Worthington Mancap LLP

Lincoln House and 123 Deansgate, Manchester

Phase II Site Investigation Report

108348/03

February 2016







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CONTROL SHEET

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Executive Summary of Site Conditions, Page 1 of 4

Developer and Funded		Worthington Mancap LLP
Current Site Status		The current site comprises 2 No. multi storey commercial premises with ground floor retail units, offices and a basement car park.
Development Proposals		New multi-storey commercial premises containing retail units, offices and a basement car park with localised landscaping along the perimeter
Site Conditions	Location	The site is centred at the corner of Deansgate and Brazennose Street, Manchester at Grid Ref: 383640, 398190.
	Site History	• Unidentified buildings with Mulberry Street running through centre in 1850's • Small print works at corner of Deansgate and Brazennose Street (southern part of site) in 1890's • Finnegan's Department store from 1910's until 1980's • Partial demolition of department store in 1980's replaced with 2 new buildings – the existing 123 Deansgate and Lincoln House.
	Adjacent land History	• Gas works to the north from 1850's • Iron works to the north west from 1890's • Deansgate goods station to the south from 1940's • 1948 OS plan shows 2 areas on opposite side of Deansgate shown as Ruins (Possible WW2 bomb damage) • Offices, hotels, library and commercial buildings
	Geology	The following soil profile was identified within the basement of Lincoln House. Further investigation is required to confirm the soil profile beneath the footprint of 123 Deansgate; • Concrete floor slab between 300mm and 450mm thick • Made Ground as brick and concrete fill to between 1.1 and 1.7m • Concrete obstruction encountered between 0.7m and 1.45m. The rotary rig drilled through the concrete at 2 locations. Concrete was 550mm thick at one location with the concrete extending to 5.7mbgl at the other location • Bedrock as very weak to weak sandstone locally recovered as very dense sand proven to 20mbgl. Further investigation is required at street level. Based on historical borehole logs the following soil profile has been identified; • Fill to between 1.2 and 1.4mbgl • Loose to medium dense Gravel to between 4.2 and 4.9m • Bedrock as Sandstone proven from 4.2 and 4.9m to 15mbgl
	Surface Water	• There are no surface water features on site • The River Irwell is located 292m north west
	Groundwater	• Basement - Groundwater strike encountered at 6.2m below basement level (approx. 25.85mAOD) during the rotary drilling. During long term groundwater monitoring a water level of between 8.03m (24.02mAOD) and 10.0m below basement level (22.05mAOD) was recorded. • Street Level - Adjacent historical boreholes identify the ground to be damp at 1m and below but water is added after this so groundwater depths are unknown • The bedrock is identified as a Principal Aquifer • The superficial deposits are classified as a Secondary A Aquifer
Landfill		• The nearest historical landfill to site was located 870m west of the site
Radon		The site is within a lower probability radon area. Basic protective measures will not be required.

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Executive Summary of Site Conditions, Page 2 of 4

Geotechnical Constraints	• Existing basement floor slab at Lincoln House is between 300mm to 450mm thick of reinforced concrete • Numerous concrete obstructions encountered between 0.7m and 1.45mbgl within basement of Lincoln House. Concrete proven to 2mbgl at one location (550mm thick) and down to 5.7m at a second location (possible pile). • Further below ground obstructions anticipated associated with existing and historical foundations, substructures and basements of 123 Deansgate • Made ground is poorly compacted of variable thickness to between 0.7m and 1.8m below basement level of Lincoln House. • Granular superficial deposits anticipated from street level. Therefore, potential for washout of sands and gravels and the subsequent settlement of adjacent buildings/services/highways • Potential for infilled historical basements and deep made ground associated with the Deansgate Building • Existing basement retaining walls • Asbestos fibres identified within the made ground beneath Lincoln House. • Groundwater strike encountered at 6.2m below basement level (approximately 25.85mAOD) during the rotary drilling. During long term groundwater monitoring a water level of between 8.03m (24.02mAOD) and 10.0m below basement level (22.05mAOD) was recorded. • Basement excavation may require rock excavation due to shallow rock • Side support required for new basement excavation with significant temporary works required due to the location adjacent to the highway with services. • Numerous services along boundary with Brazennose Street, Mulberry Street and Deansgate; temporary and permanent works may impact on easements. • Limited space for development with a busy main road along the western boundary. • Highways Authority approval required; construction and temporary works may have an impact to highways. • Services Utility Approvals required; construction and temporary works may have an impact on existing services. • The new basement footprint will be adjacent to an existing building and party wall structural surveys may be required for neighbouring buildings.
Foundation and Slab Design	The following constraints impact on the foundation solution for the development; • Poorly compacted made ground • Numerous concrete obstructions, possible historical floor slabs within basement of Lincoln House • Historical and existing foundations anticipated at street level • Services running along the pavement of Deansgate and Brazennose Street • High loads of the proposed development Based on the anticipated loads and ground conditions a piled foundation solution is required. Subject to confirmation from specialist contractor.
Floor slab design	Based on the ground conditions identified the following floor slab design is considered viable; • Localised ground bearing floor slabs may be appropriate for areas not underlain by basements. The slab should be constructed on a minimum 300mm of stone with basal geogrid/textile to prevent loss of stone • Groundwater identified during the site investigation. As such, basement structures should be designed for uplift water pressures at ground level

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Executive Summary of Site Conditions, Page 3 of 4

Earthworks	Excavation works will be required for the basement of the proposed development. The material generated is likely to comprise; • Hardstanding • Made ground as construction fill • Weathered sandstone bedrock
Services	• Electricity sub station located on Mulberry Street at entrance to Lincoln House basement car park. Numerous LV and 6kV cables run along the eastern face of Lincoln House, along the southern face (Brazennose Street) and along the pavement of Deansgate along the western face of the building. • Low Pressure gas main runs along Mulberry Street and Brazennose Street along boundary of Lincoln House • BT cables enter Lincoln House and 123 Deansgate from Mulberry Street. BT cables run along Brazennose Street and Deansgate. • 450mm diameter combined sewer present on Mulberry Street to the east of Lincoln House connecting to sewer on Brazennose Street • Water main present along Mulberry Street to the east of site
Temporary Works	• Pneumatic breakers will be necessary for the relic slab and foundations of the previous on site development. • Side support required for new basement excavation or retained basement structure with significant temporary works required due to the location adjacent to the highway with services. • Numerous services along boundary with Brazennose Street, Mulberry Street and Deansgate; temporary and permanent works may impact on easements. • Limited space for development with a busy main road along the western boundary. • Highways Authority approval required; construction and temporary works may have an impact to highways. • Services Utility Approvals required; construction and temporary works may have an impact on existing services. • The new basement footprint will be adjacent to an existing building and party wall structural surveys may be required for neighbouring buildings • Temporary support may be required to the retained basement structure during demolition.

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Contamination Issues	• Asbestos fibres identified within the made ground • Marginally elevated TPH within groundwater
Remediation Options	The following measures are recommended to ensure a low risk to receptors is maintained in the development; • An asbestos survey should be undertaken in the existing buildings and any asbestos removed from the buildings before demolition works start • Asbestos fibres identified within the made ground the presence of further asbestos debris and contamination to any made ground or basement infill cannot be discounted. If encountered this material may require removal. Construction workers should be made aware and shall adopt appropriate health and safety measures during earthworks • Dust suppression measures should be adopted during all earthworks. • Covered lorries should be used to take site generated material off site • Construction workers should undertake soil gas and VOC monitoring prior to and during man entry of below ground voids. • Surface water control measures should be adopted during construction to limit runoff and infiltration through exposed made ground horizons and to limit siltation of the surface drainage system. • Validation testing on a 10m grid should be undertaken as a precautionary approach to confirm the absence of significant contamination • No soil gas protection measures required.. • Clean cover required for localised areas of landscaping along perimeter.

1.0 INTRODUCTION

Fairhurst have been instructed by Worthington Mancap LLP to carry out a Site Investigation for a proposed commercial development site off Deansgate, Manchester at Grid Ref: 383640, 398190, Figure 1, **Appendix A**.

The aim of the Site Investigation was to provide geotechnical and environmental information for the site to enable design of proposed development including;

- Foundation and retaining wall design
- To identify development abnormals
- To develop the site's Conceptual Site Model
- To develop an environmental risk assessment and update the preliminary Risk Assessment included in the Desk Study Report
- To establish whether contamination is present and requires remedial action
- To discharge Condition 10 of the Planning Application No 110078/FO/2015/C1

This was carried out via an intrusive ground investigation with chemical and geotechnical testing.

The design of the site investigation was informed by the site's Phase I desk study, CSM and Preliminary Risk Assessment (Ref 1).

1.1 Development Proposals

The proposed development layout is shown on the Architects Plan, **Appendix B**, and includes new multi-storey commercial premises containing retail units, offices and a basement car park with localised landscaping along the perimeter.

In order to facilitate the development the following works will be required;

- Demolition of the existing development and site clearance.
- Minor level alteration to develop an appropriate development platform and gradients.

1.2 Sources of Information

Information has been obtained from the following sources:

- Statutory Services **(Appendix A)**
- Fairhurst Report DIL/108348/01 Phase I Desk Study Report (Ref. 1)
- Fairhurst Report DIL/108348/02 Flood Risk Assessment Report (Ref. 2)
- Ian Farmer Associates Factual Report on Site Investigation, presented in **Appendix F** (Ref. 3)

2.0 THE SITE

2.1 Site Location

The site, at National Grid Reference 383640, 398200 is located off Deansgate, as shown on Figures 1, 2, and 3, **Appendix A**.

The current site comprises 2 No. multi storey commercial premises with ground floor retail units, offices and a basement car park.

The site is bound by Deansgate along the western boundary with a library, offices and restaurants beyond, a pedestrian road Brazennose Street to the south with offices beyond, offices to the north and offices to the east.

2.1 Phase I Desk Study

A Phase I Desk Study has been undertaken for the site (Ref. 1) and is summarised below:

- Historical uses of the site include a small print works and a department store.
- Historical borehole records from 40m south west and 57m north of site have identified the following soil profile:
  - Fill to between 1.2 and 1.4mbgl
  - Loose to medium dense Gravel to between 4.2 and 4.9m
  - Bedrock as Sandstone proven from 4.2 and 4.9m to 15mbgl
- The adjacent historical boreholes identify the ground to be damp at 1m and below but water is added after this so groundwater depths are unknown
- There are no surface waters adjacent to the site

The preliminary conceptual site model and risk assessment identified the following:

Potential Sources of Contamination

- Historical on site and adjacent land uses including small print works and department store
- Potential for Asbestos within Made Ground

Pathways

- Ingestion
- Skin contact
- Inhalation
- Direct contact by buried structures
- Leaching of soluble contamination into groundwater
- Saturated zone flow through Aquifer
- Preferential pathway via piles
- Accumulation of potentially explosive gases within confined spaces
- Construction pathways.

Receptors

- End Users
- Construction Workers
- Main Groundwater Body (Sandstone – Principle Aquifer)
- Buried Structures and Services
- Landscaping

Based on the preliminary Conceptual Site Model (CSM) an Environmental Risk Assessment (ERA) was undertaken. The Environmental Risk Assessment was based on a simple matrix taken from CIRIA C552 (Rudland et al., 2001) 'Contaminated Land Risk Assessment – A Guide to Good Practice' which provides a consistent basis for decision-making. The

probability and consequences of complete pollution pathways are defined according to parameters relevant to the situation and risk assessment.

The following Pollution Linkages Tables (Table 1 and 2) indicate the level of risk associated with the identified contaminant sources and is based on the combination of consequence and probability. Tables 5, 6, 7, and 8 in **Appendix C** provide a Risk Matrix, together with a Classification of Consequence, Probability, and Risk.

Table 1 – Summary of plausible source - pathway – receptor pollutant linkage – Onsite sources

Source	Pathway	Receptor	Con.	Prob.	Risk
General Made Ground	Ingestion, Inhalation, Dermal Contact	Future Site Users	Md	Ul	**L**
		Construction Workers	Md	Lw	**M/L**
		Adjacent Land Users	Md	Ul	**L**
	Leaching, Migration, and Surface run-off	Groundwater (Principal Aquifer)	Md	Lw	**M/L**
	Existing and proposed piles	Groundwater (Principal Aquifer)	Md	Lw	**M/L**
	Direct Contact	Buried Concrete	Mi	Lw	**L**
		Underground Services	Mi	Lw	**L**
Existing Built Development – Potential Asbestos Containing Materials.	Inhalation	Future Site Users	Sv	Ul	**M/L**
		Construction Workers	Sv	Lw	**M**
Potential Asbestos in made ground	Inhalation	Future Site Users	Sv	Ul	**M/L**
		Construction Workers	Sv	Lw	**M**
Ground Gases associated with on-site land uses	Inhalation	Future Site Users	Sv	Ul	**M/L**
		Construction Workers	Sv	Lw	**M**
Historical use of the site as print works.	Ingestion, Inhalation, Dermal Contact	Future Site Users	Md	Ul	**L**
		Construction Workers	Md	Lw	**M/L**
		Adjacent Land Users	Md	Ul	**L**
	Leaching, Migration, and Surface run-off	Groundwater (Principal Aquifer)	Md	Lw	**M/L**
	Existing and proposed piles		Md	Lw	**M/L**
	Direct Contact	Buried Concrete	Mi	Lw	**L**
		Underground Services	Mi	Lw	**L**

After CIRIA Report C552, Contaminated Land Risk Assessment A Guide to Good Practice, 2001.

Where Con = Consequence and Prob = Probability. **Consequence:** Sv = Severe, Md = Medium, Mi = Mild, Mr = Minor. **Probability:** Hi = High likelihood, Li = Likely, Lw = Low Likelihood, Ul = Unlikely. **Risk:** VH = Very High, H = High, M = Moderate, M/L = Moderate/Low, L = Low, VL = Very Low.

Table 2 – Summary of plausible source - pathway – receptor pollutant linkage – Offsite sources

Source	Pathway	Receptor	Con.	Prob.	Risk
Historical and Present land use as a works, hospital and warehouses.	Ingestion, Inhalation, Dermal Contact	Future Site Users	Md	Ul	**L**
		Construction Workers	Md	Ul	**L**
	Leaching, Migration and Surface run-off	Groundwaters (Principal Aquifer)	Md	Lw	**M/L**
	Direct Contact	Buried Concrete	Mi	Ul	**L**
		Underground Services	Mi	Ul	**L**

After CIRIA Report C552, Contaminated Land Risk Assessment A Guide to Good Practice, 2001.

Where Con = Consequence and Prob = Probability. **Consequence:** Sv = Severe, Md = Medium, Mi = Mild, Mr = Minor. **Probability:** Hi = High likelihood, Li = Likely, Lw = Low Likelihood, Ul = Unlikely. **Risk:** VH = Very High, H = High, M = Moderate, M/L = Moderate/Low, L = Low, VL = Very Low

Based on the known site history, the pollution linkage assessment, and the geological setting of the site, the preliminary risk assessment has indicated the following;

- Potentially contaminated made ground on site represents a **Low** risk to human health and a **Moderate to Low** risk to Construction Workers. However, with the use of appropriate PPE the risk is to construction workers is **Low**.
- Potential soil gas beneath the site represents a **Moderate to Low** risk to future site users and a **Moderate** risk to Construction Workers. However, with the use of appropriate PPE the risk is to construction workers is **Low**.
- The site represents a **Moderate to Low** risk to the Principal Aquifer

2.2 Site Inspection

A site walkover was undertaken on 14th May 2015. Photographs from the walkover are included in **Appendix D**, and are summarised below:

- The site comprises Lincoln House, a multi storey office block with basement car park, and 123 Deansgate, a multi storey office block with basement
- Fast food restaurant and a Bookmakers operate from the ground floor
- Entrance to Lincoln House basement car park is off Mulberry Street
- A substation is present to the rear of Lincoln House on Mulberry Street
- Deansgate is present along the western boundary with the Ryland's Library directly opposite as well as numerous restaurants, bars and shops
- Brazennose Street runs along the southern boundary. This road is a pedestrian road lined with trees

3.0 GROUND CONDITIONS

3.1 Site Investigation

3.1.1 Objectives

A site investigation was designed and implemented by Fairhurst within the basement of Lincoln House. The overall aim of the investigation was to:

- Identify and confirm the general soil profile.
- Identify suitable founding strata and assist in foundation design.
- To investigate and identify potential contamination as identified in the desk study and therefore refine the environmental site conceptual model.
- Establish any potential development abnormals prior to site development.
- Provide information to assist in the characterisation of the site in order to satisfy regulators that environmental risks have been adequately identified and mitigated.

3.1.2 Exploratory Works

Due to access issues the site investigation was limited to the basement of Lincoln House. As yet no investigation has been undertaken for the footprint of 123 Deansgate. Additional site investigation will be required once demolition of these structures has taken place. The following exploratory works were completed on site; locations are shown on drawing No. 108348/9001, **Appendix A**:

- 4 No. rotary boreholes to between 8m and 20m
- 5 No. window sample probe holes to a maximum depth of 2.4m

- 4 No. 85mm horizontal concrete cores into basement retaining wall

3.1.3 Monitoring

5 No. monitoring well installations were installed, 2 No into the made ground and 3 No into the bedrock. The following were recorded on monitoring visits:

- O_2 , CO_2 , CH_4 , CO, H_2S , VOC and LEL
- Gas flow rate, and atmospheric pressure
- Water Level

Monitoring well locations are shown on Drawing No. 108348/9001, **Appendix A**.

3.1.4 Chemical Testing

Disturbed and Jar samples were taken throughout the exploratory holes and chosen for testing to target specific strata and areas of visual or olfactory evidence of contamination.

Determinands selected as part of the chemical analysis are detailed below;

- Heavy Metals - Arsenic, Boron (Water Soluble), Cadmium, Chromium (III/VI), Copper, Lead, Mercury, Magnesium (Water Soluble), Nickel, Selenium, Zinc.
- Organics - PAH, TPH, BTEX, MTBE, TOC, Phenol (total)
- Inorganics - Sulphur, Sulphate (Total / 2:1 water-soil extract), Sulphide, Chloride, Nitrate, Ammonium, Cyanide (free/complex/total), Thiocyanate.
- Miscellaneous - Asbestos, pH

3.1.5 Geotechnical Testing

The following Geotechnical Testing was undertaken as part of the Site Investigation:

- SPT's within the window sample probe holes
- 12 No. point load tests
- Bedrock core samples were not suitable for UCS testing

3.2 Soil Profile

Detailed descriptions of the materials encountered, together with groundwater observations and the results of in situ tests are given in Factual Report (Ref 3). A summary of the soil profile is detailed below;

Table 3 – Summary of Soil Profile

Location	Details of Strata	Base of strata
Basement of Lincoln House (approx.32.05mAOD)	Concrete floor slab	300mm to 450mm
	Made Ground as brick and concrete fill	1.1 and 1.7m
	Numerous concrete obstructions encountered between 0.7m and 1.45m. Concrete proven to 2mbgl at one location (550mm thick) and down to 5.7m at a second location (possible pile)	
	Bedrock as very weak to weak sandstone locally recovered as very dense sand	Proven to 20m
Footprint of 123 Deansgate	Further investigation required for the footprint of 123 Deansgate to confirm soil profile.	

Existing Street Level (approx.35.26mAOD)	Further site investigation is required at street level. However, the following soil profile was encountered in an adjacent historical boreholes; • Fill to between 1.2 and 1.4mbgl • Loose to medium dense Gravel to between 4.2 and 4.9m • Bedrock as Sandstone proven from 4.2 and 4.9m to 15mbgl

Retaining Wall Cores

A total of 4 No. horizontal cores were taken within the retaining wall of the basement car park of Lincoln House facing Brazennose Street and Deansgate. Logs and photographs of the cores are presented within the Factual Report (Ref 3) and are summarized below;

- Reinforced concrete of between 300 and 600mm thick

3.3 Groundwater Profile

Existing Street level

The adjacent historical boreholes identify the ground to be damp at 1m and below but water is added after this so groundwater depth is unknown

Basement level

Groundwater strike encountered at 6.2m below basement level (approximately 25.85mAOD) during the rotary drilling. During long term groundwater monitoring a water level of between 8.03m (24.02mAOD) and 10.0m below basement level (22.05mAOD) was recorded.

3.4 Geotechnical Properties

In the following sections a summary of the geotechnical properties, based on physical description and in-situ testing, for each strata encountered is presented. The results of the geotechnical laboratory tests are included in **Appendix B**.

3.4.1 Made Ground

Basement

Made Ground was identified across the footprint of the basement of Lincoln House as sandy gravel and gravelly sand of brick, concrete and limestone. 1 No SPT were taken within the made ground recording 'N' values of 20.

Street Level

Made Ground is anticipated at street level

3.4.2 Superficial Deposits

Basement

No superficial deposits encountered.

Street Level

Superficial deposits as loose to medium dense gravel have been identified to between 4.2 and 4.9m in an historical borehole adjacent to the site.

3.4.3 Bedrock

Bedrock was encountered as very weak to weak Sandstone locally recovered as very dense sand. SPT's taken at the top of the Sandstone all refused.

The rock core measurements are summarised below;

- Total Core Recovery (TCR) – 0% to 100%
- Solid Core Recovery (SCR) – 0% - 76%
- Rock Quality Designation (RQD) – Generally 0% locally 13%

An RQD of 0 indicates that the rock is very poor quality. Due to the weak nature of the bedrock the core recovery was not suitable to undertake ultimate compressive strength tests (UCS).

A total of 18 No point load tests were undertaken on core samples from the basement of Lincoln House. The results were between 0.6MN/m^2 and 4.4MN/m^2 with an average of 2.2MN/m^2 indicating very weak to weak rock.

3.5 Relic Structures

During drilling in the basement of Lincoln House concrete obstructions were encountered at between 0.7m and 1.4m below basement level at several locations with 2 of the rotary boreholes drilling through the concrete. The concrete was 550mm thick (possible historical floor slab) at one location with the concrete extending to 5.7m below basement level at the other location (possible historical pile).

Historical floor slabs and piles are also anticipated within the footprint of 123 Deansgate.

Obstructions are anticipated from street level including numerous services.

3.6 Evidence of Contamination

No visual or olfactory signs of contamination identified during the site investigation.

4.0 GEOTECHNICAL ASSESSMENT

4.1 Geotechnical Hazards/Constraints

The following geotechnical constraints have been identified on the site;

- Existing basement floor slab at Lincoln House is between 300mm to 450mm thick of reinforced concrete
- Numerous concrete obstructions encountered between 0.7m and 1.45mbgl within basement of Lincoln House. Concrete proven to 2mbgl at one location (550mm thick) and down to 5.7m at a second location (possible pile).
- Further below ground obstructions anticipated associated with existing and historical foundations, substructures and basements of 123 Deansgate
- Made ground is poorly compacted of variable thickness to between 0.7m and 1.8m below basement level of Lincoln House.
- Granular superficial deposits anticipated from street level. Therefore, potential for washout of sands and gravels and the subsequent settlement of adjacent buildings/services/highways

- Potential for infilled historical basements and deep made ground associated with the Deansgate Building
- Existing basement retaining walls
- Asbestos fibres identified within the made ground beneath Lincoln House.
- Groundwater strike encountered at 6.2m below basement level (approximately 25.85mAOD) during the rotary drilling. During long term groundwater monitoring a water level of between 8.03m (24.02mAOD) and 10.0m below basement level (22.05mAOD) was recorded.
- Basement excavation may require rock excavation due to shallow rock
- Side support required for new basement excavation with significant temporary works required due to the location adjacent to the highway with services.
- Numerous services along boundary with Brazennose Street, Mulberry Street and Deansgate; temporary and permanent works may impact on easements.
- Limited space for development with a busy main road along the western boundary.
- Highways Authority approval required; construction and temporary works may have an impact to highways.
- Services Utility Approvals required; construction and temporary works may have an impact on existing services.
- The new basement footprint will be adjacent to an existing building and party wall structural surveys may be required for neighbouring buildings.

4.2 Demolitions

Demolition of both Lincoln House and 123 Deansgate is required to facilitate the development. The following issues will need to be addressed before demolition;

- Asbestos survey required prior to demolition.
- Structural surveys of party walls
- Highways Authority approval
- Services utilities approval

4.3 Foundation Design and Floor Slab Considerations

4.3.1 Foundations Design

The proposed structure is a 12 storey commercial and retail tower block with basement and car parking.

In order to accommodate the high column loads the use of a piled foundation will be required. The current proposals are to utilise CFA pile technique to between approximately 10m to 15m below existing ground levels.

A new basement structure is required and in order to mitigate abnormal development costs and works it is proposed to utilise the existing basement walls and structure in the new development. Significant temporary works and propping will be required to facilitate this.

The advice of a pile contractor has been obtained presented in **Appendix C**. The following comments and advice have been provided;

Advice from Batchy Soletanche

- CFA piling techniques recommended based on rock strength data. However, rotatory may need to be considered if large rock sockets were required.
- At this stage Batchy suggest the following limits based on a CFA pile
  - 600mm – 2250kN axial, 150kN shear
  - 750mm – 3250kN axial, 225kN shear
- Due to restricted working conditions and distance piles would need to be from existing walls if piling were to be done from basement level Batchy recommend that piling is to be done from pavement level. This would require the existing floor slab to be broken out and basement backfilled with an engineered fill

The following constraints impact on the foundation solution for the development;

- Poorly compacted made ground
- Numerous concrete obstructions, possible historical floor slabs within basement of Lincoln House
- Historical and existing foundations anticipated at street level
- Granular superficial deposits likely from street level with potential groundwater
- Services running along the pavement of Deansgate and Brazennose Street
- High foundation loads of the proposed development
- Existing basement and retaining structures
- Adjacent highway and party wall boundaries
- Restricted space

4.3.2 Floor slabs

Based on the ground conditions identified the following floor slab design is considered viable;

- Localised ground bearing floor slabs may be appropriate for areas not underlain by basements. The slab should be constructed on a minimum 300mm of stone with basal geogrid/textile to prevent loss of stone
- Groundwater identified during the site investigation. As such, basement structures should be designed for uplift water pressures at ground level

4.4 Mining

The site is not indicated to be within a coal mining area.

4.5 Earthworks

Excavation works will be required for the basement of the proposed development. The materials generated are likely to comprise;

- Hardstanding
- Made ground as construction fill
- Bedrock as weathered sandstone

Demolition material is likely to be suitable for reuse as capping following crushing and reprocessing. However, due to the limited space on site crushing may need to be undertaken off site.

