

Room2 Homotel Piccadilly, Manchester

Cover note:

Introduction:

The following Site investigation reports have been assigned to Northside (Manchester) Ltd and Lamington Group to support a full planning application and Listed Building Consent for an aparthotel development (hereafter referred to as the 'Proposed Development') at 12-16 Manchester Piccadilly, Manchester M1 3AN (hereafter referred to as 'the Site').

The development site has a long history of planning permissions dating back to the early 2000's, and the original documents undertaken by Resource & Environmental Consultants Ltd (REC). have been attached as part of the submission.

Document reference:

REC PHASE_I_GROUND_SURVEY-969768

REC PHASE_II_LAND_CONTAMINATION_ASSESSMENT-965114

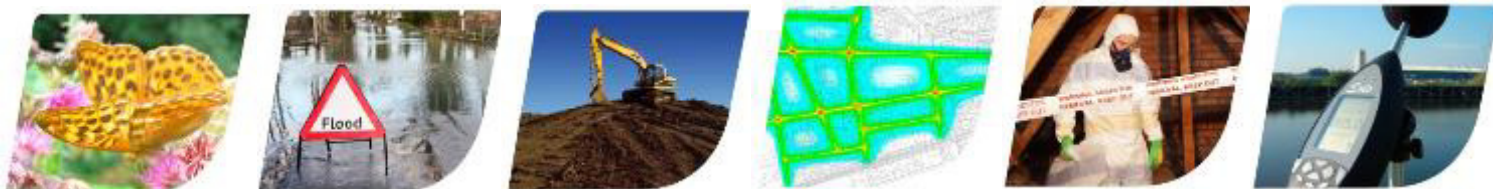
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PHASE I GEO-ENVIRONMENTAL SITE ASSESSMENT
12 – 16 PICCADILLY, MANCHESTER
M1 3AQ

REC REFERENCE: 101145P1R0

REPORT PREPARED FOR: TOYOKO INN CO LIMITED

MARCH 2016



QUALITY ASSURANCE

Issue/revision	Issue 1	Revision 1	Revision 2
Remarks	Final		
Date	March 2016		
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Signature			
Project number	101145		

EXECUTIVE SUMMARY	
Site Address	12-16 Piccadilly, Manchester, M1 3AQ
Grid Reference	E:384579, N:398142
Site Area	0.07 ha
Current Site Use	The subject site comprises a four storey late Georgian-style stone constructed commercial building named the 'Union Bank of Manchester'. The engraving at the top of the building dates its construction to 1836. The area to the rear of the building is surfaced in asphalt and is currently used as a car park accessed off Gore Street.
Adjacent Site Use	Predominantly commercial city centre.
Environmental Setting	<p>Geology – The site is underlain by Glacial Till clay deposits overlying Chester Pebble Beds Formation sandstone.</p> <p>Aquifers – The site is underlain by a Principal Aquifer (sandstone).</p> <p>Sensitive Land Uses – No environmentally sensitive land uses have been identified within close proximity to the subject site.</p> <p>Hydrology – Rochdale Canal is located 72m south east of the site.</p>
Site History	Historical maps indicate that the site has been extensively developed and re-developed over the past 150 years as is typical for a city centre site. The site has remained in its current form since circa 1980's.
Landfill Sites & Ground Gases	Made Ground deposits associated with the construction of former and current site buildings and adjacent buildings has been identified as a possible source of hazardous ground gases beneath the site. There are no landfills within a 500m radius of the site.
Radon	Less than 1% of homes are above the Action Level. The BGS reports that no radon protective measures are necessary in the construction of new dwellings or extensions.
Coal Mining / Land Stability	Site is unaffected by coal mining.
Unexploded Ordnance	A preliminary (pre phase I) unexploded ordnance desk based study assessment is currently in preparation and will be sent as an addendum to this report in due-course.
Initial Conceptual Site Model (CSM)	<p>Human Health</p> <p>On-site - Potential onsite contaminants have been identified associated with historical and present site activities, particularly in relation to the presence of significant thicknesses of made ground and the site's previous use as a wire works. However findings of a previous ground investigation carried out onsite in 2013 by REC did not find widespread exceedances from the chemical testing carried out other than the potential presence of asbestos containing material (ACM) and concluded there was a low risk to current and future site users as the site was to be completely covered in hardstanding. Risk to Construction workers from the presence of short term (acute) risks is considered to be Moderate, mainly in association with the visual presence of ACM that was visually identified during the 2013 intrusive ground investigation. From this ground investigation, ground gas monitoring (based on a total of six monitoring visits) identified a Characteristic Situation 1 gassing regime based on CIRIA C665 guidance (comprising of six rounds) and hence gas protection measures were not considered to be necessary).</p> <p>Off-site The nearest potential source of off-site contamination is considered to be Made Ground deposits associated with the construction of nearby buildings and railway lines.</p> <p>Controlled waters Results of analysis of soil leachates performed on site during a 2013 ground investigation identified only marginally elevated concentrations of</p>

	PAHs. Groundwater and surface waters are at a low risk from site contamination based on the impermeable clay deposits underlying the site negating the migration of contaminants.
Preliminary Geotechnical Assessment	<p>Ground Conditions The site is underlain by drift deposits of Glacial Till which in turn overlies sandstone bedrock. It is anticipated that the clay deposits would not be subject to heave or swell based upon the lack of mature trees in close proximity to the site. Significant made ground deposits (between 2.00m and 3.00m) during a previous site investigation.</p> <p>Ground Instability The site is located in an area which was historically mined for coal; however, previous site investigation works carried out found the site is underlain by a substantial layer of sandstone and it is expected that any mine workings would be at depth beneath the site posing an insignificant risk of subsidence.</p> <p>Indicative Foundation Solutions Based on the findings of a previous investigation carried out on site and the loadings required for the complex construction, a piled solution is deemed most suitable. Pile design should be undertaken by a specialist contractor.</p>
Recommendations	<p>A detailed Phase II intrusive Geo-Environmental ground investigation should be undertaken in order to confirm the findings of the initial conceptual site model, to determine foundation design and to assess the anticipated depths of Made Ground. In light of the intrusive ground investigation and assessment undertake by REC for a Third Party in 2013, it is considered prudent that reliance of this report is sought from the Third Party (and REC) and the report is updated to specifically reflect the new development proposed and the geo-environmental quantitative risk assessment is amended to reflect recent amendments to contamination assessment guidance and Regulations.</p> <p>Due to the strength and thickness of the concrete slab in the basement area of the former bank building it is recommended that concrete cores are advanced using an electric rig to obtain information on the existing floor construction.</p> <p>It is recommended that an asbestos survey should be undertaken by a specialist contractor prior to redevelopment of the site.</p> <p>In order for new water supply pipes to be adopted by the water utilities company, an intrusive ground investigation that includes sampling and analysis of soils will be required along the proposed water supply pipe route on site followed by an assessment of suitable water supply pipe materials. The assessment will need to be performed in accordance with UK Water Industry Research (UKWIR) and United Utilities requirements.</p>

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APPENDICES

Appendix I	Limitations
Appendix II	Drawings
	Drawing No 101145p1r0-001 – Site Location Plan
	Drawing No 101145p1r0-002 – Site Plan
Appendix III	Photographs
Appendix IV	Historical Mapping
Appendix V	Regulatory Correspondence - Awaiting
Appendix VI	Preliminary Pre-Phase I Unexploded Ordnance Assessment - Awaiting

1.0 INTRODUCTION

1.1 Background

Resource and Environmental Consultants Ltd (REC) has been commissioned by Toyoko Inn Co Ltd to undertake a Phase I Geoenvironmental Site Assessment at 12-16 Piccadilly, Manchester, M1 3AQ.

1.2 Proposed Development

REC understands that Toyoko Inn intends to redevelop the site with a 26-storey hotel along with refurbishment of the existing listed Georgian building.

1.3 Objectives

The objectives of the desk based study are to:

-  Review historical plans, geology, hydrogeology, site sensitivity, flood-plain issues, mining records and any local authority information available in order to complete a Desk Study in line with Environment Agency (EA) document Model Procedures for the Management of Contaminated Land (Contaminated Land Report 11 (CLR11));
-  Assess the implications of any potential environmental risks, liabilities and development constraints associated with the site in relation to the future use of the site and in relation to off-site receptors; and,
-  Provide a factual and interpretative report relating to the desk study and provide preliminary recommendations on any potential development issues.

1.4 Sources of Information

Background information was sought from the following sources:

-  Groundsure Database Search (ref: GS-2821154, dated 15th March 2016);
-  REC Phase I Report 44334p1r0 July 2013 and Phase II Geo-environmental Site Investigation – Preliminary Report 44934p2R0 October 2013 prepared for a Third Party;
-  Historical mapping dated 1846 to 2014. A selection of historical maps are reproduced in Appendix IV;
-  On-line planning records held by Manchester City Council;
-  Consultations with representatives of the Manchester City Council;
-  Environment Agency Groundwater Vulnerability Map (www.environment-agency.gov.uk/wiyby);
-  Radon: Guidance on protective measures for new buildings (BRE Document BR 211, 2015); and,
-  British Geological Survey (BGS) Map (Sheet 085, 1:50,000, Manchester, Solid & Drift edition).

1.5 Risk Classification

REC has utilised the available data to classify the site on the basis of its likely contaminated land liability and potential for geotechnical constraints in relation to the property development. The risk classification definitions are summarised below:

Risk	Definition
Low	There are unlikely to be significant contaminated land liabilities/geotechnical constraints associated with the property.
Low-Moderate	There are unlikely to be significant contaminated land liabilities/geotechnical constraints associated with the property with regard to the proposed use. However, minor issues may require further consideration in the event of a future redevelopment of the site etc.
Moderate	Some potential contaminated land liabilities/geotechnical constraints are likely to affect the property as a result of historical and/or current activities. The risks identified are unlikely to pose an immediate significant issue but the purchaser/developer may wish to make further enquiries of the vendor or undertake further environmental improvements. Redevelopment of the site will likely require further site investigation.
Moderate-High	Some potentially significant contaminated land liabilities/geotechnical constraints have been identified at the property that requires further assessment including intrusive ground investigations.
High	Significant potential contaminated land liabilities/geotechnical constraints have been identified at the property. Further assessment including intrusive ground investigation will be required to determine to level of risk and associated liability.

1.6 Limitations of the Study

The full limitations of this report are presented in Appendix I.

1.7 Previous Investigations

A previous investigation carried out by REC in September 2013 (Report Ref: 44934p2r0) found a substantial thickness of Made Ground present beneath the site based on the size of the former / current buildings and the extensive re-development of the site at various times over the past 150 years.

Chemical results from analysis of soils during this investigation did not record widespread elevated concentrations during initial screening. Concentrations above the relevant generic assessment criteria applicable at the time were limited to elevated Benzo(a)Pyrene at one location and elevated Lead at two, together with a number of marginally elevated soil leachate concentrations for select PAHs. The probability of exposure to future site users, construction workers and controlled waters was anticipated to be **low**.

A gas and groundwater monitoring survey undertaken between 14th October and 28th November 2013 which comprised of six monitoring visits recorded concentrations of methane up to 0.3%v/v

and 0.9%v/v of Carbon Dioxide with flow rates of up to 0.2 l/h. This places the site in a Characteristic Situation 1 bracket, requiring no special gas protection measures. As a result, the site is considered to be at a **low** risk of generating ground gas.

2.0 SITE SETTING

2.1 Site Details

Site Address	12 – 16 Piccadilly, Manchester, M1 3AQ
National Grid Reference	E:384579, N:398142
Site Area	0.07 ha

A site location map is presented in Appendix II as Drawing No. 101145p1r0-001.

2.2 Current Site Use

Site Walkover Brief

A site walkover was undertaken on 15th March 2016 and the following site description comprises the site's current layout / features based on the REC Engineer's observations at the time of the site walkover. The walkover is primarily used to identify potential sources of soil and water contamination present at the site. The walkover is not a professional assessment of any potential future remedial, demolition or decommissioning works required and advice on such matters should be sought by the appropriate specialist contractors. A site features plan is shown in Appendix II as Drawings No. 101145p1r0-002.

Site Description

The subject site is approximately rectangular in shape and is located in the Piccadilly area of Manchester city centre. The site is bound by adopted roads on all but the western side: Piccadilly to the east; Chatham Street to the north and Gore Street to the south. Adjacent site uses include: a hotel and public house to the east; multi-storey car park to the north; hotel to the south and YMCA training centre / public house to the west.

The subject site comprises a four storey late Georgian-style stone constructed commercial building named the 'Union Bank of Manchester'. The engraving at the top of the building dates the construction of the building to 1836. It is anticipated that the building may have previously had basements and although no evidence was observed during the site walkover, it is noted that a basement was encountered during an intrusive investigation reported by REC in 2013. The area to the rear of the building is surfaced in bit macadam and is currently used as a car park accessed off Gore Street. The site area is topographically flat and entirely surfaced in buildings or hard standing. The on-site property is currently unoccupied.

Hazardous Materials Storage

No Above Ground Storage tanks (AST) or Underground Storage Tanks (USTs) were observed at the site.

Polychlorinated Biphenyls (PCBs)

No equipment that may potentially contain PCBs was observed at the site.

Asbestos Containing Material (ACM)

Although no ACMs were identified during the site walkover, given the age of the building, the presence of ACM cannot be discounted. It is recommended that an asbestos survey should be undertaken by a specialist contractor prior to redevelopment of the site. It is noted that the previous investigation visually identified ACM (as bonded cement) within the made ground at a number of locations on the site. It is unclear whether such ACM was specifically sampled and analysed.

Waste Storage

No potential waste streams were identified to be generated at the site. Low level fly-tipping/general rubbish accumulation was present in the car park area of the site.

Drainage Issues

A formal drainage survey has not been completed but both foul and surface water sewers are located running along the roads on all sides of the site.

2.3 Surrounding Area

The surrounding land uses are summarised below:

Direction	Land Use
North	Chatham Street with Commercial City Centre buildings beyond.
East	Piccadilly with Commercial City Centre buildings beyond.
South	Gore Street with Commercial City Centre buildings beyond.
West	Commercial buildings with Roby Street beyond.

3.0 SITE HISTORY

3.1 On-Site Historical Development

A review of historical maps pertinent to the site is summarised in Table 3.1 below.

Table 3.1 Summary of On-Site Potentially Contaminative Historical Land Uses

Map Edition	Historical Land Use
1851 (1:1,1056)	The subject site is almost entirely covered by a number of buildings. The building in the south is recorded as a wire works.
1891 (1:500)	The site is entirely covered by buildings with a bank recorded in the north of the site.
1922 (1:2,500)	The two buildings occupying the north west of the site have been converted into a single building.
1931 – 1933 (1:2,500)	The building in the centre of the site has been replaced by two separate buildings. The building in the south east of the site is now recorded as a bank.
1948 (1:1,250)	The bank in the north east corner has been extended to the west.
1986 – 1990 (1:1,250)	The buildings in the southern section of the site have been demolished. The bank has been extended to cover the northern half of the site.
1995 – Present (1:1,250)	No significant change to site layout up until present day.

The subject site is located within Manchester City Centre and the OS mapping indicates that the site was extensively developed since before 1851. The site has been redeveloped a number of times over the past 150 years and appears to have been in its current layout since the mid-1980s. A wire works was recorded on the site in 1851.

3.2 Off-Site Historical Development

A review of potentially contaminative land uses identified on historical Ordnance Survey maps within a 250m radius of the site is summarised below in Table 3.2.

Table 3.2 Summary of Potentially Contaminative Off-Site Historical Land Uses

Surrounding Feature	Distance	Dates	Direction
Timber Yard Then Employment Exchange	50m	Pre 1851 – Pre 1933 Pre 1933 - Present	South
Piccadilly Printing Works Then demolished and replaced with two buildings and a road.	120m	Pre 1851 to Pre 1931 Pre 1931 to 2013	South
Railway line and Goods shed Then dismantled	120m	Pre 1889 to Pre 1965 Pre 1965 to Present	East

Surrounding Feature	Distance	Dates	Direction
Tramway Then Piccadilly Road	Adjacent	Pre 1891 to Pre 1950 Pre 1950 to Present	East

3.3 Planning History

REC has undertaken a review of on-line planning records held by Manchester City Council and no environmentally pertinent information has been obtained for the site.

4.0 ENVIRONMENTAL SETTING

4.1 Geology & Hydrogeology

The British Geological Survey (BGS) map for the site, (Sheet 085, 1:50,000, Manchester, Solid & Drift edition) indicates that the site is underlain by the following geological sequence:

Geological Unit	Classification	Description	Aquifer Classification	Sensitivity
Drift	Glacial Till, Devensian	Clay	Secondary Aquifer - Undifferentiated	Low
Solid	Chester Pebble Beds Formation	Sandstone	Principal	High

The Groundsure report indicates there are four historical groundwater abstractions between 251 and 500m radius of the site. Two abstractions (boreholes at origin developments) are located 435m south west of the site and are utilised for non-evaporite cooling. Two abstractions (boreholes at George Street) are located 484m west of the site and are utilised for general cooling and are dated 1971 and 1984.

Additionally, there are no potable water abstractions, surface water abstractions or source protection zones within 500m of the site.

Previous work undertaken by REC in September 2013 (Report Ref: 44934p2r0) identified significant made ground deposits ranging from 2.45m to 4.0m in thickness across the site. Made ground generally comprised asphalt of concrete underlain by sandy gravel with frequent cobbles of brick and concrete. Gravels also comprised ash, glass, timber, plastic, clinker and occasional fragments of potential asbestos containing materials (anticipated to exist as bonded cement). A concrete slab (presumed to be a former basement floor) was encountered across the central areas of the existing car park area at circa 2.50 – 2.60m bgl. Drift generally comprised Glacial Till between 3.00m and 4.00m. Weathered sandstone was met at 22.00m bgl with more competent deposits encountered between 27.20m and 28.00m. Perched groundwater was identified at 2.8mbgl. The true water table was not encountered during the intrusive investigation.

4.2 Geotechnical Data

Geotechnical Data presented within the Groundsure report identifies the following ground conditions:

Hazard	Designation
Shrink-Swell Clay	Very Low
Landslides	Very Low
Soluble Rocks	Negligible
Compressible Ground	Moderate
Collapsible Deposits	Very Low
Running Sand	Very Low

4.3 Coal Mining

The Coal Authority interactive map viewer indicates that the site is located within a coal mining reporting area and as such a Coal Authority Report was obtained for the site.

The Coal Authority Report indicates that the site is not within a surface area that could be affected by past underground mining and the Coal Authority does not record the site as being within a high risk development area and therefore a coal mining risk assessment (CMRA) is not required. The Coal Authority Report is contained in Appendix II.

Previous works carried out on the site to investigate shallow coal mining concluded that the site is underlain by a substantial layer of sandstone and if any unrecorded mine workings would be at a depth beneath the site posing an insignificant risk of subsidence.

4.4 Hydrology

The nearest local surface water body - Rochdale Canal - is located 72m south east of the site.

The site is not located within a currently defined fluvial flood zone with the highest risk of flooding onsite from Rivers and the Sea (RoFRas) Rating being **very low**.

4.5 Radon Risk Potential

The UK radon website indicates the site is situated in an area where less than 1% of homes are above the Action Level and that the BGS reports that no radon protective measures are necessary in the construction of new dwellings or extensions.

4.6 Industrial Land Uses

The site is situated within a predominantly commercial area of Manchester City Centre with the Trade Directory recording 26 trade entries within 250m. The entries within 100m radius of the site include;

-  Vehicle hire and rental 4m south west of the site;
-  Electricity substation 13m south west of the site;
-  Industrial estate 56m south east including civil engineers and publishers;
-  Industrial products 66m to the west of the site; and,
-  Vehicle components 89m north west of the site.

4.7 Unexploded Ordnance (UXO)

A response from a UXO specialist concerning a preliminary (pre-phase I) risk assessment for the site is awaited.

4.8 Sensitive Land Uses

No environmentally sensitive land uses have been identified within close proximity to the subject site.

4.9 Site Sensitivity Assessment

The site is considered to be located within a low sensitivity setting due to the following reasons:

-  The underlying solid geology is classified as a Principal Aquifer; however, the site is underlain by low permeability drift deposits of Glacial Till, that will offer protection to the underlying aquifer;
-  There are no sensitive land uses in close proximity to the site; and,
-  Rochdale Canal is located 71m south east of the site.

4.10 Geotechnical Assessment

The following potential geotechnical constraints have been identified:

-  Unknown depth of Made Ground generated during the construction of the current and former buildings;
-  Potential basements beneath current building; and,
-  Potential locally deep excavations following the removal of the former below ground structures.

5.0 CONSULTATIONS

5.1 Consultations

Manchester City Council was contacted for information relating to building control, planning and contaminated land regarding the site. A response is currently awaited and will be reported as soon as available.

5.2 Landfill Sites and Waste Treatment Sites

There are no historical or active landfill sites within a 500m radius of the subject site. There are no active or historical waste treatment sites within 250m of the site.

5.3 Regulatory Database

The following information has been obtained from a commercially available environmental database. The summary table only includes records not otherwise detailed in the report.

Table 5.1 Summary of Groundsure Data

Activity	0-249m	250-500m	Details
Contaminated Land Register Entries and Notices	0	0	Not Applicable (N/A).
Authorised industrial processes (IPC/IPPC/LAPPC).	0	3	Express Printers Ltd located 395m north held an historical Part B permit for coating processes. Johnsons Cleaners UK Ltd are dry cleaners and are located 456m to the north-west. Presbar Diecastings Ltd located 458m east holds a current Part B permit relating to Non-Ferrous metals.
Fuel Stations Entries	0	0	N/A
Licensed radioactive substances	0	0	N/A.
Enforcements, prohibitions or prosecutions	0	1	Presbar Diecastings Ltd located 458m east Enforcement was notified on 12/09/2013 and 09/01/2014 relating to Statutory noise nuisance.
Discharge Consents & red list discharge consents.	3	11	Sewage discharge consent relating to storm overflow located 121m south dated 1/1/95 until 03/15. Two sewage discharge consents relating to storm overflow 241m south dated 30/9/94 and 1/1/95. Red list Discharge consents : N/A
Environment Agency Pollution Incidents	1	1	Nearest pollution incident located 186m north west occurred in had a minor impact on land involving an unidentified pollutant. A further pollution incident recording minor impact to water is located at 309m east of the site. Both the above are described as a list 2 incidents.

Activity	0-249m	250-500m	Details
Consents issued under the Planning (Hazardous Substances) Act 1990	0	0	N/A.
Control of Major Accident Hazard (COMAH) sites	0	0	N/A.

6.0 CONCEPTUAL SITE MODEL (CSM)

6.1 Initial CSM

In accordance with Environment Agency, CLR 11 (2004) and BSI 10175 (Code of Practice for Investigation of Potentially Contaminated Land), REC have developed an initial CSM to identify potential contamination sources, migration pathways and receptors within the study area.

6.2 Contaminant Sources

On-site Potential Sources

As the site has never had any previous industrial land-use it is expected that there are no significant contaminant sources. However, consideration may need to be given to the presence of Made Ground associated with the construction of the former and current buildings and external hard-standing areas. Made Ground may give rise to contaminants such as toxic heavy metals, sulphates, PAHs, asbestos and hydrocarbons, along with the potential for the generation of hazard ground gases (methane and carbon dioxide).

It is anticipated that a substantial thickness of Made Ground may be present beneath the site based on the size of the former / current buildings and the extensive re-development of the site at various times over the past 150 years, therefore the potential for significant contamination to be present at the site is considered to be a **low to moderate** risk.

Off-site Potential Sources

Off-site sources of contamination are relevant to the site if pathways for migration of contaminants exist (see the discussion of pathways below). Historically, the surrounding land used for predominantly commercial purposes.

The nearest potential source of off-site contamination is considered to be Made Ground deposits associated with the construction of nearby buildings and railway lines. Made Ground may give rise to contaminants such as toxic heavy metals, sulphates, PAHs, asbestos and hydrocarbons, along with the potential for the generation of hazard ground gases (methane and carbon dioxide).

6.3 Potential Pathways

Receptors may be potentially at risk from the identified potential sources of contamination via the following pathways:

- Migration of mobile contaminants on or off site via services, sewers and manmade conduits;
- Direct contact, ingestion (home grown produce and contaminated dusts) and inhalation of contaminants on site;
- Migration of contaminated dusts during earthworks;
- Migration of mobile contaminants into groundwater and transport into surface waters;
- Migration of mobile contaminants directly into the surface waters;
- Migration of hazardous gases; and,
- Consumption of contaminated potable waters.

6.4 Potential Receptors

Human Receptors

-  Site investigation and construction workers during the redevelopment of the site from hazardous short term exposure;
-  Future users of the site and buildings from ground gases; and,
-  Users of adjacent areas due to off-site migration of gases, vapours or contaminated dust.

