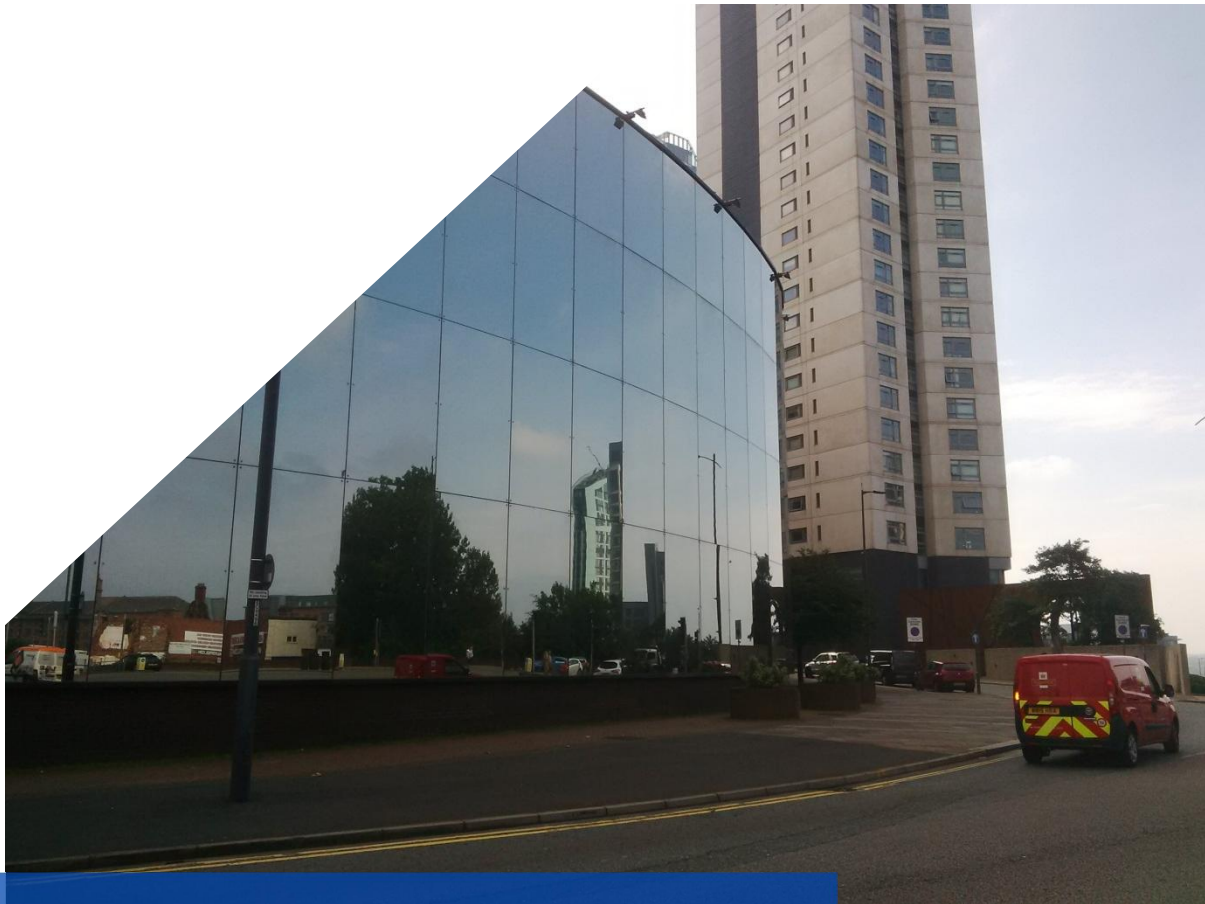


REPORT N^o 70023367-401/10635

122 OLD HALL STREET, LIVERPOOL

PHASE 1 PRELIMINARY ENVIRONMENTAL RISK ASSESSMENT



NOVEMBER 2016

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122 Old Hall Street Limited

Report no: 70023367-401/10635(1)
Date: November 2016

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1 INTRODUCTION

1.1 AUTHORISATION

WSP | Parsons Brinckerhoff was instructed by 122 Old Hall Street Limited (the Client) to undertake a Phase 1 Preliminary Environmental Risk Assessment. A site location plan is provided as Figure 1 in **Appendix A**.