Excess materials generated during the earthworks should be taken away for offsite disposal at an appropriate landfill.

4.6 Services

Statutory services plans are shown in **Appendix A**. The following comments are provided on existing services;

- Electricity sub station located on Mulberry Street at entrance to Lincoln House basement car park. Numerous LV and 6kV cables run along the eastern face of Lincoln House, along the southern face (Brazennose Street) and along the pavement of Deansgate along the western face of the building.
- Low Pressure gas main runs along Mulberry Street and Brazennose Street along boundary of Lincoln House
- BT cables enter Lincoln House and 123 Deansgate from Mulberry Street. BT cables run along Brazennose Street and Deansgate.
- 450mm diameter combined sewer present on Mulberry Street to the east of Lincoln House connecting to sewer on Brazennose Street
- Water main present along Mulberry Street to the east of site

4.7 Temporary Works

The following temporary works are anticipated for the proposed development;

- Pneumatic breakers will be necessary for the relic slab and foundations of the previous on site development.
- Side support required for new basement excavation or retained basement structures with significant temporary works required due to the location adjacent to the highway with services.
- Numerous services along boundary with Brazennose Street, Mulberry Street and Deansgate; temporary and permanent works may impact on easements.
- Limited space for development with a busy main road along the western boundary.
- Granular superficial deposits anticipated from street level. Therefore, potential for washout of sands and gravels and the subsequent settlement of adjacent buildings/services/highways
- Highways Authority approval required; construction and temporary works may have an impact to highways.
- Services Utility Approvals required; construction and temporary works may have an impact on existing services.
- The new basement footprint will be adjacent to an existing building and party wall structural surveys may be required for neighbouring buildings.
- Temporary support may be required to the basement structure during demolition works.

5.0 ENVIRONMENTAL RISK ASSESSMENT

5.1 General

5.1.1 Human Health

A Generic Quantitative Risk Assessment for Human Health has been undertaken in accordance with the Environment Agency's guidance 'Using Soil Guideline Values' (Ref. 6).

The Tier 1 assessment for the site has been undertaken using the Environment Agency's Soil Guideline Values (SGV's) for commercial development where available. In the absence of any published SGV's Atkins Soil Screening Values (SSV's) based on Soil Organic Mater (SOM) of 1% have been used.

5.1.2 Controlled Waters

A Tier One assessment has been undertaken in accordance with the EA Remedial Targets Methodology (Ref. 7) to assess the risk to controlled waters (groundwater and surface water).

The groundwater chemical results have been assessed against UK Drinking Water Standards (2000) (DWS) where available or UK Environmental Quality Standards for Fresh Water (EQS). In the absence of DWS or EQS values DW2 class threshold values specified in the Surface Water (Abstraction for Drinking Water) (Classification) Regulations (1996) (Ref. 8) have been used.

5.1.3 Ground Gas

A ground gas risk assessment has been undertaken in accordance with advice provided in the Ground Gas Handbook (Ref. 9) and CIRIA 665 'Assessing risks posed by hazardous ground gases to buildings' (Ref. 4). The level of gas protection measures required for the development is based on the calculated "Characteristic Situations" for the site.

The results of soil, groundwater and ground gas testing are presented in the Factual Report (Ref. 3). The assessment criteria for the site, including the sources used for individual determinands, is included in **Appendix B**. Summary comparison tables of the results is included in Table B1 **Appendix B** and is discussed in the following sections.

5.2 Statistical Analysis in the Assessment of Soil Contamination Data

5.2.1 General

The statistical analysis techniques have been jointly produced by CIEH and CL: AIRE and are drafted on the perspective of either the Planning System or part 2A of the Environmental Protection Act 1990. In this instance the statistical analysis has been undertaken on the perspective of the planning process.

The following statistical approach is based on two Hypotheses, the Null Hypothesis and the Alternative Hypothesis. These hypotheses have been structured to show (with a defined level of confidence) which of the two hypotheses is most likely to be true in any particular case.

5.2.2 Null and Alternative Hypothesis- Under the Land Use Planning System

The Null Hypothesis is that the level of contamination (in the land of interest) is the same as, or higher than, the critical concentration.

If the statistical test shows that the Null Hypothesis should be rejected, the assessor can conclude that the Alternative Hypothesis is more likely to be true i.e. that contaminant concentrations are low relative to the critical concentration and that, potentially, the land is suitable for use.

If the test shows that the Null Hypothesis should not be rejected the assessor should conclude that contaminant concentration may be the same as, or higher than the critical concentration and further assessment may be needed.

5.2.3 Null and Alternative Hypothesis- Under Part IIA

The Null Hypothesis is that the level of contamination in the land of interest is the same as or lower that the critical concentration and the Alternative Hypothesis is that the level of contamination is higher than the critical concentration.

In this case if the Null Hypothesis is rejected the assessor can conclude that contaminant concentrations are high relative to the critical concentration (and a basis for intervention under the regime potentially exists). If the Null Hypothesis is not rejected, contamination levels may be the same as, or lower than, the critical concentration and a basis for regulatory input is unlikely to be available.

5.3 Human Health Risk Assessment - Assessment Criteria: Commercial End Use

Comparison of the analysis results with the relevant assessment criteria is shown on Table B1, **Appendix B**. The results of the chemical analyses of the samples recovered from the investigatory works at the site have revealed the site to be free of significant soil contamination (based on soil samples analysed at 0.5mbgl). The following sections summarise the categories of chemicals tested and the analysis results.

5.3.1 Inorganic compounds, metals, non metals

The assessment has been made against the SSV's or SGV where available. Contaminants assessed in this way include;

- Arsenic, Boron, Cadmium, Chromium (Total, III, VI), Copper, Lead, Mercury, Nickel, Selenium, Zinc;
- Thiocyanate and Cyanide (total, free, complex)

No elevated concentrations were identified. Therefore the risk to human health is considered to be **Low.**

5.3.2 Organic Compounds

The assessment has been made against the Atkins Site Specific Values (SSV's). Contaminants assessed in this way are:

- Polycyclic Aromatic Hydrocarbons (PAH), Total Petroleum Hydrocarbons (EPH) and Phenol

All of the samples were found to be below the SSV's for commercial end use. Therefore, the risk to human health is considered to be **Low**.

5.3.3 Asbestos

Asbestos fibres as Amosite, Chrysotile and Crocidolite were identified within 4 out of the 5 samples of made ground. Supplementary Asbestos Quantification Analysis confirmed that the percentage of asbestos was between <0.001% and 0.017%.

The entire footprint of the proposed development will be under hardstanding. Therefore no pathway exists between the asbestos fibres within the soils and future site users and the risk to human health from asbestos debris in the general made ground is considered **Low**.

However, the risk to construction workers is considered to be **Moderate**. Appropriate health and safety measures should be implemented during construction and all soils should be

dampened down during any earthworks. This will reduce the risk to construction workers to **Low**.

The presence of further asbestos as fibres within the soil matrix or as asbestos containing materials cannot be discounted based on the age of the building.

5.4 Controlled Waters

The site is located in an area where bedrock is designated by the Environment Agency as being a Principle Aquifer. Standpipes were installed within the made ground and the bedrock.

During post site investigation monitoring ground water samples were collected from 2 No monitoring wells with a response zone within the sandstone formation. The results are presented in Ian Farmer Associates Factual Report (Ref 3) and are summarized below;

- Marginally elevated lube oil range organics of between 0.014 and 0.023mg/l above the obsolete DWS
- Elevated Diesel Range Organics (DRO) at between 0.064 and 0.11mg/l above the obsolete DWS.

Though elevated compared to the obsolete DWS the concentrations are comfortably below the DW2 class threshold values specified in the Surface Water (Abstraction for Drinking Water). In addition there are no groundwater abstraction points within 1km of the site.

In view of the above the risk to the main groundwater body is considered to be **Low**.

5.5 Ground Gas

5.5.1 Methane and Carbon Dioxide

Based on the site investigation the following potential sources of soil gas have been identified on site;

- Made Ground as a concrete and brick fill - **Very Low** soil gas generating potential
- Bedrock as sandstone – **Very Low** soil gas generating potential

The proposed development, a multi storey office block with a basement, is classified as a **Low** sensitivity development.

4 No round of monitoring has been undertaken.

CIRIA Report 665 “Assessing Risks Posed by Hazardous ground gases to Buildings” (Ref. 4) presents current best practice on the assessment of ground gases. The report presents a risk based approach based on gas screening levels which depend on both the concentration and emission rate of gas from the ground. Gas screening levels are calculated as follows:

Gas screening value (l/hr)	=	gas concentration (%) x measured borehole flow rate (l/h)
Maximum CO_2 recorded	=	0.6%v/v
Maximum Gas flow rate	=	0.05 l/h
GSV	=	0.0003

A Maximum GSV of 0.0003 l/hr has been recorded giving Characteristic Situation 1. Therefore, no specific gas protection measures required.

5.5.2 Radon

The site is indicated to be within a lower probability Radon area. As such, basic radon protective measures will not be required for the development.

5.6 Aggressive Ground

5.6.1 Concrete

Chemical test results have been assessed in accordance with BRE Special Digest 1 (Ref. 5) to identify how aggressive the site conditions are to buried concrete.

6 No. samples were tested for Sulphate Aqueous Extract. For a data set of this size, the highest result (1400mg/l) is taken as the characteristic value for Sulphate. A characteristic value for Sulphate of 1400mg/l indicates a design sulphate class of **DS-2**.

The ACEC class is calculated using Table C2 of the BRE Special Digest 1, where the Design Sulphate Class and pH of groundwater or soil give the ACEC classification. Groundwater pH is recorded at 8.6 – 10.6.

A Design Sulphate Class of DS-2 and a pH of 10.6 gives an ACEC classification of **AC-2**.

5.6.2 Services

The advice of service providers should be obtained to ensure that appropriate measures are taken to protect services from contamination and aggressive ground conditions.

5.7 Refined Pollution Linkages and Conceptual Model

5.7.1 Introduction

The potential implication of contamination on the subject site has been considered in terms of the planning process.

The statutory guidance sets out the definition of contaminated land within the context of Government Policy including the 'suitability of use' approach. Action is necessary only where there are unacceptable risks to human health or the environment, taking into account the current land and its environmental setting.

In the context of land contamination, there are three essential elements to any risk;

- **Source**: Substances that are potential contaminants or pollutants that may cause harm.
- **Pathway**: A potential route by which contaminants can move from the source to the receptor.
- **Receptor** or target: A receptor that may be harmed (for example the water environment, humans, flora and fauna).

Each of these elements can exist independently. They create a risk only where they are linked together, so that a particular contaminant affects a particular receptor via one of more pathways. This kind of linked combination of source - pathway - receptor is described as a pollutant linkage.

In order to assess the contamination risk at the subject site an assessment of pollutant linkages has been undertaken and is discussed in the following sections.

5.7.2 Sources

The following sources have been identified on site;

- Asbestos fibres within the made ground
- Elevated Sulphate within soil
- Marginally elevated TPH within the groundwater

5.7.3 Pathways

The following potential pathways have been identified:

- Inhalation
- Ingestion
- Dermal Contact
- Leaching and Lateral Migration
- Surface Run-off
- Direct Contact
- Root Uptake
- Accumulation in confined spaces
- Existing and proposed piles

5.7.4 Receptors

The following receptors have been identified;

- Site end users
- Construction Workers
- Adjacent Land Users
- Groundwater (Principle Aquifer)
- Buried Concrete
- Services

5.7.5 Refined Pollution Linkages

Pollution linkages based on the identified soil and ground gas hazards have been undertaken with respect to the pathways and receptors. A summary table of the expected level of risk from the identified hazards is presented in Table 4 (On Site Sources) and Table 5 (Off Site Sources).

Risk classifications used are detailed in Tables 5 - 8 contained within **Appendix B**.

Table 4 – Refined On Site Pollution Linkages

Source	Pathway	Receptor	Con.	Prob.	Risk	Are Mitigation Measures required?
General Made Ground	Ingestion, Inhalation and Dermal Contact	Future Site Users	**Md**	**Ul**	**L**	No
		Construction Workers	**Md**	**Lw**	**M/L**	Yes - Construction workers should adopt appropriate health and safety measures and use of appropriate PPE during any earthworks operations.
		Adjacent Land Users	**Md**	**Ul**	**L**	Yes - Dust suppression measures required to prevent fugitive dusts migrating to the adjacent land during construction phase.
	Leaching and Lateral Migration	Principle Aquifer	**Md**	**Ul**	**L**	No
	Existing and proposed piles	Principle Aquifer	**Md**	**Ul**	**L**	No.
	Direct Contact	Buried Concrete	**Mi**	**Lw**	**L**	Yes - Buried concrete should be designed in accordance with BRE special publication
		Services	**Mi**	**Lw**	**L**	No
	Direct contact & Root Uptake	Landscaping	**Mi**	**Lw**	**L**	No
Elevated groundwater contamination	Leaching and Lateral Migration	Principle Aquifer	**Md**	**Ul**	**L**	No.
Existing Built Development - Potential Asbestos Containing Materials.	Inhalation	Future Site User	**Sv**	**Ul**	**M/L**	No.
		Construction Worker	**Sv**	**Lw**	**M**	Asbestos survey required before pre demolition. Any asbestos identified to be removed by a specialist contractor.
Asbestos in made ground	Inhalation	Future Site User	**Sv**	**Ul**	**M/L**	No. Made ground will be confined beneath hardcovers.
		Construction Worker	**Sv**	**Lw**	**M**	Yes - Construction workers should adopt appropriate H&S measures and use of appropriate PPE during any earthworks operations.
		Off site land Users	**Sv**	**Ul**	**M/L**	Yes. Damping down to be undertaken during earthworks to prevent dust migration. Covered lorries to be used to remove material from site.
Ground gases	Inhalation	Future Site Users	**Md**	**Ul**	**L**	No - the site is classified as Characteristic Situation 1.
		Construction Workers	**Md**	**Lw**	**M/L**	Yes - Ground gas monitoring should be undertaken before man entry into void spaces.
Historical use of the site as print works.	Ingestion, Inhalation, Dermal Contact	Future Site Users	**Md**	**Ul**	**L**	No. No elevated concentrations of contamination identified.
		Construction Workers	**Md**	**Lw**	**M/L**	Yes. Construction workers should adopt appropriate health and safety measures and use of appropriate PPE during any earthworks operations
		Adjacent Land Users	**Md**	**Ul**	**L**	No.
	Leaching, Migration, and Surface run-off	Principle Aquifer	**Md**	**Ul**	**L**	No
	Existing and proposed piles	Principle Aquifer	**Md**	**Ul**	**L**	No

Table 5 - Refined Off Site Pollution Linkages

Source	Pathway	Receptor	Con.	Prob.	Risk	Are Mitigation Measures required?
Historical and present land use as works, hospital and warehouses.	Ingestion, Inhalation, Dermal Contact	Future Site Users	**Md**	**Ul**	**L**	No
		Construction Workers	**Md**	**Ul**	**L**	No
	Leaching, Migration and Surface run-off	Principle Aquifer	**Md**	**Ul**	**L**	No

After CIRIA Report C552, Contaminated Land Risk Assessment A Guide To Good Practice, 2001

KEY: **Consequence**: Sv = Severe, Md = Medium, Mi = Mild, Mr = Minor
Probability: Hi = High likelihood, Li = Likely, Lw = Low Likelihood, Ul = Unlikely
Risk: VH = Very High, H = High, M = Moderate, M/L = Moderate/Low, L = Low, VL = Very Low

Based on the results of the site investigation, the pollution linkage assessment, and the geological setting of the site, the refined risk assessment has indicated the following;

- Localised contamination as asbestos fibres identified in the made ground on site represents a **Low** risk to human health and a **Moderate to Low** risk to Construction Workers. However, with the use of appropriate PPE the risk is to construction workers is **Low**.
- Potential soil gas beneath the site represents a **Low** risk to future site users and a **Moderate** to **Low** risk to Construction Workers. However, with the use of appropriate PPE the risk is to construction workers is **Low**.
- The marginally elevated groundwater concentrations identified are considered to be a **Low** risk to offsite groundwater receptors (Principle Aquifer)

5.8 Recommendations for Site Remediation

5.8.1 General

The results from laboratory analysis indicate that localised contamination hazards are present on this site. However, the Environmental Risk Assessment has indicated the potential risk to receptors is **Low**.

In order to ensure that risks to identified receptors from the proposed development are maintained at a **Low** level, specific mitigation and validation precautionary measures should be incorporated.

The remediation and mitigation measures summarised in the following sections are recommended for the proposed development.

5.8.2 Site Wide Preparatory Earthworks

The following mitigation measures should be undertaken during the general preparatory earthworks.

<u>General Measures Implemented During Construction</u>

- Asbestos fibres were identified within the made ground during the site investigation. As such, construction workers should adopt appropriate health and safety measures - including damping of materials - when working with made ground deposits. The presence of further asbestos as fibres within the soils matrix or as asbestos containing materials cannot be discounted. If any asbestos containing materials are identified they should be removed and disposed of to landfill by a specialist contractor.
- Construction workers should undertake ground gas and VOC monitoring prior to and during man entry of below ground voids.
- Construction workers should adopt appropriate health and safety measures.
- Surface water control measures should be adopted during construction to limit runoff, siltation of the adjacent watercourses, and infiltration through exposed made ground horizons.
- Dust suppression measures should be adopted during all earthworks to mitigate associated risks.

Minimum Measures to Mitigate Risk to Human Health-End Users

No pollutant linkages were identified which have the potential to impact human end users of the site. As such, the risk to end-users posed by contamination is considered to be **Low** and no remedial measures are currently required during preparatory earthworks with respect to end users.

Minimum Measures to Mitigate Risk to Controlled Waters

Although the presence of significant contamination has not been identified and is not expected, localised contaminants may be present within the made ground materials and cannot be discounted.

The following precautionary minimum measures should be implemented during the preparatory earthworks;

- On completion of the site strip, a visual inspection and validation testing should be undertaken to confirm the absence of any further areas of unknown contamination.
- Additional contaminated materials, if encountered, during construction works and proven to represent an unacceptable risk should be removed and disposed of to an appropriate landfill. After completion of these works validation testing and auditing should be undertaken to confirm the successful removal of contaminants.
- Validation testing to be carried out on site won material and imported bulk fill.

5.8.3 Mitigation Measures within the Built Development

It is recommended that the following mitigation measures should be incorporated into the built development;

- Buried concrete and services should be designed in accordance with the guidance given in BRE Special publication No. 1 (Ref. 5). Based on sulphate conditions the use of Design sulphate DS-2 and ACEC Class AC-2 is considered appropriate.
- The advice of service providers should be obtained to ensure that appropriate measures are taken to protect services from contamination and aggressive ground conditions.
- Soil gas monitoring indicates areas of the site to classify as Characteristic Situation 1. Therefore, no soil gas protection measures are required.
- A minimum 300mm clean cover should be incorporated into soft landscaping areas to provide a suitable rooting zone for proposed planting.

5.8.4 Validation and Reporting

All Environmental works should be validated by suitable validation testing and reporting to prove the of the applied mitigation strategy and to assess any residual risks to the development.

5.9 Waste Regulations

The development of the site will require the excavation and handling of made ground materials and potentially contaminated materials associated with the former land use. These materials could classify as waste and, if this is the case, their excavation and handling would be subject to Waste Management Licensing and Regulations (Ref 10.)

Earthworks materials, which are not a risk to human health or the wider environment can cease to be waste for a particular use by following the current voluntary industry definition of waste: Development Industry Code of Practise (COP) (Ref 10).

This requires registration of the site under the waste COP and presentation of a materials management plan and earthworks validation report to confirm compliance.

Site won waste material which is designated for offsite disposal must comply with the following criteria;

- Waste should be characterised prior to disposal
- It is the waste producer's responsibility to ensure compliance with the requirements of Landfill Directive/Transfer notes

During the recent site investigation samples were collected from across the site and sent for chemical analysis in order to determine the waste classification of materials generated during the earthworks. The results, together with the results from the initial site investigation were inputted into a database known as Hazwaste Online to determine the waste classification. A waste classification report was generated, presented in **Appendix E**, and summarised below;

- 6 out of 6 samples of made ground tested were determined as potentially hazardous waste due to presence of potentially flammable TPH. Concentrations of TPH identified are low and are not considered to be flammable.

Based on the above it is anticipated that made ground waste generated on site would have enhanced disposal costs.

All results should be issued to the selected landfill to establish if they will accept the waste.

REFERENCES

1. Fairhurst Report DIL/108348/01 Phase I Desk Study
2. Fairhurst Report DIL 108348/02, Flood Risk Assessment Report
3. Ian Farmers Associates Ltd – Factual report on Ground Investigation (W15/41743v1)
4. CIRIA C665 Assessing risks posed by hazardous ground gases to buildings (2007)
5. Building Research Management. Concrete in Aggressive Ground Special Digest 1 (2005)
6. Environment Agency, 'Using Soil Guideline Values', SC050021/SGV
7. Environment Agency, 2004, Remedial Targets Methodology
8. Surface Waters (Abstraction for Drinking Water)(Classification) Regulations (1996)
9. Ground Gas Handbook
10. CL:AIRE Waste Code of Practice

Appendix A

Figures

Figure 1 - Site Location Plan

Figure 2 - Site Plan

Figure 3 – Aerial Photograph

Drawings

- 108348/9001 – Exploratory Hole Location Plan
- 108348/9002 – Conceptual Model for Basement of Lincoln House
- Architects Proposed Site Plan

