vegetation is present. Consideration to shrink / swell where future planting proposed	✔	-
Elevated sulphates present in the soils.	Sulphate testing to be undertaken.	✔	-
Adverse chemical ground conditions, (e.g. expansive slag).	Not affected.	-	✔
Obstructions.	Site previously covered by buildings and hardstanding.	✔	-
Existing below ground structures to remain.	Not affected.	-	✔
High groundwater.	Not affected.	-	✔
Changing groundwater conditions.	Not affected.	-	✔
Risk from erosion.	Not affected.	-	✔

Hazard	Comment	Hazard status based on desk study	
		Could be present and / or affect site (i.e. Plausible)	Unlikely to be present and/or affect site
Risk from flooding.	Not affected.	-	✔
Running sands and / or loose Made Ground, leading to difficulty with excavation and collapse of side walls.	Potential for loose Made Ground and granular horizons within the Till.	✔	
Slope stability issues – general slopes.	Not affected.	-	✔
Slope stability issues – retaining walls.	Not affected.	-	✔
Earthworks – settlement (due to placement of fill on soft / loose ground).	Not affected.	-	✔
Earthworks – poor bearing capacity of new fill.	Not affected.	-	✔
Earthworks – unsuitability of site won material to be reused as fill.	Not affected.	-	✔
Solution features in Chalk.	Not affected.	-	✔
Cavities in the Superficial Deposits due to solution features.	Not affected.	-	✔
Dissolution (associated with “wet rock head”).	Not affected.	-	✔
Brine extraction.	Not affected.	-	✔
Mining.	Not affected.	-	✔
Cambered ground with gulls possibly present.	Not affected.	-	✔
Relict Slip Surfaces.	Not affected.	-	✔
Solifluction.	Not affected.	-	✔
Problematic soils (silts and rewetting etc.).	Not affected.	-	✔

Geotechnical Hazard Identification – Following Ground Investigation

The preliminary Geotechnical Risk Register following Ground Investigation is set out in Table J.3.

The probability and impact of a hazard have been judged on a qualitative scale as set out in Table J.2. The degree of risk (R) is determined by combining tan assessment of the probability (P) of the hazard occurring with an assessment of the impact (I) of the hazard and associated mitigation it will require if it occurs (R = P x I).

Table J.2: Qualitative assessment of hazards and risks

P = Probability			I = Impact			R = Risk Rating (P x I)	
1	Very unlikely (VU)		1	Very Low		1 – 4	None / negligible
2	Unlikely (U)		2	Low		5 – 9	Minor
3	Plausible(P)		3	Medium		10 – 14	Moderate
4	Likely (Lk)		4	High		15 – 19	Substantial
5	Very Likely (VLk)		5	Very High		20 - 25	Severe

Table J.3: Preliminary geotechnical risk register

Whilst the probability and impact of the hazard occurring can be reduced to a minimum by geotechnical design, the impact cannot be reduced below very low. The risk register will need to be up-dated, as necessary, to reflect design, additional information, data and experience as it is gained through the construction process.

Impacts of the design with regard to health and Safety considerations will need to be included by the designer at design stage.

Hazard	Comments	Who is at Risk	Consequence	Risk Before Mitigation			Actions Required
				P	I	R	
Uncontrolled Made Ground (variable strength and compressibility).	There is Made Ground due to historical construction activity at the site. The Made Ground is up to 4.0m thick due to previous developments.	New buildings	Bearing capacity failure, settlement (total and differential).	5	4	20	Design foundations to found below Made Ground.
			Floor slab failure.	5	4	20	Design floor slabs as suspended.
		Roads and Pavements.	Pavement failure	4	3	12	Design roads and pavements using suitable geotechnical parameters and increase the sub-base and use geo-grids as appropriate. Consider over-excavation and re-engineering/replacement of Made Ground
		Services.	Settlement (differential), causing damage to services.	3	3	9	Consider over-excavation of Made Ground below sensitive services such as drainage.
		Construction staff, vehicles and plant operators.	Trafficking of the site in temporary conditions. Overturning of plant during construction.	4	3	12	Where soft spots encountered, over-excavation and replacement with suitable fill. Design of appropriate working platform and temporary haul roads. Separate geotechnical design required for tower cranes and mobile cranes. Site inspection and watching brief by Contractor to review working platform frequently and regularly.
Soft / loose ground (low strength and high settlement potential).	The shallow natural soils comprise low strength Glacial Till which consist of firm	New buildings	Foundation bearing capacity failure, settlement (total and differential).	5	4	20	Design deep foundations to found into competent soils at a suitable depth in order to meet the ultimate and serviceability requirements.
			Floor slab failure.	5	4	20	Design floor slabs as suspended.