The risk to current site users from ground gases is considered **moderate** due to the potential substantial thickness of Made Ground deposits anticipated.

Controlled Waters

The site has been shown to be directly underlain by impermeable glacial boulder clay which would negate the migration of any contamination into the underlying Principal Aquifer (Chester Pebble Beds Formation Sandstone). Therefore, it is considered that the Aquifer would be at a **low** risk from any on-site contamination.

7.0 CONCLUSIONS & RECOMMENDATIONS

Current Environmental Risk
The subject site comprises a four storey late Georgian-style stone constructed commercial building named the 'Union Bank of Manchester'. The engraving at the top of the building dates the construction of the building to 1836. The area to the rear of the building is surfaced in bit macadam and is currently used as a car park accessed off Gore Street. The current environmental risk is considered low .
Environmental Sensitivity
<p>Geology – The site is underlain by Glacial Till clay deposits overlying Chester Pebble Beds Formation sandstone.</p> <p>Aquifers – The site is underlain by a Principal Aquifer (sandstone).</p> <p>Sensitive Land Uses – No environmentally sensitive land uses have been identified within close proximity to the subject site.</p> <p>Hydrology – Rochdale Canal is located 72m south east of the site.</p>
Likelihood of Historical Contamination
Historical maps indicate that the site has been extensively developed and re-developed over the past 150 years as is typical for a city centre site. It is expected that the previous on-site buildings would have had a commercial use rather than an industrial use. The site has remained in its current form since circa 1980's. The likelihood of historical contamination is considered low-moderate .
Likelihood of Regulatory Action
Awaiting Response.
Unexploded Ordnance
A preliminary (pre phase I) unexploded ordnance desk based study assessment is currently in preparation and will be sent as an addendum to this report in due-course.
Radon Risk
Less than 1% of homes are above the Action Level, the BGS reports that no radon protective measures are necessary in the construction of new dwellings or extensions.
Initial Conceptual Site Model (CSM)
<p>On-site - Potential onsite contaminants have been identified associated with historical and present site activities, particularly in relation to the presence of significant thicknesses of made ground and the site's previous use as a wire works. Made Ground may give rise to contaminants such as toxic heavy metals, sulphates, polycyclic aromatic hydrocarbons (PAHs), asbestos and hydrocarbons, along with the potential for the generation of hazard ground gases (methane and carbon dioxide). However findings of a previous ground investigation carried out onsite in 2013 did not find widespread exceedances from the chemical testing carried out other than the potential presence of asbestos containing material (ACM) and concluded there was a low risk to current and future site users as the site was to be completely covered in hardstanding. Ground gas monitoring performed during this investigation (based on a total of six monitoring visits) identified a Characteristic Situation 1 gassing regime based on CIRIA C665 guidance (and hence gas protection measures were not considered to be necessary). However, as this is based on one round of gas monitoring, further gas monitoring is considered prudent.</p> <p>Off-site The nearest potential source of off-site contamination is considered to be Made Ground deposits associated with the construction of nearby buildings and railway lines.</p> <p>Human Health The risk to future site users from any on-site soil contamination is considered to be low based on the commercial end use of the site and the lack of soft landscaped areas proposed in the development plan and the lack of significant concentrations of contaminants identified during a previous intrusive investigation performed on the site. The proposed development plan indicates that the entire site area would be occupied by a building thus no pathway would exist between any underground contamination and future site users. However, the risk to construction workers are considered to be moderate, particularly in light of the bonded</p>

asbestos cement identified within soil during a previous intrusive investigation.

Controlled waters Groundwater and surface waters are at a **low risk** from site contamination based on the impermeable clay deposits underlying the site negating the migration of contaminants and a previous intrusive investigation identifying only marginally elevated PAH contaminants within soil leachates analysed.

Overall Environmental Risk Rating		Low – Moderate
Recommendations	A detailed Phase II intrusive Geo-Environmental ground investigation should be undertaken in order to confirm the findings of the initial conceptual site model, to determine foundation design and to assess the anticipated depths of Made Ground. In light of the intrusive ground investigation and assessment undertake by REC for a Third Party in 2013, it is considered prudent that reliance of this report is sought from the Third Party (and REC) and the report is updated to specifically reflect the new development proposed and the geo-environmental quantitative risk assessment is amended to reflect recent amendments to contamination assessment guidance and Regulations.	
	Due to the strength and thickness of the concrete slab in the basement area of the former bank building it is recommended that concrete cores are advanced using an electric rig to obtain information on the existing floor construction.	
	It is recommended that an asbestos survey should be undertaken by a specialist contractor prior to redevelopment of the site.	
	In order for new water supply pipes to be adopted by the water utilities company, an intrusive ground investigation that includes sampling and analysis of soils will be required along the proposed water supply pipe route on site followed by an assessment of suitable water supply pipe materials. The assessment will need to be performed in accordance with UK Water Industry Research (UKWIR) and United Utilities requirements.	

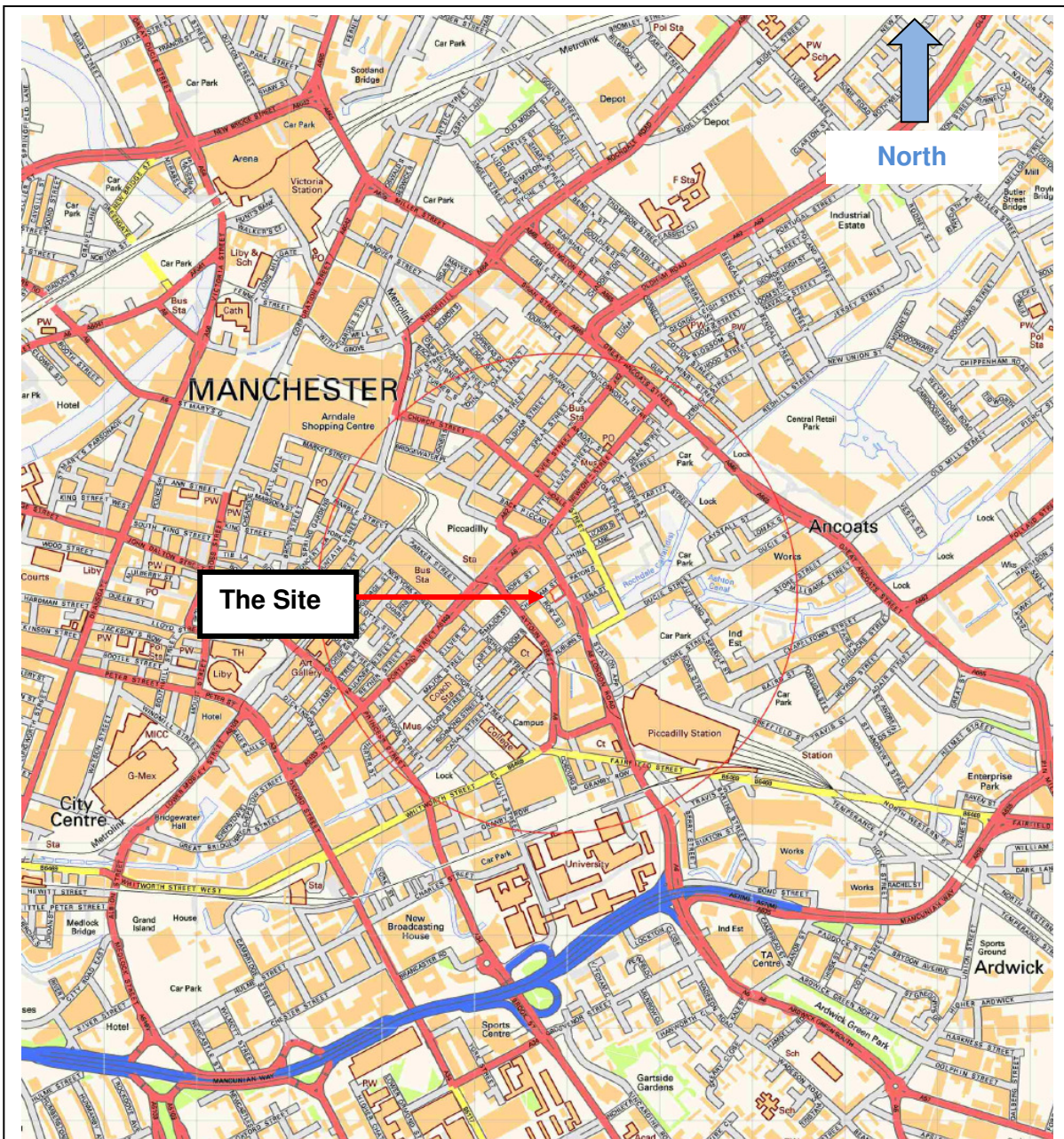
END OF REPORT

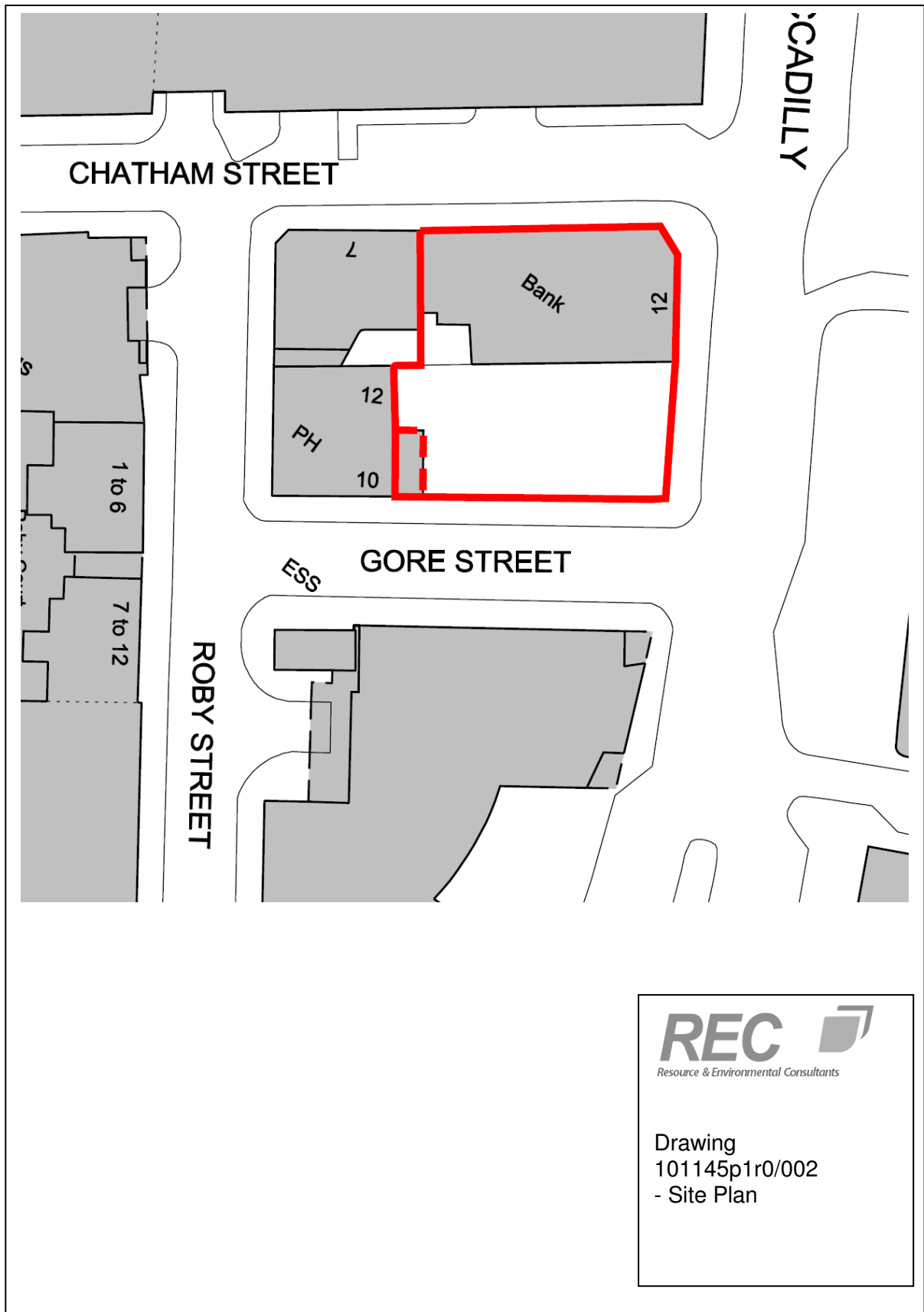
APPENDIX I
LIMITATIONS

1. This report and its findings should be considered in relation to the terms of reference and objectives agreed between REC Ltd and the Client as indicated in Section 1.2.
2. For the work, reliance has been placed on publicly available data obtained from the sources identified. The information is not necessarily exhaustive and further information relevant to the site may be available from other sources. When using the information it has been assumed it is correct. No attempt has been made to verify the information.
3. This report has been produced in accordance with current UK policy and legislative requirements for land and groundwater contamination which are enforced by the local authority and the Environment Agency. Liabilities associated with land contamination are complex and requires advice from legal professionals.
4. During the site walkover reasonable effort has been made to obtain an overview of the site conditions. However, during the site walkover no attempt has been made to enter areas of the site that are unsafe or present a risk to health and safety, are locked, barricaded, overgrown, or the location of the area has not be made known or accessible.
5. Access considerations, the presence of services and the activities being carried out on the site limited the locations where sampling locations could be installed and the techniques that could be used.
6. Site sensitivity assessments have been made based on available information at the time of writing and are ultimately for the decision of the regulatory authorities.
7. Where mention has been made to the identification of Japanese Knotweed and other invasive plant species and asbestos or asbestos-containing materials this is for indicative purposes only and do not constitute or replace full and proper surveys.
8. The executive summary, conclusions and recommendations sections of the report provide an overview and guidance only and should not be specifically relied upon without considering the context of the report in full.
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10. New information, revised practices or changes in legislation may necessitate the re-interpretation of the report, in whole or in part.