Figure 1 - Location Plan

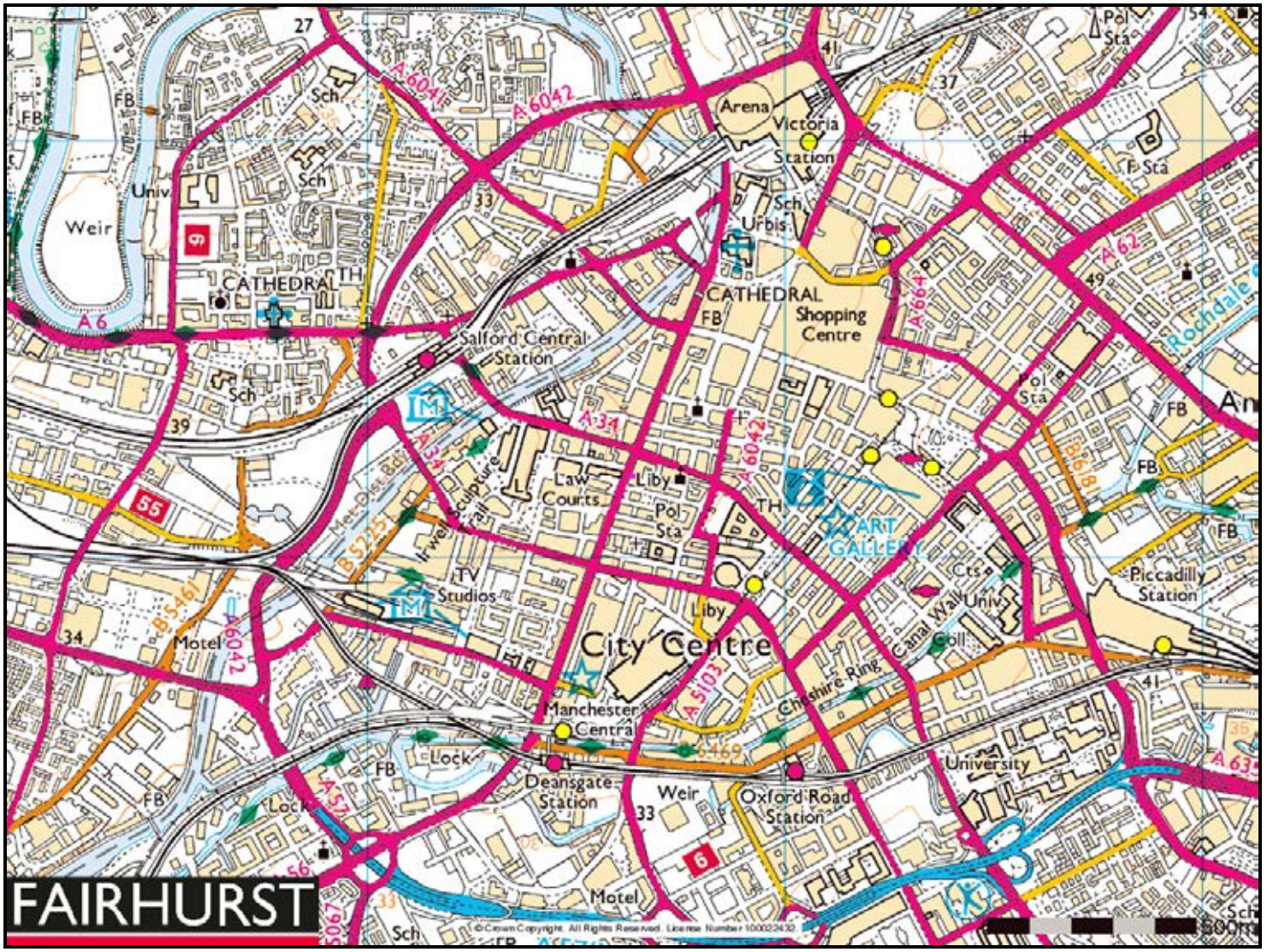


Figure 2 - Site Plan

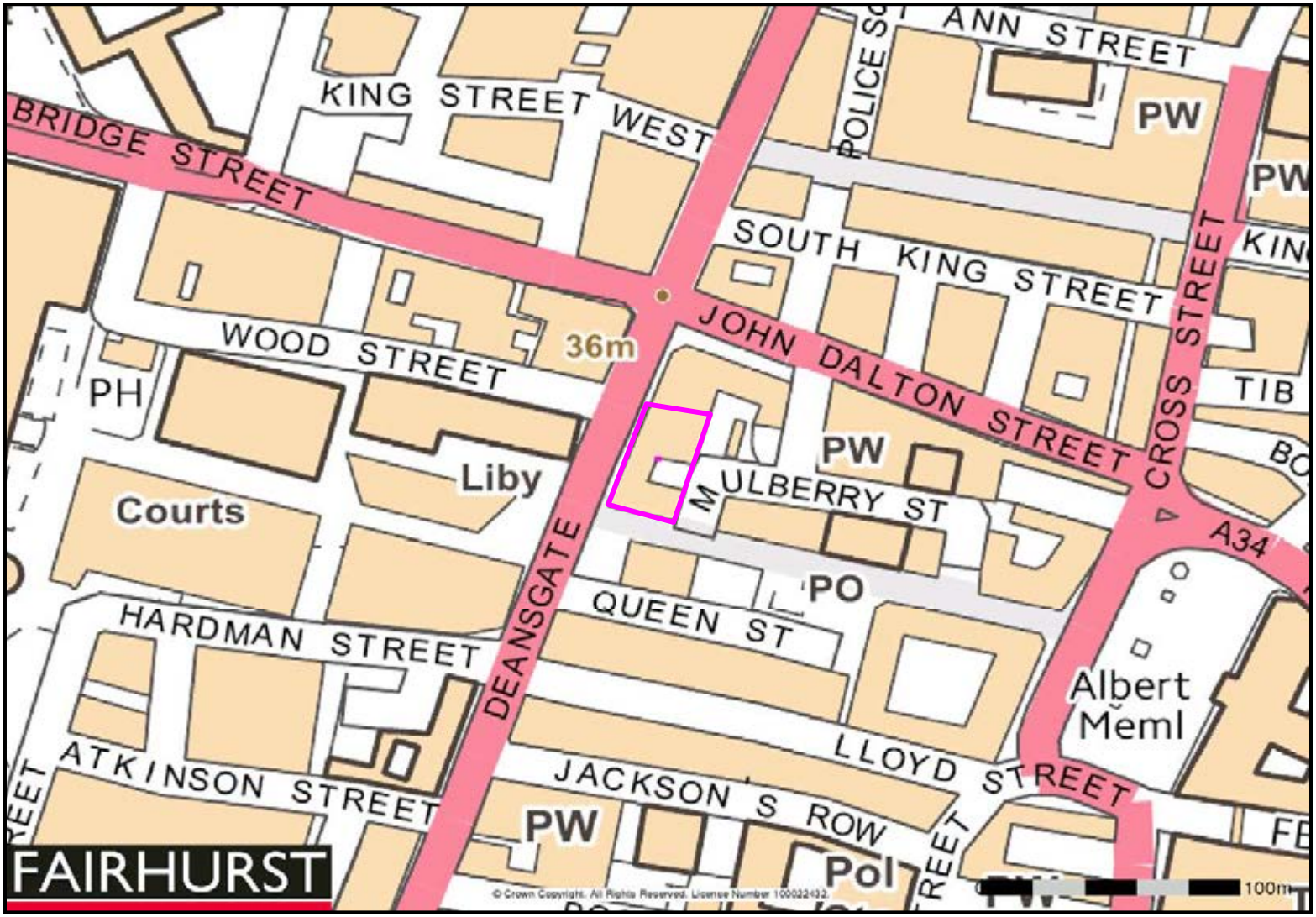


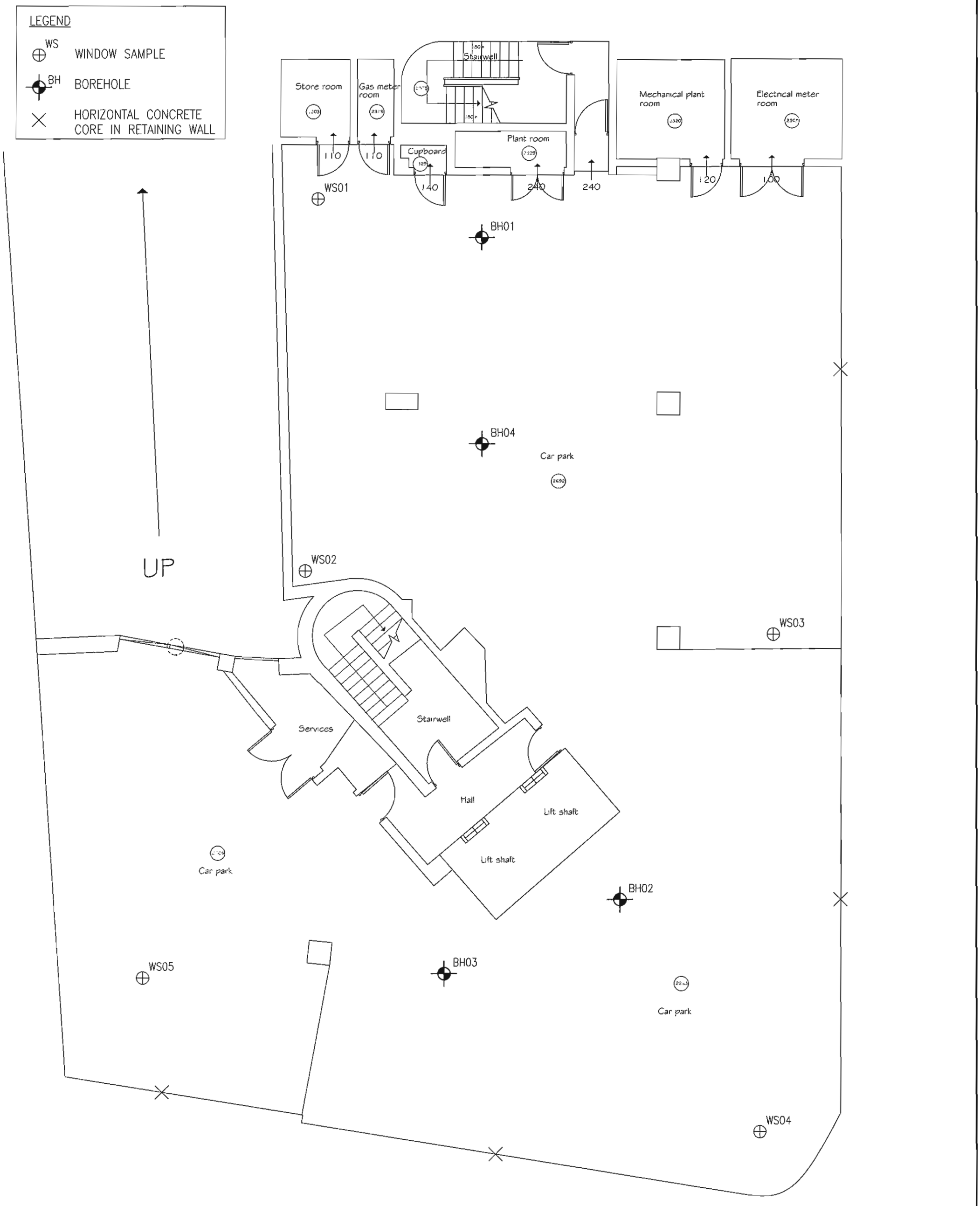
Figure 3 - Aerial Photograph



Do not scale from this drawing.

LEGEND

- WS — WINDOW SAMPLE
- BH — BOREHOLE
- HORIZONTAL CONCRETE CORE IN RETAINING WALL



Rev.	Date	Description	Drawn	Checked	Approved

Client:

MARCUS WORTHINGTON & CO. LTD.
BUILDING CONTRACTORS

Project Title:

LINCOLN HOUSE/123 DEANSGATE MANCHESTER

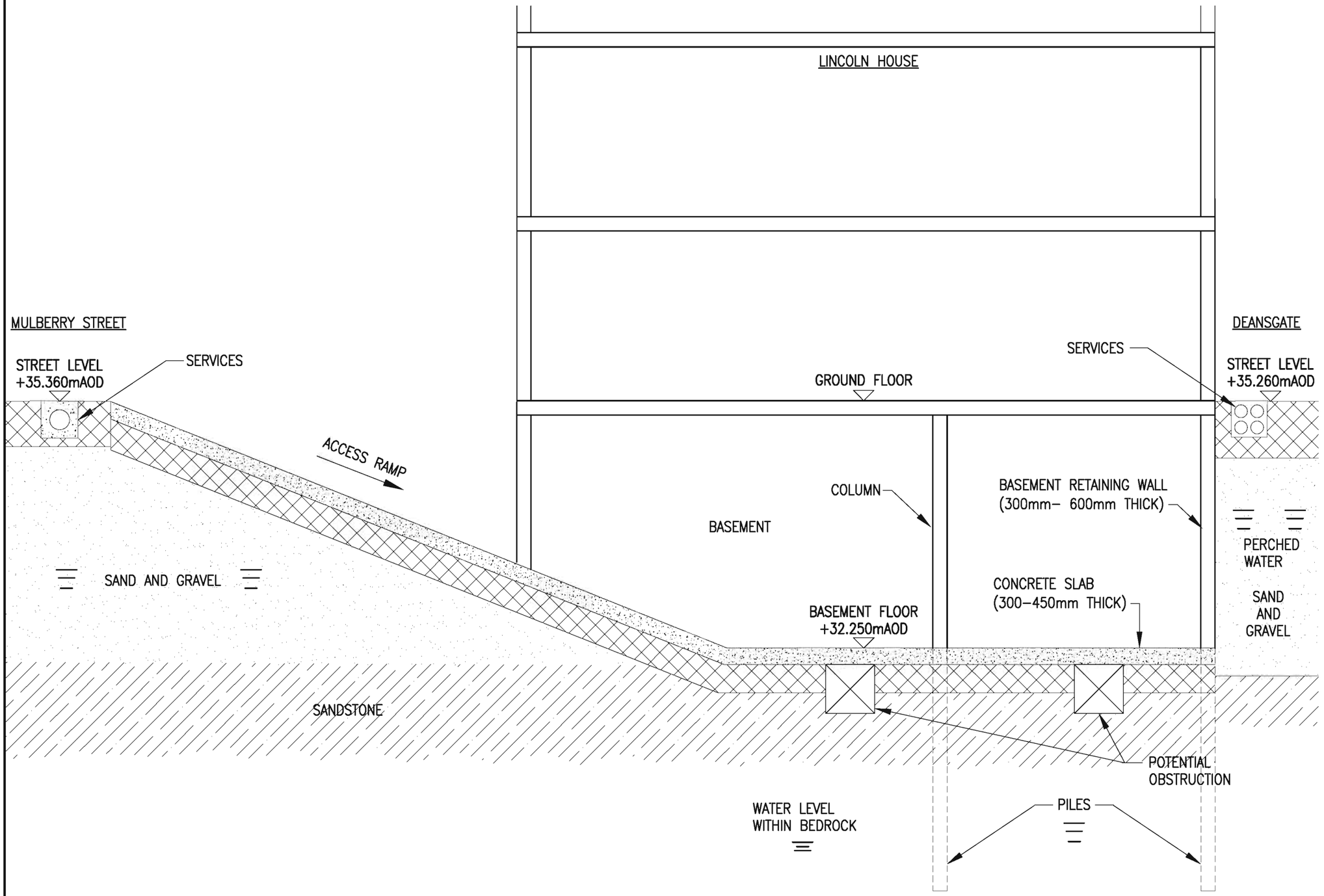
Drawing Title:

SITE INVESTIGATION OF BASEMENT OF LINCOLN HOUSE

FAIRHURST

51o St. Pauls Street,
LEEDS, LS1 2TE
Tel: 0113 243 4671 Fax: 0844 381 4412

Scale at A3:	Status:	
1:100	Preliminary	
Drawn: CG	Checked:	Approved:
Date: 24/09/15	Date:	Date:
Drawing No.: 108348/9001		Revision: –



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SAFETY HEALTH AND ENVIRONMENTAL INFORMATION
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, not the following risk and information.
Hazards listed here are not exhaustive. Refer to Design Assessment Form No.
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DEMOLITION
For information relating to Use, Cleaning and maintenance see the Health and Safety File
It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement.

Rev.	Date	Description	Drwn.	Chkd.	Appd.

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Client:
MARCUS WORTHINGTON & CO. LTD.
BUILDING CONTRACTORS

Project Title:
LINCOLN HOUSE/123 DEANSGATE
MANCHESTER

Drawing Title:
BASEMENT CONCEPTUAL MODEL
FOR LINCOLN HOUSE

Scale at A3:	Status:	
NTS		
Drawn:	Checked:	Approved:
AK		
Date:	Date:	Date:
11/02/2016		
Drawing No.:		Revision:
108348/9002		–

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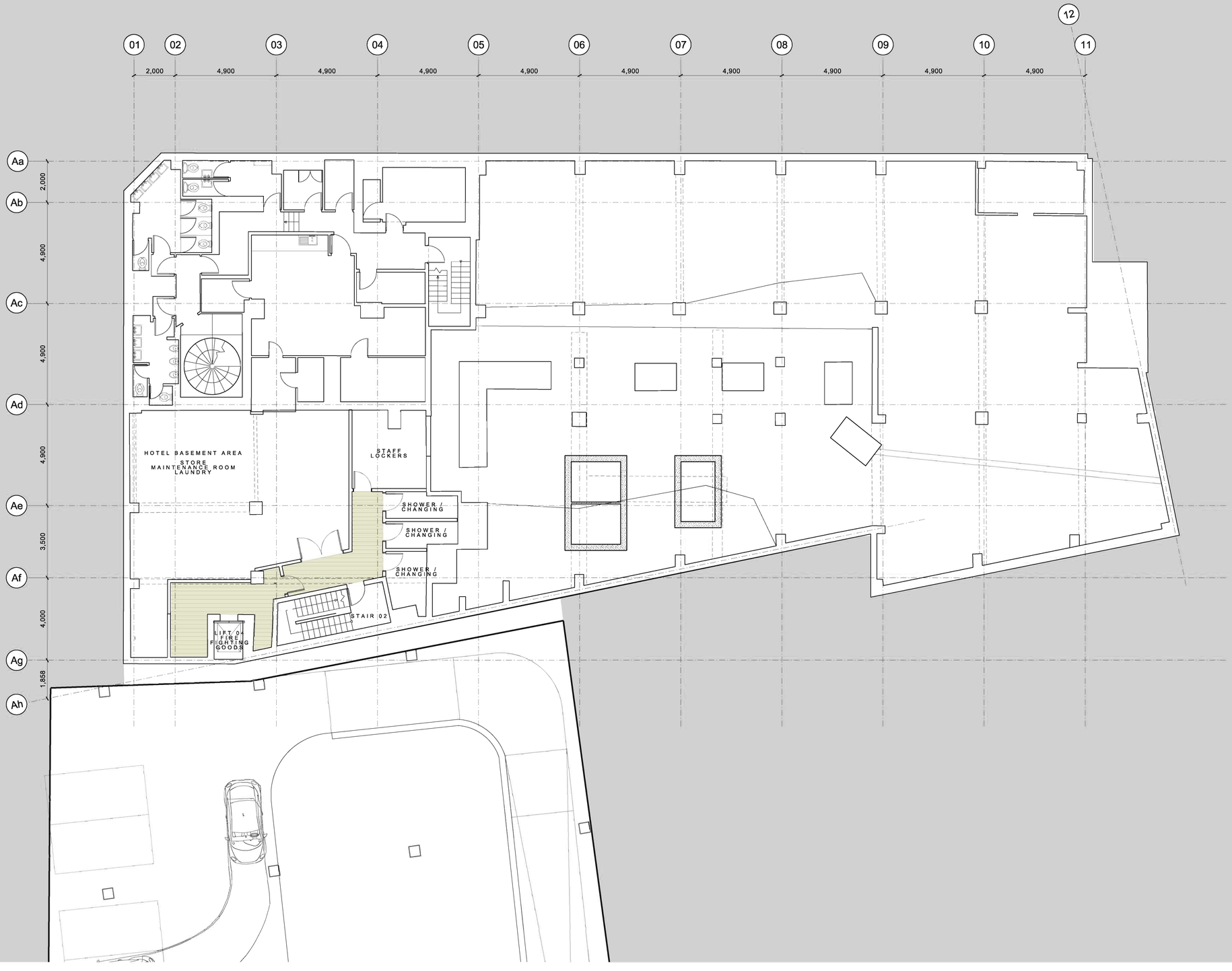
NOTE: To be read in conjuction with 5plus dwgs:
B1_02_200 to B1_02_210

Drawn information based on West Coast survey issued 05.08.15

Drawing to be printed and read in colour.



REV:	DATE:	DETAILS:
E	01.02.16	Riser 02 omitted at this level.
D	04.01.16	Drawing update. Fire lobby amended.
C	02.12.15	Drawing update
B	17.11.15	Core layout/lift overun amended.
A	15.10.15	Core layout/lift overun added.

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PROJECT:
John Dalton House
Manchester

TITLE:
Proposed Plan
Lower Ground Floor

SCALE:	ORIGIN DATE:	DRAWN:	CHECKED:
1:100 @ A1	28.07.15	IB	JB

STATUS:
Preliminary

PROJECT	DRAWING NO:	REV:
05441	B1_02_199	E

Architecture I Masterplanning I Interiors I Graphics I Branding

Appendix B

Contamination Assessment Criteria

Tier 1 Acceptance Criteria for Commercial Development (1% SOM)

Table B1 Assessment of Contamination Results

Table 6 Risk Classification Matrix

Table 7 Classification of Consequence

Table 8 Classification of Probability

Table 9 Classification of Risk and Likely Action Required

Tier 1 Acceptance Criteria for Commercial Development – 1% SOM

	Assessment Criteria Soils mg/kg	Source	Assessment Criteria Groundwater µg/l	Source
Metals				
Antimony	4830	B	5	C
Arsenic (Inorganic)	640	A	10	C
Barium	22,100	-	1 mg/l	E
Beryllium	1010			
Cadmium	230	A	5	E
Chromium III	213,000		5 - 250	
Chromium VI	330	B		E
Copper	109,000	B	1 - 28	E
Lead	2300	C4SL	4 - 250	E
Manganese	-	-	50	D
Mercury - Elemental	4.3	A		
Mercury – Inorganic	3600	A	1	E
Mercury - methyl	414	A		
Nickel	1,800	A	20	E
Selenium	13,000	A	10	C
Vanadium	7,530	B	20 - 60	E
Zinc	≤ 1kg/kg	B	8 - 500	E
Inorganics				
Ammonium (NH4)	-	-	0.5mg/l	C
Ammonia (NH3)	-	-	0.015mg/l	E
Asbestos	Not Present	-	-	
Boron	-	-	2 mg/l	E
Chloride	-	-	250 mg/l	E
Conductivity	-	-	2500	C
Cyanide (complex)		-	50	C
Cyanide (free)	34	B	50	C
Thiocyanate (Thio)	-	-	-	-
pH	-	-	5.5 - 9.5	D
Water Soluble Sulphate	-	-	-	-
Sulphate (total)	-	-	250 mg/l	C
Sulphide	-	-	-	-
Sulphur	-	-	-	-
Calorific Value	2MJ/kg	-	-	-
Organics				
Benzene	13.1	A	1	C
Carbon Disulphide	11.6	B	-	-
Carbon Tetrachloride	1.44	B	-	-
Chlorobenzene	533	B	-	-
Ethylbenzene	180,000	A	-	-
MTBE	-	-	15	H
Oil / Fuel Hydrocarbons		-	10	D
PAH Screen		-	0.1	C
Phenol	686	A	0.5	E
Tetrachloroethene (PCE)	75.8	B	10	C
Toluene	414,000	A	50	E
Trichloroethene (TCE)	5.48	B	10	C
M - Xylene	276,000	A	30	E
O - Xylene	296,000	A	30	E
P - Xylene	279,000	A	30	E
Vinyl Chloride	0.0329	B	0.5	C

	Assessment Criteria Soils mg/kg	Source	Assessment Criteria Groundwater µg/l	Source
Priority PAHs				
Acenaphthene	109,000	B	-	-
Acenaphtylene		B	-	-
Anthracene	536,000	B	0.02	E
Benzo(a)anthracene	131	B	-	-
Benzo(a)pyrene	14.3	B	0.01	C
Benzo(b)flouranthene	142	B	-	-
Benzo(g,h,i)perylene	1440	B	-	-
Benzo(k)fluoranthene	1430	B	-	-
Chrysene	14,000	B	-	-
Dibenz(a,h)anthracene	14.3	B	-	-
Fluoranthene	72,300	B	0.02	E
Fluorene	66,800	B	-	-
Indeno(1,2,3-cd)pyrene	142	B	-	-
Napthalene	8,180	B	10	E
Phenanthrene	-	B	-	-
Pyrene	54,200	B	-	-
Total Petroleum Hydrocarbons				
Aliphatics EC>5-6	≤ 1kg/kg	B	-	-
Aliphatics EC>6-8	≤ 1kg/kg	B	-	-
Aliphatics EC>8-10	167,000	B	-	-
Aliphatics EC>10-12	171,000	B	-	-
Aliphatics EC>12-16	171,000	B	-	-
Aliphatics EC>16	≤ 1kg/kg	B	-	-
Aromatics EC>8-10	58,600	B	-	-
Aromatics EC >10-12	68,300	B	-	-
Aromatics EC >12-16	68,400	B		-
Aromatics EC >16-21	28,400	B		-
Aromatics EC >21-35	28,400	B		-

A. CLEA Soil Guideline Value for Commercial Land Use (2011).

B. Atkins Consultant Limited ATRISK SSV's March 2011

C. Statutory Instrument 2000 No. 3184 *The Water Supply (Water Quality) Regulations (2000)* and Statutory Instrument 2001 No. 2885 *The Water Supply (Water Quality) (Amendment) Regulations (2001)*.

D. Statutory Instrument 1991 No. 2790 The Private Water Supplies Regulations (1991)

E. Environment Agency (2004) Environmental Quality Standards (EQS) – Freshwater

H. Environment Agency (2001) The Fuel Additive MTBE – A groundwater protection issue?

Note – Atkins values for PAH and TPH assume free product is not present

Table B1 - Assessment of Contamination Results

Target	Material Type	Sample Location	Concentrations above Assessment Criteria	Testing Undertaken
Lincoln House basement	Made Ground	BH01 at 0.5	None identified	GS
	Made Ground	WS01 at 0.5	Amosite fibres (<0.001%v/v)	GS, Asb Quantification
	Made Ground	WS02 at 0.5	Chrysotile fibres (<0.001%v/v)	GS, Asb Quantification
	Made Ground	WS03 at 0.5	None identified	GS, Asb
	Made Ground	WS04 at 0.5m	Chrysotile, Amosite and Crocodilite fibres (0.018%v/v)	GS, Asb Quantification
	Made Ground	WS05 at 0.5m	Chrysotile and Amosite (0.02%v/v)	GS, Asb Quantification

Table B2 - Summary of Groundwater Concentrations above Assessment Level

Target	BH ID	Concentrations above Assessment Criteria	Testing Undertaken
		Round 2	
Made Ground	WS03	NA	Dry
	WS04	NA	Dry
Principle Aquifer	BH01	Diesel Range Organics (110), Lube Oil Range Organics (23)	GS, sTPH
	BH02	NA	Insufficient water
	BH04	Diesel Range Organics (64), Lube Oil Range Organics (14)	GS, sTPH

Abbreviations			
GS	Arsenic, Cadmium, Chromium (III, VI, Total), Copper, Lead, Mercury, Nickel, Selenium, Zinc, pH, Cyanides (total, free, complex), Thiocyanate, Sulphur (free), Sulphate, Sulphide, Monohydric Phenols, TPH Screen and speciated PAH		
CS	Total Sulphate, Water Soluble Sulphate, Sulphide, Total Sulphur, Water Soluble Magnesium, Ammonium ion, pH, Chloride ions, Nitrate ions		
sPAH	Speciated Polyaromatic Hydrocarbons	**sTPH**	Speciated Total Petroleum Hydrocarbons
Asb	Asbestos		

Table 6 – Risk Classification Matrix

		Consequence			
		Severe (Sv)	Medium (Md)	Mild (Mi)	Minor (Mr)
Probability	High (Hi)	Very high risk	High Risk	Moderate Risk	Moderate/low risk
	Likely (Li)	High risk	Moderate risk	Moderate/low risk	Low risk
	Low likelihood (Lw)	Moderate risk	Moderate/low risk	Low risk	Very low risk
	Unlikely (Ul)	Moderate/low risk	Low risk	Very low risk	Very low risk

After CIRIA Report C552, Contaminated Land Risk Assessment A Guide to Good Practice, 2001

Table 7 – Classification of Consequence

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

After CIRIA Report C552, Contaminated Land Risk Assessment A Guide to Good Practice, 2001

Table 7 – Classification of Probability

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

After CIRIA Report C552, Contaminated Land Risk Assessment A Guide to Good Practice, 2001

Table 8 - Classification of Risk and Likely Action Required

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

After CIRIA Report C552, Contaminated Land Risk Assessment A Guide to Good Practice, 2001

Appendix C

Specialist Advice

Owain Gwilym

From: Guy Ruhaza
Sent: 01 March 2016 16:11
To: Owain Gwilym
Cc: FileCopy - Leeds
Subject: FW: 108348 - Lincoln House Deansgate Manchester
Attachments: CM-700 Piling Rig.pdf

Regards

Guy Ruhaza
Engineer
For and on behalf of

Fairhurst
51a St Paul's Street,
Leeds, LS1 2TE
Tel: 0113 243 4671 Fax: 0844 381 4412
Email: guy.ruhaza@fairhurst.co.uk Website: http://www.fairhurst.co.uk

Consider the environment. Please don't print this e-mail unless you really need to.

From: BROWN Matthew I [mailto:matt.brown@bacsol.co.uk]
Sent: 19 February 2016 15:06
To: Stephen Southwick
Cc: Guy Ruhaza; FileCopy - Leeds
Subject: RE: 108348 - Lincoln House Deansgate Manchester

Steve,

Thank you for the opportunity to assist on this project. Please find below some preliminary advice with regards to capacities for various pile diameters.

Based on the rock strength data received, we would look to utilise CFA piling techniques. However, if large rock sockets were required due to high tensile forces or large horizontal loads, then we may need to consider rotary methods. We would review this further upon receipt of additional site investigation to be undertaken from within the existing John Dalton House. The diameters adopted below can be constructed using either technique.

At this stage we would suggest the following limits based on CFA methods. These limits are based on piles being designed as restrained at the head in two directions by pile caps, ground beams and/or the structural slab. Following receipt of additional site investigation we may be able to improve on these values.

600mm – 2250 kN axial, 150 kN shear
750mm – 3250kN axial, 225 kN shear

We could also consider a 900mm diameter pile but due to the size of the site, we would ideally look to limit the pile solution to a single diameter to avoid requirements to change augers and to limit the amount of equipment to be stored on site. As some piles are more lightly loaded, a 900mm diameter option is unlikely to be cost effective.