1.2 AIMS AND OBJECTIVES

The purpose of this report is to provide information on the ground conditions and potential contamination status of the site and identify associated issues that could impact on the site's redevelopment in support of a planning application. The report includes a ground model, assessment of the potential risks associated with contamination due to current and historical uses and presents a preliminary conceptual site model in accordance with Model Procedures for the Management of Land Contamination (CLR11).

1.3 SOURCES OF INFORMATION

This report has been prepared using the information sources listed below:

- Site walkover completed by WSP | PB on 21 September 2016 (photographs in **Appendix B**).
- Landmark Envirocheck report Reference 98339759_1_1, dated 22 September 2016 (**Appendix C**).
- Historical Ordnance Survey maps, town plans and detailed historical building plans (**Appendix D**) contained within the above Envirocheck report.
- Flood Screening Report reference 98339759_1_1, dated 22 September 2016 (**Appendix F**).
- Zetica Pre-Desk Study Unexploded Ordnance (UXO) Assessment (**Appendix E**).
- British Geological Survey (BGS) geology viewer available online.
- BGS 1:50,000 Geological Maps, Sheet 96 (Liverpool), Solid and Drift editions.
- Online environmental data available on the Environment Agency (EA) website.

It should be noted that the site boundary indicated on the Envirocheck plans, the Envirocheck report and Flood Screening Report relates to a previous site boundary rather than the current site boundary, which comprises the north-eastern part of the area. The current site boundary and the Envirocheck report site boundary are indicated on Figure 2.

1.4 LIMITATIONS

General limitations of this assessment and information on the approach used are outlined in **Appendix G**.

2

SITE INFORMATION

Site Address	122 Old Hall Street, Liverpool, L3 9BD
National Grid Reference Coordinates	SJ 339 910
Area	0.1 Ha (1,100m ²)
Site Location and Boundaries	<p>The site is located to the northwest of Liverpool city centre within the dock area of the city, approximately 440m east of the River Mersey. The area is currently used as a car park.</p> <p>The site is located to the east of the northern end of Back Leeds Street and south of Leeds Street (A5053). A site layout plan is presented as Figure 2 in Appendix A. The site has the following surrounding land uses:</p> <ul style="list-style-type: none"> • North: Leeds Street with car dealership beyond. • East: Multi-storey Car Park • South: Car parks with BT substation beyond. • West: Back Leeds Street with a data centre building beyond.
Current Site Use	The site is currently used for car parking.
Site Description	<p>The site is roughly rectangular in shape and comprises a fenced tarmac surfaced ground level car park.</p> <p>The northern end of an approximately 2.5m tall embankment associated with a former rail spur encroaches into the south-eastern part of the site. The embankment is covered with dense shrubs and is topped with concrete blocks. During the site walkover, a WSP Parsons Brinckerhoff engineer recorded several sightings of rats within the vegetation of the embankment. The rest of the site is generally flat.</p> <p>The site is at an elevation of approximately 15m above Ordnance Datum (AOD).</p>
Proposed Development	The proposed re-development is understood to comprise one high-rise (27 Storeys) tower (Tower 1) for residential use, with a double-story basement for plant and building services at a finished floor level of 7.3m AOD.

3

SITE SETTING & HISTORY

3.1

PUBLISHED GEOLOGY

British Geological Survey (BGS) geological map Sheet 96, Liverpool, scale 1:50,000, Solid and Drift editions, show the site to be underlain by the following:

Table 3.1 Summary of Mapped Geology

Geological Unit	Description	Aquifer Designation*
Superficial Deposits: Glacial Till	Variable lithology, usually sandy, gravelly clay.	Secondary Aquifer (undifferentiated)
Bedrock: Chester Pebble Beds	Sandstone, fine- to coarse-grained, commonly pebbly, with conglomerates and sporadic siltstones; cross-stratified	Principal

Available online borehole logs from the British Geological Survey (BGS) for boreholes referenced SJ39SW108, located approximately 50m east of the site, indicate the presence of Made Ground comprising cobbles, ash concrete, bricks and rubble to depths of approximately 6 feet (1.8m) bgl, over Boulder Clay (Glacial Till) to 25 feet (7.6 m) bgl over red-brown sandstone. Boreholes SJ39SW/64A-F record ground conditions 50m southwest of site (beneath Lancaster House), with Boulder Clay commencing at 1-2 feet (0.3-0.6m) bgl present to between 10 feet and 13 feet (3-4m) bgl, overlying dense cemented red sand to approximately 12 feet (3.7m) bgl. Sandstone bedrock was recorded underlying the cemented sand. BGS borehole logs are presented in **Appendix C**.