APPENDIX II

DRAWINGS





APPENDIX III
PHOTOGRAPHS



PLATE 1: FOUR STOREY GEORGIAN BUILDING NORTH OF SITE ON CLATHAM STREET



PLATE 2: CARPARK FROM PICCADILLY



PLATE 3: CAR PARK ON GORE STREET



PLATE 3: REAR OF NOTHERN BUILDING

APPENDIX IV
HISTORICAL MAPS



REC 
Resource & Environmental Consultants

Historical Map

Dated: 18511

Original Scale:
1:10,560

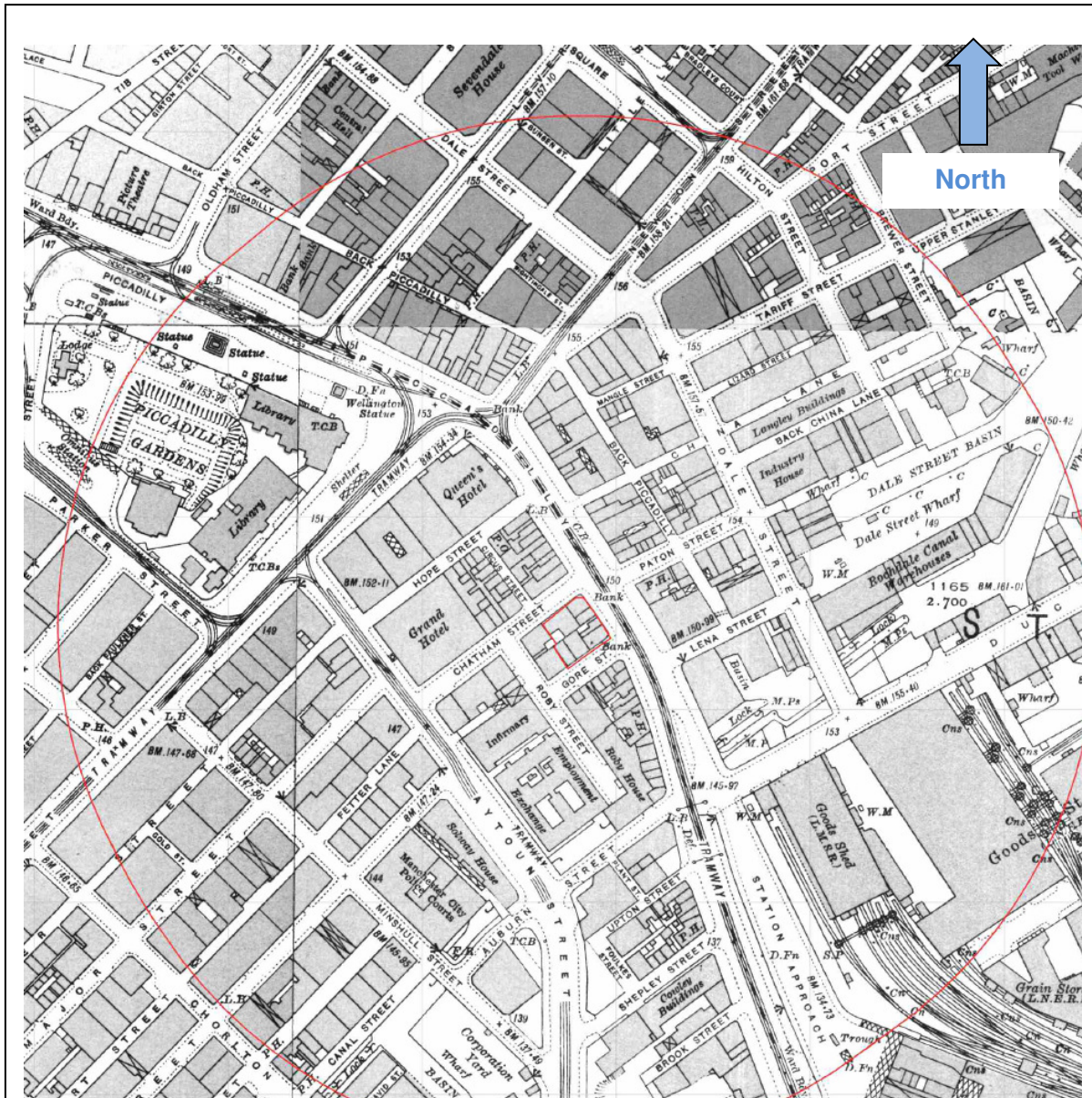


REC 
Resource & Environmental Consultants

Historical Map

Dated: 1922

Original Scale:
1:2,500



REC 
Resource & Environmental Consultants

Historical Map

Dated: 1931 - 1933

Original Scale:
1:2,500

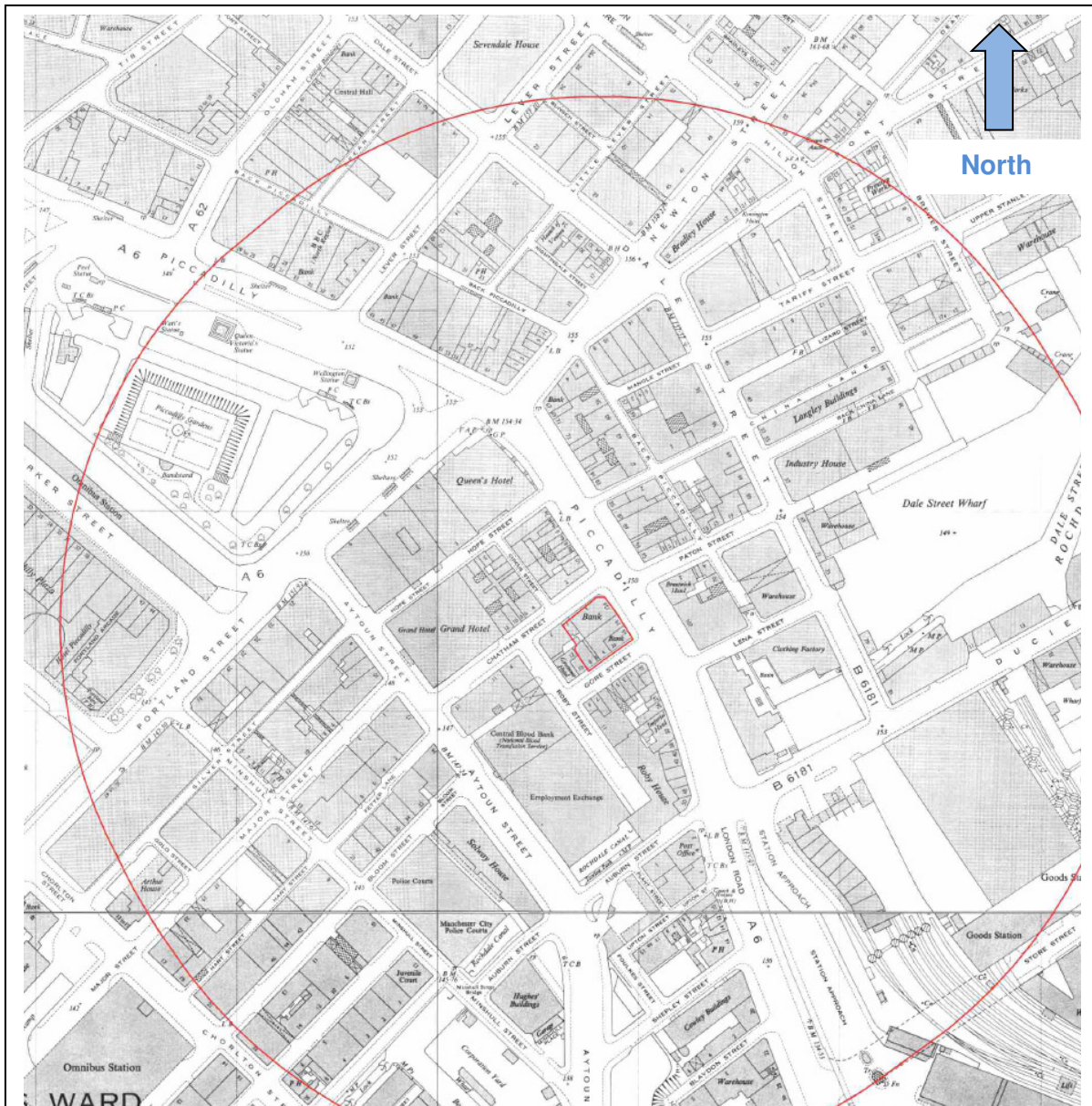


REC 
Resource & Environmental Consultants

Historical Map

Dated: 1948

Original Scale:
1:1,250

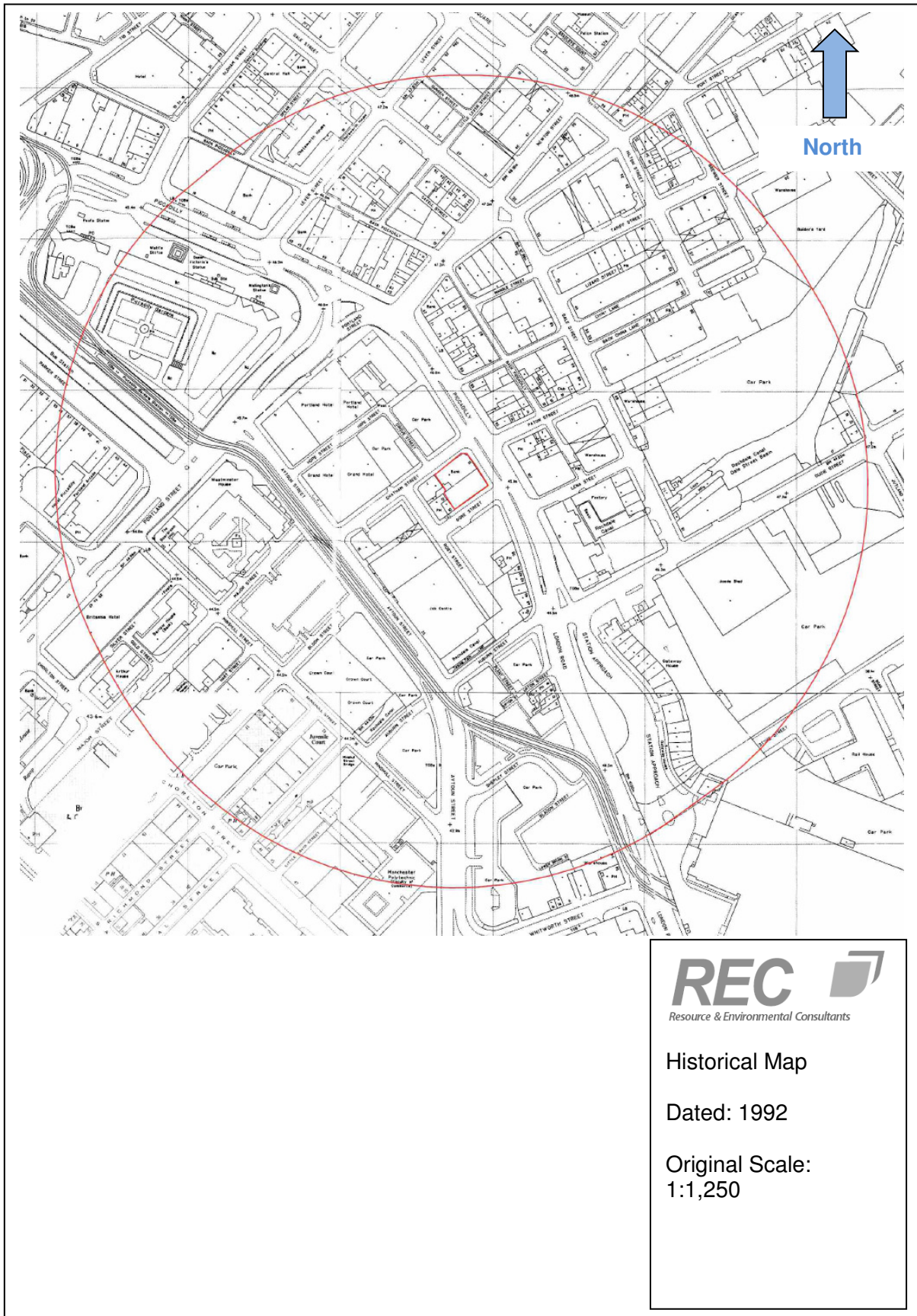


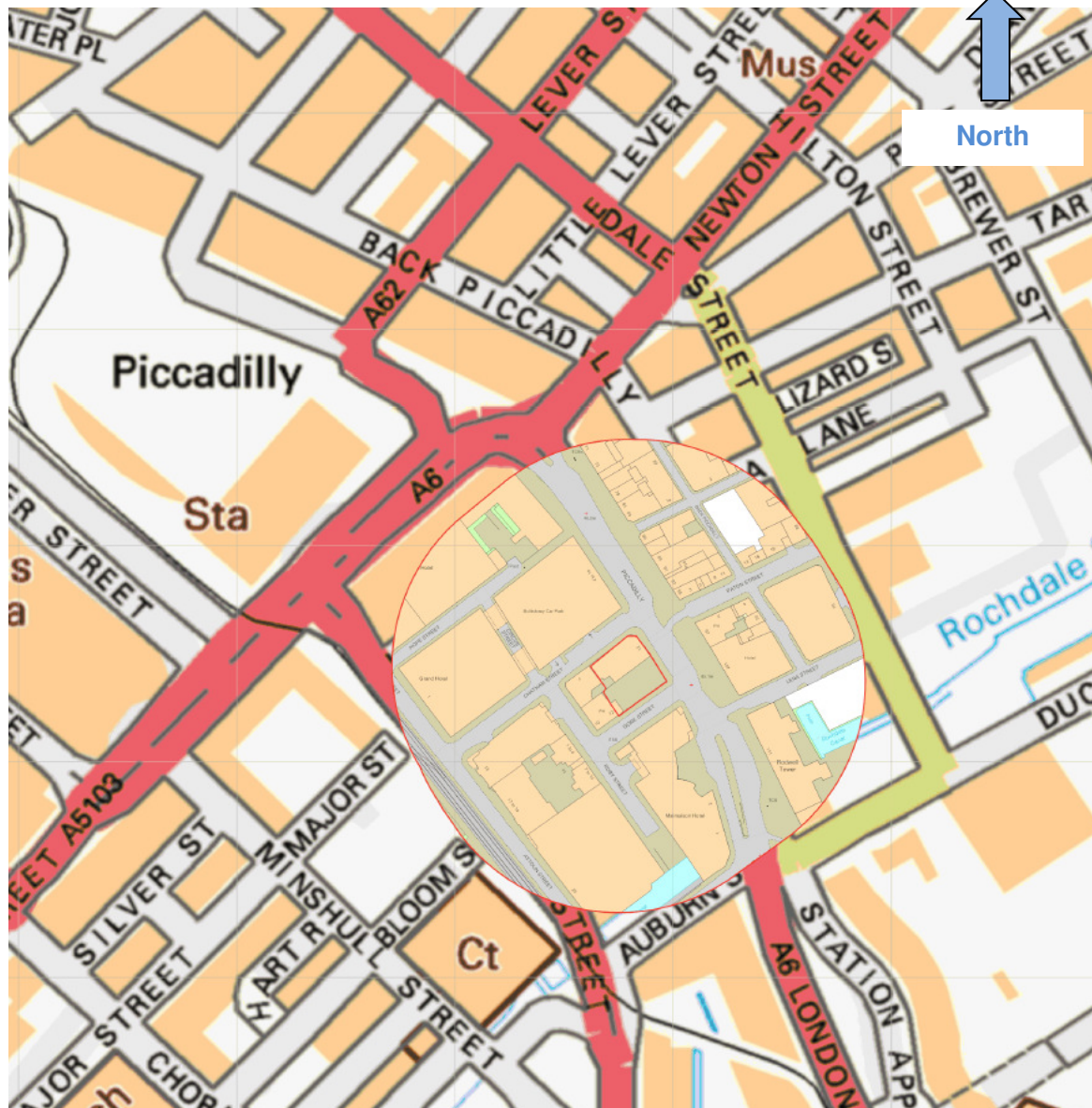
REC 
Resource & Environmental Consultants

Historical Map

Dated: 1967

Original Scale:
1:2,500





APPENDIX V

REGULATORY CORRESPONDENCE

RESPONSE AWAITED

APPENDIX VI

PRELIMINARY (PRE-PHASE I) UNEXPLODED ORDNANCE ASSESSMENT

RESPONSE AWAITED

**PHASE II GEO-ENVIRONMENTAL SITE
INVESTIGATION – PRELIMINARY REPORT**

**Yotel
Piccadilly
Manchester
M1 3AQ**

**REC Report: 44934p2r0
Issued: October 2013**

Prepared for:



QUALITY ASSURANCE

Issue/revision	Issue 1	Revision 1	Revision 2
Remarks	Prelim 1		
Date	October 2013		
Prepared by	Mikolaj Jakuc		
Qualifications	BSc (Hons), PGDip, FGS		
Signature			
Checked by	D. Cox		
Qualifications	BSc (Hons), AIEMA, FGS		
Signature			
Authorised by	M. Dyer		
Qualifications	BSc (Hons), FGS, CEnv, M IEnvSci, AIEMA		
Signature			
Project number	44934		
<div>Doc. Ref – QR4A-3</div> <div>Issued – August 2013</div> <div>By – A Edgar</div>			

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EXECUTIVE SUMMARY

Site Address	Yotel, Piccadilly, Manchester, M1 3AQ
Grid Reference	384580, 398141
Site Area	0.07ha
Current Site Use	The subject site comprises a four storey late Georgian-style stone constructed commercial building named the 'Union Bank of Manchester'. The engraving at the top of the building dates the construction of the building to 1836. The area to the rear of the building is surfaced in bit macadam and is currently used as a car park accessed off Gore Street.
Environmental Setting	<p>Drift – Till, Devensian (glacial clays)</p> <p>Bedrock – Sherwood Sandstone Group</p> <p>Groundwater – Principal Aquifer</p> <p>Flood Risk – Unaffected by flooding from rivers.</p> <p>Compressible Ground and Subsidence Hazards – No hazard. No special precautions with regard to foundations anticipate</p> <p>Ecology – Trees, ponds, hedges, invasive, habitat</p>
Site History	Historical maps indicate that the site has been extensively developed and re-developed over the past 150 years as is typical for a city centre site. It is expected that the previous on-site buildings would have had a commercial use rather than an industrial use. The site has remained in its current form since circa 1980's.
Hazardous Installations and Development Constraints	None identified
Utility Locations	<p>The location of services close to the site are as follows:</p> <ul style="list-style-type: none">  Low pressure gas main running along Gore Street, Roby Street and Chatham Street;  Public sewers and water mains running along the roads on all sides of the site; and,  Electricity cables running along all the site boundaries with the pavement.
Landfill Sites & Ground Gases	<p>Made Ground deposits associated with the construction of former and current site buildings and adjacent buildings has been identified as a possible source of hazardous ground gases beneath the site.</p> <p>There are no landfills within a 500m radius of the site.</p>
Radon	Unaffected – no special precautions required.
Coal Mining / Land Stability	The site is located in an area which was historically mined for coal; however, the site is underlain by a substantial layer of sandstone (Sherwood sandstone Group) and it is expected that any mine workings would be at depth beneath the site posing an insignificant risk of subsidence.

Intrusive Ground Investigation

<p>Ground Conditions</p>	<p>Made Ground</p> <p>Made Ground was encountered within all of the exploratory locations typically comprising asphalt of concrete underlain by sandy gravel with frequent cobbles of brick and concrete. Gravels also comprised ash, glass, timber, plastic, clinker and occasional fragments of potential asbestos containing materials (cement bonded). Made Ground was encountered to a maximum proven depth of 4.00m bgl (RB102). Due to the nature of the material and obstructions encountered the majority of the boreholes were unable to reach the proposed completion depths. A concrete slab (presumed to be a former basement floor) was encountered across the central areas of the existing car park area at circa 2.50 – 2.60m bgl.</p> <p>Only one hand excavated foundation inspection pit could be completed to a viable depth, this was located outside on the southern facing wall of the existing building. The remaining locations were positioned within the basement area of the former bank building. The trial pits were all terminated due to the significant thickness and strength of the concrete.</p> <p>Drift</p> <p>Superficial drift deposits were proven in two window sample boreholes, WS101, WS104 and all of the rotary percussive boreholes. Drift deposits generally comprised high strength very stiff brown gravelly CLAY. Gravel is fine to medium angular to sub-rounded of coal, sandstone and mudstone to a maximum proven depth of 22.20m bgl.</p> <p>Solid Geology</p> <p>Weak weathered sandstone bedrock was encountered within RB102 and 103 at circa 22.20m bgl. Core runs were advanced within the material however recovery of the bedrock was unsuccessful when coring with both air and water methods due to the weak and highly weathered nature of the rock. Drilling became more competent typical of less fractured sandstone at circa 27.00m bgl.</p> <p>Ground Water</p> <p>During the ground investigation, a slow seepage of groundwater was encountered in WS101 at a depth of 2.80m bgl; this is considered a shallow perched aquifer confined by the former basement structure. Subsequent monitoring of groundwater indicated that all the wells were dry for their full depth.</p>
---------------------------------	---

Tier 1 Contaminated Land Risk Assessment

<p>Human Health</p>	<p>For the purposes of the Tier 1 assessment REC have compared the laboratory test data directly to the relevant Tier 1 GAC value for the protection of human health. The results of this direct comparison indicates that Benzo(a)Pyrene is above the threshold within WS107. Elevated lead concentrations were identified within WS103 and WS107.</p>
<p>Controlled Waters</p>	<p>The Tier I controlled water assessment identifies that there is unlikely to be a significant impact due to the lack of a significant source.</p>
<p>Eco-toxic</p>	<p>No significant concentrations of potentially eco-toxic contaminants have been identified.</p>
<p>Ground Gas</p>	<p>Characteristic Situation 1 – Pending remaining gas assessment visits</p>

Potable Water Infrastructure	No issues identified.
Geotechnical Assessment	
Underground Obstructions	Relic foundations associated with former and existing building across much of the site will need to be removed to facilitate the installation of any proposed infrastructure, building foundations and services.
Allowable Bearing Capacity	>3000kN/m ² at 27.50m bgl cored a minimum 3m into competent sandstone bedrock.
Foundation Options	End bearing CFA Piles to be designed by a specialist contractor.
Sulphate Assessment	Sulphate Class DS-1, (ACEC) AC-1s
Waste Classification	Likely to be Stable non-Reactive Non-Hazardous
Developed Conceptual Site Model (CSM)	
<p>In the case of lead and Benzo(a)Pyrene the exposure pathway is dermal contact and ingestion. Due to the nature of the development the pathway will be broken as the proposed hotel will cover the entire area of the site thus capping the identified elevated determinants; however careful consideration should be taken during the design of the piles proposed to support the structure to prevent a pathway into the underlying Principal Aquifer.</p> <p>The ground gas assessment indicates a low risk to future site users.</p>	
Recommendations	
<p>It is recommended that a Materials Management Plan (MMP) be developed to ensure a development led solution that ensures this material is retained on-site or exported to a donor site through the CL:AIRE Protocol.</p> <p>Due to the strength and thickness of the concrete slab in the basement area of the former bank building it is recommended that concrete cores are advanced using an electric rig to obtain information on the existing floor construction.</p>	

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APPENDICES

Appendix I Limitations

Appendix II Glossary

Appendix III Drawings

Drawing No 44934p2r0/001 – Site Location Plan

Drawing No 44934p2r0/002 – Existing Site Plan

Drawing No 44934p2r0/003 – Proposed Development Plan

Drawing No 44934p2r0/004 – Historical Features Plan

Drawing No 44934p2r0/005 – Exploratory Hole Location Plan

Drawing No 44934p2r0/006 – Depth Of Made Ground

Drawing No 44934p2r0/007 – Constraints Plan

Drawing No 44934p2r0/008 – FP102 Foundation Detail

Appendix IV Photographs

Appendix V REC Exploratory Hole Logs

Appendix VI Chemical Testing Results

Appendix VII Origin of Generic Assessment Criteria

A CD containing all relevant environmental database information, historical & geological mapping and a complete PDF version of this report is attached to hard copy of the report.

1.0 INTRODUCTION

1.1 Background

Resource and Environmental Consultants (REC) Ltd have been commissioned by Russells Construction to undertake a Phase II Intrusive Investigation at the proposed site of Yotel, Piccadilly, Manchester, M1 3AQ.

The Scope of Work (SoW) consisted of an intrusive Ground Investigation, comprising eight Window Sample (WS) probeholes, five of which have been completed as environmental monitoring wells, three rotary boreholes and three foundation pits (one outside the building and two inside the building's basement area).

REC has previously undertaken a Phase I GeoEnvironmental Desk Study (43934p1r0) dated July 2013; the desk study assessment informed the development of the Initial Conceptual Site Model (ICSM) which was used to prepare the proposed scope of intrusive investigation works. This report should be read in conjunction with the Phase I Desk Study.

1.2 Proposed Development

The client intends to redevelop the site for a commercial end use, comprising a 19 storey high-rise hotel and refurbishment of the existing listed Georgian building. A draft layout for the site is shown on Drawing No 44934p2r0-003 in Appendix III.

1.3 Objectives

The objectives of the geo-environmental investigation are to:

- Undertake a preliminary stage of investigation and analysis to provide an overview of conditions identified;
- Assess the implications of any potential environmental risks, liabilities and development constraints associated with the site in relation to the future use of the site and in relation to off-site receptors;
- Assess the geotechnical information and provide preliminary recommendations in relation to foundations, pavement construction and floor slabs;
- Provide recommendations regarding future works required.

1.4 Limitations

The limitations of this report are presented in Appendix I.

1.5 Confidentiality

REC has prepared this report solely for the use of the Client and those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from REC; a charge may be levied against such approval.

2.0 SITE INVESTIGATION

2.1 Desk Study Information

Site Description

The subject site is approximately rectangular in shape and is located in the Piccadilly area of Manchester city centre. The site is bound by adopted roads on all sides as follows: Piccadilly to the east; Chatham Street to the north; Roby Street to the west and Gore Street to the south. Adjacent site uses include: a hotel and public house to the east; multi-storey car park to the north; hotel to the south and YMCA training centre / public house to the west.

The subject site comprises a four storey late Georgian-style stone constructed commercial building named the 'Union Bank of Manchester'. The engraving at the top of the building dates the construction of the building to 1836. It is anticipated that the building may have previously had basements, although no evidence was observed during the site walkover. The area to the rear of the building is surfaced in bit macadam and is currently used as a car park accessed off Gore Street. The site area is topographically flat and entirely surfaced in hard standing. The on-site property is currently unoccupied.

Development History

Historical maps indicate that the site has been extensively developed and re-developed over the past 150 years as is typical for a city centre site. It is expected that the previous on-site buildings would have had a commercial use rather than an industrial use. The site has remained in its current form since circa 1980's.

Coal Mining

The site is located in an area which was historically mined for coal; however, the site is underlain by a substantial layer of sandstone (Sherwood sandstone Group) and it is expected that any mine workings would be at depth beneath the site posing an insignificant risk of subsidence.

Initial Conceptual Site Model

As the site has never had any previous industrial land-use it is expected that there are no significant contaminant sources. However, consideration may need to be given to the presence of Made Ground associated with the construction of the former and current buildings and external hard-standing areas. Made Ground may give rise to contaminants such as toxic heavy metals, sulphates, PAHs, asbestos and hydrocarbons, along with the potential for the generation of hazard ground gases (methane and carbon dioxide). Based on the conceptual site model and current site use, the site is considered to represent a **moderate to high** risk in terms of contaminated land liabilities.

Salient site features are presented on the Site Plan (Drawing No 44934p2/002) in Appendix III, in addition, the Historical Features Plan is presented as Drawing No 44934p2/004.

Potential contamination sources have been identified from the desk study and these are listed in Table 2.1 below:

Table 2.1 Summary of Potential Contaminant Sources

Potential Source	Potential Contaminants	Potential Impact
Made Ground across the site	Metals and hydrocarbons	Groundwater and human health

All acronyms used within this report are defined in the Glossary presented in Appendix II.

2.2 Site Investigation

2.2.1 General

A ground investigation has been designed based on the findings of the desk study with exploratory holes advanced to target specific potential contaminant sources summarised in Table 2.1. Rotary boreholes were also advanced to provide information geotechnical conditions across the site to enable a pragmatic and cost effective foundation solution for the site. In addition, foundation pits were advanced to assess base of the existing building. The investigation has also been used to collect geotechnical information to assist in the design and construction of the development.

Exploratory fieldwork was completed on the 30th September 2013. The works are summarised in Table 2.2.

Table 2.2 Summary of Fieldwork

Potential Source/Rationale	Location Hole	Type	Maximum Depth (m bgl)	Monitoring Wells Response Zone
Ground Gas/Site coverage	WS101	Windowless sampler probehole	4.00	N/A
Ground Gas/Site coverage	WS102	Windowless sampler probehole	1.50	0.5m – 1.50m
Ground Gas/Site coverage	WS103	Windowless sampler probehole	2.50	0.50m - 2.50m
Ground Gas/Site coverage	WS104	Windowless sampler probehole	6.35	0.50m – 1.50m
Ground Gas/Site coverage	WS105	Windowless sampler probehole	2.80	N/A
Ground Gas/Site coverage	WS106	Windowless sampler probehole	0.70	N/A
Ground Gas/Site coverage	WS107	Windowless sampler probehole	2.50	0.50m – 2.00m
Ground Gas/Site coverage	WS108	Windowless sampler probehole	2.80	0.50m – 1.50m
Shallow mine workings	RB101	Rotary borehole	18.00	N/A
Shallow mine workings	RB102	Rotary borehole	29.50	N/A
Shallow mine workings	RB103	Rotary borehole	31.50	N/A
Foundation Inspection	FP102	Foundation pit	1.20	N/A
Foundation Inspection	FP103	Foundation pit	0.26	N/A
Foundation Inspection	FP104	Foundation pit	0.12	N/A

Notes

m bgl – metres below ground level.

The window sample probeholes were designed to provide geotechnical information and confirm the findings of the Initial Conceptual Site Model (ICSM). Dual purpose monitoring wells were installed in five no window sample holes. The ground conditions encountered and details of monitoring well response zones are indicated on the logs which are provided in Appendix V.

Three rotary open hole boreholes were advanced to depths ranging from 18.00 to 31.50m bgl, to investigate the geotechnical properties of the ground conditions and identify competent sandstone bedrock to facilitate a safe and cost effective piling design.

Foundation pits were excavated to inspect the existing building's foundations. The ground conditions encountered and foundations are indicated on the logs which are provided in Appendix V. The existing foundation constructions are presented within Appendix III.

Return visits were made to monitor installations for groundwater level and gas concentrations. Groundwater was not encountered during the investigation; therefore samples were subject to leachate analysis.

Soil samples destined for chemical analysis were collected at regular intervals in appropriate sampling containers. All samples were subsequently stored in cooled boxes prior to submission to analytical laboratory.

All samples were collected using appropriate PPE and sampling equipment that was cleaned at each sampling location. A detailed copy of REC Ltd sampling methodology, QA procedures and laboratory chain of custody forms can be provided upon request.

2.2.2 In-Situ Standard Penetration Testing (SPT)

In-situ geotechnical testing was conducted using the Standard Penetration Test (SPT) and where the ground is granular, a 60° cone (SPT(C)) was used instead of the sampling tube. The testing was conducted using the Cone Penetration Test (CPT). The results are shown in the probehole logs in Appendix V with interpretation tables presented in Table 3.1 and discussed in Section 3.0.

2.3 Laboratory Analysis

Selected soil samples were submitted for a range of chemical analysis comprising, metals, pH, total sulphate, water soluble sulphate (2:1 extract), sulphide, cyanide, phenols, total and speciated poly-aromatic hydrocarbons (PAHs), asbestos, organic carbon and total and speciated petroleum hydrocarbon (TPH).

Scientific Analysis Laboratories (SAL) Ltd of Manchester undertook the analytical work and the testing results are included in Appendix VI and discussed in Section 4.0.

3.0 GROUND AND GROUNDWATER CONDITIONS

3.1 Ground Conditions

3.1.1 Summary of Ground Conditions

The ground investigation generally confirms the published geology and identifies the strata set out in Table 3.1 below:

Table 3.1 Summary of Strata

Strata	Typical Description	Min Depth to Top of Strata (m)	Max Depth to Top of Strata (m)	Max Thickness (m)
Made Ground	Asphalt	0.00	0.00	0.20
Made Ground	Concrete	0.00	2.80	>0.26
Made Ground	Loose fine to medium dark brown/black gravelly sand with cobbles. Gravel is fine to coarse angular to sub-angular of brick, concrete, ash, clinker, metal and wood. Cobbles are angular to sub-angular of brick and concrete.	0.15	0.15	4.00
Made Ground	Very loose to medium dense brown/orange sandy gravel. Gravel is fine to coarse angular to sub-angular of brick, concrete, sandstone and coal.	0.06	0.08	3.17
Gravelly CLAY	High strength very stiff brown gravelly CLAY. Gravel is fine to medium angular to sub-rounded of coal, sandstone and mudstone.	3.00	3.00	1.00
Sandy gravelly CLAY	High strength very stiff brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium sub-angular to sub-rounded of sandstone and coal.	3.25	3.25	3.10
CLAY	Brown CLAY/MARL	3.00	4.00	19.20
Weathered SANDSTONE	Weathered orange brown SANDSTONE	22.2	22.2	5.00
SANDSTONE	Orange Brown SANDSTONE	27.2	28.00	>4.3

3.1.2 Made Ground

Made Ground was encountered within all of the exploratory locations typically comprising asphalt of concrete underlain by sandy gravel with frequent cobbles of brick and concrete. Gravels also comprised ash, glass, timber, plastic, clinker and occasional fragments of potential asbestos containing materials (cement bonded). Made Ground was encountered to a maximum proven depth of 4.00m bgl (RB102). Due to the nature of the material and obstructions encountered the majority of the boreholes were unable to reach the proposed completion depths. A concrete slab (presumed to be a former basement floor) was encountered across the central areas of the existing car park area at circa 2.50 – 2.60m bgl.

Only one hand excavated foundation inspection pit was able to be advanced to depth which was located outside on the southern facing wall of the existing building. The remaining

locations were positioned within the basement area of the former bank building. The trial pits were all terminated due to the thickness and strength of the concrete.

3.1.3 Drift Deposits

Superficial drift deposits were proven in two window sample boreholes, WS101, WS104 and all of the rotary boreholes. Drift deposits generally comprised high strength very stiff brown gravelly CLAY. Gravel is fine to medium angular to sub-rounded of coal, sandstone and mudstone to a maximum proven depth of 22.20m bgl.

3.1.4 Solid Geology

Weak weathered sandstone bedrock was encountered within RB102 and 103 at 22.20m bgl. Core runs were advanced within the material however recovery of the bedrock was unsuccessful when coring with both air and water methods. Drilling became more competent typical of less fractured sandstone at circa 27.00m bgl.

3.1.5 Soil Consistency

Results of the Standard Penetration Tests, including undrained shear strengths derived from SPTs are included on Table 3.2.