Generally the piles should be spaced at 3 x diameter centre to centre spacing but if necessary, in core areas, we could examine the effects of group settlements and may be able to accept a reduced spacing of say 2.5 x diameter if it assists.

It appears that the project will require 100+ piles based on initial layout. Generally for a project with 100+ piles, we test at least 1% of the working piles to 1.5 x working load to verify the design. However, if all parties (specialist contractor, client, engineer and building control) are in agreement we can adopt a more conservative design approach to negate the requirements to undertake testing. This approach may be worth considering on this project as a test pile would require additional reaction piles to be constructed. This may be difficult if the proposed test piles (normally the most heavily loaded piles) fall within a core or are located along the boundary with the existing basement wall.

As the scheme develops it would be helpful to understand if the foundations are to be designed in accordance with the superseded British Standards or Eurocodes (both approaches are used in industry at present). If Eurocodes are to be adopted, the loads must be presented in the correct format – permanent and variable components. At this stage, the limits noted above would need to be reviewed as the proportion of permanent and variable load affects the design resistance required.

We would also note some concerns of your initial proposal to construct the piles from within the basement:

> The site appears to be relatively small (circa. 45m x 30m, narrowing to 25m at the John Dalton House end) and as we understand the existing wall will need to be temporarily propped during the piling works, reducing the working area further. This would create extremely restricted working conditions for the size of rig required to undertake this work (see typical rig details attached). We would also need to consider attendant excavators, concrete trucks, concrete pumps, reinforcement storage, piling spoil, stores, offices, welfare provisions and access ramps / stairs. The wall props would need to be designed such that they could be temporarily removed to enable piling rig access to the positions close to the wall. Notwithstanding the design issues that this would create, the addition of this process would obviously effect piling production and overall cost and programme.
>
> A further limitation of piling within the basement is the distance we would be able to locate the piles from the existing wall. We generally require 1.0-1.2m from wall to pile centre against a perpendicular wall and at least 1.5m in a corner position. This may impact on the current proposals requiring the piles to be relocated further from the wall than currently shown.
>
> If the rig were required to operate from basement level a ramp at a gradient no greater than 1:10 would be required.

We would strongly recommend that you investigate the possibility of piling from the “pavement” level. This would require the existing basement slab to be broken out and the basement backfilled with an engineered fill. Subject to the nature of the existing buildings on site, the demolition contractor may be able to re-use some of the demolition material. Whilst this proposal would still leave a relatively restricted site, it would eliminate the raking wall props creating a larger working footprint and offer greater flexibility with regards to programming works / storing materials / receiving deliveries. We would also be able to construct the piles much closer to the existing wall – say 300mm from outside edge of pile to wall. However, consideration would need to made with regards to integrity of the existing basement wall, the methodology of breaking the piles down and the proposed construction of the new wall.

We trust the above information is useful to enable you to progress the scheme further. We look forward to receiving the full enquiry and the opportunity to tender for this work in the future.

Kind Regards,

Matt Brown *MEng (Hons) CEng MICE* | **Design Engineer**
Bachy Soletanche, Henderson House, Langley Place, Higgins Lane, Burscough, Lancashire, L40 8JS
DD: +44 (0)1704 891 022 Mob: +44(0)7870 247 901 Tel: +44 (0)1704 895 686

BACHY SOLETANCHE

From: Stephen Southwick [mailto:stephen.southwick@fairhurst.co.uk]
Sent: 17 February 2016 16:05
To: BROWN Matthew I <matt.brown@bacsol.co.uk>
Cc: Guy Ruhaza <guy.ruhaza@fairhurst.co.uk>; FileCopy - Leeds <FileCopyLeeds@fairhurst.co.uk>
Subject: 108348 - Lincoln House Deansgate Manchester

Matthew

Further to our telephone conversation please find attached the following ;

1. Ground investigation Factual Report by Ian Farmer Assoc
2. Drawing 108348/7300 detailing the preliminary column layout and foundation loads.
3. Drawing 108348/7013 which shows a plan and section at a typical perimeter column.

Can you please provide preliminary advice with respect to pile type, diameter, safe working vertical load capacity and horizontal shear capacity based on the soils recorded in the report. Just consider the gravity loads for now we will translate the core moments into areas of compression and tension when we get a better idea of what the piles can achieve.

Feedback as soon as possible next week would be appreciated.

Regards

Steve Southwick
Technical Director
engineering solutions, delivering results

Fairhurst
51a St Paul's Street,
Leeds, LS1 2TE
Tel: 0113 243 4671 Fax: 0844 381 4412 Mob 07920 592323
Email: stephen.southwick@fairhurst.co.uk Website: http://www.fairhurst.co.uk

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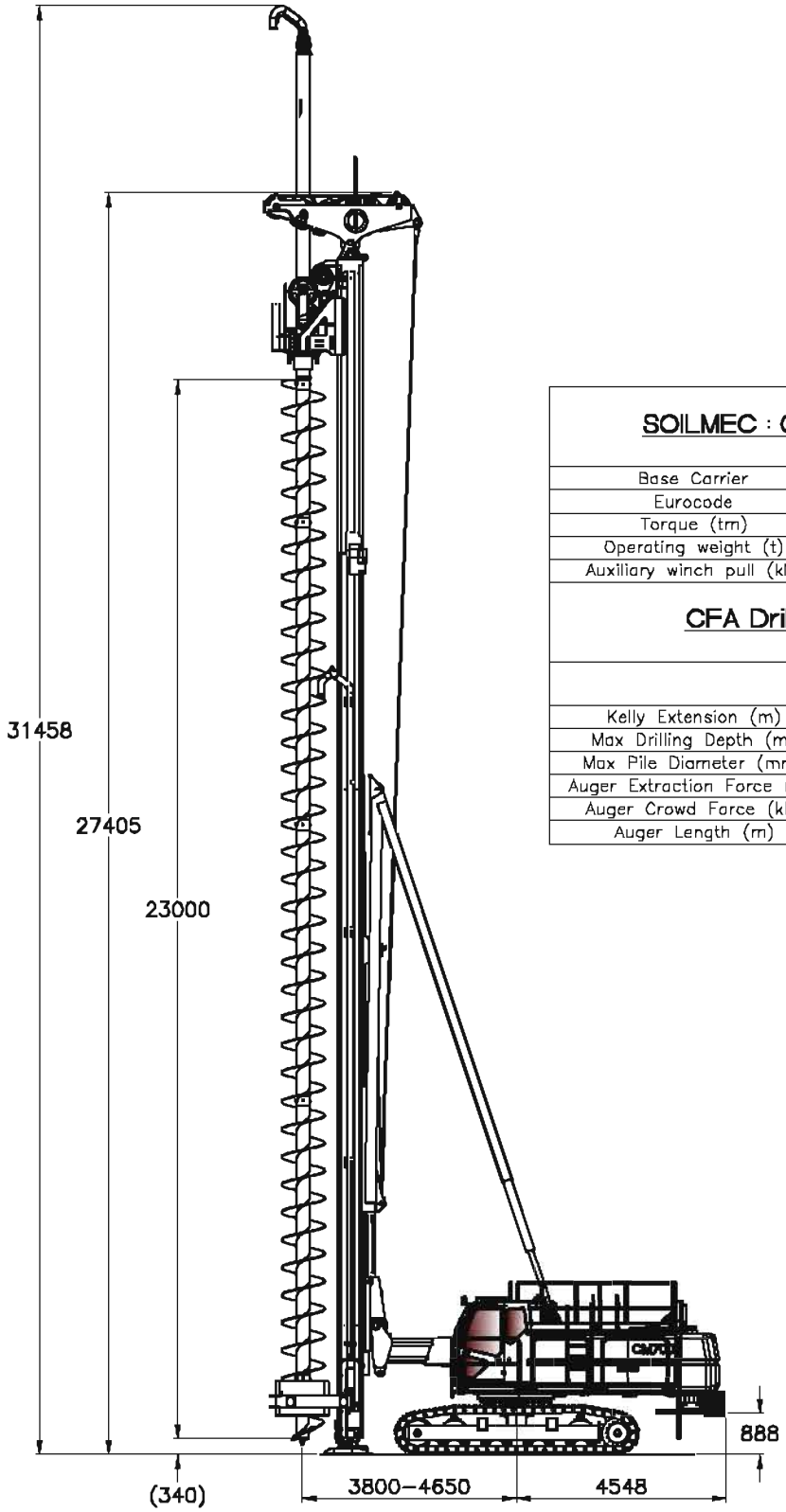
BACHY SOLETANCHE

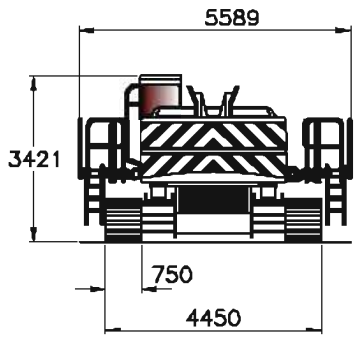


SOILMEC : CM700 #1842

Base Carrier	Soilmec : CM700
Eurocode	K207230001
Torque (tm)	172
Operating weight (t)	75
Auxiliary winch pull (kN)	75

CFA Drilling Data

	Standard	Extension
Kelly Extension (m)		6
Max Drilling Depth (m)	22.5	28.5
Max Pile Diameter (mm)	1050	1050
Auger Extraction Force (kN)	680	680
Auger Crowd Force (kN)	120	120
Auger Length (m)	23	23



DRAWN SO	Soilmec CM700 K207230001	SCALES 1:160	
CHECKED SO		DRAWING No. 609/15	SHT No. 1/2 REV. 7
APPROVED SA			
DATE 20.02.07	DRAWING STATUS Plant Information	DATE REVISED 15.09.14	

Appendix D

Photographs



Photo 1 – Floor slab core at WS4



Photo 2 – WS4



Photo 3 – Floor slab core at BH01

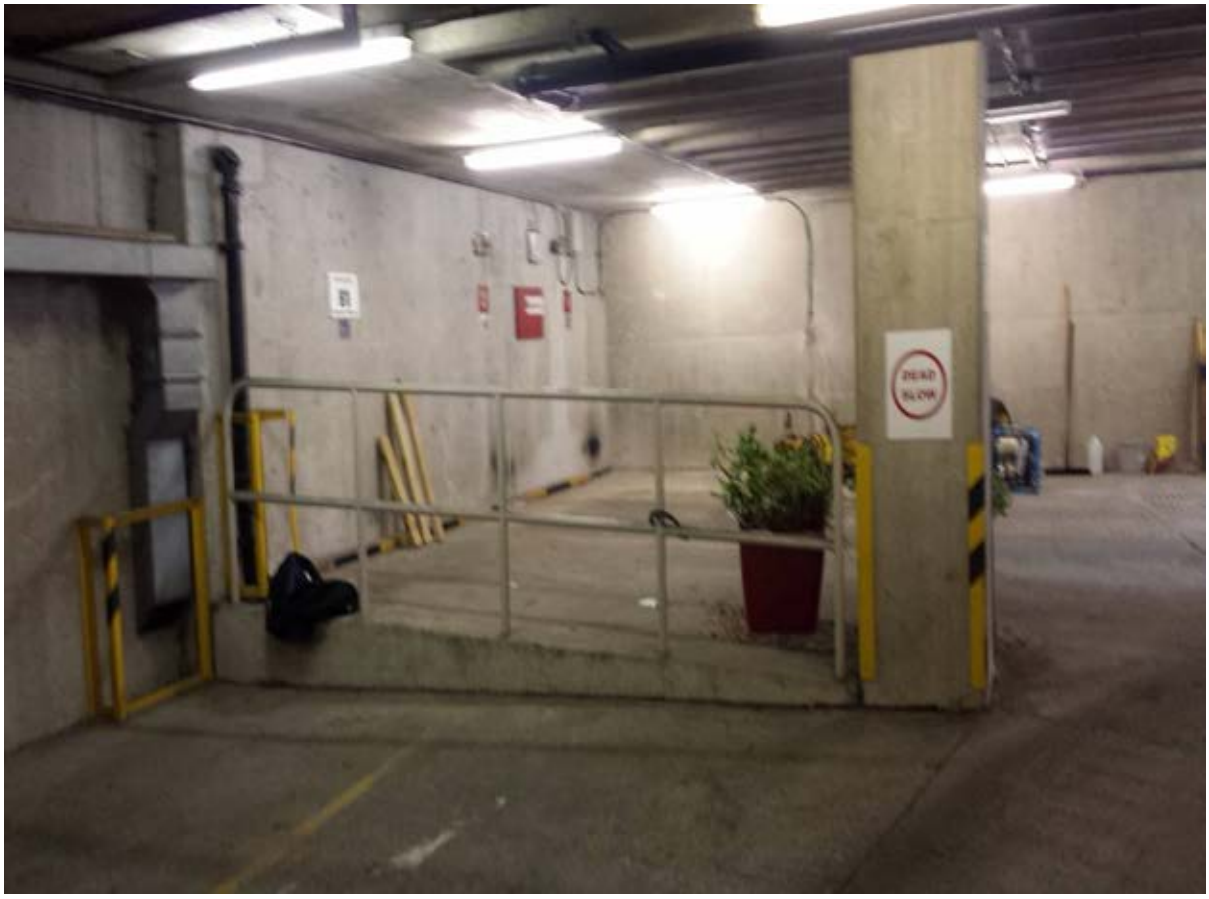


Photo 4 – Northwest corner of basement car park for Lincoln House

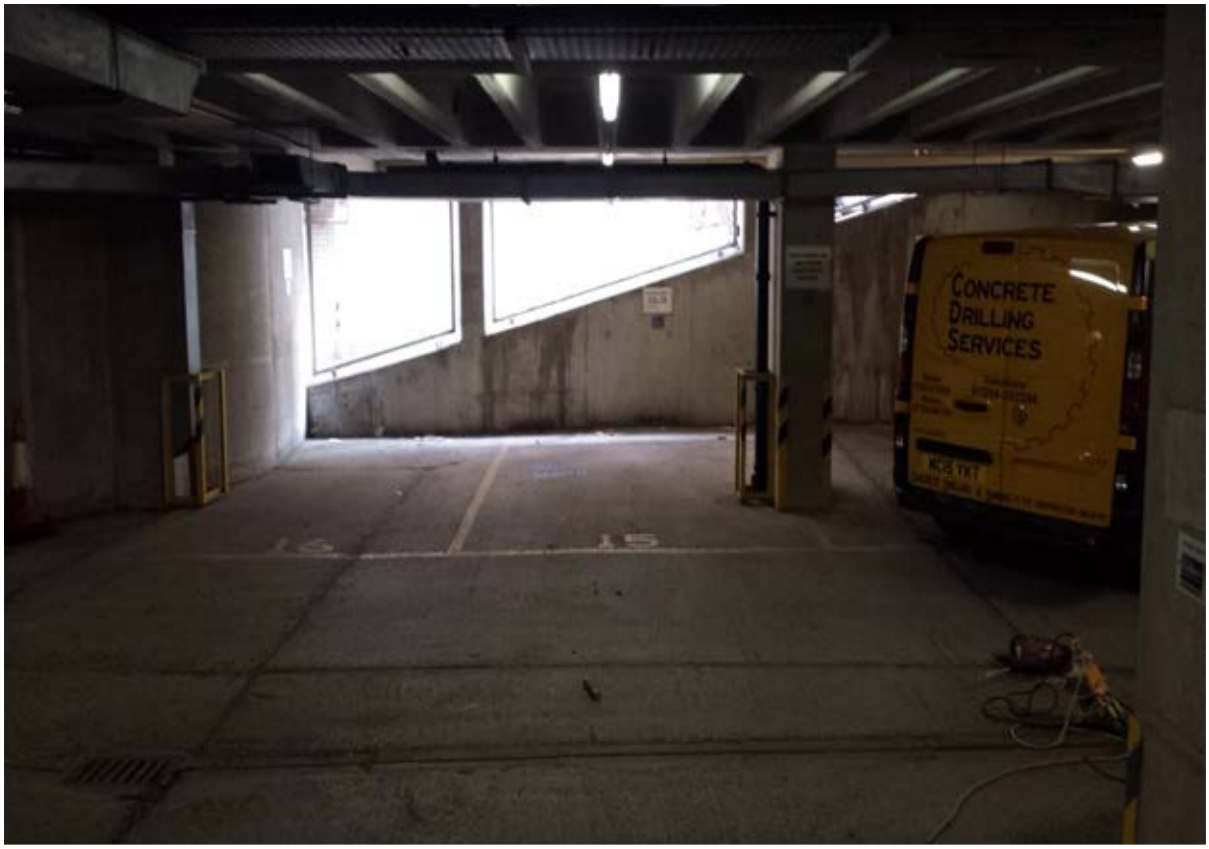


Photo 5 – Centre of basement car park of Lincoln House – Facing north



Photo 6 – South west corner of basement car park of Lincoln House

Appendix E

HazWaste print out

FAIRHURST

HazWasteOnline™

Waste Classification Report

CBUYQ-W4XZK-84TF5

Job name

Lincoln House, Manchester

Waste Stream

Default Contaminated Land

Comments

Project

Lincoln House

Site

Lincoln House

Classified by

Name:
Jones, Andrew
Date:
02/03/2016 09:43 UTC
Telephone:
0113 243 4671

Company:
Fairhurst
51a St Paul's Street
Leeds
LS1 2TE

Report

Created by: Jones, Andrew
Created date: 02/03/2016 09:43 UTC

Job summary

#	Sample Name	Depth [m]	Classification Result	Hazardous properties	Page
1	BH01 at 1m		Potentially Hazardous	HP 3(i)	2
2	WS01 at 0.5m		Potentially Hazardous	HP 3(i)	4
3	WS02 at 0.5m		Potentially Hazardous	HP 3(i)	7
4	WS03 at 0.5m		Potentially Hazardous	HP 3(i)	10
5	WS04 at 0.5m		Potentially Hazardous	HP 3(i)	12
6	WS05 at 0.5m		Potentially Hazardous	HP 3(i)	14

Appendices	Page
Appendix A: Classifier defined and non CLP determinands	16
Appendix B: Notes	18
Appendix C: Version	18

Classification of sample: BH01 at 1m

Potentially Hazardous Waste
Classified as **17 05 04** or **17 05 03 ***
in the List of Waste

Sample details

Sample Name:
BH01 at 1m
Sample Depth:
0 m
Moisture content: **0%**
(no correction)

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

Hazard properties (substances considered hazardous until shown otherwise)

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"

Hazard Statements hit:

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

Because of determinands:

diesel petroleum group: (conc.: 0.0015%)
TPH (C6 to C40) petroleum group: (conc.: 0.0029%)

Determinands (Moisture content: 0%, no correction)

confirm TPH has NOT arisen from diesel or petrol: (Confirmed)
acenaphthene: (Whole conc. entered as: <0.1 mg/kg or <0.00001%) IGNORED Because: "<LOD"
acenaphthylene: (Whole conc. entered as: <0.1 mg/kg or <0.00001%) IGNORED Because: "<LOD"
anthracene: (Whole conc. entered as: <0.1 mg/kg or <0.00001%) IGNORED Because: "<LOD"
arsenic trioxide: (Cation conc. entered: 2.2 mg/kg, converted to compound conc.:2.905 mg/kg or 0.00029%)
benzo[a]anthracene: (Whole conc. entered as: <0.1 mg/kg or <0.00001%) IGNORED Because: "<LOD"
benzo[a]pyrene; benzo[def]chrysene: (Whole conc. entered as: <0.1 mg/kg or <0.00001%) IGNORED Because: "<LOD"
benzo[b]fluoranthene: (Whole conc. entered as: <0.1 mg/kg or <0.00001%) IGNORED Because: "<LOD"
benzo[ghi]perylene: (Whole conc. entered as: <0.1 mg/kg or <0.00001%) IGNORED Because: "<LOD"
benzo[k]fluoranthene: (Whole conc. entered as: <0.1 mg/kg or <0.00001%) IGNORED Because: "<LOD"
cadmium sulfide: (Cation conc. entered: 0.9 mg/kg, converted to compound conc.:1.157 mg/kg or 0.000116%, Note 1 conc.: 0.00009%)
chromium(III) oxide: (Cation conc. entered: 45 mg/kg, converted to compound conc.:65.77 mg/kg or 0.00658%)
chromium(VI) oxide: (Cation conc. entered: <1 mg/kg, converted to compound conc.:<1.923 mg/kg or <0.000192%) IGNORED Because: "<LOD"
chrysene: (Whole conc. entered as: <0.1 mg/kg or <0.00001%) IGNORED Because: "<LOD"
copper (I) oxide: (Cation conc. entered: 6.6 mg/kg, converted to compound conc.:7.431 mg/kg or 0.000743%)
salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex: (Cation conc. entered: <0.2 mg/kg, converted to compound conc.:<0.377 mg/kg or <0.0000377%) IGNORED Because: "<LOD"
dibenz[a,h]anthracene: (Whole conc. entered as: <0.1 mg/kg or <0.00001%) IGNORED Because: "<LOD"
diesel petroleum group: (Whole conc. entered as: 15 mg/kg or 0.0015%)
fluoranthene: (Whole conc. entered as: 0.3 mg/kg or 0.00003%)
fluorene: (Whole conc. entered as: <0.1 mg/kg or <0.00001%) IGNORED Because: "<LOD"
indeno[123-cd]pyrene: (Whole conc. entered as: <0.1 mg/kg or <0.00001%) IGNORED Because: "<LOD"
lead chromate: (Cation conc. entered: 32 mg/kg, converted to compound conc.:49.914 mg/kg or 0.00499%, Note 1 conc.: 0.0032%)

mercury dichloride: (Cation conc. entered: <0.05 mg/kg, converted to compound conc.:<0.0677 mg/kg or <0.00000677%) IGNORED Because: "<LOD"
naphthalene: (Whole conc. entered as: <0.1 mg/kg or <0.00001%) IGNORED Because: "<LOD"
nickel dihydroxide: (Cation conc. entered: 6.9 mg/kg, converted to compound conc.:10.899 mg/kg or 0.00109%)
pH: (Whole conc. entered as: 10.6 pH, converted to conc.:10.6 pH or 10.6 pH)
phenanthrene: (Whole conc. entered as: 0.3 mg/kg or 0.00003%)
phenol: (Whole conc. entered as: <0.3 mg/kg or <0.00003%) IGNORED Because: "<LOD"
pyrene: (Whole conc. entered as: 0.3 mg/kg or 0.00003%)
selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex: (Cation conc. entered: 6.9 mg/kg, converted to compound conc.:17.62 mg/kg or 0.00176%)
TPH (C6 to C40) petroleum group: (Whole conc. entered as: 29 mg/kg or 0.0029%)
zinc chromate: (Cation conc. entered: 23 mg/kg, converted to compound conc.:63.805 mg/kg or 0.00638%)

Notes utilised in assessment

C14: Step 5
"identify whether any individual ecotoxic substance is present at or above a cut-off value ..." , used on:

Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "cadmium sulfide"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "arsenic trioxide"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "chromium(III) oxide"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "copper (I) oxide"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "fluoranthene"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "lead chromate"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "nickel dihydroxide"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "phenanthrene"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "pyrene"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "zinc chromate"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "diesel petroleum group"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "TPH (C6 to C40) petroleum group"

Note 1 , used on:

Test: "HP 5 on STOT SE 1; H370, STOT RE 1; H372" for determinand: "cadmium sulfide"
Test: "HP 5 on STOT SE 2; H371, STOT RE 2; H373" for determinand: "cadmium sulfide"
Test: "HP 6 on Acute Tox. 4; H302" for determinand: "cadmium sulfide"
Test: "HP 7 on Carc. 1A; H350, Carc. 1B; H350, Carc. 1A; H350i, Carc. 1B; H350i" for determinand: "cadmium sulfide"
Test: "HP 10 on Repr. 1A; H360, Repr. 1A; H360D, Repr. 1A; H360Df, Repr. 1A; H360F, Repr. 1A; H360Fd, Repr. 1A; H360FD, Repr. 1B; H360, Repr. 1B; H360D, Repr. 1B; H360Df, Repr. 1B; H360F, Repr. 1B; H360Fd, Repr. 1B; H360FD " for determinand: "lead chromate"
Test: "HP 10 on Repr. 2; H361, Repr. 2; H361d, Repr. 2; H361f, Repr. 2; H361fd" for determinand: "cadmium sulfide"
Test: "HP 11 on Muta. 2; H341" for determinand: "cadmium sulfide"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "cadmium sulfide"

Determinand notes

Note 1 , used on:

determinand: "cadmium sulfide"
determinand: "lead chromate"

Note A , used on:

determinand: "selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex"
determinand: "zinc chromate"

WM3: Unknown oil , used on:

determinand: "TPH (C6 to C40) petroleum group"

Classification of sample: WS01 at 0.5m

Potentially Hazardous Waste
Classified as **17 05 04** or **17 05 03 ***
in the List of Waste

Sample details

Sample Name:
WS01 at 0.5m
Sample Depth:
0 m
Moisture content: **0%**
(no correction)

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

Hazard properties (substances considered hazardous until shown otherwise)

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"

Hazard Statements hit:

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

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.089%)