The British Geological map (Sheet 96, Liverpool, scale 1:50,000, Solid and Drift) records the north-south trending Castle Field Fault to be located approximately 130m to the east of the site.

3.2

GROUND STABILITY

The Envirocheck Report classes the potential for collapsible ground, compressible ground, ground dissolution, landslide, running sand and shrinking or swelling clay ground stability hazards on site as either Very Low or No Hazard. The Envirocheck Report does identify one area 200m west of the site as a moderate hazard potential for compressible ground stability hazards.

3.3

MINING AND MINERAL SITES

The site is not within a Coal Mining Affected Area and has not been affected by any mineral extraction.

3.4

LANDFILLS

There are no recorded landfill sites on the site, though there are three historical landfill sites within 1km of the site boundary. All three are associated with infilling of the old docks on the River Mersey. The closest of these is Waterloo Dock River Entrance 500m west of site, which last received waste in 1985. The type of material used to infill these sites are not specified within the Envirocheck report.

Site sensitivity plans from the Envirocheck Report show an area of potentially infilled land (water) to the west of the site, which is shown on historical maps as part of the Old Mill Street Basin of the Liverpool Canal. This was marked as disused by 1888 and was later infilled. This area is indicated on Figure 2.

3.5 RADON

The Envirocheck Report indicates the area is in a lower probability radon area with less than 1% of homes above the action level and that no radon protection measures are necessary in the construction of new dwellings or extensions.

3.6 HYDROGEOLOGY

The Glacial Till is classified by the Environment Agency as a Secondary Aquifer, whilst the underlying Chester Pebble Beds is classified as a Principal Aquifer.

The site is not within a groundwater Source Protection Zone, as defined by the Environment Agency. There are 10 recorded Water Abstractions within 500m of the site boundary. There are four entries registered to ECF at 90m south of the site for the purpose of non-evaporative cooling. Four abstractions are registered to Trinity Mirror PLC at 323-326m south of the site for the use in heat pumps and non-evaporative cooling. Two abstractions are licensed to J Bibby & Sons Ltd at 261-292m from site for the purpose of cooling.

BGS borehole logs SJ39SW/EA-F did not record any information regarding groundwater depths. Borehole log SJ39SW108 records that no groundwater was encountered during drilling to a depth of 34 feet 6 inches (10.5m).

3.7 HYDROLOGY

Princes Dock on the River Mersey is the nearest surface water feature located 330m to the west of the site. The River Mersey is located beyond the dock to the west.

The Flood Screening Report indicates that the site has a negligible risk of groundwater flooding (negligible risk is classified as <1% probability of occurrence). The site is within a postcode sector that is classified as having a medium flood insurance claim rating.

3.8 SENSITIVE LAND USES

The Envirocheck Report has identified that as of 2004, the site has been included within the World Heritage Site of Liverpool Maritime Mercantile City.

3.9 SITE HISTORY

The Envirocheck historical maps are presented in **Appendix D** (note the site boundary indicated on the maps relates to a previous boundary). The maps have been reviewed and details are also provided in **Appendix D** (in relation to the previous site boundary). A summary of the pertinent details of the site history is provided below.

The earliest available historical map (1850) shows the site to be occupied by a coal yard, likely associated with the Old Mill Street Basin of the Liverpool and Leeds Canal, located approximately 30m to the west of the site. By 1884, the basin is marked as disused and shown to have been infilled, with the coal yard shown until 1891. Back Leeds Street is shown to run along the site's southern boundary until 1891, when it was rerouted to its current path along the western boundary.

Historical building plans dated 1900 show the site was redeveloped as a metal polishers and a cardboard box factory with further industrial units to the southeast of the site. Several rail sidings are shown off site to the east associated Whitbread & co Ltd bottling services. Liverpool Exchange Station is located to the south east of the site.