Table 3.2 Standard/Cone Penetration Test Results

Boreholes	Depth (m bgl) (i)	Material Field Description	CPT/SPT "N" Value	Corrected "N" Value (N ₁) ₆₀	Terzaghi & Peck Relative Density (Sands)	Eurocode Soil strength	Consistency (BS5930)	Terzaghi & Peck Approximate Undrained Shear Strength (kN/m ²)
WS101	1.00-1.45	Gravelly sand	6	6.05	Loose	N/A	N/A	N/A
	2.00-2.45	Gravelly sand	7	6.39	Loose	N/A	N/A	N/A
	3.00-3.45	Gravelly CLAY	29	25.22	N/A	High strength	Very stiff	126.10
WS102	1.00-1.45	Sandy gravel	11	11.09	Medium dense	N/A	N/A	N/A
	2.00-2.45	Sandy gravel	50	45.68	Dense	N/A	N/A	N/A
	2.45-2.90	Sandy gravel	50	44.52	Dense	N/A	N/A	N/A
WS103	1.00-1.45	Gravelly sand	7	7.06	Loose	N/A	N/A	N/A
	2.00-2.45	Gravelly sand	7	6.39	Loose	N/A	N/A	N/A
WS104	1.00-1.45	Gravelly sand	2	2.02	Very loose	N/A	N/A	N/A
	2.00-2.45	Gravelly sand	12	10.96	Medium dense	N/A	N/A	N/A
	3.00-3.45	Gravelly sand	22	19.13	Medium dense	N/A	N/A	N/A
	4.00-4.35	Slightly sandy slightly gravelly CLAY	18	15.21	N/A	High strength	Very stiff	76.04
	5.00-5.45	Slightly sandy slightly gravelly CLAY	29	24.06	N/A	High strength	Very stiff	120.30
	5.45-5.90	Slightly sandy slightly gravelly CLAY	33	27.22	N/A	High strength	Very stiff	136.08
	5.90-6.35	Slightly sandy slightly gravelly CLAY	44	36.11	N/A	Very high strength	Very stiff	180.55
WS105	1.00-1.45	Sandy gravel	4	4.03	Loose	N/A	N/A	N/A
	1.45-1.90	Sandy gravel	18	17.19	Medium dense	N/A	N/A	N/A
	1.90-2.35	Sandy gravel	16	14.72	Medium dense	N/A	N/A	N/A
	2.35-2.80	Sandy gravel	50	44.75	Dense	N/A	N/A	N/A
WS107	1.00-1.45	Gravelly sand	5	5.04	Loose	N/A	N/A	N/A
	2.00-2.45	Gravelly sand	3	2.74	Very loose	N/A	N/A	N/A
	2.60-2.95	Gravelly sand	50	44.20	Dense	N/A	N/A	N/A
WS108	1.00-1.45	Gravelly sand	3	3.02	Very loose	N/A	N/A	N/A
	2.00-2.45	Gravelly sand	1	0,91	Very loose	N/A	N/A	N/A

3.1.6 pH and Sulphate

Chemical analyses for pH and soluble sulphate content contained in Appendix VI (summarised below in Table 3.3), shows that the soils at the site generally meet Class DS-1, Aggressive Chemical Environment for Concrete Classification (ACEC) AC-1s in accordance with BRE Special Digest 1 (2005).

Elevated sulphate concentrations meeting Class DS-2 were noted in WS103 within the Made Ground deposits at 1.20mbgl. This is considered to be due to the high brick content identified within the fine gravels in this area.

Table 3.3 Summary of pH and Sulphate Data

Location	Depth (m)	SO ₄ in 2:1 water / soil (g/l)	pH Value
WS101	3.40	0.2	8.1
WS103	1.20	1.2	7.8
WS107	0.40	<0.1	8.4
WS102	1.00	<0.1	8.3
WS104	3.50	0.1	8.0

3.2 Groundwater Conditions

A single Groundwater strike was encountered as seepage in WS101 at 2.80m bgl. The depth of the seepages and the depth to which groundwater rose are shown on the exploratory hole records and summarised in Table 3.4 below:

Table 3.4 Summary Groundwater Strikes

Location	Depth to strike (m)	Depth to standing water (m)	Notes
WS101	2.80	N/A	Perched in Made Ground

Monitoring was undertaken using an electronic dip meter and interface probe to record the depth to groundwater and the thickness of any free phase hydrocarbon product, if present.

3.3 Ground Gas

Concentrations of methane (CH₄), carbon dioxide (CO₂) and Oxygen (O₂) were measured using an infra red gas analyser (GA2000) calibrated to a reference standard (before and after each survey) and gas flow rates were measured using an attached flow pod.

Gas measurements were recorded for a minimum of sixty seconds at each location, at which point the maximum concentration of CH₄ and CO₂ together with the lowest concentration of O₂ were recorded. The results of the ground gas monitoring are presented in Table 3.5 overleaf.

Table 3.5 Summary of Ground Gas and Groundwater Monitoring Results

Well	Date	CH ₄ Initial %v/v	CH ₄ Steady %v/v	CH ₄ GSV l/hr	CO ₂ Initial %v/v	CO ₂ Steady %v/v	CO ₂ GSV l/hr	O ₂ %v/v	Atmos(mb)	Atmos. Dynamic	Flow (l/hr)	Response Zone (mbgl)	Depth to Base (mbgl)	Depth to Water (mbgl)
WS102	14/10/2013	0.3	0.3	0.0003	0.1	0.1	0.0001	20.6	1003	Falling	0.1	0.50-1.50	1.365	DRY
WS103	14/10/2013	0.3	0.3	0.0003	0.2	0.2	0.0002	20.6	1003	Falling	0.1	0.50-2.50	2.633	DRY
WS104	14/10/2013	0.3	0.3	0.0003	0.1	0.1	0.0001	20.7	1003	Falling	0.1	0.50-1.50	1.443	DRY
WS107	14/10/2013	0.3	0.3	0.0003	0.2	0.2	0.0002	20.5	1003	Falling	0.1	0.50-2.00	2.192	DRY
WS108	14/10/2013	0.3	0.3	0.0006	0.2	0.2	0.0004	20.5	1003	Falling	0.2	0.50-1.50	1.545	DRY

4.0 TIER 1 QUALITATIVE CONTAMINATED LAND RISK ASSESSMENT

REC has undertaken a Tier 1 qualitative risk assessment to determine if any potential contaminants within the underlying soils and groundwater pose an unacceptable level of risk to the identified receptors.

4.1 Human Health Risk Assessment

At a Tier 1 stage the long term (chronic) human health toxicity of the soil has been assessed by comparing the on-site concentrations of organic and inorganic compounds with reference values published by the EA (Contaminated Land Exposure Assessment (CLEA) Soil Guideline Values (SGV)) and where absent, Generic Assessment Criteria (GACs) published by LQM/CIEH (2nd edition).

The results of this comparison have been summarised within Table 4.1 (overleaf).

Table 4.1 Summary of Inorganic and Hydrocarbon Toxicity Assessment for a Commercial End Use

Determinand	Units	GAC ^{V3}	n	MC	Loc. of Ex	Pathway	Assessment
Arsenic	mg/kg	640	5	49	NA	1	No Further Action
Cadmium	mg/kg	230	5	<1	NA	1	No Further Action
Chromium (VI)	mg/kg	35	5	<1	NA	1	No Further Action
Lead ⁽ⁱⁱⁱ⁾	mg/kg	590	5	710	WS103 & WS107	1	Further Assessment
Mercury	mg/kg	410	5	1	NA	2	No Further Action
Nickel	mg/kg	1800	5	34	NA	1	No Further Action
Selenium	mg/kg	13000	5	<3	NA	1	No Further Action
Copper ⁽ⁱⁱ⁾	mg/kg	71700	5	140	NA	1	No Further Action
Zinc ⁽ⁱⁱ⁾	mg/kg	665000	5	320	NA	1	No Further Action
Cyanide - Total	mg/kg	16200	5	<1	NA	1	No Further Action
Phenols - Total.	mg/kg	1100000	5	<1	NA	1	No Further Action
Naphthalene	mg/kg	200	5	3.5	NA	2	No Further Action
Acenaphthylene	mg/kg	84000	5	0.07	NA	3	No Further Action
Acenaphthene	mg/kg	85000	5	12	NA	1	No Further Action
Fluorene	mg/kg	64000	5	8.6	NA	1	No Further Action
Phenanthrene	mg/kg	22000	5	49	NA	3	No Further Action
Anthracene	mg/kg	530000	5	14	NA	3	No Further Action
Fluoranthene	mg/kg	23000	5	58	NA	3	No Further Action
Pyrene	mg/kg	54000	5	50	NA	3	No Further Action
Benzo(a)Anthracene	mg/kg	90	5	28	NA	3	No Further Action
Chrysene	mg/kg	140	5	27	NA	3	No Further Action
Benzo(b/k)Fluoranthene ⁽ⁱ⁾	mg/kg	100	5	48	NA	3	No Further Action
Benzo(a)Pyrene	mg/kg	14	5	29	WS107	3	Further Assessment
Indeno(123-cd)Pyrene	mg/kg	60	5	15	NA	3	No Further Action
Dibenzo(a,h)Anthracene	mg/kg	13	5	4.1	NA	3	No Further Action
Benzo(ghi)Perylene	mg/kg	650	5	12	NA	3	No Further Action
TPH C ₅ -C ₆ (aliphatic)*	mg/kg	3400	5	<0.10	NA	2	No Further Action
TPH C ₆ -C ₈ (aliphatic)*	mg/kg	8300	5	<0.10	NA	2	No Further Action
TPH C ₈ -C ₁₀ (aliphatic)*	mg/kg	2100	5	<0.10	NA	2	No Further Action
TPH C ₁₀ -C ₁₂ (aliphatic)*	mg/kg	10000	5	<10	NA	2	No Further Action
TPH C ₁₂ -C ₁₆ (aromatic)*	mg/kg	36000	5	58	NA	1	No Further Action
TPH C ₁₆ -C ₂₁ (aromatic)*	mg/kg	28000	5	350	NA	1	No Further Action
TPH C ₂₁ -C ₃₅ (aromatic)*	mg/kg	28000	5	1600	NA	1	No Further Action

Notes

Main Exposure Pathways: 1 = Soil Ingestion, 2 = Vapour Inhalation (indoor), 3 = Dermal Contact & Ingestion, 4 = Dust Inhalation.

Abbreviations: GAC = General Assessment Criteria, n = number of samples, ME = Maximum Exceedance concentration; Loc of Ex = Location of Exceedances

* The Tier 1 GAC for the hydrocarbon fraction is derived from the CIEH assessment for petroleum hydrocarbons Criteria Working Group (CWG) for both aliphatic and aromatic compounds. REC has utilised the Tier 1 values for aliphatic compounds for the volatile and semi volatile fractions (C₅-C₁₂) and the Tier 1 values for aromatic compound for the non volatile fractions (C₁₂-C₃₅). The comparison of a total (aliphatic/aromatic) compounds to an individual fraction is considered to be a conservative approach and satisfactory for the protection of human health.

(i) Benzo (b) Fluoranthene (100mg/kg) Benzo (k) Fluoranthene (140mg/kg)

Referring to Table 4.1, the results of the direct comparison show that screening values have been exceeded for the following determinands:

- Lead (WS103 – 1.20 bgl and WS107 0.40m bgl); and,
- Benzo(a)Pyrene. (WS103 – 1.20m bgl)

It can be seen from the distribution of the results that the elevated concentrations were not widespread. The elevated concentrations were recorded in two discrete areas and therefore are considered to represent two hotspots; WS103 and WS107.

In the case of lead and Benzo(a)Pyrene the exposure pathway is dermal contact and ingestion. Due to the nature of the development the pathway will be broken as the proposed hotel will cover the entire area of the site thus capping the identified elevated determinands; however careful consideration should be taken during the design of the piles proposed to support the structure to prevent a pathway into the underlying Principal Aquifer.

Due to the type of construction it is likely that the circa 4.0m of Made Ground will be removed and processed prior to the construction phase. If the material is removed from site all construction workers should be appropriately inducted to ensure that the correct PPE is used to mitigate the potential risks.

If a screening process is completed on site during the enabling a Materials Management Plan will need to be undertaken for the site. The Materials Management Plan (MMP) is a document designed in accordance with the Development Industry Code of Practice (COP) "The Definition of Waste", published by Contaminated Land: Application in Real Environments (CL:AIRE). The COP relates to the re-use of chemically and geotechnically suitable materials where a definitive need has been established as part of the development process.

Asbestos was not identified in any of the soil samples submitted for screening analysis.

4.2 Controlled Waters

The site has been shown to be directly underlain by impermeable glacial boulder clay which would negate the migration of any contamination into the underlying Principal Aquifer (Sherwood Sandstone). Therefore, it is considered that the Aquifer would be at a **low** risk from any on-site contamination. A Tier I risk assessment has been undertaken with concentrations of determinands compared with the relevant thresholds. These are presented in Table 4.2.

Table 4.2 Comparison of Groundwater Analysis with Tier 1 Screening Levels

Determinand	Units	EQS ^(v1)	Drinking Water Threshold	n	MC	No of Ex	Loc of Ex	Assessment
Inorganics								
Arsenic	µg/l	50	10	3	2.4	NA	NA	No Further Action
Cadmium	µg/l	5	5	3	0.03	NA	NA	No Further Action
Chromium	µg/l	2	50	3	2	NA	NA	No Further Action
Copper	µg/l	5	2000	3	26	NA	NA	No Further Action
Cyanide	µg/l	-	50	3	<50	NA	NA	No Further Action
Lead	µg/l	4	10	3	2.7	NA	NA	No Further Action
Mercury	µg/l	1	1	3	<0.05	NA	NA	No Further Action
Nickel	µg/l	8	20	3	3	NA	NA	No Further Action
Selenium	µg/l	-	10	3	1.0	NA	NA	No Further Action
Sulphate	mg/l	400	250	3	68	NA	NA	No Further Action
Zinc	µg/l	30	5000	3	15	NA	NA	No Further Action
pH	-	6-9	-	3	8.9	NA	NA	No Further Action
Organics								
PAH (total)	µg/l	-	0.1	3	0.36	3	WS101, 103 & 104	Further Assessment
Napthalene	µg/l	10	-	3	0.05	NA	N/A	No Further Action
Benzo(a)pyrene	µg/l	0.05	0.01	3	0.01	1	WS104	Further Assessment
benzo[b/k]fluoranthene	µg/l	0.03	-	3	0.03	1	WS103	Further Assessment
benzo[g,h,i]perylene&indeno(1,2,3-cd)pyrene	µg/l	0.02	-	3	0.03	1	WS103	Further Assessment
TPH C5-C6	µg/l	-	10	3	<10	NA	NA	No Further Action
TPH C6-C8	µg/l	-	10	3	<10	NA	NA	No Further Action
TPH C8-C10 DW	µg/l	-	10	3	<10	NA	NA	No Further Action
TPH C10-C12 DW	µg/l	-	10	3	<10	NA	NA	No Further Action
TPH C12-C16 DW	µg/l	-	10	3	<10	NA	NA	No Further Action
TPH C16-C21 DW	µg/l	-	10	3	<10	NA	NA	No Further Action
TPH C21-C35	µg/l	-	10	3	<10	NA	NA	No Further Action

Referring to Table 4.2 above, the results of this direct comparison indicates that marginal exceedances of benzo(b/k)fluoranthene and Indeno(1,2,3-cd)pyrene were recorded in the leachate sample from WS103 when compared to Environmental Quality Standards. A slight exceedance of PAH (total) was recorded in WS101, WS103 and WS104 when compared to the drinking water threshold. Exceedances of Benzo(a)pyrene (WS104) and benzo[b/k]fluoranthene (WS103) were detected. The marginal exceedances are likely to be a result of the extraction methodology used during the analytical stages. Leachate analysis will provide an exaggerated level of determinants. It is therefore in REC's opinion that the site posed no unacceptable risk to controlled waters.

4.3 Ground Gas

The potential impact on the development from ground gases has been assessed with reference to standards and guidelines published in CIRIA Report 665 (*Assessing risks posed by hazardous ground gases to buildings*, 2007). However, it is recommended that the full ground gas assessment and recommended protection measures are agreed with the local authority prior to their adoption on-site. Furthermore, all protection measures adopted should be validated by a suitably qualified engineer.

The Phase I report and subsequent ground investigation has identified the following potential sources of ground gas:

- Made Ground across the site from historical developments and demolition of former buildings.

During the monitoring visits completed to date, no significantly elevated concentrations of methane were recorded within any of the probeholes. A maximum concentration of 0.20%v/v of carbon dioxide was recorded in all of the monitoring installations, this was also associated with low flow rates of less than 0.1litres/hr.

To date monitoring was undertaken during periods with high atmospheric pressure of more than 1000mb. It is proposed to collect point sampling data in periods of low (preferably falling) atmospheric pressure during future monitoring visits.

In accordance with the methodology outlined with the CIRIA publication C665, REC have utilised the results of the ground gas monitoring surveys to calculate a tentative Gas Screening Value (GSV). The maximum GSV calculated for methane was 0.0004l/hr and for carbon dioxide was 0.0006l/hr (WS108).

The GSV has been compared to the criteria outlined with CIRIA C665 to determine the level of risk to the proposed development and to ensure the appropriate remedial options are incorporated into any future building design in this area.

CIRIA C665 states that the maximum GSV for carbon dioxide and methane is <0.07 l/hr for Characteristic Situation 1 and therefore the site would fall into this bracket.

This is an interim assessment based on preliminary ground gas readings, the final classification will be supplied as an addendum to this report on completion of the remaining monitoring visits.

4.4 Conceptual Model

Following the completion of the intrusive site investigation, chemical analysis and risk assessment the conceptual model shown in Table 4.3 has been prepared for the site.

Table 4.3 Conceptual Model

Source	Exposure Pathway	Potential Receptor	Probability of Exposure	Discussion of Pollutant Linkage
Human Health				
Lead	Ingestion	Future site users	Low	The site will be completely covered by hard standing, thus removing the pathway;
		Construction workers	Low	Appropriate PPE and health and safety procedures will be implemented during the construction works to ensure there is no unacceptable risk to the construction workers.
Benzo(a)Pyrene.	Ingestion and dermal	Future site users	Low	The site will be completely covered by hard standing, thus removing the pathway;
		Construction workers	Low	Appropriate PPE and health and safety procedures will be implemented during the construction works to ensure there is no unacceptable risk to the construction workers.
Controlled Water				
REC does not consider that the elevated PAH's and metals within the soils will pose an unacceptable risk to the controlled water receptors.				

5.0 GEOTECHNICAL ASSESSMENT

5.1 Proposed Development

It is understood that the proposed development will comprise a 19 storey hotel; with associated infrastructure. It is understood that the proposed loadings are 3000kN/m². As a part of the development, the listed building adjacent to the proposed location of the high rise building will be refurbished and become associated with the hotel.

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

5.2 Summary of Ground Conditions

Ground conditions identified at the site are summarised in Table 5.1 below:

Table 5.1 Summary of Ground Conditions

Strata	Typical Description	Min Depth to Top of Strata (m)	Max Depth to Top of Strata (m)	Max Thickness (m)
Made Ground	Asphalt	0.00	0.00	0.20
Made Ground	Concrete	0.00	2.80	>0.26
Made Ground	Loose fine to medium dark brown/black gravelly sand with cobbles. Gravel is fine to coarse angular to sub-angular of brick, concrete, ash, clinker, metal and wood. Cobbles are angular to sub-angular of brick and concrete.	0.15	0.15	4.00
Made Ground	Very loose to medium dense brown/orange sandy gravel. Gravel is fine to coarse angular to sub-angular of brick, concrete, sandstone and coal.	0.06	0.08	3.17
Gravelly CLAY	High strength very stiff brown gravelly CLAY. Gravel is fine to medium angular to sub-rounded of coal, sandstone and mudstone.	3.00	3.00	1.00
Sandy gravelly CLAY	High strength very stiff brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium sub-angular to sub-rounded of sandstone and coal.	3.25	3.25	3.10
CLAY	Brown CLAY/MARL	3.00	4.00	19.20
Weathered SANDSTONE	Weathered orange brown SANDSTONE	22.2	22.2	5.00
SANDSTONE	Orange Brown SANDSTONE	27.2	28.00	>4.3

5.3 Site Preparation

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

- Redundant services should be sealed off and grubbed out and replaced with suitable compacted engineered fill; and,
- Buried structures and old foundations have been encountered on site. These should be excavated from below the proposed development foot print with the resulting void backfilled.

5.4 Foundation Conditions and Bearing Capacity

General

It is considered that the Made Ground and Clays are not suitable for a founding material due to the loadings that are required for the complex construction. The proposed hotel will therefore be subject to a piled foundation solution.

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

Obstructions were encountered within the Made Ground comprising large concrete cobbles, metal obstructions and timber. As previously mentioned a concrete slab was encountered at circa 2.50m bgl across the majority of the existing car parking area.

Weathered weak sandstone was encountered within the two deep rotary boreholes at 22.20m bgl. Competent drilling was identified at circa 27.50m bgl. Due to the lack of recovery from the core barrel, it is recommended that the piles are socketed a minimum 3.00m into the competent sandstone.

5.5 Ground Floor Slabs

Due to the presence of substantial thickness' of Made Ground across the site is considered that ground bearing floor slabs, whilst viable, will require detailed design to accommodate variability of the formation and account for differential settlement.

As piles are to be used, this could be extended to the floor slab to improve formation conditions and reduce the risk of damage from settlement. However, it may be more reliable to opt for suspended floor slabs.

Where suspended floor slabs are employed ventilation of the under floor void will be required to address condensation issues. This would also assist in the mitigation of potential gas ingress issues.

5.6 Drainage

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

5.7 Concrete Durability

Based upon the results of the chemical analyses summarised in Table 3.3 it is considered that subsurface concrete can be designed in accordance with Design Sulphate Class DS-1, Aggressive Chemical Environment for Concrete Classification (ACEC) AC-1s in accordance with the recommendations provided in BRE Special Digest 1 (2005).

Elevated sulphate concentrations meeting Class DS-2 were noted in WS103 within the Made Ground deposits at 1.20mbgl. This is considered to be due to the high brick content identified within the fine gravels in this area.

5.8 Excavations

Site observations indicated that excavations should be feasible in the near surface with normal plant, however obstructions were identified in the near surface including former foundations and former floor slabs. It is anticipated that any obstructions will be grubbed out during the reduced level dig for the sub structure works.

Due to the variability of the Made Ground it is considered that all excavations are supported or battered back in accordance with guidance contained in CIRIA R97. A single groundwater seepage was noted in WS101 at 2.80m bgl, however, this was minor and it considered that conventional sump pumping should be adequate after periods of heavy rain.

5.9 Re-Use of Materials

Consideration has been given to the potential re-use of site won arisings from substructure works as an engineered fill. The soils have been assessed using the following:

- Physical description of the soils encountered (variability and organic content);
- Guidance given in HA44/91;

Based on this it is considered that soils are suitable for re-use as a general engineered fill in accordance with Class 2A of the Specification for Highway Works.

5.10 Minerals

The site is located in an area which was historically mined for coal; however, the site is underlain by a substantial layer of sandstone (Sherwood sandstone Group) and it is expected that any mine workings would be at depth beneath the site posing an insignificant risk of subsidence.

5.11 Further Works

The following additional works may be required:

- REC engineer to inspect the ground conditions beneath the existing buildings post-demolition of the rear elevation of the bank;
- Enabling works for removal of relict foundations; and,
- Preparation of a Material Management Plan (MMP) regarding the safe and legally compliant re-use of site won materials; and,

Materials Management Plan (MMP)

The Materials Management Plan (MMP) is a document designed in accordance with the Development Industry Code of Practice (COP) "The Definition of Waste", published by Contaminated Land: Application in Real Environments (CL:AIRE). The COP relates to the re-use of chemically and geotechnically suitable materials where a definitive need has been established as part of the development process.

5.12 Construction Activity and Inspection

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

- Excavations where access is required should be subject to a risk assessment from a competent person and where appropriate mitigation measures such as benching back the sides or use of support systems in accordance with CIRIA R97 utilised;

- It is considered that de-watering may be required, especially following periods of heavy rainfall. Removal of surface water and water within trenches should be possible with conventional sump pumping. Discharge of any water should be agreed with the relevant regulatory body and be undertaken under a trade effluent discharge, where required;
- Where access to confined spaces is required appropriate mitigation measures should be addressed within the Construction Stage Health and Safety Plan. Particular account should be taken of the gas results;
- The presence of potential contamination and mitigation measures should be addressed as part of the Construction Stage Health and Safety Plan and should include measures to design out the risks, reduce their impact and finally the use of Personnel Protective Equipment (PPE).

6.0 CONCLUSIONS & RECOMMENDATIONS

Geotechnical Assessment

The proposed hotel will therefore be subject to a piled foundation solution.

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

Obstructions were encountered within the Made Ground comprising large concrete cobbles, metal obstructions and timber. As previously mentioned a concrete slab was encountered at circa 2.50m bgl across the majority of the existing car parking area.

Weathered weak sandstone was encountered within the two deep rotary boreholes at 22.20m bgl. Competent drilling was identified at circa 27.50m bgl. Due to the lack of recovery from the core barrel, it is recommended that the piles are socketed a minimum 3.00m into the competent sandstone.

Revised Conceptual Site Model

In the case of lead and Benzo(a)Pyrene the exposure pathway is dermal contact and ingestion. Due to the nature of the development the pathway will be broken as the proposed hotel will cover the entire area of the site thus capping the identified elevated determinants; however careful consideration should be taken during the design of the piles proposed to support the structure to prevent a pathway into the underlying Principal Aquifer.