Determinands (Moisture content: 0%, no correction)

confirm TPH has NOT arisen from diesel or petrol: (Confirmed)
acenaphthene: (Whole conc. entered as: 2.3 mg/kg or 0.00023%)
acenaphthylene: (Whole conc. entered as: 0.7 mg/kg or 0.00007%)
anthracene: (Whole conc. entered as: 3.6 mg/kg or 0.00036%)
arsenic trioxide: (Cation conc. entered: 20 mg/kg, converted to compound conc.:26.407 mg/kg or 0.00264%)
benzo[a]anthracene: (Whole conc. entered as: 13 mg/kg or 0.0013%)
benzo[a]pyrene; benzo[def]chrysene: (Whole conc. entered as: 13 mg/kg or 0.0013%)
benzo[b]fluoranthene: (Whole conc. entered as: 11 mg/kg or 0.0011%)
benzo[ghi]perylene: (Whole conc. entered as: 9.3 mg/kg or 0.00093%)
benzo[k]fluoranthene: (Whole conc. entered as: 6 mg/kg or 0.0006%)
cadmium sulfide: (Cation conc. entered: 0.7 mg/kg, converted to compound conc.:0.9 mg/kg or 0.00009%, Note 1 conc.: 0.00007%)
chromium(III) oxide: (Cation conc. entered: 21 mg/kg, converted to compound conc.:30.693 mg/kg or 0.00307%)
chromium(VI) oxide: (Cation conc. entered: <1 mg/kg, converted to compound conc.:<1.923 mg/kg or <0.000192%)
IGNORED Because: "<LOD"
chrysene: (Whole conc. entered as: 14 mg/kg or 0.0014%)
copper (I) oxide: (Cation conc. entered: 29 mg/kg, converted to compound conc.:32.651 mg/kg or 0.00327%)
salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex: (Cation conc. entered: 0.9 mg/kg, converted to compound conc.:1.696 mg/kg or 0.00017%)
dibenz[a,h]anthracene: (Whole conc. entered as: 1.4 mg/kg or 0.00014%)
fluoranthene: (Whole conc. entered as: 26 mg/kg or 0.0026%)
fluorene: (Whole conc. entered as: 1.9 mg/kg or 0.00019%)
indeno[123-cd]pyrene: (Whole conc. entered as: 9.6 mg/kg or 0.00096%)
lead chromate: (Cation conc. entered: 370 mg/kg, converted to compound conc.:577.132 mg/kg or 0.0577%, Note 1 conc.: 0.037%)
mercury dichloride: (Cation conc. entered: 0.15 mg/kg, converted to compound conc.:0.203 mg/kg or 0.0000203%)
naphthalene: (Whole conc. entered as: 1.2 mg/kg or 0.00012%)
nickel dihydroxide: (Cation conc. entered: 15 mg/kg, converted to compound conc.:23.692 mg/kg or 0.00237%)

pH: (Whole conc. entered as: 9.1 pH, converted to conc.:9.1 pH or 9.1 pH)
phenanthrene: (Whole conc. entered as: 15 mg/kg or 0.0015%)
phenol: (Whole conc. entered as: <0.3 mg/kg or <0.00003%) IGNORED Because: "<LOD"
pyrene: (Whole conc. entered as: 25 mg/kg or 0.0025%)
selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex: (
Cation conc. entered: 15 mg/kg, converted to compound conc.:38.304 mg/kg or 0.00383%)
TPH (C6 to C40) petroleum group: (Whole conc. entered as: 890 mg/kg or 0.089%)
zinc chromate: (Cation conc. entered: 66 mg/kg, converted to compound conc.:183.094 mg/kg or 0.0183%)

Notes utilised in assessment

C14: Step 5

"identify whether any individual ecotoxic substance is present at or above a cut-off value ..." , used on:

Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "cadmium sulfide"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "acenaphthene"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "anthracene"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "arsenic trioxide"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "benzo[a]anthracene"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "benzo[a]pyrene; benzo[def]chrysene"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "benzo[b]fluoranthene"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "benzo[ghi]perylene"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "benzo[k]fluoranthene"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "chromium(III) oxide"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "chrysene"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "copper (I) oxide"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "dibenz[a,h]anthracene"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "fluoranthene"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "fluorene"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "lead chromate"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "mercury dichloride"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "naphthalene"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "nickel dihydroxide"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "phenanthrene"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "pyrene"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "zinc chromate"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "TPH (C6 to C40) petroleum group"

Note 1 , used on:

Test: "HP 5 on STOT SE 1; H370, STOT RE 1; H372" for determinand: "cadmium sulfide"
Test: "HP 5 on STOT SE 2; H371, STOT RE 2; H373" for determinand: "cadmium sulfide"
Test: "HP 6 on Acute Tox. 4; H302" for determinand: "cadmium sulfide"
Test: "HP 7 on Carc. 1A; H350, Carc. 1B; H350, Carc. 1A; H350i, Carc. 1B; H350i" for determinand: "cadmium sulfide"
Test: "HP 10 on Repr. 1A; H360, Repr. 1A; H360D, Repr. 1A; H360Df, Repr. 1A; H360F, Repr. 1A; H360Fd, Repr. 1A; H360FD, Repr. 1B; H360, Repr. 1B; H360D, Repr. 1B; H360Df, Repr. 1B; H360F, Repr. 1B; H360Fd, Repr. 1B; H360FD " for determinand: "lead chromate"
Test: "HP 10 on Repr. 2; H361, Repr. 2; H361d, Repr. 2; H361f, Repr. 2; H361fd" for determinand: "cadmium sulfide"
Test: "HP 11 on Muta. 2; H341" for determinand: "cadmium sulfide"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "cadmium sulfide"

Determinand notes

Note 1 , used on:

determinand: "cadmium sulfide"
determinand: "lead chromate"

Note A , used on:

determinand: "salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex"
determinand: "selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex"
determinand: "zinc chromate"

WM3: Unknown oil , used on:

determinand: "TPH (C6 to C40) petroleum group"

Classification of sample: WS02 at 0.5m

Potentially Hazardous Waste
Classified as **17 05 04** or **17 05 03 ***
in the List of Waste

Sample details

Sample Name:
WS02 at 0.5m
Sample Depth:
0 m
Moisture content: **0%**
(no correction)

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

Hazard properties (substances considered hazardous until shown otherwise)

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"

Hazard Statements hit:

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

Because of determinands:

diesel petroleum group: (conc.: 0.006%)
TPH (C6 to C40) petroleum group: (conc.: 0.012%)

Determinands (Moisture content: 0%, no correction)

confirm TPH has NOT arisen from diesel or petrol: (Confirmed)
acenaphthene: (Whole conc. entered as: <0.1 mg/kg or <0.00001%) IGNORED Because: "<LOD"
acenaphthylene: (Whole conc. entered as: <0.1 mg/kg or <0.00001%) IGNORED Because: "<LOD"
anthracene: (Whole conc. entered as: 0.2 mg/kg or 0.00002%)
arsenic trioxide: (Cation conc. entered: 4.5 mg/kg, converted to compound conc.:5.941 mg/kg or 0.000594%)
benzo[a]anthracene: (Whole conc. entered as: 0.9 mg/kg or 0.00009%)
benzo[a]pyrene; benzo[def]chrysene: (Whole conc. entered as: 1 mg/kg or 0.0001%)
benzo[b]fluoranthene: (Whole conc. entered as: 0.8 mg/kg or 0.00008%)
benzo[ghi]perylene: (Whole conc. entered as: <0.1 mg/kg or <0.00001%) IGNORED Because: "<LOD"
benzo[k]fluoranthene: (Whole conc. entered as: 0.6 mg/kg or 0.00006%)
cadmium sulfide: (Cation conc. entered: 0.5 mg/kg, converted to compound conc.:0.643 mg/kg or 0.0000643%, Note 1 conc.: 0.00005%)
chromium(III) oxide: (Cation conc. entered: 9.7 mg/kg, converted to compound conc.:14.177 mg/kg or 0.00142%)
chromium(VI) oxide: (Cation conc. entered: <1 mg/kg, converted to compound conc.:<1.923 mg/kg or <0.000192%) IGNORED Because: "<LOD"
chrysene: (Whole conc. entered as: 0.9 mg/kg or 0.00009%)
copper (I) oxide: (Cation conc. entered: 11 mg/kg, converted to compound conc.:12.385 mg/kg or 0.00124%)
salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex: (Cation conc. entered: <0.2 mg/kg, converted to compound conc.:<0.377 mg/kg or <0.0000377%) IGNORED Because: "<LOD"
dibenz[a,h]anthracene: (Whole conc. entered as: <0.1 mg/kg or <0.00001%) IGNORED Because: "<LOD"
diesel petroleum group: (Whole conc. entered as: 60 mg/kg or 0.006%)
fluoranthene: (Whole conc. entered as: 1.5 mg/kg or 0.00015%)
fluorene: (Whole conc. entered as: <0.1 mg/kg or <0.00001%) IGNORED Because: "<LOD"
indeno[123-cd]pyrene: (Whole conc. entered as: <0.1 mg/kg or <0.00001%) IGNORED Because: "<LOD"
lead chromate: (Cation conc. entered: 53 mg/kg, converted to compound conc.:82.67 mg/kg or 0.00827%, Note 1 conc.: 0.0053%)
mercury dichloride: (Cation conc. entered: 8.8 mg/kg, converted to compound conc.:11.911 mg/kg or 0.00119%)

naphthalene: (Whole conc. entered as: <0.1 mg/kg or <0.00001%) IGNORED Because: "<LOD"
nickel dihydroxide: (Cation conc. entered: 8.8 mg/kg, converted to compound conc.:13.9 mg/kg or 0.00139%)
pH: (Whole conc. entered as: 8.9 pH, converted to conc.:8.9 pH or 8.9 pH)
phenanthrene: (Whole conc. entered as: 0.9 mg/kg or 0.00009%)
phenol: (Whole conc. entered as: <0.3 mg/kg or <0.00003%) IGNORED Because: "<LOD"
pyrene: (Whole conc. entered as: 1.7 mg/kg or 0.00017%)
selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex: (Cation conc. entered: 8.8 mg/kg, converted to compound conc.:22.472 mg/kg or 0.00225%)
TPH (C6 to C40) petroleum group: (Whole conc. entered as: 120 mg/kg or 0.012%)
zinc chromate: (Cation conc. entered: 38 mg/kg, converted to compound conc.:105.418 mg/kg or 0.0105%)

Notes utilised in assessment

C14: Step 5
"identify whether any individual ecotoxic substance is present at or above a cut-off value ..." , used on:

Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "anthracene"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "arsenic trioxide"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "benzo[a]anthracene"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "benzo[a]pyrene; benzo[def]chrysene"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "benzo[b]fluoranthene"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "benzo[k]fluoranthene"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "chromium(III) oxide"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "chrysene"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "copper (I) oxide"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "fluoranthene"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "lead chromate"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "mercury dichloride"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "nickel dihydroxide"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "phenanthrene"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "pyrene"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "zinc chromate"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "diesel petroleum group"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "TPH (C6 to C40) petroleum group"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "cadmium sulfide"

Note 1 , used on:

Test: "HP 5 on STOT SE 1; H370, STOT RE 1; H372" for determinand: "cadmium sulfide"
Test: "HP 5 on STOT SE 2; H371, STOT RE 2; H373" for determinand: "cadmium sulfide"
Test: "HP 6 on Acute Tox. 4; H302" for determinand: "cadmium sulfide"
Test: "HP 7 on Carc. 1A; H350, Carc. 1B; H350, Carc. 1A; H350i, Carc. 1B; H350i" for determinand: "cadmium sulfide"
Test: "HP 10 on Repr. 1A; H360, Repr. 1A; H360D, Repr. 1A; H360Df, Repr. 1A; H360F, Repr. 1A; H360Fd, Repr. 1A; H360FD, Repr. 1B; H360, Repr. 1B; H360D, Repr. 1B; H360Df, Repr. 1B; H360F, Repr. 1B; H360Fd, Repr. 1B; H360FD " for determinand: "lead chromate"
Test: "HP 10 on Repr. 2; H361, Repr. 2; H361d, Repr. 2; H361f, Repr. 2; H361fd" for determinand: "cadmium sulfide"
Test: "HP 11 on Muta. 2; H341" for determinand: "cadmium sulfide"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "lead chromate"

Determinand notes

Note 1 , used on:

determinand: "cadmium sulfide"
determinand: "lead chromate"

Note A , used on:

determinand: "selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex"

determinand: "zinc chromate"

WM3: Unknown oil , used on:

determinand: "TPH (C6 to C40) petroleum group"

Classification of sample: WS03 at 0.5m

Potentially Hazardous Waste
Classified as **17 05 04** or **17 05 03 ***
in the List of Waste

Sample details

Sample Name:
WS03 at 0.5m
Sample Depth:
0 m
Moisture content: **0%**
(no correction)

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

Hazard properties (substances considered hazardous until shown otherwise)

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"

Hazard Statements hit:

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

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.0051%)

Determinands (Moisture content: 0%, no correction)

confirm TPH has NOT arisen from diesel or petrol: (Confirmed)
acenaphthene: (Whole conc. entered as: <0.1 mg/kg or <0.00001%) IGNORED Because: "<LOD"
acenaphthylene: (Whole conc. entered as: <0.1 mg/kg or <0.00001%) IGNORED Because: "<LOD"
anthracene: (Whole conc. entered as: 0.1 mg/kg or 0.00001%)
arsenic trioxide: (Cation conc. entered: 3 mg/kg, converted to compound conc.:3.961 mg/kg or 0.000396%)
benzo[a]anthracene: (Whole conc. entered as: <0.1 mg/kg or <0.00001%) IGNORED Because: "<LOD"
benzo[a]pyrene; benzo[def]chrysene: (Whole conc. entered as: <0.1 mg/kg or <0.00001%) IGNORED Because: "<LOD"
benzo[b]fluoranthene: (Whole conc. entered as: <0.1 mg/kg or <0.00001%) IGNORED Because: "<LOD"
benzo[ghi]perylene: (Whole conc. entered as: <0.1 mg/kg or <0.00001%) IGNORED Because: "<LOD"
benzo[k]fluoranthene: (Whole conc. entered as: <0.1 mg/kg or <0.00001%) IGNORED Because: "<LOD"
cadmium sulfide: (Cation conc. entered: 0.5 mg/kg, converted to compound conc.:0.643 mg/kg or 0.0000643%, Note 1 conc.: 0.00005%)
chromium(III) oxide: (Cation conc. entered: 7.4 mg/kg, converted to compound conc.:10.816 mg/kg or 0.00108%)
chromium(VI) oxide: (Cation conc. entered: <1 mg/kg, converted to compound conc.:<1.923 mg/kg or <0.000192%) IGNORED Because: "<LOD"
chrysene: (Whole conc. entered as: <0.1 mg/kg or <0.00001%) IGNORED Because: "<LOD"
copper (I) oxide: (Cation conc. entered: 5.7 mg/kg, converted to compound conc.:6.418 mg/kg or 0.000642%)
salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex: (Cation conc. entered: <0.2 mg/kg, converted to compound conc.:<0.377 mg/kg or <0.0000377%) IGNORED Because: "<LOD"
dibenz[a,h]anthracene: (Whole conc. entered as: <0.1 mg/kg or <0.00001%) IGNORED Because: "<LOD"
fluoranthene: (Whole conc. entered as: 0.6 mg/kg or 0.00006%)
fluorene: (Whole conc. entered as: <0.1 mg/kg or <0.00001%) IGNORED Because: "<LOD"
indeno[123-cd]pyrene: (Whole conc. entered as: <0.1 mg/kg or <0.00001%) IGNORED Because: "<LOD"
lead chromate: (Cation conc. entered: 29 mg/kg, converted to compound conc.:45.235 mg/kg or 0.00452%, Note 1 conc.: 0.0029%)
mercury dichloride: (Cation conc. entered: 6.4 mg/kg, converted to compound conc.:8.662 mg/kg or 0.000866%)
naphthalene: (Whole conc. entered as: 0.4 mg/kg or 0.00004%)
nickel dihydroxide: (Cation conc. entered: 6.4 mg/kg, converted to compound conc.:10.109 mg/kg or 0.00101%)

pH: (Whole conc. entered as: 8.6 pH, converted to conc.:8.6 pH or 8.6 pH)
phenanthrene: (Whole conc. entered as: 0.5 mg/kg or 0.00005%)
phenol: (Whole conc. entered as: <0.3 mg/kg or <0.00003%) IGNORED Because: "<LOD"
pyrene: (Whole conc. entered as: 0.8 mg/kg or 0.00008%)
selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex: (
Cation conc. entered: 6.4 mg/kg, converted to compound conc.:16.343 mg/kg or 0.00163%)
TPH (C6 to C40) petroleum group: (Whole conc. entered as: 51 mg/kg or 0.0051%)
zinc chromate: (Cation conc. entered: 24 mg/kg, converted to compound conc.:66.58 mg/kg or 0.00666%)

Notes utilised in assessment

C14: Step 5
"identify whether any individual ecotoxic substance is present at or above a cut-off value ..." , used on:

Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "anthracene"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "arsenic trioxide"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "chromium(III) oxide"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "copper (I) oxide"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "fluoranthene"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "lead chromate"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "mercury dichloride"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "naphthalene"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "nickel dihydroxide"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "phenanthrene"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "pyrene"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "zinc chromate"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "TPH (C6 to C40) petroleum group"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "cadmium sulfide"

Determinand notes

Note 1 , used on:

determinand: "cadmium sulfide"
determinand: "lead chromate"

Note A , used on:

determinand: "selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex"
determinand: "zinc chromate"

WM3: Unknown oil , used on:

determinand: "TPH (C6 to C40) petroleum group"

Classification of sample: WS04 at 0.5m

Potentially Hazardous Waste
Classified as **17 05 04** or **17 05 03 ***
in the List of Waste

Sample details

Sample Name:
WS04 at 0.5m
Sample Depth:
0 m
Moisture content: **0%**
(no correction)

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

Hazard properties (substances considered hazardous until shown otherwise)

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"

Hazard Statements hit:

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

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.0089%)

Determinands (Moisture content: 0%, no correction)

confirm TPH has NOT arisen from diesel or petrol: (Confirmed)
acenaphthene: (Whole conc. entered as: <0.1 mg/kg or <0.00001%) IGNORED Because: "<LOD"
acenaphthylene: (Whole conc. entered as: <0.1 mg/kg or <0.00001%) IGNORED Because: "<LOD"
anthracene: (Whole conc. entered as: <0.1 mg/kg or <0.00001%) IGNORED Because: "<LOD"
arsenic trioxide: (Cation conc. entered: 6.7 mg/kg, converted to compound conc.:8.846 mg/kg or 0.000885%)
benzo[a]anthracene: (Whole conc. entered as: <0.1 mg/kg or <0.00001%) IGNORED Because: "<LOD"
benzo[a]pyrene; benzo[def]chrysene: (Whole conc. entered as: <0.1 mg/kg or <0.00001%) IGNORED Because: "<LOD"
benzo[b]fluoranthene: (Whole conc. entered as: <0.1 mg/kg or <0.00001%) IGNORED Because: "<LOD"
benzo[ghi]perylene: (Whole conc. entered as: <0.1 mg/kg or <0.00001%) IGNORED Because: "<LOD"
benzo[k]fluoranthene: (Whole conc. entered as: <0.1 mg/kg or <0.00001%) IGNORED Because: "<LOD"
cadmium sulfide: (Cation conc. entered: 0.5 mg/kg, converted to compound conc.:0.643 mg/kg or 0.0000643%, Note 1 conc.: 0.00005%)
chromium(III) oxide: (Cation conc. entered: 9.7 mg/kg, converted to compound conc.:14.177 mg/kg or 0.00142%)
chromium(VI) oxide: (Cation conc. entered: <1 mg/kg, converted to compound conc.:<1.923 mg/kg or <0.000192%) IGNORED Because: "<LOD"
chrysene: (Whole conc. entered as: <0.1 mg/kg or <0.00001%) IGNORED Because: "<LOD"
copper (I) oxide: (Cation conc. entered: 24 mg/kg, converted to compound conc.:27.021 mg/kg or 0.0027%)
salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex: (Cation conc. entered: <0.2 mg/kg, converted to compound conc.:<0.377 mg/kg or <0.0000377%) IGNORED Because: "<LOD"
dibenz[a,h]anthracene: (Whole conc. entered as: <0.1 mg/kg or <0.00001%) IGNORED Because: "<LOD"
fluoranthene: (Whole conc. entered as: 0.5 mg/kg or 0.00005%)
fluorene: (Whole conc. entered as: <0.1 mg/kg or <0.00001%) IGNORED Because: "<LOD"
indeno[123-cd]pyrene: (Whole conc. entered as: <0.1 mg/kg or <0.00001%) IGNORED Because: "<LOD"
lead chromate: (Cation conc. entered: 73 mg/kg, converted to compound conc.:113.867 mg/kg or 0.0114%, Note 1 conc.: 0.0073%)
mercury dichloride: (Cation conc. entered: 13 mg/kg, converted to compound conc.:17.595 mg/kg or 0.00176%)
naphthalene: (Whole conc. entered as: <0.1 mg/kg or <0.00001%) IGNORED Because: "<LOD"
nickel dihydroxide: (Cation conc. entered: 13 mg/kg, converted to compound conc.:20.533 mg/kg or 0.00205%)

pH: (Whole conc. entered as: 8.9 pH, converted to conc.:8.9 pH or 8.9 pH)
phenanthrene: (Whole conc. entered as: 0.3 mg/kg or 0.00003%)
phenol: (Whole conc. entered as: <0.3 mg/kg or <0.00003%) IGNORED Because: "<LOD"
pyrene: (Whole conc. entered as: 0.6 mg/kg or 0.00006%)
selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex: (
Cation conc. entered: 13 mg/kg, converted to compound conc.:33.197 mg/kg or 0.00332%)
TPH (C6 to C40) petroleum group: (Whole conc. entered as: 89 mg/kg or 0.0089%)
zinc chromate: (Cation conc. entered: 59 mg/kg, converted to compound conc.:163.675 mg/kg or 0.0164%)

Notes utilised in assessment

C14: Step 5
"identify whether any individual ecotoxic substance is present at or above a cut-off value ..." , used on:

Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "arsenic trioxide"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "chromium(III) oxide"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "copper (I) oxide"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "fluoranthene"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "lead chromate"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "mercury dichloride"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "nickel dihydroxide"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "phenanthrene"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "pyrene"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "zinc chromate"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "TPH (C6 to C40) petroleum group"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "cadmium sulfide"

Note 1 , used on:

Test: "HP 5 on STOT SE 1; H370, STOT RE 1; H372" for determinand: "cadmium sulfide"
Test: "HP 5 on STOT SE 2; H371, STOT RE 2; H373" for determinand: "cadmium sulfide"
Test: "HP 6 on Acute Tox. 4; H302" for determinand: "cadmium sulfide"
Test: "HP 7 on Carc. 1A; H350, Carc. 1B; H350, Carc. 1A; H350i, Carc. 1B; H350i" for determinand: "cadmium sulfide"
Test: "HP 10 on Repr. 1A; H360, Repr. 1A; H360D, Repr. 1A; H360Df, Repr. 1A; H360F, Repr. 1A; H360Fd, Repr. 1A; H360FD, Repr. 1B; H360, Repr. 1B; H360D, Repr. 1B; H360Df, Repr. 1B; H360F, Repr. 1B; H360Fd, Repr. 1B; H360FD " for determinand: "lead chromate"
Test: "HP 10 on Repr. 2; H361, Repr. 2; H361d, Repr. 2; H361f, Repr. 2; H361fd" for determinand: "cadmium sulfide"
Test: "HP 11 on Muta. 2; H341" for determinand: "cadmium sulfide"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "lead chromate"

Determinand notes

Note 1 , used on:

determinand: "cadmium sulfide"
determinand: "lead chromate"

Note A , used on:

determinand: "selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex"
determinand: "zinc chromate"

WM3: Unknown oil , used on:

determinand: "TPH (C6 to C40) petroleum group"

Classification of sample: WS05 at 0.5m

Potentially Hazardous Waste
Classified as **17 05 04** or **17 05 03 ***
in the List of Waste

Sample details

Sample Name:
WS05 at 0.5m
Sample Depth:
0 m
Moisture content: **0%**
(no correction)

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

Hazard properties (substances considered hazardous until shown otherwise)

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"

Hazard Statements hit:

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

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.0058%)

Determinands (Moisture content: 0%, no correction)

confirm TPH has NOT arisen from diesel or petrol: (Confirmed)
acenaphthene: (Whole conc. entered as: <0.1 mg/kg or <0.00001%) IGNORED Because: "<LOD"
acenaphthylene: (Whole conc. entered as: <0.1 mg/kg or <0.00001%) IGNORED Because: "<LOD"
anthracene: (Whole conc. entered as: <0.1 mg/kg or <0.00001%) IGNORED Because: "<LOD"
arsenic trioxide: (Cation conc. entered: 5.4 mg/kg, converted to compound conc.:7.13 mg/kg or 0.000713%)
benzo[a]anthracene: (Whole conc. entered as: <0.1 mg/kg or <0.00001%) IGNORED Because: "<LOD"
benzo[a]pyrene; benzo[def]chrysene: (Whole conc. entered as: <0.1 mg/kg or <0.00001%) IGNORED Because: "<LOD"
benzo[b]fluoranthene: (Whole conc. entered as: <0.1 mg/kg or <0.00001%) IGNORED Because: "<LOD"
benzo[ghi]perylene: (Whole conc. entered as: <0.1 mg/kg or <0.00001%) IGNORED Because: "<LOD"
benzo[k]fluoranthene: (Whole conc. entered as: <0.1 mg/kg or <0.00001%) IGNORED Because: "<LOD"
cadmium sulfide: (Cation conc. entered: 1 mg/kg, converted to compound conc.:1.285 mg/kg or 0.000129%, Note 1 conc.: 0.0001%)
chromium(III) oxide: (Cation conc. entered: 10 mg/kg, converted to compound conc.:14.616 mg/kg or 0.00146%)
chromium(VI) oxide: (Cation conc. entered: <1 mg/kg, converted to compound conc.:<1.923 mg/kg or <0.000192%) IGNORED Because: "<LOD"
chrysene: (Whole conc. entered as: <0.1 mg/kg or <0.00001%) IGNORED Because: "<LOD"
copper (I) oxide: (Cation conc. entered: <0.1 mg/kg, converted to compound conc.:<0.113 mg/kg or <0.0000113%) IGNORED Because: "<LOD"
salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex: (Cation conc. entered: <0.2 mg/kg, converted to compound conc.:<0.377 mg/kg or <0.0000377%) IGNORED Because: "<LOD"
dibenz[a,h]anthracene: (Whole conc. entered as: <0.1 mg/kg or <0.00001%) IGNORED Because: "<LOD"
fluoranthene: (Whole conc. entered as: 0.6 mg/kg or 0.00006%)
fluorene: (Whole conc. entered as: <0.1 mg/kg or <0.00001%) IGNORED Because: "<LOD"
indeno[123-cd]pyrene: (Whole conc. entered as: <0.1 mg/kg or <0.00001%) IGNORED Because: "<LOD"
lead chromate: (Cation conc. entered: 85 mg/kg, converted to compound conc.:132.584 mg/kg or 0.0133%, Note 1 conc.: 0.0085%)
mercury dichloride: (Cation conc. entered: 0.63 mg/kg, converted to compound conc.:0.853 mg/kg or 0.0000853%)
naphthalene: (Whole conc. entered as: <0.1 mg/kg or <0.00001%) IGNORED Because: "<LOD"

nickel dihydroxide: (Cation conc. entered: 12 mg/kg, converted to compound conc.:18.954 mg/kg or 0.0019%)
pH: (Whole conc. entered as: 10.2 pH, converted to conc.:10.2 pH or 10.2 pH)
phenanthrene: (Whole conc. entered as: 0.4 mg/kg or 0.00004%)
phenol: (Whole conc. entered as: <0.3 mg/kg or <0.00003%) IGNORED Because: "<LOD"
pyrene: (Whole conc. entered as: 0.7 mg/kg or 0.00007%)
selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex: (Cation conc. entered: <0.5 mg/kg, converted to compound conc.:<1.277 mg/kg or <0.000128%) IGNORED Because: "<LOD"
TPH (C6 to C40) petroleum group: (Whole conc. entered as: 58 mg/kg or 0.0058%)
zinc chromate: (Cation conc. entered: 110 mg/kg, converted to compound conc.:305.156 mg/kg or 0.0305%)