By 1927, a railway siding is shown terminating within the south-eastern corner of the site, along the line of the embankment that is still present. Maps indicate the track was removed by 1984; however, the concrete track stops are still present.

An oil tank is shown from 1927 approximately 20m to the southeast of the site.

The metal polish and cardboard factory that were located on the site were converted to a warehouse by 1954, which by 1963 had changed into an engineering works. A small tank is shown on the 1963 map just off site along the railway siding. The building along the eastern side of the site was demolished in the 1970s and replaced with car parks.

The 1984 map shows three substations present off site to the southeast. Satellite imagery suggests that two of these have been demolished since 2010. The railway line that is shown on historical maps some 30m to the east of the site is recorded to have been converted to a railway tunnel by 1982. The historical maps show that the present day oval shaped building to the west of the site, identified as a data centre, was built in the early 1990s.

According to online information, the Williamson tunnels, which were constructed between 1810 and 1840 beneath Liverpool are not recorded in the area. The tunnels are located to the east of Liverpool Metropolitan Cathedral in the Edge Hill area of Liverpool, approximately 2.5km to the southeast of the site.

3.10

REGULATORY INFORMATION

Other regulatory information contained within the Envirocheck Report for the site is summarised in **Table 2**, below.

Table 2 – Regulatory Information

ISSUE	DETAILS
Pollution Incidents to Controlled Waters (PICW)	There have been no PICWs recorded on the site. There have been six within 500m of the site, all of which have been recorded as minor incidents.
Discharge Consents (DC)	There are 16 current discharge consents within 500m of the site. Three of these involve the reinjection of cooling of waters into a borehole, 147m southwest of the site at St Pauls Square. These are potentially associated with the aforementioned heat pumps. The rest are discharges into the river Mersey, generally of surface water sewage.
Integrated Pollution Prevention and Control (IPPC)	No IPPCs have been identified within 500m of the site boundary.
Local Authority Pollution Prevention Controls (LAPPC)	Six LAPPCs have been identified within 500m of the site boundary. The closest of these is 75m north of the site for a part B process. The next closest is 154m northwest for a petrol filling station (Costco).
Fuel Station Entries	There are four fuel stations within 1km of the site, the closest of which is the Costco Liverpool Automat at Waterloo Street, 181m northwest of the site. Elf service station is located 239m northeast of site.
Contemporary Trade Directories (CTD)	180 CTD entries are recorded within 500m of the site. These include 14 within 100m, including a car breakers and dismantlers 167m southeast of the site. The closest CTD

ISSUE	DETAILS
	<p>entry is located 167m southwest of site and is recorded as a Copy Technology Ltd. (photocopiers).</p> <p>Within 500m of the site, there are no registered waste transfer sites or waste treatment and disposal sites.</p>

3.11

UNEXPLODED ORDNANCE (UXO)

A pre-desk study assessment in relation to potential unexploded ordnance at the site was produced by Zetica for WSP | Parsons Brinckerhoff dated 03 October 2016 and is presented as **Appendix E**. The study concluded that significant bombing of the immediate vicinity of the site occurred during the Second World War and recommended a detailed desk study to further assess the potential presence of unexploded ordnance.

4

PRELIMINARY CONCEPTUAL SITE MODEL (CSM)

4.1 PRELIMINARY GROUND MODEL

The preliminary conceptual site model considers the potential contamination sources and the context of the environmental setting along with the proposed site use. It provides an assessment of the potential complete pollutant linkages between contamination sources and sensitive environmental or human receptors.

The preliminary ground model has been developed using published data and observations made during a site walkover. It is not supported by intrusive investigation.

The site is expected to be underlain by Made Ground associated with previous development. Made Ground thickness is expected to be greatest in areas of former foundations and in the railway embankment in the east of the site.

Superficial deposits are indicated to be present as Glacial Till, consisting predominately of clay with some sand and gravel content. The depth to base of these superficial deposits is indicated to be approximately 25 feet (7.6m) by the BGS borehole logs. The depth to the top of this stratum is likely to vary where previous building foundations occur, and. It is expected that the superficial deposits will be underlain by sandstone bedrock (Principal Aquifer).