It is in REC's opinion that the site posed no unacceptable risk to controlled waters. The marginal exceedances are likely to be a result of the extraction methodology used during the analytical stages. Leachate analysis will provide an exaggerated level of determinants.

The ground gas assessment indicates a low risk to future site users.

Recommendations

It is recommended that a Materials Management Plan (MMP) be developed to ensure a development led solution that ensures this material is retained on-site or exported to a donor site through the CL:AIRE Protocol.

Due to the strength and thickness of the concrete slab in the basement area of the former bank building it is recommended that concrete cores are advanced using an electric rig to obtain information on the existing floor construction.

END OF REPORT

**APPENDIX I
LIMITATIONS**

APPENDIX I LIMITATIONS

1. This report and its findings should be considered in relation to the terms of reference and objectives agreed between REC Ltd and the Client as indicated in Section 1.2.
 2. For the work, reliance has been placed on publicly available data obtained from the sources identified. The information is not necessarily exhaustive and further information relevant to the site may be available from other sources. When using the information it has been assumed it is correct. No attempt has been made to verify the information.
 3. This report has been produced in accordance with current UK policy and legislative requirements for land and groundwater contamination which are enforced by the local authority and the Environment Agency. Liabilities associated with land contamination are complex and requires advice from legal professionals.
 4. During the site walkover reasonable effort has been made to obtain an overview of the site conditions. However, during the site walkover no attempt has been made to enter areas of the site that are unsafe or present a risk to health and safety, are locked, barricaded, overgrown, or the location of the area has not been made known or accessible.
 5. Access considerations, the presence of services and the activities being carried out on the site limited the locations where sampling locations could be installed and the techniques that could be used.
 6. In addition to the above REC Ltd note that when investigating, or developing, potentially contaminated land it is important to recognise that sub-surface conditions may vary spatially and also with time. The absence of certain ground, ground gas, and contamination or groundwater conditions at the positions tested is not a guarantee that such conditions do not exist anywhere across the site. Due to the presence of existing buildings and structures access could not be obtained to all areas. Additional contamination may be identified following the removal of the buildings or hard standing.
 7. Site sensitivity assessments have been made based on available information at the time of writing and are ultimately for the decision of the regulatory authorities.
 8. Where mention has been made to the identification of Japanese Knotweed and other invasive plant species and asbestos or asbestos-containing materials this is for indicative purposes only and do not constitute or replace full and proper surveys.
 9. The executive summary, conclusions and recommendations sections of the report provide an overview and guidance only and should not be specifically relied upon without considering the context of the report in full.
 10. This report presents an interpretation of the geotechnical information established by excavation, observation and testing. Whilst every effort is made in interpretative reporting to assess the soil conditions over the Site it should be noted that natural strata vary from point to point and that man made deposits are subject to an even greater diversity. Groundwater conditions are dependent on seasonal and other factors. Consequently there may be conditions present not revealed by this investigation.
 11. REC can not be held responsible for any use of the report or its contents for any purpose other than that for which it was prepared. The copyright in this report and other plans and documents prepared by REC is owned by them and no such plans or documents may be reproduced, published or adapted without written consent. Complete copies of this may, however, be made and distributed by the client as is expected in dealing with matters related to its commission. Should the client pass copies of the report to other parties for information, the whole report should be copied, but no professional liability or warranties shall be extended to other parties by REC in this connection without their explicit written agreement there to by REC.
 12. Rather, this investigation has been undertaken to provide a preliminary characterisation of the existing sub-surface geotechnical characteristics and make up and the findings of this study are our best interpretation of the data collected, within the scope of work and agreed budget. New information, revised practices or changes in legislation may necessitate the re-interpretation of the report, in whole or in part.
 13. This investigation has been undertaken to reasonably characterise existing sub-surface conditions and the findings of this study are our best interpretation of the data collected, within the scope of work and agreed budget. New information, revised practices or changes in legislation may necessitate the re-interpretation of the report, in whole or in part.
-

APPENDIX II
GLOSSARY

TERMS

AST	Above Ground Storage Tank
BGS	British Geological Survey
BSI	British Standards Institute
BTEX	Benzene, Toluene, Ethylbenzene, Xylenes
CIEH	Chartered Institute of Environmental Health
CIRIA	Construction Industry Research Association
CLEA	Contaminated Land Exposure Assessment
CSM	Conceptual Site Model
DNAPL	Dense Non-Aqueous Phase Liquid (chlorinated solvents, PCB)
DWS	Drinking Water Standard
EA	Environment Agency
EQS	Environmental Quality Standard
GAC	General Assessment Criteria
GL	Ground Level
GSV	Gas Screening Value
HCV	Health Criteria Value
ICSM	Initial Conceptual Site Model
LNAPL	Light Non-Aqueous Phase Liquid (petrol, diesel, kerosene)
ND	Not Detected
LMRL	Lower Method Reporting Limit
NR	Not Recorded
PAH	Poly Aromatic Hydrocarbon
PCB	Poly-Chlorinated Biphenyl
PID	Photo Ionisation Detector
QA	Quality Assurance
SGV	Soil Guideline Value
SPH	Separate Phase Hydrocarbon
Sp.TPH (CWG)	Total Petroleum Hydrocarbon (Criteria Working Group)
SPT	Standard Penetration Test
SVOC	Semi Volatile Organic Compound
UST	Underground Storage Tank
VCCs	Vibro Concrete Columns
VOC	Volatile Organic Compound
WTE	Water Table Elevation

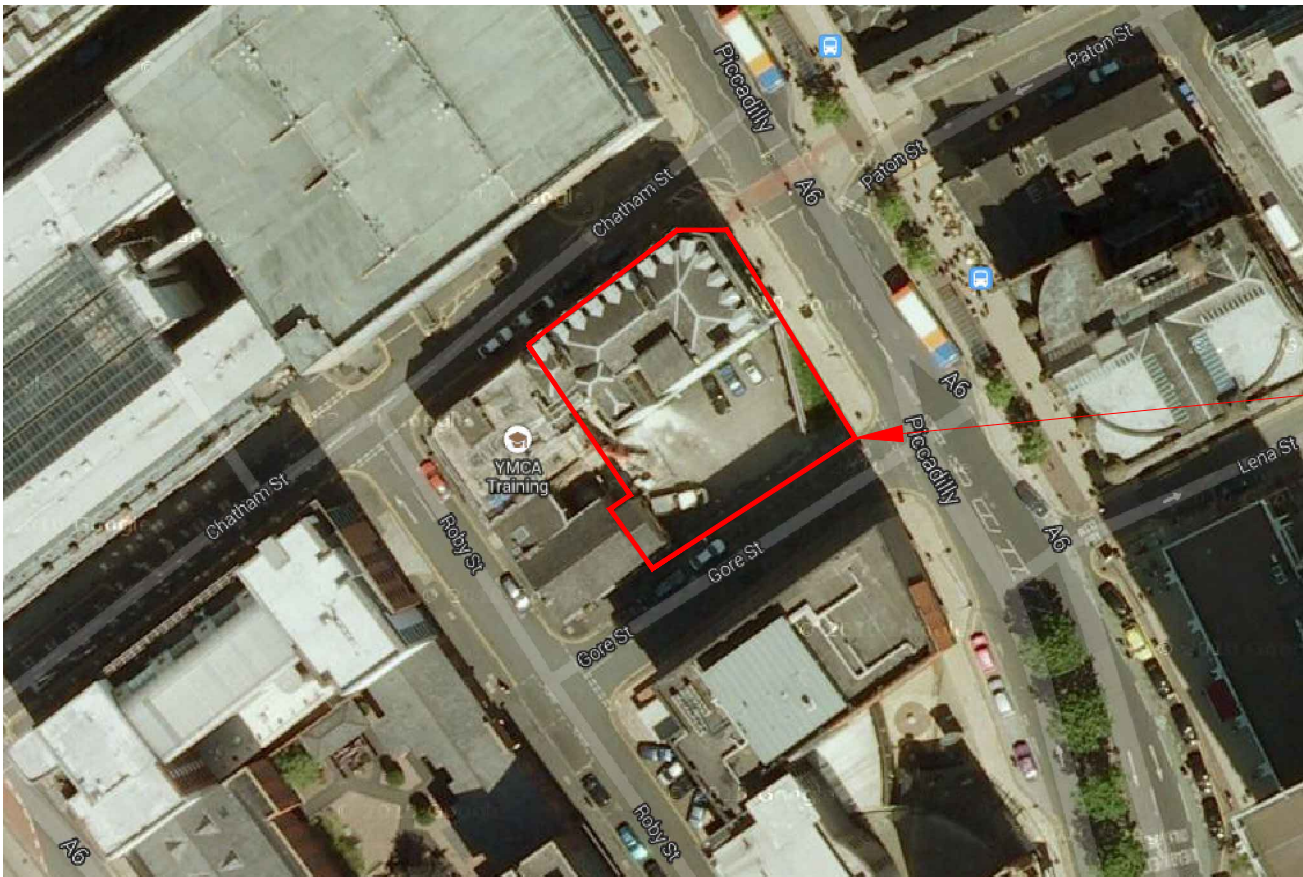
UNITS

m	Metres
km	Kilometres
%	Percent
%v/v	Percent volume in air
mb	Milli Bars (atmospheric pressure)
l/hr	Litres per hour
µg/l	Micrograms per Litre (parts per billion)
ppb	Parts Per Billion
mg/kg	Milligrams per kilogram (parts per million)
ppm	Parts Per Million

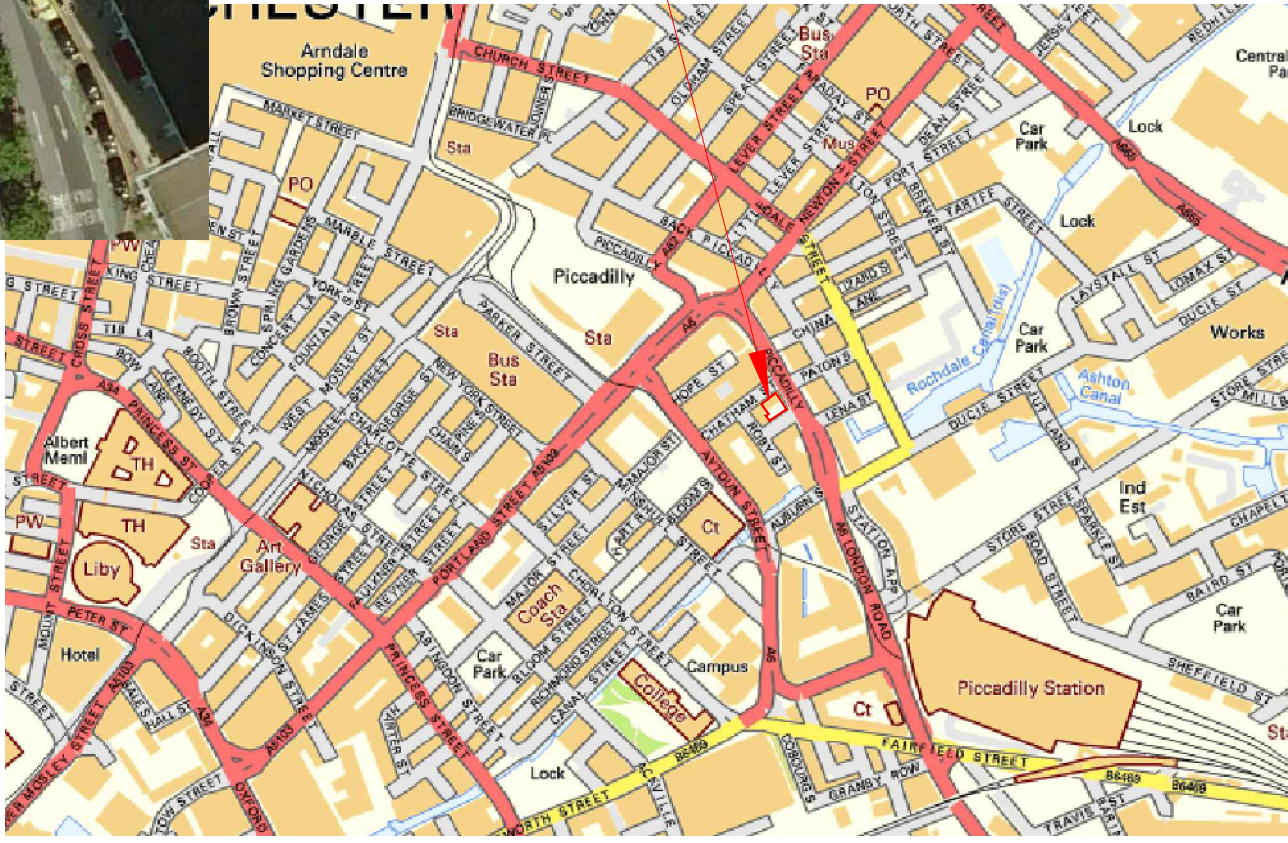


mg/m ³	Milligram per metre cubed
m bgl	Metres Below Ground Level
m bcl	Metre Below Cover Level
mAOD	Metres Above Ordnance Datum (sea level)
kN/m ²	Kilo Newtons per metre squared
µm	Micro metre

APPENDIX III
FIGURES



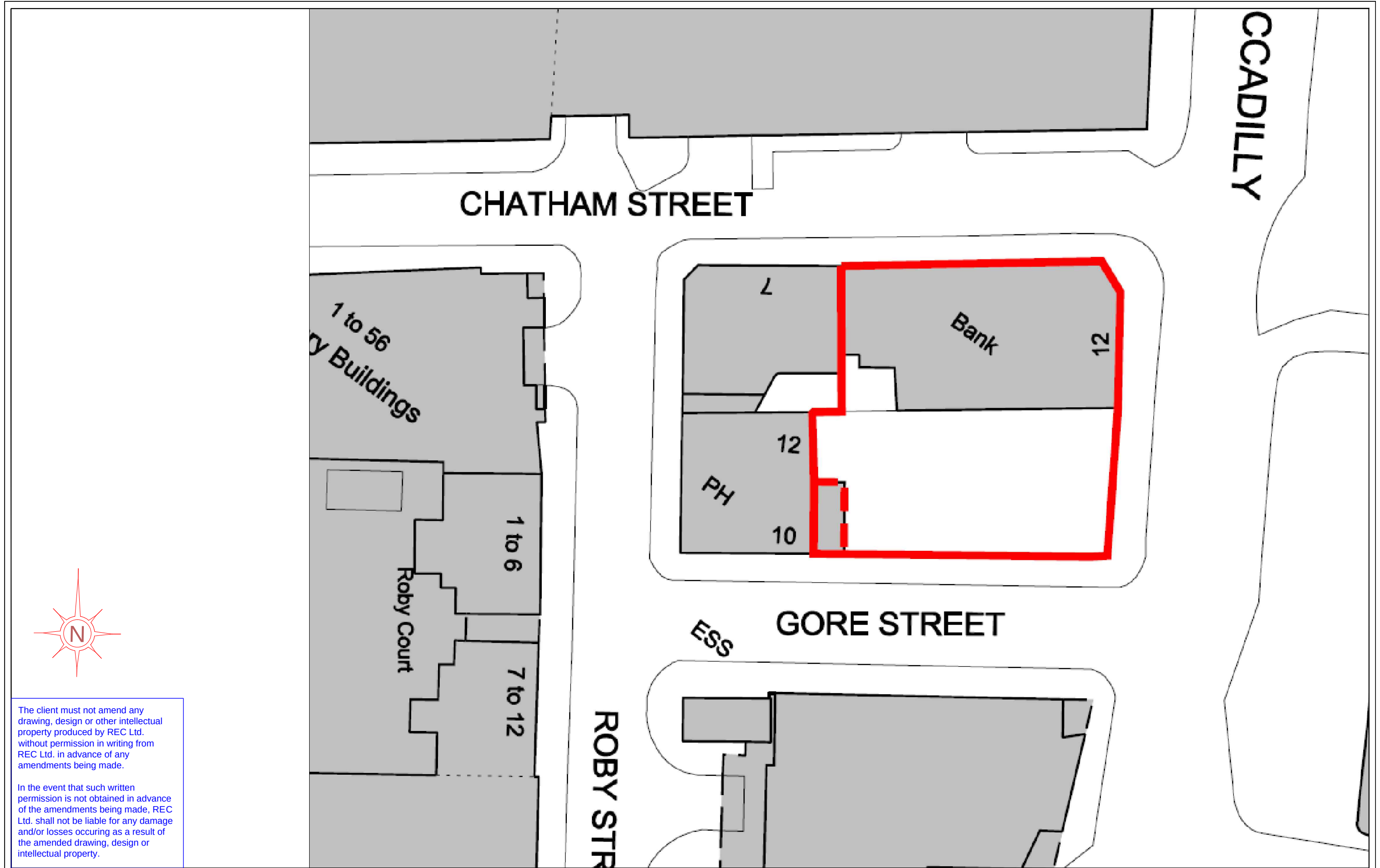
Site Location



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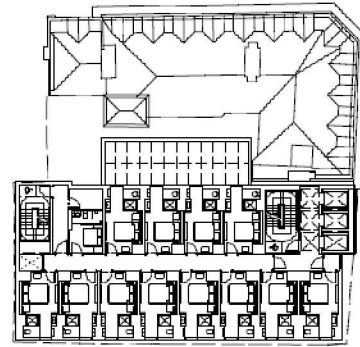
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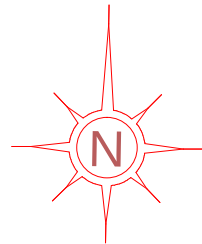
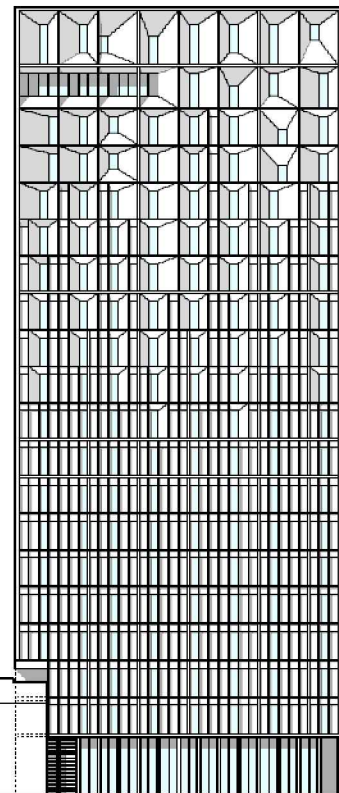


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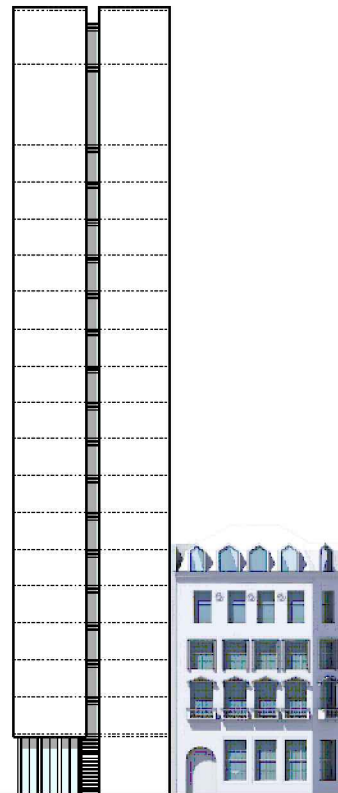
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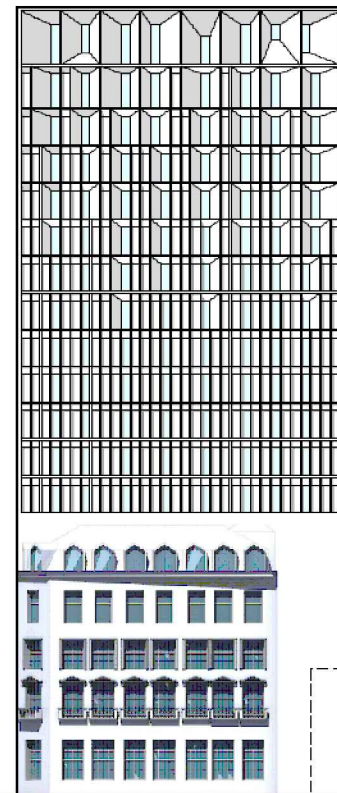
proposed typical upper floor plan



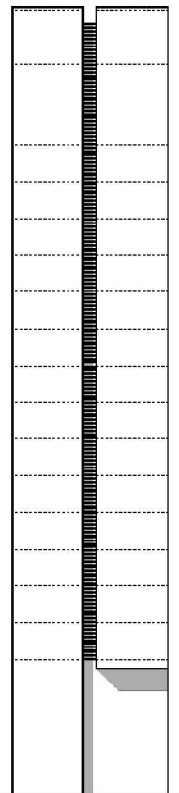
proposed south-east elevation



proposed north-east elevation



proposed north-west elevation



proposed south-west elevation

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Yotel, Piccadilly,
Manchester

Client:

Russells
Construction

Job No: 44934

Drawn by: R. Willoughby

Approved by: M. Dyer

Scale: Not To Scale

DATE:
15-07-13

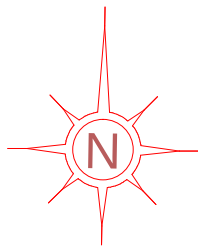
Notes:

Drawing Title:

44934p1r0-003
Proposed
Development Plan

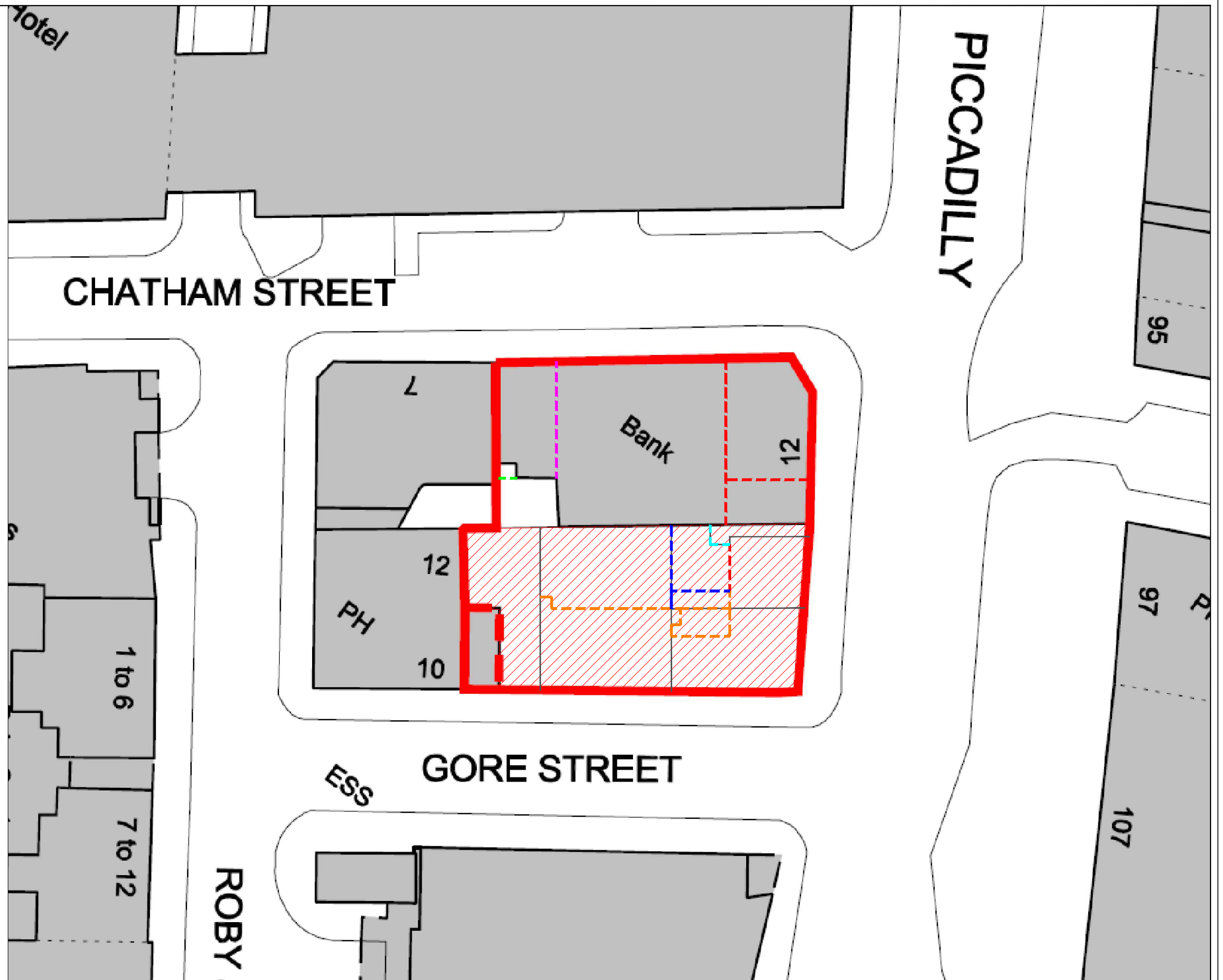
Key

- Added approximately 1922
- Demolished approximately 1922
- Added approximately 1931
- Demolished approximately 1931
- Added approximately 1948
- Demolished approximately 1948
- Demolished circa 1986