Notes utilised in assessment

C14: Step 5
"identify whether any individual ecotoxic substance is present at or above a cut-off value ..." , used on:

Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "arsenic trioxide"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "chromium(III) oxide"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "fluoranthene"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "lead chromate"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "mercury dichloride"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "nickel dihydroxide"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "phenanthrene"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "pyrene"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "zinc chromate"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "TPH (C6 to C40) petroleum group"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "cadmium sulfide"

Determinand notes

Note 1 , used on:

determinand: "cadmium sulfide"
determinand: "lead chromate"

Note A , used on:

determinand: "zinc chromate"

WM3: Unknown oil , used on:

determinand: "TPH (C6 to C40) petroleum group"

Appendix A: Classifier defined and non CLP determinands

confirm TPH has NOT arisen from diesel or petrol

Comments: Chapter 3, section 4b requires a positive confirmation for benzo[a]pyrene to be used as a marker in evaluating Carc. 1B; H350 (HP 7) and Muta. 1B; H340 (HP 11)
Data source: WM3 1st Edition 2015
Data source date: 25/05/2015
Risk Phrases: None.
Hazard Statements: None.

acenaphthene (CAS Number: 83-32-9)

Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17/07/2015
Risk Phrases: R36, R37, R38, N; R50/53, N; R51/53
Hazard Statements: Eye Irrit. 2; H319, STOT SE 3; H335, Skin Irrit. 2; H315, Aquatic Acute 1; H400, Aquatic Chronic 1; H410, Aquatic Chronic 2; H411

acenaphthylene (CAS Number: 208-96-8)

Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17/07/2015
Risk Phrases: R22, R26, R27, R36, R37, R38
Hazard Statements: Acute Tox. 4; H302, Acute Tox. 1; H330, Acute Tox. 1; H310, Eye Irrit. 2; H319, STOT SE 3; H335, Skin Irrit. 2; H315

anthracene (CAS Number: 120-12-7)

Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17/07/2015
Risk Phrases: R36, R37, R38, R43, N; R50/53
Hazard Statements: Eye Irrit. 2; H319, STOT SE 3; H335, Skin Irrit. 2; H315, Skin Sens. 1; H317, Aquatic Acute 1; H400, Aquatic Chronic 1; H410

benzo[ghi]perylene (CAS Number: 191-24-2)

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: 23/07/2015
Risk Phrases: N; R50/53
Hazard Statements: Aquatic Acute 1; H400, Aquatic Chronic 1; H410

chromium(III) oxide (CAS Number: 1308-38-9)

Conversion factor: 1.462
Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17/07/2015
Risk Phrases: R20, R22, R36, R37, R38, R42, R43, R50/53, R60, R61
Hazard Statements: Acute Tox. 4; H332, Acute Tox. 4; H302, Eye Irrit. 2; H319, STOT SE 3; H335, Skin Irrit. 2; H315, Resp. Sens. 1; H334, Skin Sens. 1; H317, Repr. 1B; H360FD, Aquatic Acute 1; H400, Aquatic Chronic 1; H410

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
Data source: Commission Regulation (EC) No 790/2009 - 1st Adaptation to Technical Progress for Regulation (EC) No 1272/2008. (ATP1)
Additional Risk Phrases: T+; R26/27/28, R32, N; R50/53
Additional Hazard Statements: Acute Tox. 2; H330, Acute Tox. 1; H310, Acute Tox. 2; H300, Aquatic Acute 1; H400, Aquatic Chronic 1; H410, EUH032, EUH032>= 0.2%
Reason:
14/12/2015 - EUH032>= 0.2% hazard statement sourced from: WM3, Table C12.2

diesel petroleum group (CAS Number: 68334-30-5, 68476-34-6, 94114-59-7, 1159170-26-9)

Comments: Hazard statements taken from WM3 1st Edition 2015; Risk phrases: WM2 3rd Edition 2013
Data source: WM3 1st Edition 2015
Data source date: 25/05/2015
Risk Phrases: R40, R51/53, R65, R66
Hazard Statements: Flam. Liq. 3; H226, Skin Irrit. 2; H315, Acute Tox. 4; H332, Carc. 2; H351, Asp. Tox. 1; H304, STOT RE 2; H373, Aquatic Chronic 2; H411

fluoranthene (CAS Number: 206-44-0)

Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 21/08/2015
Risk Phrases: Xn; R22, N; R50/53
Hazard Statements: Acute Tox. 4; H302, Aquatic Acute 1; H400, Aquatic Chronic 1; H410

fluorene (CAS Number: 86-73-7)

Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06/08/2015
Risk Phrases: N; R50/53
Hazard Statements: Aquatic Acute 1; H400, Aquatic Chronic 1; H410

indeno[123-cd]pyrene (CAS Number: 193-39-5)

Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06/08/2015
Risk Phrases: R40
Hazard Statements: Carc. 2; H351

pH

Comments: Appendix C4
Data source: WM3 1st Edition 2015
Data source date: 25/05/2015
Risk Phrases: None.
Hazard Statements: None.

phenanthrene (CAS Number: 85-01-8)

Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06/08/2015
Risk Phrases: R22, R36, R37, R38, R40, R43, N; R50/53
Hazard Statements: Acute Tox. 4; H302, Eye Irrit. 2; H319, STOT SE 3; H335, Carc. 2; H351, Skin Sens. 1; H317, Aquatic Acute 1; H400, Aquatic Chronic 1; H410, Skin Irrit. 2; H315

pyrene (CAS Number: 129-00-0)

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: 21/08/2015
Risk Phrases: Xi; R36/37/38, N; R50/53
Hazard Statements: Skin Irrit. 2; H315, Eye Irrit. 2; H319, STOT SE 3; H335, Aquatic Acute 1; H400, Aquatic Chronic 1; H410

TPH (C6 to C40) petroleum group

Comments: Hazard statements taken from WM3 1st Edition 2015; Risk phrases: WM2 3rd Edition 2013
Data source: WM3 1st Edition 2015
Data source date: 25/05/2015
Risk Phrases: R10, R45, R46, R51/53, R63, R65
Hazard Statements: Flam. Liq. 3; H226, Asp. Tox. 1; H304, STOT RE 2; H373, Muta. 1B; H340, Carc. 1B; H350, Repr. 2; H361d, Aquatic Chronic 2; H411

Appendix B: Notes

C14: Step 5

from section: WM3: C14 in the document: "WM3 - Waste Classification"

"identify whether any individual ecotoxic substance is present at or above a cut-off value ..."

Note 1

from section: 1.1.3.2, Annex VI in the document: "CLP Regulations"

"The concentration stated or, in the absence of such concentrations, the generic concentrations of this Regulation (Table 3.1) or the generic concentrations of Directive 1999/45/EC (Table 3.2), are the percentages by weight of the metallic element calculated with reference to the total weight of the mixture."

Note A

from section: 1.1.3.1, Annex VI in the document: "CLP Regulations"

"Without prejudice to Article 17(2), the name of the substance must appear on the label in the form of one of the designations given in Part 3. In Part 3, use is sometimes made of a general description such as '... compounds' or '... salts'. In this case, the supplier is required to state on the label the correct name, due account being taken of section 1.1.1.4."

WM3: Unknown oil

from section: Chapter 3: 4. Waste oils and other wastes containing or contaminated with oil in the document: "WM3 - Waste Classification"

"If the identity of the oil is unknown, and the petroleum group cannot be established, then the oil contaminating the waste can be classified as non-carcinogenic due to the presence of oil if all three of the following criteria are met:

- the waste contains **benzo[a]pyrene (BaP)** at a concentration of less than 0.01% (1/10,000th) of the TPH concentration (This is the carcinogenic limit specified in table 3.2 of the CLP for BaP)
- this has been determined by an appropriate and representative sampling approach in accordance with the principles set out in Appendix D, and
- the analysis clearly demonstrates, for example by carbon bands or chromatograph, and the laboratory has reasonably concluded that the hydrocarbons present have not arisen from petrol or diesel

"

Appendix C: Version

Classification utilises the following:

- CLP Regulations - 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
- WM3 - Waste Classification - May 2015
- 7th ATP - Regulation 2015/1221/EU of 24 July 2015
- 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

HazWasteOnline Engine: WM3 1st Edition, May 2015
HazWasteOnline Engine Version: 2016.56.3035.6037 (25 Feb 2016)
HazWasteOnline Database: 2016.56.3035.6037 (26 Feb 2016)

Appendix F

IFA Factual Report

FAIRHURST

LINCOLN HOUSE, MANCHESTER

FACTUAL REPORT ON GROUND INVESTIGATION

Contract: W15/41743v1

Date: October 2015

Ian Farmer Associates (1998) Limited
17 Rivington Court, Hardwick Grange, Woolston, Warrington, WA1 4RT
Tel: 01925 855 440
Fax: 01925 855 441

FACTUAL REPORT ON

GROUND INVESTIGATION

Carried out at

LINCOLN HOUSE, MANCHESTER

Prepared for

FAIRHURST
51a St. Pauls Street,
Leeds
LS1 2TE

Contract No: W15/41743v1

Date: October 2015

Ian Farmer Associates (1998) Limited
17 Rivington Court, Hardwick Grange, Woolston, Warrington, WA1 4RT
Tel: 01925 855 440
Fax: 01925 855 441

Issue & Revision Record			
Contract Number:		**W15/41743**	
Contract Name:		**Lincoln House, Manchester**	
Client:		**Fairhurst**	
Engineer:		**Fairhurst**	
Report Title:		**Factual Report on Ground Investigation**	
Version	**Issue Date**	**Report / revision details**	**Distribution**
V1	07/10/2015	Complete report on ground investigation for comment & approval. Wall core locations to be added to A1.2. Monitoring on-going	PDF copy to Fairhurst

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1.0 INTRODUCTION

1.1 It is understood that it is proposed to develop the site for a multi-storey office block.

1.2 On the instructions of Fairhurst, a ground investigation was undertaken to determine ground and groundwater conditions at the site.

1.3 This report has been prepared for the sole use of the Client for the purpose described and no extended duty of care to any third party is implied or offered. Third parties using any information contained within this report do so at their own risk.

1.4 The comments given in this report and the opinions expressed herein are based on the information received, the conditions encountered during site works, and on the results of tests made in the field and laboratory. However, there may be conditions prevailing at the site which have not been disclosed by the investigation and which have not been taken into account in the report.

1.5 The comments on groundwater conditions are based on observations made at the time the site work was carried out. It should be noted that groundwater levels vary owing to seasonal or other effects.

2.0 SITE SETTING

2.1 Site Location

2.1.1 The site is situated at Lincoln House, within the basement car park. The site was located in Manchester city centre.

2.1.2 Access to the site was off Mulberry Street.

2.1.3 The site may be located by Grid reference 383647, 398190.

2.1.4 A site location plan is included in Appendix 1, Figure A1.1.

2.2 Site Description

2.2.1 At the time of investigation the site comprised a basement concrete car park. The building above the car park was a multi store vacant office block.

2.2.2 The entrance to the site comprised of a steep vehicle ramp.

2.2.3 A site plan is included in Appendix 1, Figure A1.2.

3.0 SITE WORK

3.1 The site work was carried out between 24th August and 1st September 2015. The locations of exploratory holes were indicated by the Engineer, and the site works carried out on the basis of the practices set out in BS 10175:2011, ref. 5.1, and BS 5930 :1999 + A2 2010 ref. 5.2.

3.2 Four boreholes, designated BH01, BH02, BH02A, BH03 and BH04, were sunk by rotary open hole and rotary coring methods utilising air flush. Five boreholes, designated WS01 to WS05 were undertaken by drive-in window sampler technique.

3.3 The borehole positions are shown on the site plan, Figure A1.2 in Appendix 1.

3.4 The depths of holes, descriptions of strata encountered and comments on ground water conditions are given in the exploratory hole records, presented in Appendix 2. A photographic record of the core is given in Appendix 5.

3.5 Four wall cores designated HC01 to HC04 were undertaken by hand-held core techniques. A photographic record of the core is given in Appendix 5.

3.6 Representative disturbed samples were taken at the depths shown on the borehole records and despatched to the laboratory.

3.7 Samples were collected for environmental purposes in amber glass jars and kept in a cool box.

3.8 The ground levels at the exploratory hole locations were not determined.

3.9 Groundwater and gas monitoring visits were undertaken subsequent to site works as detailed in Appendix 6. Monitoring is on-going.

4.0 LABORATORY TESTS

4.1 Geotechnical Testing

4.1.1 Rock samples for geotechnical testing were prepared and tested in accordance with ISRM Suggested Methods ref. (ref.5.5). The following tests were carried out:

- 18 No. Point Load Testing (PLT)

4.1.2 The results of the testing are given in Appendix 3, Test Reports 41743R/1.

4.2 Chemical Testing – Soil

4.2.1 The chemical analyses were carried out on eight samples of soil. The nature of the analyses is detailed below:

4.2.2 **General Suite** - arsenic, cadmium, chromium (total, III and VI split), copper, lead, mercury, nickel, selenium, zinc, boron, speciated PAH, cyanides (total, free, complex), thiocyanate, total sulphate, soluble sulphate, sulphur, sulphide, pH, total phenols and TOC

4.2.3 **Concrete Suite –** total sulphate, water soluble sulphate, sulphide, total sulphur, water soluble magnesium, ammonium ion, pH, chloride ions, nitrate ions, all tested in accordance with BRE Special Digest No. 1 2005.

4.2.4 **Others** –speciated TPH (sTPH), asbestos (identification and quantification).

4.2.5 The results of these tests are shown in Appendix 4, Test report 15-43967-1

4.3 Chemical Testing – Water

4.3.1 **General Suite** - arsenic, cadmium, chromium (total, III and VI split), selenium, mercury, lead, copper, nickel, zinc, boron, speciated PAH, total petroleum hydrocarbons (TPH) screen, cyanides (total, free, complex), thiocyanate, total sulphate, soluble sulphate, sulphur, sulphide, pH, total phenols, TOC.

4.3.2 **Other** - Speciated TPH

4.3.3 The results of these tests are shown in Appendix 4, Test report 15-46015

5.0 REFERENCES

5.1 British Standards Institute: BS 10175 'Code of practice for the investigation of potentially contaminated sites', BSI 2011.

5.2 British Standards Institute: BS 5930 + A2 'Code of practice for site investigations', BSI 2010.

5.3 British Standards Institute: BS EN ISO 22476-3: 2005 + A1: 2011. 'Geotechnical investigation and testing. Field testing. Standard penetration test.'

5.4 British Standard 1377:1990, Part 1-9, 'Methods of Test for Soils for Civil Engineering Purposes'.

5.5 ISO 14689 Part 1:2003, 'Geotechnical Investigation and Testing – Identification and Classification of Rock'.

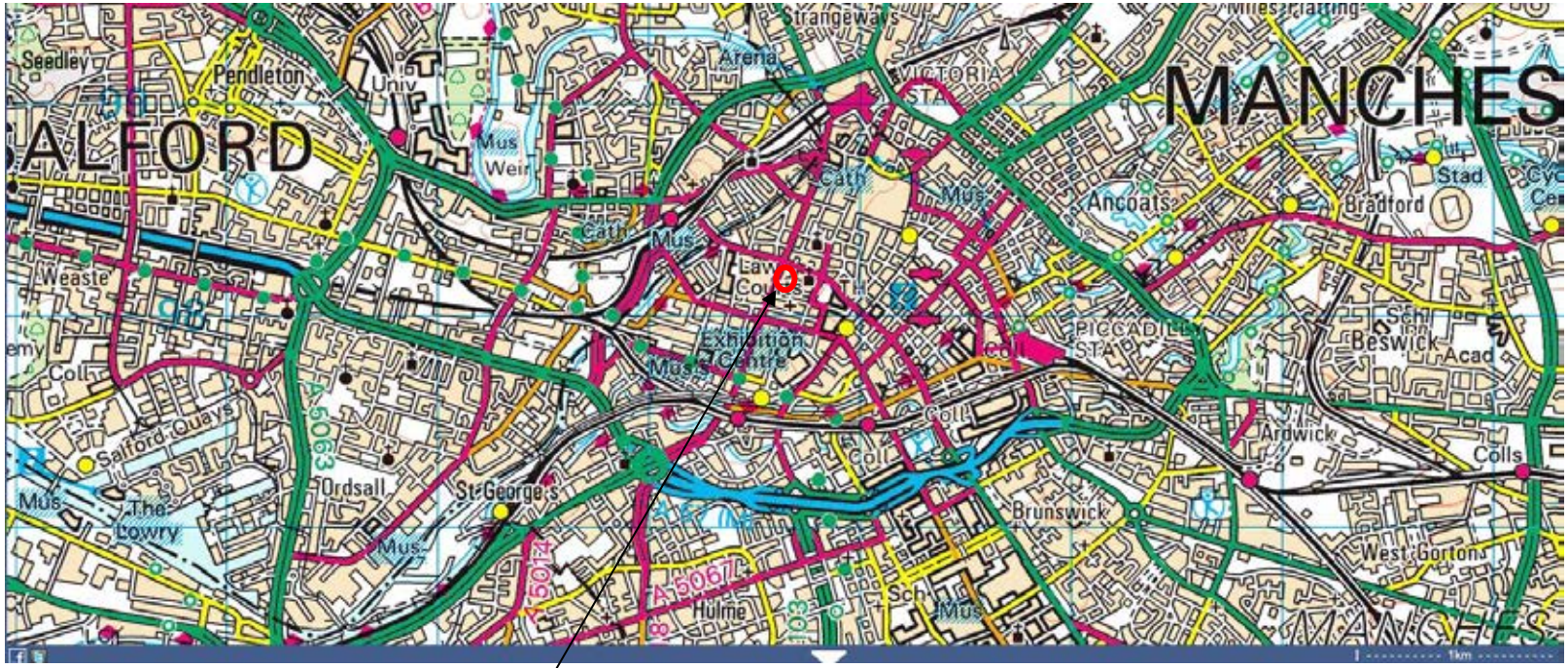
For and on behalf of Ian Farmer Associates (1998) Limited

H Hadwin
BSc (Hons)
Engineering Geologist

J A Latimer
BSc (Hons) FGS
Director

APPENDIX 1

DRAWINGS



Site

PROJECT: 41743 Lincoln House, Manchester
FIGURE No. A1.1 **SCALE: As Indicated**
TITLE: Site Location Plan
IAN FARMER ASSOCIATES Geotechnical & Environmental Specialists

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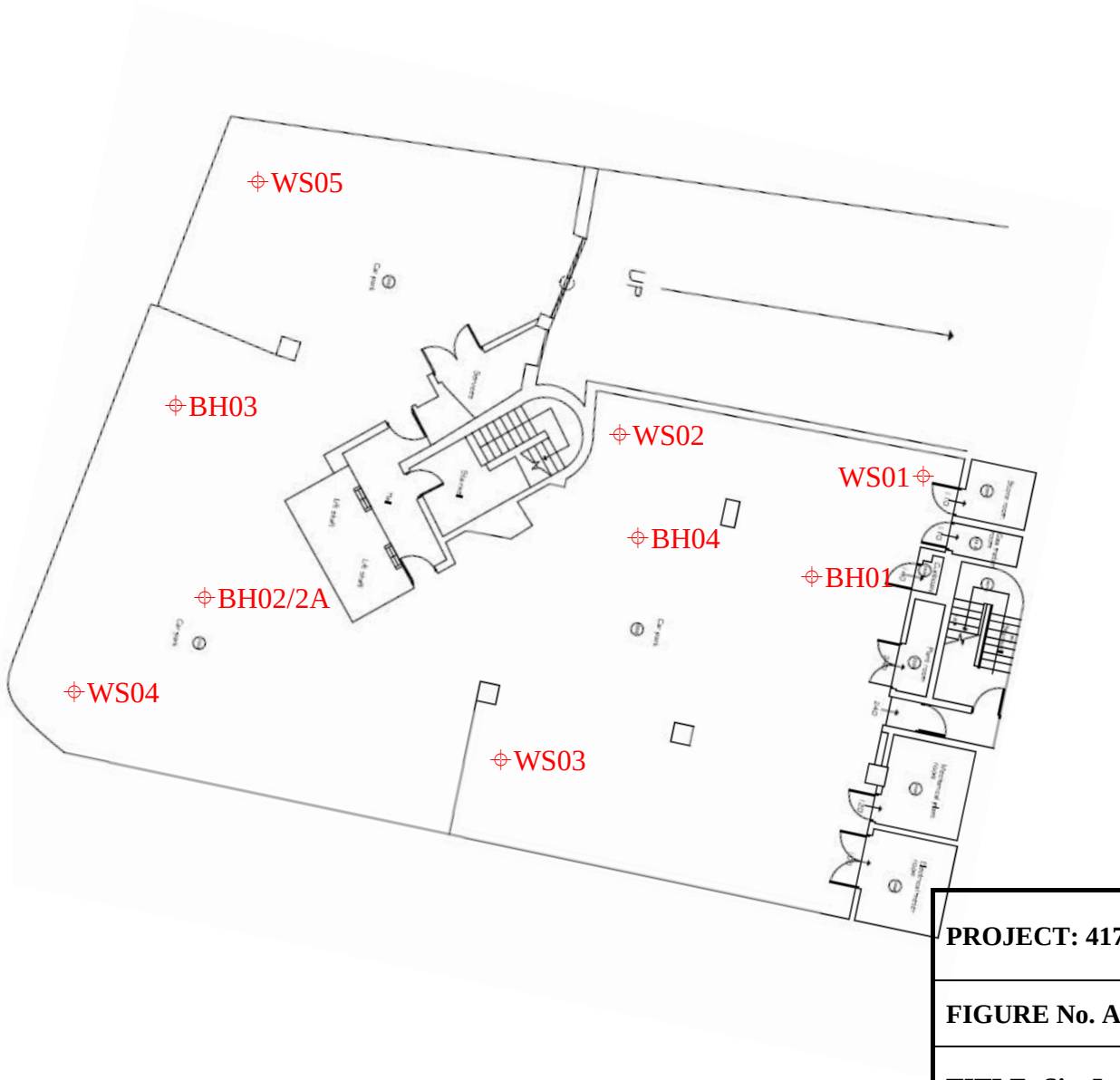

N

PROJECT: 41743 Lincoln House, Manchester

FIGURE No. A1.1 **SCALE: As Indicated**

TITLE: Site Location Plan

IAN FARMER ASSOCIATES
Geotechnical & Environmental Specialists

APPENDIX 2

SITE WORK

APPENDIX 2

GENERAL NOTES ON SITE WORKS

A2.1 SITE WORK

A2.1.1 Drive-in Window Sampler

The drive-in window sampler consists of a series of cylindrical sample tubes, generally varying in diameter from 80mm to 35mm. A cutting shoe is fitted to the bottom of each tube, while a window, representing about a quarter of the circumference, is cut along the length of the tube.

The largest diameter tube is driven into the ground using a small vibrating breaker. The sample tube is extracted by means of a ratchet or hydraulic extraction system.

The borehole is extended by using progressively smaller diameter tubes.

Soil samples are extracted through the window of the tube.

A2.1.2 Rotary Drilling

For exploration within rock rotary drilling methods are employed, where the drill bit is rotated on the bottom of the borehole. This method is occasionally used for drilling within soils. The drilling fluid is transferred from the surface though hollow drilling rods to the bit cooling and lubricating. Drilling fluids commonly comprise clean water, air, foam, mud or polymers which aid the transportation of drill cuttings to the surface and maximise core recovery.

There are two basic types of rotary drilling:

- Open hole where the drill bit cuts all the material within the diameter of the borehole. This technique is sometimes used in soils and weak rocks as a rapid and economical means of making holes for taking soil samples, carrying out insitu soil tests, installing instruments and probing for voids such as mine workings or solution cavities. The only samples recovered are the poor quality drill cuttings.

- Core drilling where an annular bit fixed to the bottom of the core barrel cuts a core, which is recovered within the innermost tube of the core barrel. Coring is normally carried out by triple tube core barrels. At the end of the core run the core barrel assembly is brought to the surface. The core is prevented from dropping out of the barrel by a core catcher made of spring steel. The non-rotating inner barrel contains a removable sample tube or liner. At the end of each coring run the liner is extracted from the barrel and stored in a core box, where it can be photographed, described and tested.

A2.2 IN-SITU TESTS

A2.2.1 Standard Penetration Test

The Standard Penetration Test is carried out in accordance with the proposals recommended in ref 5.3.

The standard penetration test, **SPT**, covers the determination of the resistance of soils to the penetration of a split barrel sampler. A 50mm diameter split barrel sampler is driven 450mm into the soil using a 65kg hammer with a 760mm drop. The penetration resistance is expressed as the number of blows required to obtain 300mm penetration below an initial seating drive of 150mm through any disturbed ground at the bottom of

the borehole. The number of blows to achieve the standard penetration of 300mm is reported as the 'N' value.

The test is generally carried out in fine soils, however, it may also be carried out in coarse granular soils, weak rocks and glacial tills using the same procedure as for the SPT but with a 50mm diameter, 60° apex solid cone replacing the split spoon sampler, **CPT.**

When attempting the standard penetration test in very dense material or weathered rocks it may be necessary to terminate the test before completion to prevent damage to the equipment. In these circumstances it is important to distinguish how the blow count relates to the penetration of the sampler. This may be achieved in the following manner:

- Where the seating drive has been completed, the test drive is terminated if 50 blows are reached before the full penetration of 300mm is achieved. The penetration for 50 blows is recorded and an approximate N value obtained by linear extrapolation of the number of blows for the partial test drive.