The site is in close proximity to the River Mersey and as such groundwater is expected to be in continuity with the river. BGS borehole log SJ39SW108 (**Appendix C**) records that no groundwater was encountered during drilling to a depth of 34 feet 6 inches (10.5m).

4.2 POTENTIAL PRIMARY SOURCES OF CONTAMINATION

- Infill materials / Made Ground within areas of former foundations and embankment.
- Historical and current tanks to the east and west of the site.
- Previous industrial uses of the site.
- Sub-stations present off-site to the southeast.

4.3 POLLUTANT LINKAGE ASSESSMENT

The potential contaminants (sources), receptors that could be impacted and pathways, via which sources and receptors may be connected, are described below. These pollutant linkages assume redevelopment of the site as a high-density residential housing development (without gardens).

Potential Contaminant Sources

Given the historical use of the site the following potential contaminative sources are considered to be limited to:

- Potential contamination (including asbestos containing materials and asbestos fibres in soil) within Made Ground / historical fill materials;
- Generation of hazardous ground gases from significant areas of Made Ground or organic soils (if present);

- Potential contamination associated with spills/leakages from the Metal Polish Works, Engineering Works and other industrial uses previously present on site;
- Potential contamination associated with spills/leakages from the oil and fuel tanks and fuel lines currently and historically present in the immediate vicinity of site; and
- Potential contamination sourced from cooling oil spills/leakages from the substations previously present in the immediate vicinity of site (possibly containing polychlorinated biphenyls).

Potential Receptors

Relevant potential receptors are considered to include:

- Future construction workers during redevelopment.
- Neighbouring site users during redevelopment.
- Future site users.
- Future maintenance workers.
- Future building services (such as potable water pipes).
- Surface waters (River Mersey).
- Groundwater (Primary Aquifer – Bedrock).

Potential Contaminant Pathways

Relevant potential pathways are considered to include:

- Direct contact, ingestion or inhalation of soil bound contaminants / dust.
- Inhalation of vapours associated with soil / groundwater contamination.
- Migration of leachable contamination.
- Migration of potential ground gas into on-site or neighbouring buildings, causing asphyxiation or risk of explosion.

Potentially Complete Pollutant Linkages

The site has a long industrial history and as such there is potential for contamination to be present. The potentially complete pollutant linkages are considered to be:

1. Direct contact, ingestion or inhalation of soil-bound contamination during redevelopment by construction workers.
2. Inhalation of ground gases by construction workers and future site users following redevelopment.
3. Inhalation of vapours associated with ground contamination by construction workers, future site users and neighbouring site users during redevelopment.
4. Direct contact, ingestion or inhalation of soil-bound contamination by future site users and maintenance workers, following redevelopment.
5. Migration of mobile contamination to surface waters and the wider groundwater environment.
6. Direct contact between contamination in soil/groundwater and future below ground structures.

4.4**WASTE CLASSIFICATION**

If contaminated soil / Made Ground is present at the site, there is a potential for this material to be classified as hazardous waste if it were taken off site for disposal at landfill, which may have significant cost implications for the redevelopment given the proposal to excavate a two-storey basement.

Consideration should be given to the future waste classification of any excess material and associated disposal costs, particularly if significant volumes of spoil are expected to be generated in the course of basement and/or foundation construction.

Potential contamination within groundwater should also be considered in relation to de-watering options.

5

POTENTIAL GEOTECHNICAL CONSTRAINTS

5.1

GROUND CONDITIONS, FOUNDATIONS AND BASEMENT CONSTRUCTION

Based on available geological and historical information, it is likely that the site is underlain by a sequence of Made Ground, Glacial Till and the Chester Pebble Beds. The historical boreholes undertaken on the land boundary southwest of the site suggest that weathered rock is present at between 2.5m and 4.0m bgl (approximately 8-13 feet).

Given that the basement excavation is likely to be in excess of 10m deep it is considered at this stage that the development could in theory be founded on a raft foundation. At this depth it is considered likely that the development will be founded below the invert level of the railway tunnels adjacent to the eastern boundary of the site and are, therefore, unlikely to have any significant detrimental effect on the integrity of the tunnels. However, the tunnel levels should be ascertained to confirm this is the case and it is likely that a formal approvals process will need to be undertaken. This may include detailed modelling to assess potential increases in stress and ground movements.