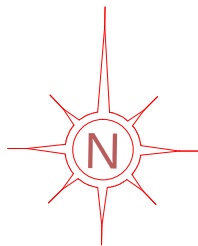
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Key

- WS101 Approximate Window Sample
Probehole Location
- FP101 Approximate Foundation
Pit Location
- FP101(ND) Approximate Foundation
Pit Location (Not Done)
- RB101 Approximate Rotary Borehole
Location



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Client:

Job No: 44934

Drawn by: R. Willoughby

Approved by: M. Dyer

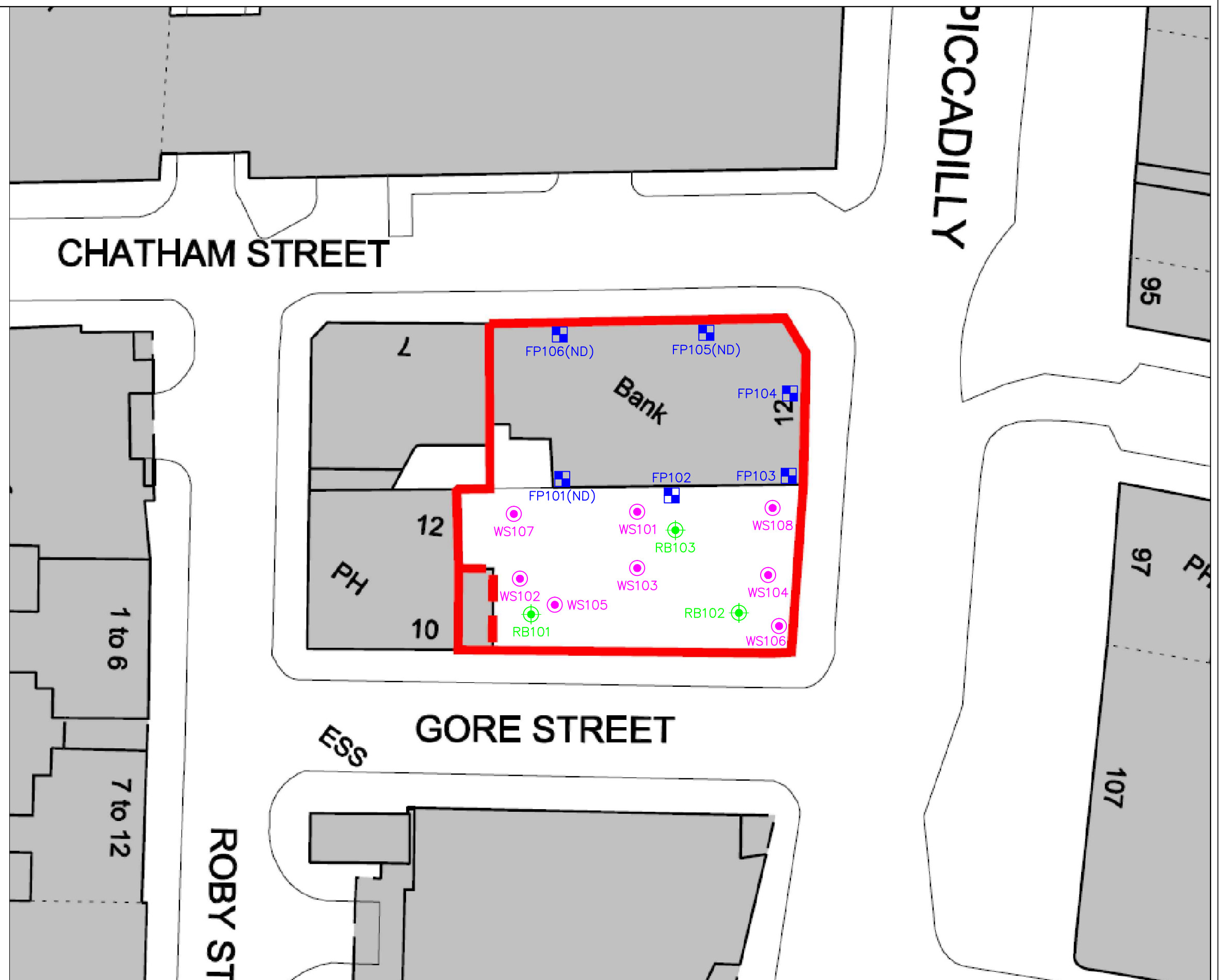
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DATE:
04-10-13

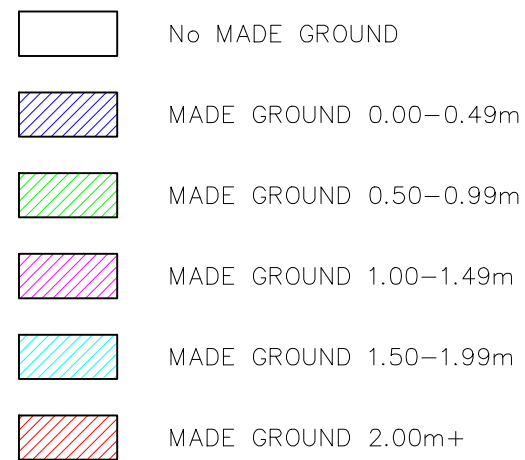
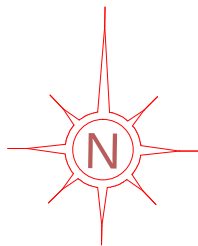
Notes:

Drawing Title:

44934p1r0-005
Exploratory Hole
Location Plan



Key



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Client:

Russells
Construction

Job No: 44934

Drawn by: R. Willoughby

Approved by: M. Dyer

Scale: Not To Scale

DATE:
04-10-13

Notes:

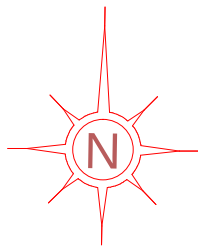
Drawing Title:

44934p1r0-006
Depth of Made
Ground Plan



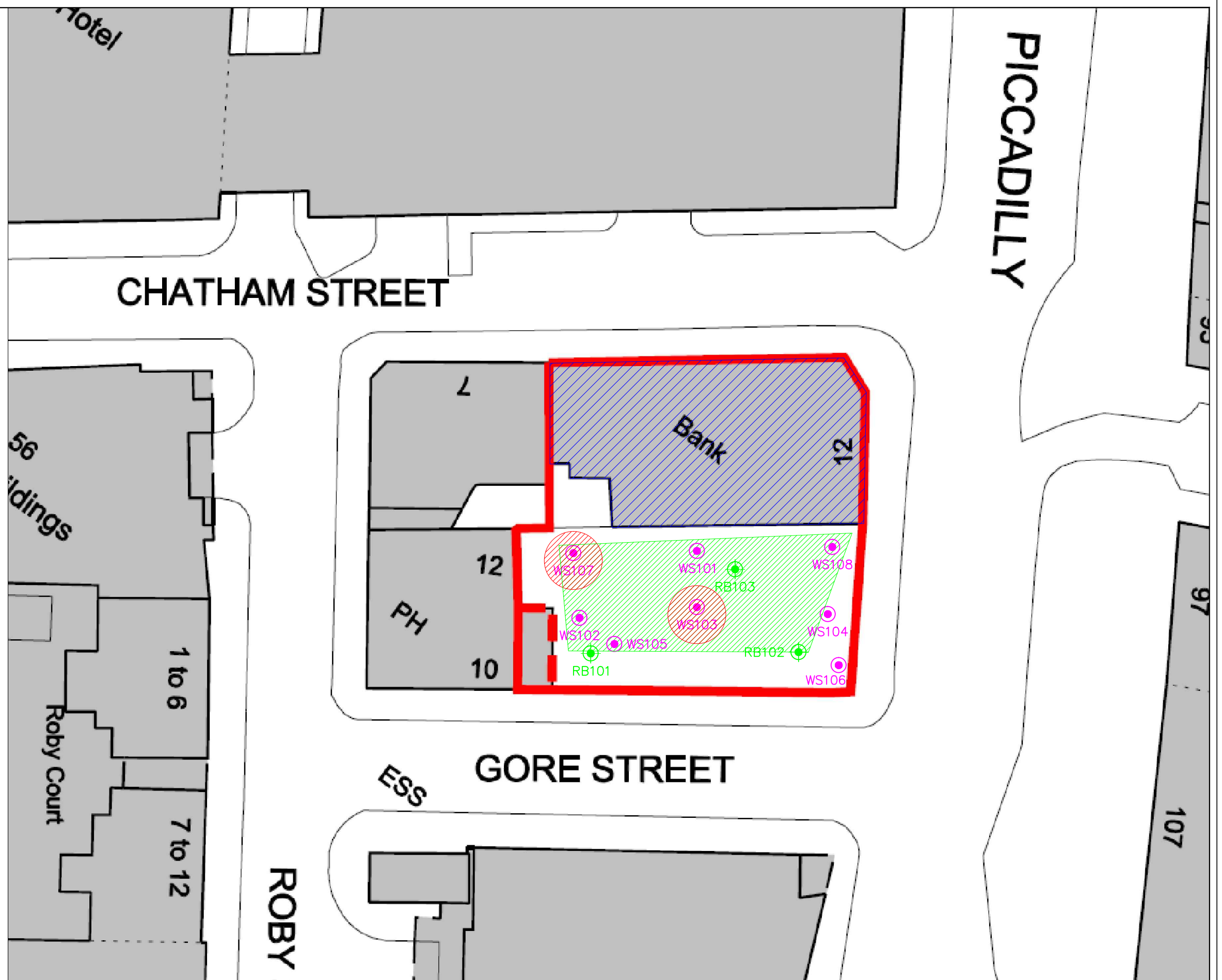
Key

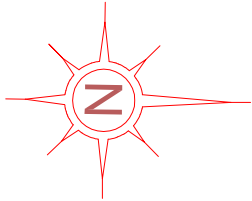
- Unable to penetrate concrete slab due to thickness & Strength
- Concrete Slab, Possible basement floor identified
- Elevated Lead Concentrations Identified



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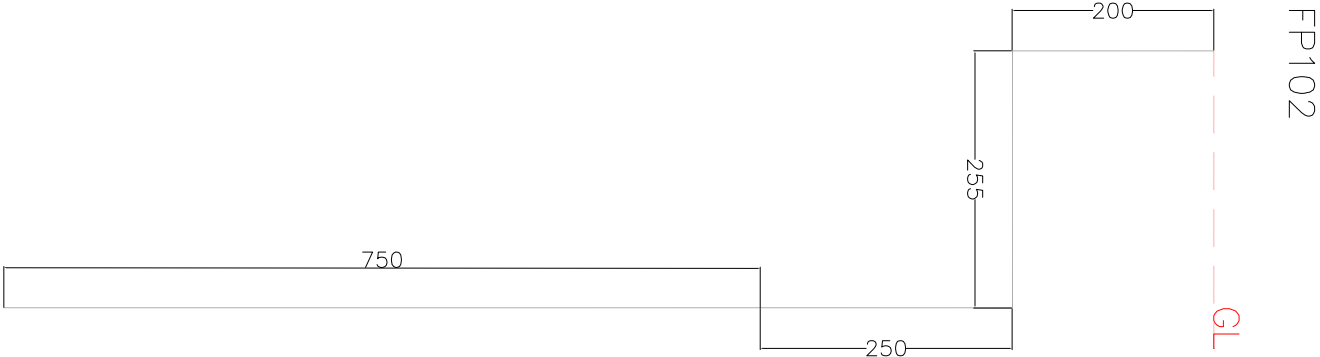
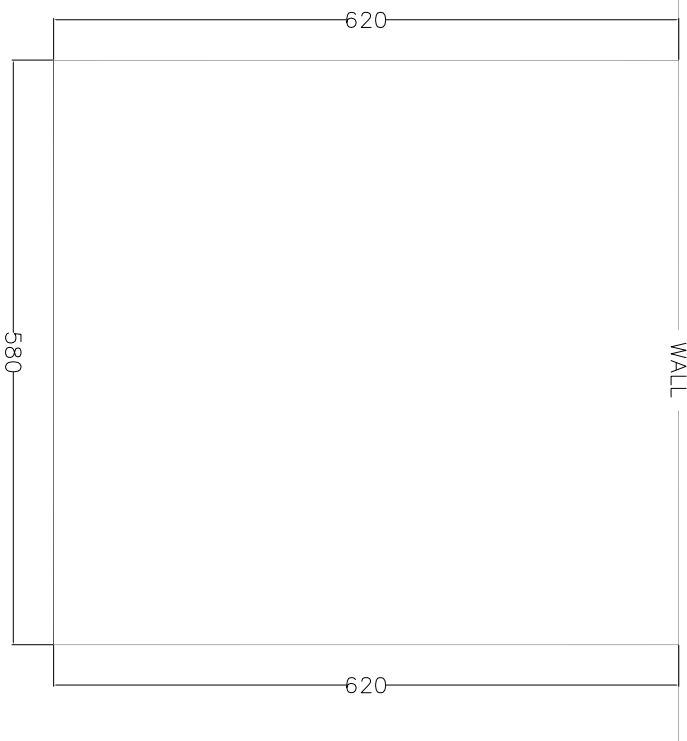
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FP102

0.00 – 0.20m: Tarmac (MADE GROUND)
0.20 – 1.20m: Fine to medium black, gravelly sand with cobbles. Gravel is fine to coarse, angular to sub-angular of brick, concrete, ash, clinker, metal, glass & plastic. Cobbles are angular to sub-angular of brick.



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Job Title:

Yotel
Piccadilly, Manchester

Client:



Job No: 44934

Drawn By: K. Doolan

Approved By: M. Dyer

Scale: 1:7.5 @ A3

Notes:

Drawing Title:

44934p1r0-008
Foundation Pit Detail
(FP102)

APPENDIX IV
PHOTOGRPAHS

APPENDIX IV PHOTOGRAPHS

PLATE 1 – CAR PARK AREA TO REAR OF ON-SITE BUILDING (EASTERN SIDE)



PLATE 2 – CAR PARK TO REAR OF ON-SITE BUILDING (WESTERN SIDE)



PLATE 3 – FP103



PLATE 4 – FP103



APPENDIX V
REC EXPLORATORY LOGS

Trial Pit Record

Trial Pit Number: FP102

Project Number: 44934

Contract Name: Yotel, Gore Street

Client: Russells Construction

Engineer: M. Jakuc

Date Started: 26/09/2013

Date Completed: 26/09/2013

Elevation AOD (m): N/A

Co-ordinates: N/A

Excavation Method: Hand excavated



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SUBSURFACE PROFILE

SAMPLES AND IN-SITU TESTING

Depth (mbgl)	Legend	Description	Depth of Strata (mbgl)	Type	Depth (mbgl)	Water Level (mbgl)	P.I.D (ppm)					Field / Laboratory Testing
							0	25	50	75	100	
		MADE GROUND: Asphalt.	0.20									
1.0		MADE GROUND: Fine to medium black gravelly sand with cobbles. Gravel is fine to coarse angular to sub-angular of brick, concrete, ash, metal, glass and plastic. Cobbles are angular to sub-angular of brick.	1.20	ES	0.50							
2.0		Complete at 1.20m bgl.										
3.0												
4.0												
5.0												
6.0												

Key

B. Bulk (Bag)

W. Water

U100. 100mm Undisturbed

U38. 38mm Undisturbed Sample

SPT. Standard Penetration Test

D. Disturbed

G. Amber Glass Jar / Bottle

CPT. Cone Penetration Test

U100. Blows (Recovery mm)

V. 40ml Glass Vial

T. Plastic Tub

N. 'N' Value

HV. Hand Shear Vane

PID. Photo Ionisation Detector

ES. Environmental Sample

Notes

Dimensions: 400 x 400 x 1200

Services: Prior to excavation the trial pit location was scanned with a Cable Avoidance Tool (CAT).

Stability: Stable

Groundwater: None encountered

Date: 07/10/2013

Status: Final

Trial Pit Record

Trial Pit Number: FP103

Project Number: 44934

Contract Name: Yotel, Gore Street

Client: Russells Construction

Engineer: M. Jakuc

Date Started: 26/09/2013

Date Completed: 26/09/2013

Elevation AOD (m): N/A

Co-ordinates: N/A

Excavation Method: Hand excavated



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SUBSURFACE PROFILE

SAMPLES AND IN-SITU TESTING

Depth (mbgl)	Legend	Description	Depth of Strata (mbgl)	Type	Depth (mbgl)	Water Level (mbgl)	P.I.D (ppm)					Field / Laboratory Testing
							0	25	50	75	100	
		MADE GROUND: Re-inforced concrete.	0.26									
1.0		Terminated at 0.26m bgl due to refusal.										
2.0												
3.0												
4.0												
5.0												
6.0												

Key

B. Bulk (Bag)

W. Water

U100. 100mm Undisturbed

U38. 38mm Undisturbed Sample

SPT. Standard Penetration Test

D. Disturbed

G. Amber Glass Jar / Bottle

CPT. Cone Penetration Test

U100. Blows (Recovery mm)

V. 40ml Glass Vial

T. Plastic Tub

N. 'N' Value

HV. Hand Shear Vane

PID. Photo Ionisation Detector

ES. Environmental Sample

Notes

Dimensions: 450 x 400 x 260

Services: Prior to excavation the trial pit location was scanned with a Cable Avoidance Tool (CAT).

Stability: Stable

Groundwater: None encountered

Date: 07/10/2013

Status: Final

Trial Pit Record

Trial Pit Number: FP104

Project Number: 44934

Contract Name: Yotel, Gore Street

Client: Russells Construction

Engineer: M. Jakuc

Date Started: 26/09/2013

Date Completed: 26/09/2013

Elevation AOD (m): N/A

Co-ordinates: N/A

Excavation Method: Hand excavated



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SUBSURFACE PROFILE

SAMPLES AND IN-SITU TESTING

Depth (mbgl)	Legend	Description	Depth of Strata (mbgl)	Type	Depth (mbgl)	Water Level (mbgl)	P.I.D (ppm)					Field / Laboratory Testing
							0	25	50	75	100	
		MADE GROUND: Re-inforced concrete.	0.12									
1.0		Terminated at 0.12m bgl due to refusal.										
2.0												
3.0												
4.0												
5.0												
6.0												

Key

B. Bulk (Bag)

W. Water

U100. 100mm Undisturbed

U38. 38mm Undisturbed Sample

SPT. Standard Penetration Test

D. Disturbed

G. Amber Glass Jar / Bottle

CPT. Cone Penetration Test

U100. Blows (Recovery mm)

V. 40ml Glass Vial

T. Plastic Tub

N. 'N' Value

HV. Hand Shear Vane

PID. Photo Ionisation Detector

ES. Environmental Sample

Notes

Dimensions: 300 x 400 x 1200

Services: Prior to excavation the trial pit location was scanned with a Cable Avoidance Tool (CAT).

Stability: Stable

Groundwater: None encountered

Date: 07/10/2013

Status: Final

Borehole Record - Open Hole Log

Borehole Number: RB101

Project Number: 44934

Contract Name: Yotel, Gore Street

Client: Russells Construction

Engineer: M. Jakuc

Date Started: 26/09/2013

Date Completed: 26/09/2013

Elevation AOD (m): N/A

Co-ordinates: N/A

Drilling Equipment: Klemm Rig



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Depth (mbgl)	Legend	Description of Strata	Depth of Strata (mbgl)	Field Notes / Insitu Testing / Sampling	Groundwater	Monitoring Installation / Backfill
1.0		MADE GROUND: Fine to medium dark brown/black gravelly sand with cobbles. Gravel is fine to coarse angular to sub-angular of brick, concrete and ash. Cobbles are angular to sub-angular of brick and concrete.				
2.0						
3.0						
4.0			4.0			
5.0		Brown gravelly CLAY.				
6.0						
7.0						
8.0						
9.0			9.0			
9.0		SANDSTONE.				
10.0		Core 9.00-10.50 m bgl 100% recovery				

Key

B. Bulk (Bag)
W. Water
U100. 100mm Undisturbed
U38. 38mm Undisturbed
SPT. Standard Penetration Test

D. Disturbed
G. Glass Jar / Bottle
CPT. Cone Penetration Test
U100. Blows (Recovery mm)
V. 40ml Glass Vial

T. Plastic Tub
N. 'N' Value
HV. Hand Shear Vane
PID. Photo Ionisation Detector
1. Driller's Description

Notes

Chiselling: N/A
Services: Prior to drilling the borehole location was scanned with a Cable Avoidance Tool (C.A.T).
Addition of water: None added
Casing diameter: 152mm

Date: 07/10/2013

Status: Final

Borehole Record - Open Hole Log

Borehole Number: RB101

Project Number: 44934

Contract Name: Yotel, Gore Street

Client: Russells Construction

Engineer: M. Jakuc

Date Started: 26/09/2013

Date Completed: 26/09/2013

Elevation AOD (m): N/A

Co-ordinates: N/A

Drilling Equipment: Klemm Rig



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Depth (mbgl)	Legend	Description of Strata	Depth of Strata (mbgl)	Field Notes / Insitu Testing / Sampling	Groundwater	Monitoring Installation / Backfill
		Brown gravelly CLAY.	10.5			
11.0		SANDSTONE. Core 10.50-12.00 100% recovery				
12.0		Brown gravelly CLAY.				
13.0						
14.0						
15.0						
16.0						
17.0						
18.0			18.0			
19.0		Complete at 18.00m bgl.				
20.0						

Key

B. Bulk (Bag)
W. Water
U100. 100mm Undisturbed
U38. 38mm Undisturbed
SPT. Standard Penetration Test

D. Disturbed
G. Glass Jar / Bottle
CPT. Cone Penetration Test
U100. Blows (Recovery mm)
V. 40ml Glass Vial

T. Plastic Tub
N. 'N' Value
HV. Hand Shear Vane
PID. Photo Ionisation Detector
1. Driller's Description

Notes

Chiselling: N/A
Services: Prior to drilling the borehole location was scanned with a Cable Avoidance Tool (C.A.T).
Addition of water: None added
Casing diameter: 152mm

Date: 07/10/2013

Status: Final

Borehole Record - Open Hole Log

Borehole Number: RB101

Project Number: 44934

Contract Name: Yotel, Gore Street

Client: Russells Construction

Engineer: M. Jakuc

Date Started: 27/09/2013

Date Completed: 27/09/2013

Elevation AOD (m): N/A

Co-ordinates: N/A

Drilling Equipment: Klemm Rig



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Depth (mbgl)	Legend	Description of Strata	Depth of Strata (mbgl)	Field Notes / Insitu Testing / Sampling	Groundwater	Monitoring Installation / Backfill
1.0		MADE GROUND: Fine to medium dark brown/black gravelly sand with cobbles. Gravel is fine to coarse angular to sub-angular of brick, concrete and ash. Cobbles are angular to sub-angular of brick and concrete.				
2.0			2.8			
3.0		MADE GROUND: Concrete.	3.1			
4.0		Brown gravelly CLAY. Core run - 18.00 - 19.50 100% recovery		SPT - 4/3/2/4/4/4 N= 14 SPT - 6/8/8/7/8/8 N= 31 SPT - 7/9/9/9/10/10 N= 38 SPT - 7/5/5/6/8/7 N= 26 SPT - 9/9/10/12/11/10 N= 43		
5.0						
6.0						
7.0						
8.0						

Key

B. Bulk (Bag)
W. Water
U100. 100mm Undisturbed
U38. 38mm Undisturbed
SPT. Standard Penetration Test

D. Disturbed
G. Glass Jar / Bottle
CPT. Cone Penetration Test
U100. Blows (Recovery mm)
V. 40ml Glass Vial

T. Plastic Tub
N. 'N' Value
HV. Hand Shear Vane
PID. Photo Ionisation Detector
1. Driller's Description

Notes

Chiselling: N/A
Services: Prior to drilling the borehole location was scanned with a Cable Avoidance Tool (C.A.T).
Addition of water: Water Flush
Casing diameter: 152mm