- If the seating drive of 150mm is not achieved within the first 25 blows, the penetration after 25 blows is recorded and the test drive then commenced.

- For tests in soft rocks, the test drive should be terminated after 100 blows where the penetration of 300mm has not been achieved.

The N-value obtained from the Standard Penetration Test may be used to assess the relative density of sands and gravels as follows:

Term	SPT N-Value : Blows/300mm Penetration
Very Loose	0 - 4
Loose	4 - 10
Medium Dense	10 - 30
Dense	30 - 50
Very Dense	Over 50

A2.3 SAMPLES

B represents large bulk disturbed samples

D represents small disturbed sample

E represents environmental sample

W represents water sample

$\underline{\nabla}$ respresents water strike

$\underline{\blacktriangledown}$ represents level to which water rose

A2.4 DESCRIPTION OF SOILS

A2.4.1 General

The procedures and principles given in Section 6 of BS 5930+A2, ref. 5.2 have been used in the soil descriptions contained within this report.

A2.5 GEOLOGICAL LOGGING

A2.5.1 General

The procedures and principles given in Section 6 of BS 5930, ref. 5.2 have been used in the rock descriptions contained within this report.

Open hole drilling (OH) was achieved with a tricone rock bit.

A core run is the length of rock drilled from the base of the hole each time the core barrel is run into the hole.

A2.5.2 Fracture State

Various criteria may be used for quantitative description of the Fracture State of rock cores. The standard terms are as follows.

TCR (%)	ratio of core recovered (solid and non intact) to length of core run.
SCR (%)	ratio of solid core recovered to length of core run.
RQD (%)	ratio of solid core pieces longer than 100mm to length of core run.
Fracture Index	a count of the number or spacing of fractures over an arbitrary length of core of similar intensity of fracturing. Commonly reported as either Fracture Index (FI, number of fractures per metre) or as Fracture Spacing (I_f mm).
NR	indicates no core recovery.
NI	indicates intensely fractured rock which is not of sufficient quality to allow an assessment of fracture spacing to be made.

IAN FARMER ASSOCIATES

Site	Borehole Number
Lincoln House, Manchester	BH01

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Dynamic sampling with rotary core	121mm cased to 6.00m		Fairhurst	41743
	Location	**Dates**	**Engineer**	**Sheet**
		24/08/2015-25/08/2015	Fairhurst	1/3

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
						(0.45)	MADE GROUND: Concrete			
0.35-0.70	B1					0.45				
0.50	D3					(0.25)	MADE GROUND: Orange brown, sandy, angular to subangular, fine to coarse GRAVEL of brick with a high cobble content of brick			
0.50	E2					0.70				
0.70-1.20	B4						MADE GROUND: Yellow, sandy, angular to subangular, fine to coarse GRAVEL of limestone			
1.00	D6	0				(0.80)				
1.00	E5									
1.40	D7					1.50	Red, slightly gravelly, fine to coarse SAND. Gravel is angular to subangular, fine to coarse of sandstone.			
1.80	D8					(0.70)				
	TCR / SCR / RQD		**FI**			2.20				
2.20	0 / 0 / 0						Very weak, red, medium grained SANDSTONE. Very closely spaced, horizontal, planar smooth discontinuities. Between 2.20m to 5.20m: assumed zone of core loss.			
3.20	0 / 0 / 0		NR							
4.20	0 / 0 / 0									
5.35				C1						
5.20	100 / 66 / 0	0	NI				Between 5.20m and 5.34m: non-intact recovered a gravelly medium and coarse sand.			
5.34			35							
5.45			NI				Between 5.45m and 5.52m: non-intact recovered a gravelly medium and coarse sand.			
5.52			24				At 5.50m: sub vertical discontinuity. At 5.67m: vertical discontinuity.			
6.00				C2						
5.90			NI				Between 5.90m to 5.94m: non-intact recovered a sandy angular coarse gravel		▽1	
5.94			19							
6.20				Water strike(1) at 6.20m.			Between 6.20m and 6.70m: assumed zone of cores loss.			
6.70	40 / 40 / 0		NR				Between 6.70m to 7.00m: non-intact recovered a sandy angular coarse gravel			
7.00			NI							
7.00				C3			Between 7.00m to 9.30m: assumed zone of core loss.			
7.20	0 / 0 / 0					(10.00)				

Remarks
Excavating from 0.00m to 1.20m for 1.00 hour.

Scale (approx)	Logged By
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Figure No.
41743.BH01

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

IAN FARMER ASSOCIATES

Site	Borehole Number
Lincoln House, Manchester	BH01

Machine	Casing Diameter	Ground Level (mOD)	Client	Job Number
Comacchio 205	121mm cased to 6.00m		Fairhurst	41743
Flush : Air:mist				
Core Dia : 92 mm				
Method : Rotary open hole/coring	**Location**	**Dates** 24/08/2015-25/08/2015	**Engineer** Fairhurst	**Sheet** 2/3

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
				NR							
8.20	0	0	0								
9.30					C4						
9.20								Below 9.20m: weak, fine and medium grained.			
9.30				13							
9.60	80	57	0	NR				Between 9.50m and 9.52m: extremely closely spaced, sub vertical discontinuity.			
10.00					C5			Between 9.60m to 9.78m: assumed zone of core loss.			
9.78				NI				Between 9.78- and 9.86m: non-intact recovered a firm clay.			
9.92				22				Between 9.86m to 9.92m: non-intact recovered a sandy angular coarse gravel			
10.10								Between 10.10m to 12.20m: assumed zone of core loss.			
10.20	0	0	0								
				NR							
11.20	0	0	0								
12.20							12.20	Weathered red SANDSTONE (drillers description).			

Remarks

Scale (approx)	Logged By
1:40	DD/HH

Figure No. 41743.BH01

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IAN FARMER ASSOCIATES

Site Lincoln House, Manchester			**Borehole Number** BH01
Machine : Comacchio 205 **Flush :** Air:mist **Core Dia :** 92 mm **Method :** Rotary open hole/coring	**Casing Diameter** 121mm cased to 6.00m	**Ground Level (mOD)**	**Client** Fairhurst	**Job Number** 41743
	Location	**Dates** 24/08/2015-25/08/2015	**Engineer** Fairhurst	**Sheet** 3/3

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
							(7.80)				
							20.00	Complete at 20.00m			

Remarks

Scale (approx)	Logged By
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Figure No. 41743.BH01

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Site	Borehole Number
Lincoln House, Manchester	BH02

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Hand excavated			Fairhurst	41743
	Location	**Dates** 26/08/2015	**Engineer** Fairhurst	**Sheet** 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						(0.30)	MADE GROUND: Concrete.		
0.30-1.10	B1					0.30	MADE GROUND: Red brown, gravelly, fine to coarse SAND. Gravel is angular to subangular, fine to coarse including limestone and brick.		
0.50	D3					(0.80)			
0.50	E2					1.10	Terminated at 7.90m		
6.78	C1								
7.26	C2								
7.90	C3								

Remarks
Borehole terminated due to concrete structure at 1.10m.
Excavating from 0.00m to 1.10m for 1.00 hour.

Scale (approx)	Logged By
1:40	DD

Figure No. 41743.BH02

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Site	Borehole Number
Lincoln House, Manchester	BH02A

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Dynamic sampling with rotary core	121mm cased to 6.00m		Fairhurst	41743
	Location	**Dates** 01/09/2015	**Engineer** Fairhurst	**Sheet** 1/3

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
						(0.30) 0.30	MADE GROUND: Concrete.			
						(0.80) 1.10	MADE GROUND: Red brown, gravelly, fine to coarse sand. Gravel is angular to subangular, fine to coarse including limestone and brick.			
						(3.40) 4.50	MADE GROUND: Concrete.			
						(0.10) 4.60	VOID	VOID		
						(1.10) 5.70	MADE GROUND: Concrete			
	TCR / SCR / RQD / FI					(0.30) 6.00	Weathered, red SANDSTONE, recovered as medium sand.			
6.00	40 / 27 / 0 / NI			Water strike(1) at 6.20m.		(2.00) 8.00	Weak, red, medium and coarse grained SANDSTONE. Very closely spaced, horizontal, smooth planar discontinuities. Between 6.00m to 6.60m: assumed zone of core loss. Between 6.60m to 6.76m: non-intact recovered as gravel. Between 7.00m to 7.26m: assumed zone of core loss. Between 7.52m to 7.70m: non-intact recovered as sandy coarse gravel.		▽1	
6.60	21									
7.00	NR									
7.26	19									
7.52	74 / 57 / 0 / NI									
7.70	17									
8.00										

Remarks
Excavating from 0.00m to 1.20m for 1.00 hour.

Scale (approx)	Logged By
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Figure No. 41743.BH01

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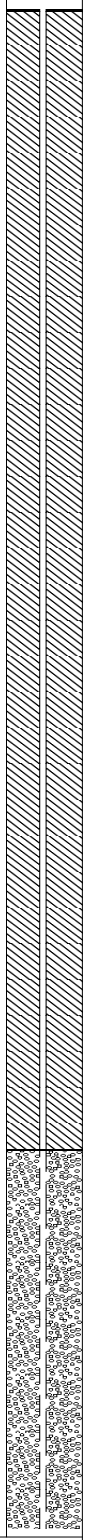
Site	Borehole Number
Lincoln House, Manchester	BH02A

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Dynamic sampling with rotary core	121mm cased to 6.00m		Fairhurst	41743
	Location	**Dates** 01/09/2015	**Engineer** Fairhurst	**Sheet** 2/3

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr



Remarks

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Figure No. 41743.BH01

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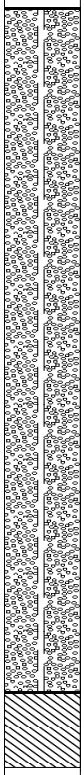
IAN FARMER ASSOCIATES

Site	Borehole Number
Lincoln House, Manchester	BH02A

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Dynamic sampling with rotary core	121mm cased to 6.00m		Fairhurst	41743
	Location	**Dates** 01/09/2015	**Engineer** Fairhurst	**Sheet** 3/3

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr



Remarks

Scale (approx)	Logged By
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Figure No. 41743.BH01

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

IAN FARMER ASSOCIATES

Site	Borehole Number
Lincoln House, Manchester	BH03

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Hand excavated			Fairhurst	41743
	Location	**Dates** 26/08/2015	**Engineer** Fairhurst	**Sheet** 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						(0.30) 0.30	MADE GROUND: Concrete.		
0.30-0.70	B1					(0.40) 0.70	MADE GROUND: Red brown, gravelly, fine to coarse SAND. Gravel is angular to subangular, fine to coarse including limestone and brick.		
0.50	D3						Terminated at 0.70m		
0.50	E2								

Remarks
Borehole terminated due to unknown concrete structure at 0.70m.
Excavating from 0.00m to 0.70m for 1.00 hour.

Scale (approx)	Logged By
1:40	DD

Figure No. 41743.BH03

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

IAN FARMER ASSOCIATES

Site	Borehole Number
Lincoln House, Manchester	BH04

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Dynamic sampling with rotary core	121mm cased to 9.00m		Fairhurst	41743
	Location	**Dates**	**Engineer**	**Sheet**
		27/08/2015-28/08/2015	Fairhurst	1/3

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
						(0.30) 0.30	MADE GROUND: Concrete.			
0.30-0.70	B1					(0.40) 0.70	MADE GROUND: Red brown, slightly gravelly, fine to coarse SAND. Gravel is angular to subangular, fine to coarse including brick and limestone.			
0.50	D3					(0.75) 1.45	MADE GROUND: Yellow brown, sandy, angular to subangular, fine to coarse GRAVEL including limestone.			
0.50	E2					(0.10) 1.55	MADE GROUND: Tarmacadam (drillers description).			
0.70-1.20	B4					(0.45) 2.00	MADE GROUND: Concrete.			
1.00	D6					(9.50)	Weathered red SANDSTONE. (driller notes poor recovery).			
1.00	E5									

Remarks
Excavating from 0.00m to 1.20m for 1.00 hour.

Scale (approx)	Logged By
1:40	DD/HH

Figure No.
41743.BH04

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IAN FARMER ASSOCIATES

Site	Borehole Number
Lincoln House, Manchester	BH04

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Dynamic sampling with rotary core	121mm cased to 9.00m		Fairhurst	41743
	Location	**Dates**	**Engineer**	**Sheet**
		27/08/2015-28/08/2015	Fairhurst	2/3

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
						11.50	Weathered SANDSTONE (drillers description).			
						(5.50)				

Remarks

Scale (approx)	Logged By
1:40	DD/HH

Figure No. 41743.BH04

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

IAN FARMER ASSOCIATES

Site	Borehole Number
Lincoln House, Manchester	BH04

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Dynamic sampling with rotary core	121mm cased to 9.00m		Fairhurst	41743
	Location	**Dates**	**Engineer**	**Sheet**
		27/08/2015-28/08/2015	Fairhurst	3/3

Depth (m)	Sample / Tests		Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
	TCR	SCR	RQD	FI							
17.00											
17.00				NR	C1		17.00				
17.10				23				Very weak, red, medium grained SANDSTONE with occasional quartz inclusions.Very closely spaced, horizontal to sub horizontal, smooth planar discontinuities. Between 17.00m to 17.10m: assumed zone of core loss. Between 17.52m and 17.67m: non-intact recovered as sandy, angular to subangular gravel. Between 17.40m to 17.45m: highly weathered recovered as medium and coarse sand At 17.85m: sub vertical discontinuities. Between 17.90m and 18.10m: fine and medium grained. At 18.00m and 18.15m: assumed zone of core loss. Between 18.15m to 18:57m: non-intact recovered as sandy, angular to subangular, corase gravel. Between 18.94m to 19.03m: non-intact recovered as slightly gravelly, medium and coarse sand. Between 19.19m and 20.00m: assumed zone of core loss.			
17.40	90	76	0	NI							
17.45				30							
17.52				NI							
17.67				24	C2						
17.95											
18.00				NR							
18.15				NI							
18.66	85	50	13		C3		(3.00)				
18.57				14							
18.96					C4						
18.94				NI							
19.00				19							
19.03											
19.19	0	0	0	NR							
20.00							20.00	Complete at 20.00m			

Remarks

Scale (approx)	Logged By
1:40	DD/HH

Figure No. 41743.BH04

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

IAN FARMER ASSOCIATES

Site	Number
Lincoln House, Manchester	WS01

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Hand excavated			Fairhurst	41743
	Location	**Dates** 26/08/2015	**Engineer** Fairhurst	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.30) 0.30	MADE GROUND: Concrete.		
0.30-0.60	B1				(0.30) 0.60	MADE GROUND: Brown, sandy, angular to subangular, fine to coarse GRAVEL with medium cobble content. Gravel includes brick and limestone w. Cobbles are angular to sub angualr of brick.		
0.50	D3					Terminated at 0.60m		
0.50	E2							

Remarks
Window sample borehole terminated at 0.60m due to concrete.
Excavating from 0.00m to 0.60m for 0.50 hours.

Scale (approx)	Logged By
1:40	DD

Figure No. 41743.WS01

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

IAN FARMER ASSOCIATES

Site	Number
Lincoln House, Manchester	WS02

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Hand excavated			Fairhurst	41743
	Location	**Dates** 26/08/2015	**Engineer** Fairhurst	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20) 0.20	MADE GROUND: Concrete.		
0.20-0.40	B1				(0.50)	MADE GROUND: Red, gravelly, fine to coarse SAND. Gravel is angular to subangular, fine to coarse including limestone and brick.		
0.50	D3				0.70	Terminated at 0.70m		
0.50	E2							

Remarks
Window sample hole terminated due to concrete obstruction.
Excavating from 0.00m to 0.70m for 0.50 hours.

Scale (approx)	Logged By
1:40	DD

Figure No. 41743.WS02

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IAN FARMER ASSOCIATES

Site	Number
Lincoln House, Manchester	WS03

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Drive-in Window Sampler			Fairhurst	41743
	Location	**Dates** 26/08/2015	**Engineer** Fairhurst	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
					(0.30)	MADE GROUND: Concrete.			
					0.30				
0.30-1.20	B1					MADE GROUND: Red brown, gravelly, fine to coarse SAND. Gravel is angular to subangular, fine to coarse including limestone, brick and concrete.			
0.50	D3								
0.50	E2								
					(1.50)				
1.20-1.65	SPT N=20		3,3/3,3,7,7			Below 1.20m: medium dense.			
1.40	D4								
					1.80				
1.80	D5					Very dense, red, slightly gravelly, fine to coarse SAND. Gravel is angular to subangular, fine to medium including sandstone (Weathered Sandstone).			
2.00-2.41	SPT 50/260		8,9/12,14,16,8		(0.61)				
					2.41	Terminated at 2.41m			

Remarks
Excavating from 0.00m to 1.20m for 0.50 hours.

Scale (approx)	Logged By
1:40	DD

Figure No. 41743.WS03

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IAN FARMER ASSOCIATES

Site	Number
Lincoln House, Manchester	WS04

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Drive-in Window Sampler			Fairhurst	41743
	Location	**Dates** 26/08/2015	**Engineer** Fairhurst	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
					(0.30) 0.30	MADE GROUND: Concrete			
0.30-0.20	B1					MADE GROUND: Red, gravelly, fine to coarse SAND. Gravel is angular to subangular, fine to coarse including brick, sandstone and limestone			
0.50	D3								
0.50	E2				(0.90)				
					1.20				
1.20-1.65	SPT 50/295		2,2/3,4,17,26		(0.45)	Very dense, brown, slightly gravelly, fine to coarse SAND. Gravel is angular to subangular, fine to medium including sandstone (weathered sandstone).			
					1.65	Complete at 1.65m			

Remarks
Excavating from 0.00m to 1.20m for 0.50 hours.

Scale (approx)	Logged By
1:40	DD

Figure No. 41743.WS04

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IAN FARMER ASSOCIATES

Site	Number
Lincoln House, Manchester	WS05

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Drive-in Window Sampler			Fairhurst	41743
	Location	**Dates** 25/08/2015	**Engineer** Fairhurst	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.15) 0.15	MADE GROUND: Concrete		
0.30-0.70	B1				(0.55)	MADE GROUND: Red, gravelly, fine to coarse SAND. Gravel is angular to subangular, fine to coarse including brick, concrete and limestone		
0.50	D3				0.70			
0.50	E2					Terminated at 0.70m		

Remarks
Window sample hole terminated due to concrete substructure at 0.70m
Excavating from 0.00m to 0.70m for 0.50 hours.

Scale (approx)	Logged By
1:40	DD

Figure No. 41743.WS05

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IAN FARMER ASSOCIATES

Site	Number
Lincoln House, Manchester	HC01

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Horizontal core			Fairhurst	41743
	Location	**Dates** 24/08/2015	**Engineer** Fairhurst	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.30) 0.30	MADE GROUND: Concrete with no voids. Aggregate in concrete is subangular to subrounded, fine and medium including shale and limestone. At 0.15m: 5mm steel reinforcement.		
						Complete at 0.30m		

Remarks

Scale (approx)	Logged By
1:50	DD

Figure No. 41743.HC01

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IAN FARMER ASSOCIATES

Site	Number
Lincoln House, Manchester	HC02

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Horizontal core			Fairhurst	41743
	Location	**Dates** 24/08/2015	**Engineer** Fairhurst	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.35) 0.35	MADE GROUND: Concrete with no voids. Aggregate in the concrete is subangular to subrounded, fine and medium including shale and limestone. At 0.15m: 5mm steel reinforcement. At 0.33m: brick. Complete at 0.35m		

Remarks

Scale (approx)	Logged By
1:50	DD

Figure No. 41743.HC02

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IAN FARMER ASSOCIATES

Site	Number
Lincoln House, Manchester	HC03

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Horizontal core			Fairhurst	41743
	Location	**Dates** 24/08/2015	**Engineer** Fairhurst	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.60)	MADE GROUND: Concrete with no voids. Aggregatein concrete is subangular to subrounded, fine and medium including shale and limestone. At 0.15m: steel reinforcement. At 0.45m: steel reinforcement.		
					0.60	Complete at 0.60m		

Remarks

Scale (approx)	Logged By
1:50	DD

Figure No. 41743.HC03

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IAN FARMER ASSOCIATES

Site	Number
Lincoln House, Manchester	HC04

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Horizontal core			Fairhurst	41743
	Location	**Dates** 24/08/2015	**Engineer** Fairhurst	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.35) 0.35	MADE GROUND: Concrete with no voids. Aggregate in concrete is subangular to subrounded, fine and medium including shale and limestone.		
						Complete at 0.35m		

Remarks

Scale (approx)	Logged By
1:50	DD

Figure No. 41743.HC04

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APPENDIX 3

LABORATORY TESTS

IAN FARMER ASSOCIATES

Unit 4 Faraday Close, Pattinson North Industrial Estate, Washington, Tyne & Wear, NE38 8QJ.
Tel. 0191 4828500 Fax. 0191 4828520 Email. washington@ianfarmer.co.uk Internet.www.ianfarmer.co.uk

Ian Farmer Associates (1998) Ltd
17 Rivington Court
Warrington
Cheshire
WA1 4RT

F.A.O. Mr A Latimer

TEST REPORT - 41743R/1

Site :	Lincoln House, Manchester
Job Number :	41743R
Originating Client :	Fairhurst
Originating Reference :	41743R
Date Sampled :	Not given
Date Scheduled :	09/09/2015
Date Testing Started :	15/09/2015
Date Testing Finished :	15/09/2015

Remarks :

- First Report for above Job Number
- Samples will be disposed of 28 days after the report is issued unless otherwise agreed
- This report may contain results from tests which are not included within the scope of the UKAS accreditation. Please see final sheet for details.

Data Input By: J Clarke. Jemma Clark

Position : Laboratory Administrator Date : 15/09/2015

Authorised By: D. Smith Daniel Smith

Position : Laboratory Supervisor Date : 15/09/2015

Ian Farmer Associates (1998) Limited. Registered in England and Wales No. 3661447
Registered Office: Unit 4 Faraday Close, Pattinson North Industrial Estate, Washington. NE38 8QJ
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Warrington (01925) 855440. Newcastle upon Tyne (0191) 4828500. Motherwell (01698) 230231.

constructionline

AGS ASSOCIATION OF GEOTECHNICAL & GEOENVIRONMENTAL SPECIALISTS

UKAS TESTING
1464

IAN FARMER ASSOCIATES

Laboratory Test Report - 41743R/1

Site : Lincoln House, Manchester

Client : Fairhurst

Job Number 41743R

DETERMINATION OF POINT LOAD STRENGTH OF ROCK

Borehole/ Trial Pit	Depth (m)	Sample	Type and Direction	W (mm) *=Avg	D (mm)	P (kN)	De (mm)	Is P/De^2 (MPa)	Is(50) (MPa)	F	eUCS (MPa)	Description
BH01	5.35	C1	A R	80.2	63.0	0.4	80.2	0.06	0.08	20	1.6	Brown SANDSTONE
BH01	6.00	C2	A PD	84.1	55.0	0.7	76.8	0.12	0.14	20	2.8	Brown SANDSTONE
BH01	7.00	C3	A R	79.2	75.0	0.6	86.9	0.08	0.10	20	2.0	Brown SANDSTONE
BH01	9.30	C4 C4	D R A R	0.0 83.8	102.0 44.0	0.6 0.5	102.0 68.5	0.06 0.11	0.08 0.12	20 20	1.6 2.4	Brown SANDSTONE
BH01	10.00	C5	L R	70.1	87.0	0.5	88.1	0.06	0.08	20	1.6	Brown SANDSTONE
BH02	6.78	C1 C1	D R A R	0.0 80.8	101.0 62.0	0.9 1.2	101.0 79.9	0.09 0.19	0.12 0.23	20 20	2.4 4.6	Brown SANDSTONE
BH02	7.26	C2	A R	83.2	79.0	0.5	91.5	0.06	0.08	20	1.6	Brown SANDSTONE
BH02	7.90	C3 C3	D PL A PD	0.0 85.2	101.0 77.0	0.3 0.5	101.0 91.4	0.03 0.06	0.04 0.08	20 20	0.8 1.6	Brown SANDSTONE
BH04	17.00	C1 C1	D R A R	0.0 84.0	101.0 42.0	0.5 0.1	101.0 67.0	0.05 0.02	0.07 0.03	20 20	1.4 0.6	Brown SANDSTONE
BH04	17.95	C2 C2	D PL A PD	0.0 85.0	102.0 55.0	0.6 1.0	102.0 77.1	0.06 0.17	0.08 0.20	20 20	1.6 4.0	Brown SANDSTONE
BH04	18.66	C3 C3	D R A R	0.0 83.3	99.0 83.0	0.5 0.9	99.0 93.8	0.05 0.10	0.07 0.14	20 20	1.4 2.8	Brown SANDSTONE
BH04	18.96	C4	A R	85.2	93.0	1.6	100.4	0.16	0.22	20	4.4	Brown SANDSTONE

Key to abbreviations: **Test Type & Direction**

A	**axial**	**PL**	**parallel to planes of weakness**		
D	**diametrical**	**PD**	**perpendicular to planes of weakness**		
L	**irregular lump**	**R**	**random or unknown orientation**		
B	**block**				

Others

W	**sample width**	**Is**	**uncorrected point load index**
D	**platen separation**	**Is50**	**corrected point load index**
P	**failure load**	**eUCS**	**estimated uniaxial compressive strength**
De	**equivalent diameter**	**F**	**Correction Factor**

Method of Preparation : Based on ISRM Commission on Testing Methods (1985)

Method of Test : Based on ISRM Commission on Testing Methods (1985)

Remarks :

IAN FARMER ASSOCIATES

Test Report : **41743R/1**

Site : Lincoln House, Manchester
Job Number : 41743R
Originating Client : Fairhurst

All opinions and interpretations contained within this report are outside of our Scope of Accreditation.