The possible presence of the Castle Street Fault adjacent to the eastern boundary of the site is noted in Section 3.1. It is possible that the rock mass in the immediate vicinity of the fault may have an increased weathering profile or have a weakened / broken state compared to the typical rock mass. Such zones may be very localised and difficult to locate through investigation, particularly as the position of the fault is conjectured. If such weathered/weakened zones are encountered during foundation excavation an appropriately qualified engineer should inspect the formation to determine the appropriate remedial action. This may comprise grouting, or the deepening of the foundations locally.

A basement retention system will be required to control deflections and ground movement on the site boundaries. This is likely to be in the form of a contiguous or secant bored pile wall.

It is likely that the groundwater will be encountered within the excavation and dewatering may be required. Groundwater level and the permeability of the bedrock will need to be confirmed as part of any future ground investigation. Analysis is required to establish the chemical quality of the groundwater, which may have an impact on disposal costs.

5.2

OBSTRUCTIONS AND EXCAVATABILITY

Below ground obstructions associated with previous phases of development should be anticipated across the site. Such obstructions could present a risk to the installation of the basement retention system and the basement excavation. Careful consideration should be given to appropriate mitigation measures to deal with any obstructions.

Based on the available data, the majority of the basement excavation may be undertaken through bedrock. Therefore, rock coring and laboratory strength testing will be required to assess the excavation methodology required, but at this stage it is anticipated that hard digging with the use of hydraulic breakers may be required to reach formation level.

5.3

UXO

As outlined in Section 3.11 a pre-desk study assessment undertaken by Zetica UXO concluded that significant bombing of the immediate vicinity of the site occurred during the Second World War. A further detailed desk study is recommended to further assess the potential risk.

It is the responsibility of the Principal Contractor to ensure that the UXO risk is appropriately addressed and mitigated during the groundworks. In planning mitigation measures, reference should be made to CIRIA 681 '*Unexploded Ordnance (UXO) – A Guide for the Construction Industry*' 2009.

6

CONCLUSIONS AND RECOMMENDATIONS

6.1

CONCLUSIONS

Contamination

The potential for deep Made Ground and the former industrial use of the site gives rise to the potential for soil and groundwater contamination. Made Ground materials may also contain asbestos containing materials or asbestos fibres and produce hazardous ground gases. As a result, a number of potentially complete pollutant linkages have been identified.

The presence of chemical or asbestos contamination within excess excavated soils will have implications for material reuse or off-site disposal to landfill and, along with groundwater quality, should be considered and assessed during any intrusive investigation.

Geotechnical

Given that the basement excavation is likely to be in excess of 10m deep it is considered at this stage that the development could in theory be founded on a raft foundation. The tunnels adjacent to the eastern boundary of the site are unlikely to be affected by site redevelopment; however the tunnel levels should be ascertained to confirm this is the case. Detailed modelling may be required to assess potential increases in stress and ground movements.

It is possible that the rock mass in the immediate vicinity of the Castle Street Fault may have an increased weathering profile or have a weakened / broken state and if such zones are encountered during foundation excavation should be inspected by an appropriately qualified engineer.

A basement retention system will be required to control deflections and ground movement on the site boundaries. This is likely to be in the form of a contiguous or secant bored pile wall.

Below ground obstructions associated with the substructure from existing / previous phases could present a risk to the installation of the basement retention system and the basement excavation, the majority of which may be undertaken through bedrock.

6.2

RECOMMENDATIONS

Based on the data presented within this report it is recommended that an intrusive investigation is completed to confirm the presence/absence of risks associated with contamination and to provide geotechnical information. The production of an intrusive investigation report and remediation strategy (if required) is likely to be a condition of the planning permission.

The groundwater level and the permeability of the bedrock will need to be confirmed as part of any future ground investigation. As outlined in Section 3.11 a pre-desk study assessment undertaken by Zetica UXO concluded that significant bombing of the immediate vicinity of the site occurred during the Second World War. A detailed UXO desk study is recommended to assess the potential UXO risk in more detail prior to ground disturbance works.