Date: 07/10/2013
Status: Final

Casing diameter: 152mm

Borehole Record - Open Hole Log

Borehole Number: RB101

Project Number: 44934

Contract Name: Yotel, Gore Street

Client: Russells Construction

Engineer: M. Jakuc

Date Started: 27/09/2013

Date Completed: 27/09/2013

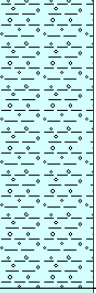
Elevation AOD (m): N/A

Co-ordinates: N/A

Drilling Equipment: Klemm Rig



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Depth (mbgl)	Legend	Description of Strata	Depth of Strata (mbgl)	Field Notes / Insitu Testing / Sampling	Groundwater	Monitoring Installation / Backfill
17.0		Brown gravelly CLAY.				
18.0		Brown MARL.	18.0			
19.0		Core run 22.50 - 24.00 no recovery				
20.0						
21.0						
22.0			22.2			
23.0						
24.0						

Key

B. Bulk (Bag)
W. Water
U100. 100mm Undisturbed
U38. 38mm Undisturbed
SPT. Standard Penetration Test

D. Disturbed
G. Glass Jar / Bottle
CPT. Cone Penetration Test
U100. Blows (Recovery mm)
V. 40ml Glass Vial

T. Plastic Tub
N. 'N' Value
HV. Hand Shear Vane
PID. Photo Ionisation Detector
1. Driller's Description

Notes

Chiselling: N/A
Services: Prior to drilling the borehole location was scanned with a Cable Avoidance Tool (C.A.T).
Addition of water: Water Flush
Casing diameter: 152mm

Date: 07/10/2013

Status: Final

Borehole Record - Open Hole Log

Borehole Number: RB101

Project Number: 44934

Contract Name: Yotel, Gore Street

Client: Russells Construction

Engineer: M. Jakuc

Date Started: 27/09/2013

Date Completed: 27/09/2013

Elevation AOD (m): N/A

Co-ordinates: N/A

Drilling Equipment: Klemm Rig



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Depth (mbgl)	Legend	Description of Strata	Depth of Strata (mbgl)	Field Notes / Insitu Testing / Sampling	Groundwater	Monitoring Installation / Backfill
25.0		Weathered orange/brown SANDSTONE/Rock sand. Core run 24.00 - 25.50 no recovery				
26.0		Core run 28.00 - 29.50 no recovery.				
27.0						
28.0						
29.0			29.5			
30.0		Complete at 29.50m bgl.				
31.0						
32.0						

Key

B. Bulk (Bag)
W. Water
U100. 100mm Undisturbed
U38. 38mm Undisturbed
SPT. Standard Penetration Test

D. Disturbed
G. Glass Jar / Bottle
CPT. Cone Penetration Test
U100. Blows (Recovery mm)
V. 40ml Glass Vial

T. Plastic Tub
N. 'N' Value
HV. Hand Shear Vane
PID. Photo Ionisation Detector
1. Driller's Description

Notes

Chiselling: N/A
Services: Prior to drilling the borehole location was scanned with a Cable Avoidance Tool (C.A.T).
Addition of water: Water Flush
Casing diameter: 152mm

Date: 07/10/2013

Status: Final

Borehole Record - Open Hole Log

Borehole Number: RB103

Project Number: 44934

Contract Name: Yotel, Gore Street

Client: Russells Construction

Engineer: M. Jakuc

Date Started: 01/10/2013

Date Completed: 01/10/2013

Elevation AOD (m): N/A

Co-ordinates: N/A

Drilling Equipment: Klemm Rig



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Depth (mbgl)	Legend	Description of Strata	Depth of Strata (mbgl)	Field Notes / Insitu Testing / Sampling	Groundwater	Monitoring Installation / Backfill
1.0		MADE GROUND: Fine to medium dark brown/black gravelly sand with cobbles. Gravel is fine to coarse angular to sub-angular of brick, concrete and ash. Cobbles are angular to sub-angular of brick and concrete.				
2.0						
3.0			3.0			
4.0		Brown gravelly CLAY.				
5.0						
6.0				SPT - 2/2/2/2/3/2 N= 9		
7.0				SPT - 3/3/3/3/4/3 N= 13		
				SPT - 4/3/4/3/4/4 N= 15		
				SPT - 4/4/4/4/4/5 N= 17		
				SPT - 6/6/6/8/8/8 N= 30		
8.0				SPT - 10/10/9/10/11/12 N= 42		

Key

B. Bulk (Bag)
W. Water
U100. 100mm Undisturbed
U38. 38mm Undisturbed
SPT. Standard Penetration Test

D. Disturbed
G. Glass Jar / Bottle
CPT. Cone Penetration Test
U100. Blows (Recovery mm)
V. 40ml Glass Vial

T. Plastic Tub
N. 'N' Value
HV. Hand Shear Vane
PID. Photo Ionisation Detector
1. Driller's Description

Notes

Chiselling: N/A
Services: Prior to drilling the borehole location was scanned with a Cable Avoidance Tool (C.A.T).
Addition of water: None added
Casing diameter: 152mm

Date: 07/10/2013
Status: Final

Borehole Record - Open Hole Log

Borehole Number: RB103

Project Number: 44934

Contract Name: Yotel, Gore Street

Client: Russells Construction

Engineer: M. Jakuc

Date Started: 01/10/2013

Date Completed: 01/10/2013

Elevation AOD (m): N/A

Co-ordinates: N/A

Drilling Equipment: Klemm Rig



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Depth (mbgl)	Legend	Description of Strata	Depth of Strata (mbgl)	Field Notes / Insitu Testing / Sampling	Groundwater	Monitoring Installation / Backfill
9.0		Brown gravelly CLAY.				
10.0						
11.0						
12.0						
13.0						
14.0						
15.0						
15.0		Boulder CLAY/MARL.	15.0			
16.0						

Key

B. Bulk (Bag)
W. Water
U100. 100mm Undisturbed
U38. 38mm Undisturbed
SPT. Standard Penetration Test

D. Disturbed
G. Glass Jar / Bottle
CPT. Cone Penetration Test
U100. Blows (Recovery mm)
V. 40ml Glass Vial

T. Plastic Tub
N. 'N' Value
HV. Hand Shear Vane
PID. Photo Ionisation Detector
1. Driller's Description

Notes

Chiselling: N/A
Services: Prior to drilling the borehole location was scanned with a Cable Avoidance Tool (C.A.T).
Addition of water: None added
Casing diameter: 152mm

Date: 07/10/2013
Status: Final

Borehole Record - Open Hole Log

Borehole Number: RB103

Project Number: 44934

Contract Name: Yotel, Gore Street

Client: Russells Construction

Engineer: M. Jakuc

Date Started: 01/10/2013

Date Completed: 01/10/2013

Elevation AOD (m): N/A

Co-ordinates: N/A

Drilling Equipment: Klemm Rig



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Depth (mbgl)	Legend	Description of Strata	Depth of Strata (mbgl)	Field Notes / Insitu Testing / Sampling	Groundwater	Monitoring Installation / Backfill
17.0		Boulder CLAY/MARL.				
18.0						
19.0						
20.0						
21.0						
22.0			22.2			
23.0						
24.0						

Key

B. Bulk (Bag)
W. Water
U100. 100mm Undisturbed
U38. 38mm Undisturbed
SPT. Standard Penetration Test

D. Disturbed
G. Glass Jar / Bottle
CPT. Cone Penetration Test
U100. Blows (Recovery mm)
V. 40ml Glass Vial

T. Plastic Tub
N. 'N' Value
HV. Hand Shear Vane
PID. Photo Ionisation Detector
1. Driller's Description

Notes

Chiselling: N/A
Services: Prior to drilling the borehole location was scanned with a Cable Avoidance Tool (C.A.T).
Addition of water: None added
Casing diameter: 152mm

Date: 07/10/2013

Status: Final

Borehole Record - Open Hole Log

Borehole Number: RB103

Project Number: 44934

Contract Name: Yotel, Gore Street

Client: Russells Construction

Engineer: M. Jakuc

Date Started: 01/10/2013

Date Completed: 01/10/2013

Elevation AOD (m): N/A

Co-ordinates: N/A

Drilling Equipment: Klemm Rig



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Depth (mbgl)	Legend	Description of Strata	Depth of Strata (mbgl)	Field Notes / Insitu Testing / Sampling	Groundwater	Monitoring Installation / Backfill
25.0		Orange/brown SANDSTONE. Weak orange/brown SANDSTONE/Rock sand. Core run 22.50 - 24.00 no recovery				
26.0						
27.0						
28.0						
29.0						
30.0		Core run 30.00 - 31.50 no recovery				
31.0			31.5			
32.0		Complete at 31.50m bgl.				

Key

B. Bulk (Bag)
W. Water
U100. 100mm Undisturbed
U38. 38mm Undisturbed
SPT. Standard Penetration Test

D. Disturbed
G. Glass Jar / Bottle
CPT. Cone Penetration Test
U100. Blows (Recovery mm)
V. 40ml Glass Vial

T. Plastic Tub
N. 'N' Value
HV. Hand Shear Vane
PID. Photo Ionisation Detector
1. Driller's Description

Notes

Chiselling: N/A
Services: Prior to drilling the borehole location was scanned with a Cable Avoidance Tool (C.A.T).
Addition of water: None added
Casing diameter: 152mm

Date: 07/10/2013

Status: Final

Borehole Record - Window Sample

Probehole Number: WS101

Project Number: 44934

Contract Name: Yotel, Gore Street

Client: Russells Construction

Engineer: M. Jakuc

Date Started: 26/09/2013

Date Completed: 26/09/2013

Elevation AOD (m): N/A

Co-ordinates: N/A

Drilling Equipment: Mini tracked window sampler rig



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SUBSURFACE PROFILE

SAMPLES AND IN-SITU TESTING

Depth (mbgl)	Legend	Description	Depth of Strata (mbgl)	Type	Depth (mbgl)	In-Situ Testing SPT / U100	Water Level (mbgl)	Monitoring Installation / Backfill
		MADE GROUND: Tarmac.	0.15					
		MADE GROUND: Loose fine to medium dark brown/black gravelly sand with cobbles. Gravel is fine to coarse angular to sub-angular of brick, concrete, ash, clinker, metal and wood. Cobbles are angular to sub-angular of brick and concrete.		B ES	0.20-0.70 0.30			
1.0				SPT	1.00-1.45	2/1/2/1/2/1 N= 6		
2.0				ES SPT	2.00 2.00-2.45	1/1/2/2/1/2 N= 7		
		MADE GROUND: Loose fine to medium brown slightly clayey gravelly sand with cobbles. Gravel is fine to coarse angular to sub-rounded of sandstone, brick, asbestos and fabric. Cobbles are angular to sub-angular of brick.	2.60					
3.0			3.00	ES SPT	2.80 3.00-3.45	4/4/5/6/8/10 N= 29		
		High strength very stiff brown gravelly CLAY. Gravel is fine to medium angular to sub-rounded of coal, sandstone and mudstone.		ES T	3.40 3.50-4.00			
4.0		Terminated at 4.00m bgl (unable to advance casing).	4.00					
5.0								
6.0								

Key

B. Bulk (Bag)

W. Water

U100. 100mm Undisturbed

U38. 38mm Undisturbed Sample

SPT. Standard Penetration Test

D. Disturbed

G. Amber Glass Jar / Bottle

CPT. Cone Penetration Test

U100. Blows (Recovery mm)

V. 40ml Glass Vial

T. Plastic Tub

N. 'N' Value

HV. Hand Shear Vane

PID. Photo Ionisation Detector

ES. Environmental Sample

Notes

Groundwater: Groundwater encountered at 2.80m bgl

Services: Prior to drilling the location was scanned with a cable avoidance tool (CAT).

Addition of water: None added

Casing diameter: 110mm

Date logged: 07/10/2013

Status: Final

Borehole Record - Window Sample

Probehole Number: WS102

Project Number: 44934

Contract Name: Yotel, Gore Street

Client: Russells Construction

Engineer: M. Jakuc

Date Started: 26/09/2013

Date Completed: 26/09/2013

Elevation AOD (m): N/A

Co-ordinates: N/A

Drilling Equipment: Mini tracked window sampler rig



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SUBSURFACE PROFILE

SAMPLES AND IN-SITU TESTING

Depth (mbgl)	Legend	Description	Depth of Strata (mbgl)	Type	Depth (mbgl)	In-Situ Testing SPT / U100	Water Level (mbgl)	Monitoring Installation / Backfill
1.0		MADE GROUND: Asphalt.						
		MADE GROUND: Yellow/brown sandy gravel. Gravel is fine to coarse angular to sub-angular of concrete and limestone.	0.90	SPT	1.00-1.45	3/1/2/3/3 N= 11		
2.0		MADE GROUND: Medium dense dark brown/orange sandy gravel. Gravel is fine to coarse angular to sub-angular of brick, concrete, ash and sandstone.	2.45	SPT SPT	2.00-2.45 2.45-2.90	0/1/3/2/4/41 N= 50 25/50 for 0mm		
3.0		Terminated at 2.45m bgl due to refusal.						
4.0								
5.0								
6.0								
7.0								
8.0								

Key

B. Bulk (Bag)

W. Water

U100. 100mm Undisturbed

U38. 38mm Undisturbed Sample

SPT. Standard Penetration Test

D. Disturbed

G. Amber Glass Jar / Bottle

CPT. Cone Penetration Test

U100. Blows (Recovery mm)

V. 40ml Glass Vial

T. Plastic Tub

N. 'N' Value

HV. Hand Shear Vane

PID. Photo Ionisation Detector

ES. Environmental Sample

Notes

Groundwater: None encountered

Services: Prior to drilling the location was scanned with a cable avoidance tool (CAT).

Addition of water: None added

Casing diameter: 110mm

Date logged: 07/10/2013

Status: Final

Borehole Record - Window Sample

Probehole Number: WS103

Project Number: 44934

Contract Name: Yotel, Gore Street

Client: Russells Construction

Engineer: M. Jakuc

Date Started: 26/09/2013

Date Completed: 26/09/2013

Elevation AOD (m): N/A

Co-ordinates: N/A

Drilling Equipment: Mini tracked window sampler rig



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SUBSURFACE PROFILE

SAMPLES AND IN-SITU TESTING

Depth (mbgl)	Legend	Description	Depth of Strata (mbgl)	Type	Depth (mbgl)	In-Situ Testing SPT / U100	Water Level (mbgl)	Monitoring Installation / Backfill
		MADE GROUND: Tarmac.	0.15					
1.0		MADE GROUND: Loose fine to medium dark brown/black gravelly sand with cobbles. Gravel is fine to coarse angular to sub-angular of brick, concrete, ash, clinker, metal, wood, asbestos and slate. Cobbles are angular to sub-angular of brick and concrete.		ES	0.40			
				SPT	1.00-1.45	1/1/2/2/1/2 N= 7		
				ES	1.20			
2.0				SPT	2.00-2.45	2/1/1/2/2/2 N= 7		
			2.50					
3.0		Terminated at 2.50m bgl due to a refusal on concrete obstruction.						
4.0								
5.0								
6.0								

Key

B. Bulk (Bag)

W. Water

U100. 100mm Undisturbed

U38. 38mm Undisturbed Sample

SPT. Standard Penetration Test

D. Disturbed

G. Amber Glass Jar / Bottle

CPT. Cone Penetration Test

U100. Blows (Recovery mm)

V. 40ml Glass Vial

T. Plastic Tub

N. 'N' Value

HV. Hand Shear Vane

PID. Photo Ionisation Detector

ES. Environmental Sample

Notes

Groundwater: None encountered

Services: Prior to drilling the location was scanned with a cable avoidance tool (CAT).

Addition of water: None added

Casing diameter: 110mm

Date logged: 07/10/2013

Status: Final

Borehole Record - Window Sample

Probehole Number: WS104

Project Number: 44934

Contract Name: Yotel, Gore Street

Client: Russells Construction

Engineer: M. Jakuc

Date Started: 26/09/2013

Date Completed: 26/09/2013

Elevation AOD (m): N/A

Co-ordinates: N/A

Drilling Equipment: Mini tracked window sampler rig



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SUBSURFACE PROFILE

SAMPLES AND IN-SITU TESTING

Depth (mbgl)	Legend	Description	Depth of Strata (mbgl)	Type	Depth (mbgl)	In-Situ Testing SPT / U100	Water Level (mbgl)	Monitoring Installation / Backfill
0.0		MADE GROUND: Asphalt.						
1.0		MADE GROUND: Very loose to medium dense brown/orange sandy gravel. Gravel is fine to coarse angular to sub-angular of brick, concrete, sandstone and coal.		ES	0.80			
				SPT	1.00-1.45	3/3/2/0/0/0 N= 2		
2.0				ES	1.50			
				SPT	2.00-2.45	0/2/3/3/3/3 N= 12		
3.0			3.25	SPT	3.00-3.45	12/7/6/6/5/5 N= 22		
4.0		High strength very stiff brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium sub-angular to sub-rounded of sandstone and coal.		ES	3.50			
				SPT	4.00-4.45	5/3/3/4/5/6 N= 18		
5.0				SPT	5.00-5.45	5/6/7/7/7/8 N= 29		
				SPT	5.45-5.90	7/9/7/7/8/11 N= 33		
6.0			6.35	SPT	5.90-6.35	10/9/10/10/12/12 N= 44		
7.0		Complete at 6.35m bgl.						
8.0								

Key

B. Bulk (Bag)
W. Water
U100. 100mm Undisturbed
U38. 38mm Undisturbed Sample
SPT. Standard Penetration Test

D. Disturbed
G. Amber Glass Jar / Bottle
CPT. Cone Penetration Test
U100. Blows (Recovery mm)
V. 40ml Glass Vial

T. Plastic Tub
N. 'N' Value
HV. Hand Shear Vane
PID. Photo Ionisation Detector
ES. Environmental Sample

Notes

Groundwater: None encountered
Services: Prior to drilling the location was scanned with a cable avoidance tool (CAT).
Addition of water: None added
Casing diameter: 110mm

Date logged: 07/10/2013
Status: Final

Borehole Record - Window Sample

Probehole Number: WS105

Project Number: 44934

Contract Name: Yotel, Gore Street

Client: Russels Construction

Engineer: M. Jakuc

Date Started: 26/09/2013

Date Completed: 26/09/2013

Elevation AOD (m): N/A

Co-ordinates: N/A

Drilling Equipment: Mini tracked window sampler rig



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SUBSURFACE PROFILE

SAMPLES AND IN-SITU TESTING

Depth (mbgl)	Legend	Description	Depth of Strata (mbgl)	Type	Depth (mbgl)	In-Situ Testing SPT / U100	Water Level (mbgl)	Monitoring Installation / Backfill
		MADE GROUND: Asphalt.						
1.0		MADE GROUND: Loose to medium dense black/brown sandy ashy gravel. Gravel is fine to medium angular to sub-angular of brick, concrete and coal.		ES	0.50			
				SPT	1.00-1.45	1/2/1/1/1 N= 4		
				SPT	1.45-1.90	10/13/7/4/4/3 N= 18		
2.0				SPT	1.90-2.35	3/3/4/4/4 N= 16		
				SPT	2.35-2.80	1/1/26/24 for 19mm		
			2.80					
3.0		Terminated at 2.80m bgl due to refusal on concrete obstruction.		SPT				
4.0								
5.0								
6.0								

Key

B. Bulk (Bag)

W. Water

U100. 100mm Undisturbed

U38. 38mm Undisturbed Sample

SPT. Standard Penetration Test

D. Disturbed

G. Amber Glass Jar / Bottle

CPT. Cone Penetration Test

U100. Blows (Recovery mm)

V. 40ml Glass Vial

T. Plastic Tub

N. 'N' Value

HV. Hand Shear Vane

PID. Photo Ionisation Detector

ES. Environmental Sample

Notes

Groundwater: None encountered

Services: Prior to drilling the location was scanned with a cable avoidance tool (CAT).

Addition of water: None added

Casing diameter: 110mm

Date logged: 07/10/2013

Status: Final

Borehole Record - Window Sample

Probehole Number: WS106

Project Number: 44934

Contract Name: Yotel, Gore Street

Client: Russells Construction

Engineer: M. Jakuc

Date Started: 26/09/2013

Date Completed: 26/09/2013

Elevation AOD (m): N/A

Co-ordinates: N/A

Drilling Equipment: Mini tracked window sampler rig



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SUBSURFACE PROFILE

SAMPLES AND IN-SITU TESTING

Depth (mbgl)	Legend	Description	Depth of Strata (mbgl)	Type	Depth (mbgl)	In-Situ Testing SPT / U100	Water Level (mbgl)	Monitoring Installation / Backfill
		MADE GROUND: Asphalt.						
		MADE GROUND: Black/brown sandy ashy gravel. Gravel is fine to medium angular to sub-angular of brick, concrete and coal.	0.70					
1.0								
2.0								
3.0								
4.0								
5.0								
6.0								

Terminated at 0.70m bgl due to services.

Key

B. Bulk (Bag)

W. Water

U100. 100mm Undisturbed

U38. 38mm Undisturbed Sample

SPT. Standard Penetration Test

D. Disturbed

G. Amber Glass Jar / Bottle

CPT. Cone Penetration Test

U100. Blows (Recovery mm)

V. 40ml Glass Vial

T. Plastic Tub

N. 'N' Value

HV. Hand Shear Vane

PID. Photo Ionisation Detector

ES. Environmental Sample

Notes

Groundwater: None encountered

Services: Prior to drilling the location was scanned with a cable avoidance tool (CAT).

Addition of water: None added

Casing diameter: 110mm

Date logged: 07/10/2013

Status: Final

Borehole Record - Window Sample

Probehole Number: WS107

Project Number: 44934

Contract Name: Yotel, Gore Street

Client: Russells Construction

Engineer: M. Jakuc

Date Started: 26/09/2013

Date Completed: 26/09/2013

Elevation AOD (m): N/A

Co-ordinates: N/A

Drilling Equipment: Mini tracked window sampler rig



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SUBSURFACE PROFILE

SAMPLES AND IN-SITU TESTING

Depth (mbgl)	Legend	Description	Depth of Strata (mbgl)	Type	Depth (mbgl)	In-Situ Testing SPT / U100	Water Level (mbgl)	Monitoring Installation / Backfill
0.0		MADE GROUND: Loose to dense fine to medium dark brown/black gravelly sand with cobbles. Gravel is fine to coarse angular to sub-angular of brick, concrete, slate, metal and glass. Cobbles are angular to sub-angular of brick.		B	0.20-0.90			
0.40				ES	0.40			
1.0				SPT	1.00-1.45	1/1/1/2/1/1 N= 5		
1.10				ES	1.10			
2.0				SPT	2.00-2.45	1/0/1//0/1/1 N= 3		
2.50			2.50	SPT	2.60-2.95	25/40mm for 50/70mm		
3.0		Terminated at 2.50m bgl due to refusal on concrete obstruction.						
4.0								
5.0								
6.0								

Key

B. Bulk (Bag)

W. Water

U100. 100mm Undisturbed

U38. 38mm Undisturbed Sample

SPT. Standard Penetration Test

D. Disturbed

G. Amber Glass Jar / Bottle

CPT. Cone Penetration Test

U100. Blows (Recovery mm)

V. 40ml Glass Vial

T. Plastic Tub

N. 'N' Value

HV. Hand Shear Vane

PID. Photo Ionisation Detector

ES. Environmental Sample

Notes

Groundwater: None encountered

Services: Prior to drilling the location was scanned with a cable avoidance tool (CAT).

Addition of water: None added

Casing diameter: 110mm

Date logged: 07/10/2013

Status: Final

Borehole Record - Window Sample

Probehole Number: WS108

Project Number: 44934

Contract Name: Yotel, Gore Street

Client: Russells Construction

Engineer: M. Jakuc

Date Started: 26/09/2013

Date Completed: 26/09/2013

Elevation AOD (m): N/A

Co-ordinates: N/A

Drilling Equipment: Mini tracked window sampler rig



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Pacific Quay
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Manchester, M50 2UE
Tel: 0161 868 1300 / Fax: 0161 868 1301
www.recltd.co.uk

SUBSURFACE PROFILE

SAMPLES AND IN-SITU TESTING

Depth (mbgl)	Legend	Description	Depth of Strata (mbgl)	Type	Depth (mbgl)	In-Situ Testing SPT / U100	Water Level (mbgl)	Monitoring Installation / Backfill
		MADE GROUND: Tarmac.	0.15					
1.0		MADE GROUND: Very loose fine to medium dark brown gravelly sand with cobbles. Gravel is fine to coarse angular to sub-angular of brick, concrete, slate, asbestos, metal and glass. Cobbles are angular to sub-angular of brick.		ES B	0.30 0.30-1.00			
				SPT ES	1.00-1.45 1.20	1/1/1/0/1/1 N= 3		
2.0				SPT	2.00-2.45	0/0/0/0/0/0 N= 0		
			2.80					
3.0		Terminated at 2.80m bgl due to collapse and unable to advance casing.						
4.0								
5.0								
6.0								

Key

B. Bulk (Bag)

W. Water

U100. 100mm Undisturbed

U38. 38mm Undisturbed Sample

SPT. Standard Penetration Test

D. Disturbed

G. Amber Glass Jar / Bottle

CPT. Cone Penetration Test

U100. Blows (Recovery mm)

V. 40ml Glass Vial

T. Plastic Tub

N. 'N' Value

HV. Hand Shear Vane

PID. Photo Ionisation Detector

ES. Environmental Sample

Notes

Groundwater: None encountered

Services: Prior to drilling the location was scanned with a cable avoidance tool (CAT).