Hazard	Comments	Who is at Risk	Consequence	Risk Before Mitigation			Actions Required
				P	I	R	
	clay to approximately 12m bgl.	Roads and Pavements.	Pavement failure	4	3	12	Design roads and pavements using suitable geotechnical parameters and increase the sub-base and use geo-grids as appropriate.
		Services.	Settlement (differential), causing damage to services.	3	3	9	Consider over-excavation of Made Ground below sensitive services such as drainage.
		Construction staff, vehicles and plant operators.	Trafficking of the site in temporary conditions. Overturning of plant during construction.	4	3	12	Where soft spots encountered, over-excavation and replacement with suitable fill. Design of appropriate working platform and temporary haul roads. Separate geotechnical design required for tower cranes and mobile cranes. Site inspection and watching brief by Contractor to review working platform frequently and regularly.
Obstructions.	There is a potential for obstructions to be present due to historical construction activity, or unknown fill in Made Ground.	Construction staff, vehicles and plant operators.	Risk of collapse of excavation as obstructions are pulled out.	4	3	12	Appropriate temporary works design for excavations Enabling works design to account for the identification and removal of obstructions.
		Roads and Pavements.	Hard spots in externals and roads / pavements.	4	2	8	
		New buildings	Impact on piling, resulting in additional piles and re-design of foundations.	4	3	12	
Shallow groundwater.	Monitoring during the site investigations has proven a groundwater table (at approximately 1.2m	Construction staff, vehicles and plant operators.	Difficulty with excavation.	4	2	8	Suitable temporary drainage during construction. Contractor to appoint competent Temporary Works Designer to design temporary works, in accordance with BS 5975:2008+A1:2011. Temporary Works Designer to consider in their analysis the impact of, and requirements for, de-watering of excavations.
			Excessive deformation during trafficking of site plant, inability to place and compact fill.				

Hazard	Comments	Who is at Risk	Consequence	Risk Before Mitigation			Actions Required
				P	I	R	
	bgl), with locally relatively fast inflows.						Any water that collects at the base of excavations to be removed as soon as practicable.
Loose Made Ground, leading to difficulty with excavation and collapse of side walls.	The ground investigation has indicated that there is a potential for loose soils and Made Ground to be present at the site.	Construction staff, vehicles and plant operators.	Ground failure, instability of plant and machinery.	4	4	16	As instability has been noted in the majority of trial pits from surface. Contractor to appoint competent Temporary Works Designer Temporary Works Design to include recommendations for inspection of excavations. No person entry to unsupported excavations.
			Risk of collapse of excavation.	4	3	12	

Appendix I

Plausible Source-Pathway-Receptor Contaminant Linkages

Summary of Potential Contaminant Linkages

Table K.2 lists the plausible contaminant linkages which have been identified. These are considered as potentially unacceptable risks in line with guidelines published in LCRM (2019) and additional risk assessment is required.

Source – Pathway – Receptor Linkages have been assessed in general accordance with guidance in CIRIA Report C552 (Rudland et al 2001) but modified to add a 'no linkage' category and to remove low/moderate risk (See Table K.1). Further information is given in the relevant Hydrock methodology, referenced in Appendix J, including descriptions of typical examples of probability and consequences.

It should be noted that whilst the risk assessment process undertaken in this report may identify potential risks to site demolition and redevelopment workers, consideration of occupational health and safety issues is beyond the scope of this report and need to be considered separately in the Construction Phase Health and Safety Plan.

Table K.1: Consequence versus probability assessment.