The following tests contained within this report are not UKAS Accredited.
I.S.R.M Method; Point Load Strength of Rock

Date of Issued : 15/09/2015

APPENDIX 4

CHEMICAL TESTS

Certificate of Analysis

Certificate Number 15-43967

07-Sep-15

Client	Ian Farmer Associates 17 Rivington Court Hardwick Grange Woolston Warrington Cheshire WA1 4RT
Our Reference	15-43967
Client Reference	41743
Contract Title	Lincoln House
Description	6 Soil samples.
Date Received	29-Aug-15
Date Started	29-Aug-15
Date Completed	07-Sep-15
Test Procedures	Identified by prefix DETSn (details on request).
Notes	Opinions and interpretations are outside the scope of UKAS accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. Observations and interpretations are outside the scope of ISO 17025. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By

Rob Brown
Business Manager

UKAS TESTING
2139

Summary of Chemical Analysis
Soil Samples

Our Ref 15-43967
Client Ref 41743
Contract Title Lincoln House

	Lab No	860493	860494	860495	860496	860497
	Sample ID	BH01	WS01	WS02	WS03	WS04
	Depth	1.00	0.50	0.50	0.50	0.50
	Other ID					
	Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL
	Sampling Date	24/08/15	26/08/15	26/08/15	26/08/15	25/08/15
	Sampling Time	n/s	n/s	n/s	n/s	n/s

Test	Method	LOD	Units					
Metals								
Arsenic	DETSC 2301#	0.2	mg/kg	2.2	20	4.5	3.0	6.7
Boron (water soluble)	DETSC 2123#	0.2	mg/kg	1.6	2.4	1.3	1.1	1.4
Cadmium	DETSC 2301#	0.1	mg/kg	0.9	0.7	0.5	0.5	0.5
Chromium	DETSC 2301#	0.15	mg/kg	45	21	9.7	7.4	9.7
Chromium III	DETSC 2301*	0.15	mg/kg	45	21	9.7	7.4	9.7
Hexavalent Chromium	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	6.6	29	11	5.7	24
Lead	DETSC 2301#	0.3	mg/kg	32	370	53	29	73
Magnesium Aqueous Extract	DETSC 2076*	10	mg/l	< 10		< 10		28
Mercury	DETSC 2325#	0.05	mg/kg	< 0.05	0.15	0.26	0.15	0.52
Nickel	DETSC 2301#	1	mg/kg	6.9	15	8.8	6.4	13
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Zinc	DETSC 2301#	1	mg/kg	23	66	38	24	59
Inorganics								
pH	DETSC 2008#			10.6	9.1	8.9	8.6	8.9
Cyanide Total	DETSC 2130#	0.1	mg/kg	< 0.1	1.1	< 0.1	< 0.1	< 0.1
Cyanide Free	DETSC 2130#	0.1	mg/kg	< 0.1	0.1	< 0.1	< 0.1	< 0.1
Cyanide complex	DETSC 2130*	0.2	mg/kg	< 0.2	0.9	< 0.2	< 0.2	< 0.2
Thiocyanate	DETSC 2130#	0.6	mg/kg	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6
Total Organic Carbon	DETSC 2002	0.1	%	0.4	0.6	0.2	0.4	0.1
Ammonia Aqueous Extract as N	DETSC 2119	10	mg/l	< 10		< 10		< 10
Chloride Aqueous Extract	DETSC 2055	1	mg/l	6.2		5.6		11
Nitrate Aqueous Extract as NO3	DETSC 2055	1	mg/l	1.1		11		31
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	36	1400	180	190	1000
Sulphide	DETSC 2024#	10	mg/kg	< 10	< 10	< 10	< 10	12
Total Sulphur as S	DETSC 2320	0.01	%	0.01	0.16	0.03	0.03	0.10
Total Sulphate as SO4	DETSC 2321#	0.01	%	0.04	0.46	0.08	0.07	0.30
Petroleum Hydrocarbons								
C5-C10 Gasoline Range Organics (GRO)	DETSC 3321*	0.1	mg/kg	< 0.1		< 0.1		
C10-C24 Diesel Range Organics (DRO)	DETSC 3311#	10	mg/kg	15		60		
C24-C40 Lube Oil Range Organics (LORO)	DETSC 3311#	10	mg/kg	14		57		
EPH (C10-C40)	DETSC 3311#	10	mg/kg	29	890	120	51	89

Key: * -not accredited. # -MCERTS (accreditation only implied if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Soil Samples

Our Ref 15-43967
Client Ref 41743
Contract Title Lincoln House

	Lab No	860493	860494	860495	860496	860497
	Sample ID	BH01	WS01	WS02	WS03	WS04
	Depth	1.00	0.50	0.50	0.50	0.50
	Other ID					
	Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL
	Sampling Date	24/08/15	26/08/15	26/08/15	26/08/15	25/08/15
	Sampling Time	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**			
PAHs						
Acenaphthene	DETSC 3301	0.1	mg/kg	< 0.1	2.3	< 0.1	< 0.1	< 0.1
Acenaphthylene	DETSC 3301	0.1	mg/kg	< 0.1	0.7	< 0.1	< 0.1	< 0.1
Anthracene	DETSC 3301	0.1	mg/kg	< 0.1	3.6	0.2	0.1	< 0.1
Benzo(a)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	13	0.9	< 0.1	< 0.1
Benzo(a)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	13	1.0	< 0.1	< 0.1
Benzo(b)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	11	0.8	< 0.1	< 0.1
Benzo(g,h,i)perylene	DETSC 3301	0.1	mg/kg	< 0.1	9.3	< 0.1	< 0.1	< 0.1
Benzo(k)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	6.0	0.6	< 0.1	< 0.1
Chrysene	DETSC 3301	0.1	mg/kg	< 0.1	14	0.9	< 0.1	< 0.1
Dibenzo(a,h)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	1.4	< 0.1	< 0.1	< 0.1
Fluoranthene	DETSC 3301	0.1	mg/kg	0.3	26	1.5	0.6	0.5
Fluorene	DETSC 3301	0.1	mg/kg	< 0.1	1.9	< 0.1	< 0.1	< 0.1
Indeno(1,2,3-c,d)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	9.6	< 0.1	< 0.1	< 0.1
Naphthalene	DETSC 3301	0.1	mg/kg	< 0.1	1.2	< 0.1	0.4	< 0.1
Phenanthrene	DETSC 3301	0.1	mg/kg	0.3	15	0.9	0.5	0.3
Pyrene	DETSC 3301	0.1	mg/kg	0.3	25	1.7	0.8	0.6
PAH	DETSC 3301	1.6	mg/kg	< 1.6	150	8.5	2.5	< 1.6
Phenols								
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3

Key: * -not accredited. # -MCERTS (accreditation only implied if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Soil Samples

Our Ref 15-43967
Client Ref 41743
Contract Title Lincoln House

Lab No	860498
Sample ID	WS05
Depth	0.50
Other ID	
Sample Type	SOIL
Sampling Date	25/08/15
Sampling Time	n/s

Test	Method	LOD	Units	
Metals				
Arsenic	DETSC 2301#	0.2	mg/kg	5.4
Boron (water soluble)	DETSC 2123#	0.2	mg/kg	1.3
Cadmium	DETSC 2301#	0.1	mg/kg	1.0
Chromium	DETSC 2301#	0.15	mg/kg	10
Chromium III	DETSC 2301*	0.15	mg/kg	10
Hexavalent Chromium	DETSC 2204*	1	mg/kg	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	12
Lead	DETSC 2301#	0.3	mg/kg	85
Magnesium Aqueous Extract	DETSC 2076*	10	mg/l	
Mercury	DETSC 2325#	0.05	mg/kg	0.63
Nickel	DETSC 2301#	1	mg/kg	12
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5
Zinc	DETSC 2301#	1	mg/kg	110
Inorganics				
pH	DETSC 2008#			10.2
Cyanide Total	DETSC 2130#	0.1	mg/kg	< 0.1
Cyanide Free	DETSC 2130#	0.1	mg/kg	< 0.1
Cyanide complex	DETSC 2130*	0.2	mg/kg	< 0.2
Thiocyanate	DETSC 2130#	0.6	mg/kg	< 0.6
Total Organic Carbon	DETSC 2002	0.1	%	0.4
Ammonia Aqueous Extract as N	DETSC 2119	10	mg/l	
Chloride Aqueous Extract	DETSC 2055	1	mg/l	
Nitrate Aqueous Extract as NO3	DETSC 2055	1	mg/l	
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	730
Sulphide	DETSC 2024#	10	mg/kg	< 10
Total Sulphur as S	DETSC 2320	0.01	%	0.07
Total Sulphate as SO4	DETSC 2321#	0.01	%	0.21
Petroleum Hydrocarbons				
C5-C10 Gasoline Range Organics (GRO)	DETSC 3321*	0.1	mg/kg	
C10-C24 Diesel Range Organics (DRO)	DETSC 3311#	10	mg/kg	
C24-C40 Lube Oil Range Organics (LORO)	DETSC 3311#	10	mg/kg	
EPH (C10-C40)	DETSC 3311#	10	mg/kg	58

Key: * -not accredited. # -MCERTS (accreditation only implied if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Soil Samples

Our Ref 15-43967
Client Ref 41743
Contract Title Lincoln House

			Lab No	860498
			Sample ID	WS05
			Depth	0.50
			Other ID	
			Sample Type	SOIL
			Sampling Date	25/08/15
			Sampling Time	n/s
Test	**Method**	**LOD**	**Units**	
PAHs				
Acenaphthene	DETSC 3301	0.1	mg/kg	< 0.1
Acenaphthylene	DETSC 3301	0.1	mg/kg	< 0.1
Anthracene	DETSC 3301	0.1	mg/kg	< 0.1
Benzo(a)anthracene	DETSC 3301	0.1	mg/kg	< 0.1
Benzo(a)pyrene	DETSC 3301	0.1	mg/kg	< 0.1
Benzo(b)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1
Benzo(g,h,i)perylene	DETSC 3301	0.1	mg/kg	< 0.1
Benzo(k)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1
Chrysene	DETSC 3301	0.1	mg/kg	< 0.1
Dibenzo(a,h)anthracene	DETSC 3301	0.1	mg/kg	< 0.1
Fluoranthene	DETSC 3301	0.1	mg/kg	0.6
Fluorene	DETSC 3301	0.1	mg/kg	< 0.1
Indeno(1,2,3-c,d)pyrene	DETSC 3301	0.1	mg/kg	< 0.1
Naphthalene	DETSC 3301	0.1	mg/kg	< 0.1
Phenanthrene	DETSC 3301	0.1	mg/kg	0.4
Pyrene	DETSC 3301	0.1	mg/kg	0.7
PAH	DETSC 3301	1.6	mg/kg	1.7
Phenols				
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3

Summary of Asbestos Analysis
Soil Samples

Our Ref 15-43967
Client Ref 41743
Contract Title Lincoln House

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
860494	WS01 0.50	SOIL	Amosite	Amosite present as fibre bundles	D Wilkinson
860495	WS02 0.50	SOIL	Chrysotile	Chrysotile present as fibre bundles	D Wilkinson
860496	WS03 0.50	SOIL	NAD	none	D Wilkinson
860497	WS04 0.50	SOIL	Chrysotile Amosite Crocid	Chrysotile and Amosite present as fragments of board Crocidolite present as fibre bundles	D Wilkinson
860498	WS05 0.50	SOIL	Chrysotile Amosite	Chrysotile and Amosite present as fibre bundles and fragments of board	D Wilkinson

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * -not included in laboratory scope of accreditation.

Information in Support of the Analytical Results

Our Ref 15-43967
Client Ref 41743
Contract Lincoln House

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
860493	BH01 1.00 SOIL	24/08/15	GJ 1L, GV, PT 1L	pH + Conductivity (7 days)	
860494	WS01 0.50 SOIL	26/08/15	GJ 1L, GV, PT 1L		
860495	WS02 0.50 SOIL	26/08/15	GJ 1L, GV, PT 1L		
860496	WS03 0.50 SOIL	26/08/15	GJ 1L, GV, PT 1L		
860497	WS04 0.50 SOIL	25/08/15	GJ 1L, GV, PT 1L		
860498	WS05 0.50 SOIL	25/08/15	GJ 1L, GV, PT 1L		

Key: G-Glass P-Plastic J-Jar V-Vial T-Tub

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

Soil Analysis Notes

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

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

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

Disposal

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

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

Certificate of Analysis

Certificate Number 15-46015

06-Oct-15

Client	Ian Farmer Associates 17 Rivington Court Hardwick Grange Woolston Warrington Cheshire WA1 4RT
Our Reference	15-46015
Client Reference	41743
Contract Title	LINCOLN HOUSE
Description	2 Water samples.
Date Received	25-Sep-15
Date Started	25-Sep-15
Date Completed	06-Oct-15
Test Procedures	Identified by prefix DETSn (details on request).
Notes	Opinions and interpretations are outside the scope of UKAS accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. Observations and interpretations are outside the scope of ISO 17025. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By

Rob Brown
Business Manager

2139

Summary of Chemical Analysis
Water Samples

Our Ref 15-46015
Client Ref 41743
Contract Title LINCOLN HOUSE

			Lab No	875150	875151
			Sample ID	BH01	BH04
			Depth		
			Other ID		
			Sample Type	WATER	WATER
			Sampling Date	24/09/15	24/09/15
			Sampling Time	n/s	n/s
Test	**Method**	**LOD**	**Units**		
Metals					
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	0.84	0.80
Boron	DETSC 2123	100	ug/l	200	250
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	0.13	0.10
Chromium, Dissolved	DETSC 2306	0.25	ug/l	8.3	5.5
Copper, Dissolved	DETSC 2306	0.4	ug/l	2.2	1.2
Lead, Dissolved	DETSC 2306	0.09	ug/l	0.17	0.12
Mercury, Dissolved	DETSC 2306	0.01	ug/l	< 0.01	< 0.01
Nickel, Dissolved	DETSC 2306	0.5	ug/l	3.4	4.6
Selenium, Dissolved	DETSC 2306	0.25	ug/l	3.8	7.0
Zinc, Dissolved	DETSC 2306	1.25	ug/l	85.6	56.6
Inorganics					
pH	DETSC 2008			6.5	6.9
Cyanide Total	DETSC 2130	40	ug/l	< 40	< 40
Cyanide Free	DETSC 2130	20	ug/l	< 20	< 20
Cyanide complex	DETSC 2130*	40	ug/l	< 40	< 40
Thiocyanate	DETSC 2130	40	ug/l	< 40	< 40
Ammoniacal Nitrogen as NH4	DETSC 2207	0.02	mg/l	< 0.02	< 0.02
Ammoniacal Nitrogen as NH3	DETSC 2207	0.4	mg/l	< 0.4	< 0.4
Sulphate as SO4	DETSC 2055	0.1	mg/l	100	170
Sulphide	DETSC 2208	10	ug/l	< 10	< 10
Sulphur (free)	DETSC 3049	84	ug/l	< 84	< 84
Petroleum Hydrocarbons					
C5-C10 Gasoline Range Organics (GRO)	DETSC 3322	1	ug/l	< 1.0	< 1.0
C10-C24 Diesel Range Organics (DRO)	DETSC 3311	10	ug/l	110	64
C24-C40 Lube Oil Range Organics (LORO)	DETSC 3311	10	ug/l	23	14
EPH (C10-C40)	DETSC 3311	10	ug/l	140	78

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Water Samples

Our Ref 15-46015
Client Ref 41743
Contract Title LINCOLN HOUSE

			Lab No	875150	875151
			Sample ID	BH01	BH04
			Depth		
			Other ID		
			Sample Type	WATER	WATER
			Sampling Date	24/09/15	24/09/15
			Sampling Time	n/s	n/s
Test	**Method**	**LOD**	**Units**		
PAHs					
Acenaphthene	DETS 074*	0.01	ug/l	< 0.01	< 0.01
Acenaphthylene	DETS 074*	0.01	ug/l	< 0.01	< 0.01
Anthracene	DETS 074*	0.01	ug/l	< 0.01	< 0.01
Benzo(a)anthracene	DETS 074*	0.01	ug/l	0.03	< 0.01
Benzo(a)pyrene	DETS 074*	0.01	ug/l	< 0.01	< 0.01
Benzo(b)fluoranthene	DETS 074*	0.01	ug/l	< 0.01	< 0.01
Benzo(g,h,i)perylene	DETS 074*	0.01	ug/l	< 0.01	< 0.01
Benzo(k)fluoranthene	DETS 074*	0.01	ug/l	< 0.01	< 0.01
Chrysene	DETS 074*	0.01	ug/l	0.02	< 0.01
Dibenzo(a,h)anthracene	DETS 074*	0.01	ug/l	< 0.01	< 0.01
Fluoranthene	DETS 074*	0.01	ug/l	< 0.01	< 0.01
Fluorene	DETS 074*	0.01	ug/l	< 0.01	< 0.01
Indeno(1,2,3-c,d)pyrene	DETS 074*	0.01	ug/l	< 0.01	< 0.01
Naphthalene	DETS 074*	0.01	ug/l	< 0.01	< 0.01
Phenanthrene	DETS 074*	0.01	ug/l	< 0.01	< 0.01
Pyrene	DETS 074*	0.01	ug/l	< 0.01	< 0.01
PAH	DETS 074*	0.2	ug/l	< 0.20	< 0.20
Phenols					
Phenol	*	0.5	ug/l	< 0.50	< 0.50

Key: * -not accredited. n/s -not supplied.

Information in Support of the Analytical Results

Our Ref 15-46015
Client Ref 41743
Contract LINCOLN HOUSE

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
875150	BH01 WATER	24/09/15	GB 1L x2, GV x2		
875151	BH04 WATER	24/09/15	GB 1L x2, GV x2		

Key: G-Glass B-Bottle V-Vial

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

Disposal

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

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

APPENDIX 5

PHOTOGRAPHS

Photographs of Rock Core

Core Photographs
BH01

2.20m to 5.20m



5.20m to 8.20m



Core Photographs
BH01

8.20m to 11.20m



Core Photographs
BH02A

6.00m to 8.00m



Core Photographs
BH04

17.00m to 20.00m



Photographs of Wall Core

Wall Core Photographs
HC01



Wall Core Photographs
HC02



Wall Core Photographs
HC03



Wall Core Photographs
HC04



APPENDIX 6

MONITORING

IAN FARMER ASSOCIATES
Geotechnical & Environmental Specialists

Gas and Groundwater Monitoring Results

Contract Number:	*41743*	**Gas Monitor:**	*Gas Data*
Contract Name:	*Lincoln House, Manchester*	**Readings Taken By:**	*MC*
Date:	*11th September 2015*	**Checked By:**	*HH*

Background Readings:

		O_2%	CO_2%	CH_4%	CO	H_2S	
Weather Conditions:	*Fine/dry*	v/v	v/v	v/v	ppm	ppm	
Ground Conditions (dry / wet etc):	*n/a*						
Atmospheric Pressure (Start):	*1021mb*	*20.3*	*0.1*	*0.0*	*0.0*	*0.0*	
Atmospheric Pressure (Finish):	*1021mb*						
Time (Start):	*10:30*						
Time (Finish):	*11:50*						

Hole No:	VOC ppm	O_2% v/v	CO_2% v/v	CH_4% v/v		LEL	CO ppm	H_2S ppm	Rel Pressure (mb)	Gas flow Rate (l/hr)	Depth to base of well	SWL	LNAPL or DNAPL
	Steady	Steady	Steady	Peak	Steady	Steady	Steady	Steady	Steady	Range	mBGL	mBGL	mBGL
BH01	*0.0*	*19.8*	*0.2*	*0.1*	*0.1*	*0*	*0*	*0*	*n/a*	*0.0*	*19.79*	*9.35*	*NR*
BH02	*Missed during monitoring visit*												
BH04	*0.0*	*19.3*	*0.2*	*0.1*	*0.1*	*0*	*0*	*0*	*n/a*	*0.0*	*19.26*	*9.26*	*NR*
WS03	*0.0*	*19.4*	*0.1*	*0.1*	*0.1*	*0*	*0*	*0*	*n/a*	*0.0*	*2.04*	*DRY*	*NR*
WS04	*0.0*	*19.6*	*0.0*	*0.0*	*0.0*	*0*	*0*	*0*	*n/a*	*0.0*	*1.20*	*DRY*	*NR*

>>>> = Flow above detection limit of 30 l/hr, <<< = Negative flow greater than -10 l/hr. >Max = In excess of lower explosive limit.

Remarks:

IAN FARMER ASSOCIATES
Geotechnical & Environmental Specialists

Gas and Groundwater Monitoring Results

Contract Number:	*41743*	**Gas Monitor:**	*GA 2000*
Contract Name:	*Lincoln House*	**Readings Taken By:**	*J T*
Date:	*24th September 2015*	**Checked By:**	

Background Readings:		O_2% v/v	CO_2% v/v	CH_4% v/v	CO ppm	H_2S ppm	
	Weather Conditions: *N/A Inside*						
	Ground Conditions (dry / wet etc): *Dry*						
	Atmospheric Pressure (Start): *1009mb*	*20.6*	*0.0*	*0.0*	*0.0*	*0.0*	
	Atmospheric Pressure (Finish): *1009mb*						
	Time (Start): *10:00*						
	Time (Finish):						

Hole No:	VOC ppm	O_2% v/v	CO_2% v/v	CH_4% v/v		LEL	CO ppm	H_2S ppm	Rel Pressure (mb)	Gas flow Rate (l/hr)	Depth to base of well	SWL	LNAPL or DNAPL
	Steady	Steady	Steady	Peak	Steady	Steady	Steady	Steady	Steady	Range	mBGL	mBGL	mBGL
BH01	*0.0*	*20.6*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*NR*	*0.0*	*20.16*	*9.19*	*NR*
BH02	*1.0*	*20.5*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*NR*	*0.0*	*8.07*	*8.03*	*NR*
BH04	*1.5*	*20.4*	*0.0*	*0.0*	*0.0*	*0.0*	*1.0*	*0.0*	*NR*	*0.0*	*19.61*	*9.14*	*NR*
WS03	*0.0*	*20.5*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*NR*	*0.0*	*2.06*	*Dry*	*NR*
WS04	*0.0*	*20.6*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*NR*	*0.0*	*1.23*	*Dry*	*NR*

>>>> = Flow above detection limit of 30 l/hr, <<< = Negative flow greater than -10 l/hr. >Max = In excess of lower explosive limit.

Remarks:

IAN FARMER ASSOCIATES
Geotechnical & Environmental Specialists

Gas and Groundwater Monitoring Results

Contract Number:	*41743*	**Gas Monitor:**	*GFM*
Contract Name:	*Lincoln House, Manchester*	**Readings Taken By:**	*DD*
Date:	*7th October 2015*	**Checked By:**	*HH*

Background Readings:			O_2% v/v	CO_2% v/v	CH_4% v/v	CO ppm	H_2S ppm	
	Weather Conditions:	*Wet/overcast*						
	Ground Conditions (dry / wet etc):	*Dry*						
	Atmospheric Pressure (Start):	*1005mb*	*20.6*	*0.1*	*0.0*	*0.0*	*0.0*	
	Atmospheric Pressure (Finish):	*1005mb*						
	Time (Start):	*9:00*						
	Time (Finish):	*10:00*						

Hole No:	VOC ppm	O_2% v/v	CO_2% v/v	CH_4% v/v		LEL	CO ppm	H_2S ppm	Rel Pressure (mb)	Gas flow Rate (l/hr)	Depth to base of well	SWL	LNAPL or DNAPL
	Steady	Steady	Steady	Peak	Steady	Steady	Steady	Steady	Steady	Range	mBGL	mBGL	mBGL
BH01	*NR*	*20.6*	*0.1*	*0.0*	*0.0*	*0*	*0*	*0*	*1004*	*0.0*	*20.10*	*10.00*	*NR*
BH02	*NR*	*20.7*	*0.1*	*0.0*	*0.0*	*0*	*0*	*0*	*1005*	*0.0*	*10.00*	*Dry*	*NR*
BH04	*NR*	*20.6*	*0.1*	*0.0*	*0.0*	*0*	*0*	*0*	*1004*	*0.0*	*17.10*	*9.18*	*NR*
WS03	*NR*	*20.7*	*0.1*	*0.0*	*0.0*	*0*	*0*	*0*	*1005*	*0.0*	*2.80*	*Dry*	*NR*
WS04	*NR*	*20.6*	*0.1*	*0.0*	*0.0*	*0*	*0*	*0*	*1004*	*0.0*	*1.00*	*Dry*	*NR*

>>>> = Flow above detection limit of 30 l/hr, <<< = Negative flow greater than -10 l/hr. >Max = In excess of lower explosive limit.

Remarks:

IAN FARMER ASSOCIATES
Geotechnical & Environmental Specialists

Gas and Groundwater Monitoring Results

Contract Number:	*41743*	**Gas Monitor:**	*GA2000*
Contract Name:	*Lincoln House*	**Readings Taken By:**	*SB*
Date:	*22nd October 2015*	**Checked By:**	*HH*

Background Readings:

		O_2% v/v	CO_2% v/v	CH_4% v/v	CO ppm	H_2S ppm	
Weather Conditions:	*Dry*						
Ground Conditions (dry / wet etc):	*Dry,concrete*						
Atmospheric Pressure (Start):	*1015mb*	*20.5*	*0.1*	*0.1*	*0.0*	*0.0*	
Atmospheric Pressure (Finish):	*1014mb*						
Time (Start):	*13.45*						
Time (Finish):	*14.00*						

Hole No:	VOC ppm	O_2% v/v	CO_2% v/v	CH_4% v/v		LEL	CO ppm	H_2S ppm	Rel Pressure (mb)	Gas flow Rate (l/hr)	Depth to base of well	SWL	LNAPL or DNAPL
	Steady	Steady	Steady	Peak	Steady	Steady	Steady	Steady	Steady	Range	mBGL	mBGL	mBGL
BH01	*NR*	*20.2*	*0.02*	-	-	*0.1*	*0*	*0*	*0.19*	*0.01*	*20.10*	*8.60*	*NR*
BH02	*NR*	*20.5*	*0.0*	*0.0*	*0.0*	*0.1*	*0*	*0*	*0.19*	*0.00*	*9.98*	*Damp*	*NR*
BH04	*NR*	*20.1*	*0.6*	*0.0*	*0.0*	*0.1*	*0*	*0*	*0.19*	*0.05*	*19.20*	*8.60*	*NR*
WS03	*NR*	*20.3*	*0.1*	*0.0*	*0.0*	*0.1*	*0*	*0*	*0.19*	*0.01*	*2.00*	*Dry*	*NR*
WS04	*NR*	*20.4*	*0.01*	*0.0*	*0.0*	*0.1*	*0*	*0*	*0.19*	*0.02*	*1.20*	*Dry*	*NR*

>>>> = Flow above detection limit of 30 l/hr, <<< = Negative flow greater than -10 l/hr. >Max = In excess of lower explosive limit.

Remarks:



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