Addition of water: None added

Casing diameter: 110mm

Date logged: 07/10/2013

Status: Final

APPENDIX VI
CHEMICAL TESTING



Scientific Analysis Laboratories is a
limited company registered in England and
Wales (No 2514788) whose address is at
Hadfield House, Hadfield Street, Manchester M16 9FE

Scientific Analysis Laboratories Ltd

Certificate of Analysis

Hadfield House
Hadfield Street
Cornbrook
Manchester
M16 9FE
Tel : 0161 874 2400
Fax : 0161 874 2468

Report Number: 353222-2

Date of Report: 10-Oct-2013

Customer: Resource Environmental Consultants Ltd
Osprey House
Pacific Quay
Broadway
Salford
M50 2UE

Customer Contact: Mr Dan Cox

Customer Job Reference: 44934

Customer Site Reference: Yotel, Manchester

Date Job Received at SAL: 30-Sep-2013

Date Analysis Started: 07-Oct-2013

Date Analysis Completed: 10-Oct-2013

The results reported relate to samples received in the laboratory
Opinions and interpretations expressed herein are outside the scope of UKAS accreditation
This report should not be reproduced except in full without the written approval of the laboratory
Tests covered by this certificate were conducted in accordance with SAL SOPs
All results have been reviewed in accordance with QP22



1549

Report checked
and authorised by :
Annie Hennis
Project Manager

Issued by :
Annie Hennis
Project Manager

SAL Reference					353222 003	353222 006	353222 009	353222 011	353222 014
Customer Sample Reference					WS101 3.40	WS103 1.20	WS107 0.40	WS102 1.00	WS104 3.50
Date Sampled					27-SEP-2013	27-SEP-2013	27-SEP-2013	30-SEP-2013	30-SEP-2013
Determinand	Method	Test Sample	LOD	Units					
Arsenic	T6	AR	1	mg/kg	10	20	49	4	7
Cadmium	T6	AR	1	mg/kg	<1	<1	<1	<1	<1
Chromium	T6	AR	1	mg/kg	28	17	25	19	29
Lead	T6	AR	1	mg/kg	48	710	660	34	18
Mercury	T6	AR	1	mg/kg	<1	<1	1	<1	<1
Selenium	T6	AR	3	mg/kg	<3	<3	<3	<3	<3
Copper	T6	AR	1	mg/kg	25	90	140	16	25
Nickel	T6	AR	1	mg/kg	32	21	31	19	34
Zinc	T6	AR	1	mg/kg	75	320	300	80	63
pH	T7	AR			8.1	7.8	8.4	8.3	8.0
SO4(Total)	T6	AR	0.01	%	0.11	1.8	0.40	0.05	0.07
SO4(2:1)	T6	AR	0.1	g/l	0.2	1.2	<0.1	<0.1	0.1
Cyanide(Total)	T4	AR	1	mg/kg	(IS) -	<1	<1	<1	<1
Phenols(Mono)	T4	AR	1	mg/kg	(IS) -	<1	<1	<1	<1
Chromium VI	T6	AR	1	mg/kg	<1	<1	<1	<1	<1

SAL Reference					353222 003	353222 006	353222 014
Customer Sample Reference					WS101 3.40	WS103 1.20	WS104 3.50
Date Sampled					27-SEP-2013	27-SEP-2013	30-SEP-2013
Determinand	Method	Test Sample	LOD	Units			
As (Dissolved)	T281	10:1	0.2	µg/l	0.7	2.4	0.5
Cd (Dissolved)	T281	10:1	0.02	µg/l	<0.02	0.02	0.03
Cr (Dissolved)	T281	10:1	1	µg/l	2	2	2
Pb (Dissolved)	T281	10:1	0.3	µg/l	1.0	2.7	16
Hg (Dissolved)	T281	10:1	0.05	µg/l	<0.05	<0.05	<0.05
Se (Dissolved)	T281	10:1	0.5	µg/l	0.8	1.0	0.8
Cu (Dissolved)	T281	10:1	0.5	µg/l	2.2	2.1	26
Ni (Dissolved)	T281	10:1	1	µg/l	<1	3	<1
Zn (Dissolved)	T281	10:1	2	µg/l	3	5	15
pH	T7	10:1			8.9	8.4	8.5
Cyanide(Total)	T4	10:1	50	µg/l	<50	<50	<50
Phenols(Mono)	T4	10:1	100	µg/l	<100	<100	<100
Chromium VI	T686	10:1	3	µg/l	<3	<3	<3
Sulphate	T686	10:1	500	µg/l	5900	68000	4100

Soil	Analysed as Soil
Total and Speciated USEPA16 PAH	

SAL Reference					353222 003	353222 006	353222 009	353222 011	353222 014
Customer Sample Reference					WS101 3.40	WS103 1.20	WS107 0.40	WS102 1.00	WS104 3.50
Date Sampled					27-SEP-2013	27-SEP-2013	27-SEP-2013	30-SEP-2013	30-SEP-2013
Determinand	Method	Test Sample	LOD	Units					
Naphthalene	T149	AR	0.01	mg/kg	0.02	0.09	3.5	0.05	<0.01
Acenaphthylene	T149	AR	0.01	mg/kg	<0.01	0.01	0.07	0.01	<0.01
Acenaphthene	T149	AR	0.01	mg/kg	<0.01	0.02	12	0.08	<0.01
Fluorene	T149	AR	0.01	mg/kg	<0.01	0.01	8.6	0.08	<0.01
Phenanthrene	T149	AR	0.01	mg/kg	0.02	0.22	49	0.54	<0.01
Anthracene	T149	AR	0.01	mg/kg	<0.01	0.05	14	0.16	<0.01
Fluoranthene	T149	AR	0.01	mg/kg	0.03	0.34	58	1.3	<0.01
Pyrene	T149	AR	0.01	mg/kg	0.03	0.31	50	1.3	<0.01
Benzo(a)Anthracene	T149	AR	0.01	mg/kg	0.01	0.09	28	0.58	<0.01
Chrysene	T149	AR	0.01	mg/kg	0.01	0.13	27	0.71	<0.01
Benzo(b/k)Fluoranthene	T149	AR	0.01	mg/kg	0.02	0.25	48	1.1	<0.01
Benzo(a)Pyrene	T149	AR	0.01	mg/kg	0.01	0.12	29	0.90	<0.01
Indeno(123-cd)Pyrene	T149	AR	0.01	mg/kg	0.01	0.11	15	0.48	<0.01
Dibenzo(ah)Anthracene	T149	AR	0.01	mg/kg	<0.01	0.03	4.1	0.12	<0.01
Benzo(ghi)Perylene	T149	AR	0.01	mg/kg	0.01	0.11	12	0.50	<0.01
PAH(total)	T149	AR	0.01	mg/kg	0.17	1.9	360	7.9	<0.01

SAL Reference: 353222							
Project Site: Yotel, Manchester							
Customer Reference: 44934							
Leachate		Analysed as Water					
Total and Speciated USEPA16 PAH							
SAL Reference					353222 003	353222 006	353222 014
Customer Sample Reference					WS101 3.40	WS103 1.20	WS104 3.50
Date Sampled					27-SEP-2013	27-SEP-2013	30-SEP-2013
Determinand	Method	Test Sample	LOD	Units			
Naphthalene	T149	10:1	0.01	µg/l	0.05	0.01	<0.01
Acenaphthylene	T149	10:1	0.01	µg/l	<0.01	0.10	<0.01
Acenaphthene	T149	10:1	0.01	µg/l	<0.01	0.02	0.01
Fluorene	T149	10:1	0.01	µg/l	<0.01	0.04	0.01
Phenanthrene	T149	10:1	0.01	µg/l	0.01	0.04	0.02
Anthracene	T149	10:1	0.01	µg/l	<0.01	0.01	<0.01
Fluoranthene	T149	10:1	0.01	µg/l	<0.01	0.03	0.01
Pyrene	T149	10:1	0.01	µg/l	<0.01	0.03	0.01
Benzo(a)Anthracene	T149	10:1	0.01	µg/l	<0.01	0.01	<0.01
Chrysene	T149	10:1	0.01	µg/l	<0.01	0.01	<0.01
Benzo(b/k)Fluoranthene	T149	10:1	0.01	µg/l	<0.01	0.03	0.02
Benzo(a)Pyrene	T149	10:1	0.01	µg/l	<0.01	<0.01	0.01
Indeno(123-cd)Pyrene	T149	10:1	0.01	µg/l	<0.01	0.01	<0.01
Dibenzo(ah)Anthracene	T149	10:1	0.01	µg/l	<0.01	<0.01	<0.01
Benzo(ghi)Perylene	T149	10:1	0.01	µg/l	<0.01	0.02	<0.01
PAH(total)	T149	10:1	0.01	µg/l	0.06	0.36	0.09

SAL Reference: 353222							
Project Site: Yotel, Manchester							
Customer Reference: 44934							
Leachate				Analysed as Water			
REC Suite C (Banded TPH C5-C35)							
SAL Reference				353222 003	353222 006	353222 014	
Customer Sample Reference				WS101 3.40	WS103 1.20	WS104 3.50	
Date Sampled				27-SEP-2013	27-SEP-2013	30-SEP-2013	
Determinand	Method	Test Sample	LOD	Units			
TPH (C5-C6)	T215	10:1	10	µg/l	<10	<10	<10
TPH (C6-C8)	T215	10:1	10	µg/l	<10	<10	<10
TPH (C8-C10) DW	T215	10:1	10	µg/l	<10	<10	<10
TPH (C10-C12) DW	T81	10:1	10	µg/l	<10	<10	<10
TPH (C12-C16) DW	T81	10:1	10	µg/l	<10	<10	<10
TPH (C16-C21) DW	T81	10:1	10	µg/l	<10	<10	<10
TPH (C21-C35) DW	T81	10:1	10	µg/l	<10	<10	<10

SAL Reference: 353222									
Project Site: Yotel, Manchester									
Customer Reference: 44934									
Soil					Analysed as Soil				
REC Suite C (Banded TPH C5-C35)									
SAL Reference				353222 003	353222 006	353222 009	353222 011	353222 014	
Customer Sample Reference				WS101 3.40	WS103 1.20	WS107 0.40	WS102 1.00	WS104 3.50	
Date Sampled				27-SEP-2013	27-SEP-2013	27-SEP-2013	30-SEP-2013	30-SEP-2013	
Determinand	Method	Test Sample	LOD	Units					
TPH (C5-C6)	T54	AR	0.10	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10
TPH (C6-C8)	T54	AR	0.10	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10
TPH (C8-C10)	T54	AR	0.10	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10
TPH (C10-C12)	T8	AR	1	mg/kg	<1	⁽⁹⁾ <10	⁽⁹⁾ <10	⁽⁹⁾ <10	<1
TPH (C12-C16)	T8	AR	1	mg/kg	<1	⁽⁹⁾ <10	58	36	<1
TPH (C16-C21)	T8	AR	1	mg/kg	<1	69	350	300	<1
TPH (C21-C35)	T8	AR	1	mg/ka	1	920	1500	1600	2

SAL Reference: 353222									
Project Site: Yotel, Manchester									
Customer Reference: 44934									
Soil		Analysed as Soil							
Miscellaneous									
SAL Reference				353222 003	353222 006	353222 009	353222 011	353222 014	
Customer Sample Reference				WS101 3.40	WS103 1.20	WS107 0.40	WS102 1.00	WS104 3.50	
Date Sampled				27-SEP-2013	27-SEP-2013	27-SEP-2013	30-SEP-2013	30-SEP-2013	
Determinand	Method	Test Sample	LOD	Units					
Asbestos ID	T27	AR			N.D.	N.D.	N.D.	N.D.	-
Total Organic Carbon	T21	AR	0.1	%	-	-	8.1	-	1.0

Index to symbols used in 353222-2

Value	Description
10:1	Leachate
AR	As Received
N.D.	Not Detected
9	LOD raised due to dilution of sample
IS	Insufficient Sample
S	Analysis was subcontracted
U	Analysis is UKAS accredited
N	Analysis is not UKAS accredited

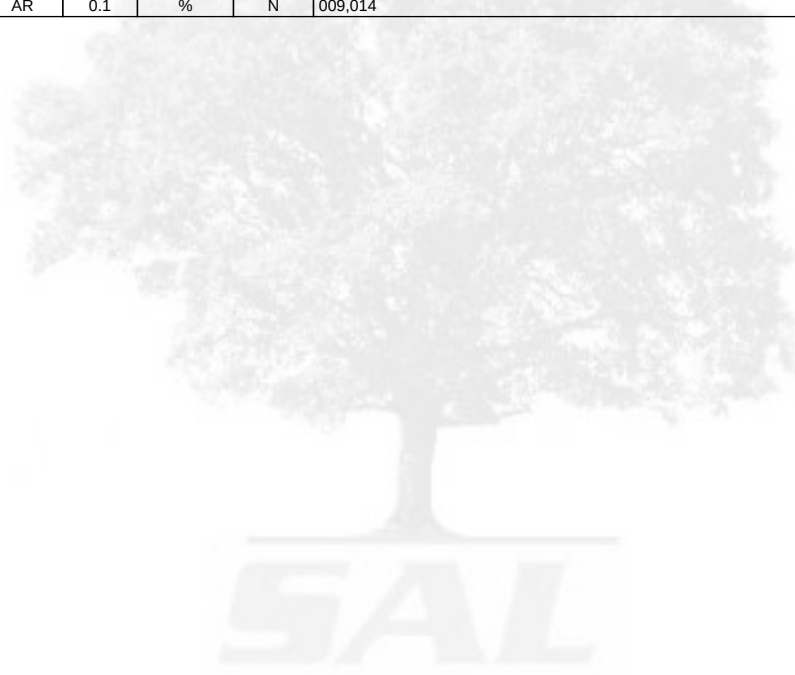
Method Index

Value	Description
T81	GC/FID (LV)
T215	GC/MS (Headspace)(LV)
T21	OX/IR
T6	ICP/OES
T7	Probe
T4	Colorimetry
T27	PLM
T686	Discrete Analyser
T54	GC/MS (Headspace)
T8	GC/FID
T281	ICP/MS (Filtered)
T149	GC/MS (SIR)

Accreditation Summary

Determinand	Method	Test Sample	LOD	Units	Symbol	SAL References
Arsenic	T6	AR	1	mg/kg	U	003,006,009,011,014
Cadmium	T6	AR	1	mg/kg	U	003,006,009,011,014
Chromium	T6	AR	1	mg/kg	U	003,006,009,011,014
Lead	T6	AR	1	mg/kg	U	003,006,009,011,014
Mercury	T6	AR	1	mg/kg	U	003,006,009,011,014
Selenium	T6	AR	3	mg/kg	U	003,006,009,011,014
Copper	T6	AR	1	mg/kg	U	003,006,009,011,014
Nickel	T6	AR	1	mg/kg	U	003,006,009,011,014
Zinc	T6	AR	1	mg/kg	U	003,006,009,011,014
pH	T7	AR			U	003,006,009,011,014
SO4(Total)	T6	AR	0.01	%	N	003,006,009,011,014
SO4(2:1)	T6	AR	0.1	g/l	N	003,006,009,011,014
Cyanide(Total)	T4	AR	1	mg/kg	U	003,006,009,011,014
Phenols(Mono)	T4	AR	1	mg/kg	U	003,006,009,011,014
Chromium VI	T6	AR	1	mg/kg	N	003,006,009,011,014
As (Dissolved)	T281	10:1	0.2	µg/l	U	003,006,014
Cd (Dissolved)	T281	10:1	0.02	µg/l	U	003,006,014
Cr (Dissolved)	T281	10:1	1	µg/l	U	003,006,014
Pb (Dissolved)	T281	10:1	0.3	µg/l	U	003,006,014
Hg (Dissolved)	T281	10:1	0.05	µg/l	U	003,006,014
Se (Dissolved)	T281	10:1	0.5	µg/l	U	003,006,014
Cu (Dissolved)	T281	10:1	0.5	µg/l	U	003,006,014
Ni (Dissolved)	T281	10:1	1	µg/l	U	003,006,014
Zn (Dissolved)	T281	10:1	2	µg/l	U	003,006,014
pH	T7	10:1			U	003,006,014
Cyanide(Total)	T4	10:1	50	µg/l	U	003,006,014
Phenols(Mono)	T4	10:1	100	µg/l	U	003,006,014
Chromium VI	T686	10:1	3	µg/l	U	003,006,014
Sulphate	T686	10:1	500	µg/l	U	003,006,014
Naphthalene	T149	AR	0.01	mg/kg	U	003,006,009,011,014
Acenaphthylene	T149	AR	0.01	mg/kg	U	003,006,009,011,014
Acenaphthene	T149	AR	0.01	mg/kg	U	003,006,009,011,014
Fluorene	T149	AR	0.01	mg/kg	U	003,006,009,011,014
Phenanthrene	T149	AR	0.01	mg/kg	U	003,006,009,011,014
Anthracene	T149	AR	0.01	mg/kg	U	003,006,009,011,014
Fluoranthene	T149	AR	0.01	mg/kg	U	003,006,009,011,014
Pyrene	T149	AR	0.01	mg/kg	U	003,006,009,011,014
Benzo(a)Anthracene	T149	AR	0.01	mg/kg	U	003,006,009,011,014
Chrysene	T149	AR	0.01	mg/kg	U	003,006,009,011,014
Benzo(b/k)Fluoranthene	T149	AR	0.01	mg/kg	U	003,006,009,011,014
Benzo(a)Pyrene	T149	AR	0.01	mg/kg	U	003,006,009,011,014
Indeno(123-cd)Pyrene	T149	AR	0.01	mg/kg	U	003,006,009,011,014
Dibenzo(ah)Anthracene	T149	AR	0.01	mg/kg	U	003,006,009,011,014
Benzo(ghi)Perylene	T149	AR	0.01	mg/kg	U	003,006,009,011,014
PAH(total)	T149	AR	0.01	mg/kg	U	003,006,009,011,014
Naphthalene	T149	10:1	0.01	µg/l	U	003,006,014
Acenaphthylene	T149	10:1	0.01	µg/l	U	003,006,014
Acenaphthene	T149	10:1	0.01	µg/l	U	003,006,014
Fluorene	T149	10:1	0.01	µg/l	U	003,006,014
Phenanthrene	T149	10:1	0.01	µg/l	U	003,006,014

Determinand	Method	Test Sample	LOD	Units	Symbol	SAL References
Anthracene	T149	10:1	0.01	µg/l	U	003,006,014
Fluoranthene	T149	10:1	0.01	µg/l	U	003,006,014
Pyrene	T149	10:1	0.01	µg/l	U	003,006,014
Benzo(a)Anthracene	T149	10:1	0.01	µg/l	U	003,006,014
Chrysene	T149	10:1	0.01	µg/l	U	003,006,014
Benzo(b/k)Fluoranthene	T149	10:1	0.01	µg/l	U	003,006,014
Benzo(a)Pyrene	T149	10:1	0.01	µg/l	U	003,006,014
Indeno(123-cd)Pyrene	T149	10:1	0.01	µg/l	U	003,006,014
Dibenzo(ah)Anthracene	T149	10:1	0.01	µg/l	U	003,006,014
Benzo(ghi)Perylene	T149	10:1	0.01	µg/l	U	003,006,014
PAH(total)	T149	10:1	0.01	µg/l	U	003,006,014
TPH (C5-C6)	T215	10:1	10	µg/l	N	003,006,014
TPH (C6-C8)	T215	10:1	10	µg/l	N	003,006,014
TPH (C8-C10) DW	T215	10:1	10	µg/l	N	003,006,014
TPH (C10-C12) DW	T81	10:1	10	µg/l	U	003,006,014
TPH (C12-C16) DW	T81	10:1	10	µg/l	U	003,006,014
TPH (C16-C21) DW	T81	10:1	10	µg/l	U	003,006,014
TPH (C21-C35) DW	T81	10:1	10	µg/l	U	003,006,014
TPH (C5-C6)	T54	AR	0.10	mg/kg	N	003,006,009,011,014
TPH (C6-C8)	T54	AR	0.10	mg/kg	N	003,006,009,011,014
TPH (C8-C10)	T54	AR	0.10	mg/kg	N	003,006,009,011,014
TPH (C10-C12)	T8	AR	1	mg/kg	U	003,006,009,011,014
TPH (C12-C16)	T8	AR	1	mg/kg	U	003,006,009,011,014
TPH (C16-C21)	T8	AR	1	mg/kg	U	003,006,009,011,014
TPH (C21-C35)	T8	AR	1	mg/kg	U	003,006,009,011,014
Asbestos ID	T27	AR			SU	003,006,009,011
Total Organic Carbon	T21	AR	0.1	%	N	009,014



APPENDIX VII
ORIGIN OF TIER I VALUES

APPENDIX VIII ORIGIN OF TIER I VALUES

ORIGIN OF REC TIER I VALUES

Constituent	Origin of Risk Assessment Value
Arsenic	2009 SGV
Cadmium	LQM CIEH 2 nd Edition 2009
Chromium	LQM CIEH 2 nd Edition 2009
Lead	Residential Half 2003 EA SGV based on planned target blood lead level reduction to 5µg/l. Commercial Calculated using commercial exposure equation within lead SGV 2003 with revised input data from HPA and taking proposed blood lead levels into account.
Mercury	2009 SGV
Nickel	2009 SGV
Selenium	Soil guideline value, DEFRA/Environment Agency
Copper	LQM CIEH 2 nd Edition 2009
Zinc	LQM CIEH 2 nd Edition 2009
Cyanide - Total	CLEA 1.06 Derived Value
Phenols - Total.	LQM CIEH 2 nd Edition 2009 – 1% SOM
Naphthalene	General Assessment Criteria (GAC) developed by CIEH / LQM the using CLEA 1-06 with supporting data from SR3, SR7 and existing Tox report where applicable. 1% SOM
Acenaphthylene	
Acenaphthene	
Fluorene	
Phenanthrene	
Anthracene	
Fluoranthene	
Pyrene	
Benzo(a)Anthracene ⁽ⁱ⁾	
Chrysene	
Benzo(b/k)Fluoranthene ⁽ⁱⁱⁱ⁾	
Benzo(a)Pyrene	
Indeno(123-cd)Pyrene	
Dibenzo(a,h)Anthracene	
Benzo(ghi)Perylene	
TPH C ₅ -C ₆ (aliphatic)	
TPH C ₆ -C ₈ (aliphatic)	
TPH C ₈ -C ₁₀ (aliphatic)	
TPH C ₁₀ -C ₁₂ (aliphatic)	
TPH C ₁₂ -C ₁₆ (aromatic)	
TPH C ₁₆ -C ₂₁ (aromatic)	
TPH C ₂₁ -C ₃₅ (aromatic)	

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REC Ltd is a multi-disciplinary health, safety, environmental and energy consultancy. Our national coverage enables our local experts to provide cost effective and pragmatic consultancy services in an efficient and sustainable manner.



- Feasibility Studies
- Ground Source Heat Pumps Installation
- Air Source Heat Pump Installation
- System Design and Maintenance
- Solar Photovoltaic (PV) Systems
- Combined Heat and Power Systems



- Sound Insulation Testing
- Noise at Work Assessment
- Development Related Noise / Vibration
- Environmental Noise / Vibration



- Phase 1 Habitat Surveys
- Invasive Species
- Legally Protected Species Surveys
- Mitigation Schemes
- Ecological Impact Assessment (EclA)
- BREEAM & Code 4 Sustainable Homes
- Habitat Management Plans
- Management planning and targeted Biodiversity Action Plan survey
- Environmental Impact Assessment



- Asbestos Management Surveys
- Demolition/Refurbishment Surveys
- Analysis of Asbestos in Soils and Bulk Samples
- Air Testing for Clearances and Reassurance
- Legionella Risk Assessment



- Flood Risk & Consequence Assessment
- Strategic Flood Risk Assessment (SFRA)
- EIA Technical Chapters
- Assessment of Flood Levels
- Hydrology & Hydrogeology
- Flood Defence Structures
- Drainage Systems (SUDS) Design
- Mitigation Measures
- Soakaway Tests



- Air Quality Impact
- Odour Assessment
- Dispersion Modelling
- Stack Emission Testing
- Pollution Monitoring



- Geotechnical Investigation & Assessment
- Contaminated Land Investigation & Assessment
- Waste Management
- Groundwater Testing
- Environmental Impact Assessment



- Health, Safety & Environmental Management Systems
- Divestment / Acquisition Due Diligence Services
- Environment Permit Application & Support
- Compliance Auditing
- Carbon Reporting
- Waste Minimisation