		Consequence			
Probability		Severe	Medium	Mild	Minor
	High Likelihood	Very high risk	High risk	Moderate risk	Low risk
	Likely	High risk	Moderate risk	Low risk	Very low risk
	Low Likelihood	Moderate risk	Low risk	Low risk	Very low risk
	Unlikely	Low risk	Very low risk	Very low risk	Very low risk
	No Linkage	No risk			

Table K.2: Exposure model – final source-pathway-receptor contaminant linkages

Sources	Possible Pathways	Receptors	Probability	Consequence	Risk Level	Comments	
Made Ground beneath the site containing significantly elevated concentrations of metals, PAH and elevated petroleum hydrocarbons.	Ingestion, Inhalation or direct contact.	Site Users	Unlikely	Severe	Low	There is Made Ground below the entire site, and there are metals and PAH at levels in excess of the GAC.	The proposed development will see the introduction of a building and external hardstanding across the majority of the site footprint. The site will be entirely covered by hardstanding, thus severing the pathway between source and receptor for the most part. Further mitigation is required to determine the volume of impacted material and remove hotspots. A simple cover system is required in areas of soft landscaping.
	Inhalation of fugitive dust.	Neighbours	Low Likelihood	Medium	Low	Loose asbestos fibres detected at 3 locations (at <0.001%) and one fragment of ACM (cement).	The risk of significant generation of dust is likely only during site development process and can therefore be controlled.
	Leaching through unsaturated zone.	Groundwater	Low Likelihood	Medium	Low	There is Made Ground below the entire site, and there are metals and PAH at levels significantly in excess of the GAC.	The Principal Sandstone Aquifer is unproven but confirmed to be separated by >10m of Glacial Till which acts as an aquitard between shallow groundwater and the Sandstone.
	Temporary Vertical migration through	Groundwater	Likely	Medium	Moderate Risk	A temporary pathway between the Made Ground and Secondary A Aquifer (Glacial Till) and potentially the Principal	Hotspots of PAH are present in the Made Ground, and during piling a pathway between near surface soils and the aquifer will be created. As such a piling works risk assessment will be

Sources	Possible Pathways	Receptors	Probability	Consequence	Risk Level	Comments	
	superficial deposits					Aquifer (Sandstone) will be created during piling works.	required to establish the risk and any mitigation measures that may be required.
Shallow groundwater containing metals, inorganics, PAH and petroleum hydrocarbons.	Temporary Vertical Migration through the superficial deposits during piling works.	Controlled water of the Secondary A Aquifer (Glacial Till) and Principal Aquifer (Sandstone).	Likely	Medium	Moderate Risk	A temporary pathway between the shallow groundwater and Secondary A Aquifer (Glacial Till) and potentially the Principal Aquifer (Sandstone) will be created during piling works.	Elevated concentrations of metals, inorganics, PAH and petroleum hydrocarbons are present in the shallow groundwater, specifically BH02. As such a piling works risk assessment will be required to establish the risk and any mitigation measures that may be required.

Appendix J

Hydrock Methodologies

This report uses Hydrock Desk Study and Ground Investigation template V47.1.

This appendix provides additional background information on certain approaches and methods used by Hydrock Consultants Limited in the preparation of this report.

The following Hydrock Methodologies apply to this report. These are not included, but are available on request by quoting the methodology reference, revision and date.

Reference	Name	Revision	Date
002	Ground Investigation	001	30/07/2018
003	Preliminary Geo-environmental Risk Assessment Rationale	001	30/07/2018
004	Preliminary geotechnical Risk Register	001	30/07/2018
005	Generic Risk Assessment for Human Health (Soils)	001	30/07/2018
006	Generic Risk Assessment for Pollution of Controlled Waters	001	30/07/2018
007	Detailed Quantitative Risk Assessment for Risk to Controlled Waters	001	30/07/2018
008	Generic Risk Assessment for Risk to Plants	001	30/07/2018
010	Generic Ground Gas Risk Assessment	001	30/07/2018
011	Determination of Contaminated Land Under Part 2A of the Environmental Protection Act 1990	001	30/07/2018
012	Waste Management	001	30/07/2018
013	Materials Management	001	30/07/2018
014	Asbestos in Soils	001	30/07/2018
015	Remediation and Mitigation (New Methodology)	001	30/07/2018
016	Geotechnical Categorization and Characteristic Design Values	001	30/07/2018
017	Foundation and Floor Slab Recommendations - Residential	001	30/07/2018
019	Earthworks Suitability Recommendations	001	30/07/2018
020	Pavements and Pavement Foundations	001	30/07/2018