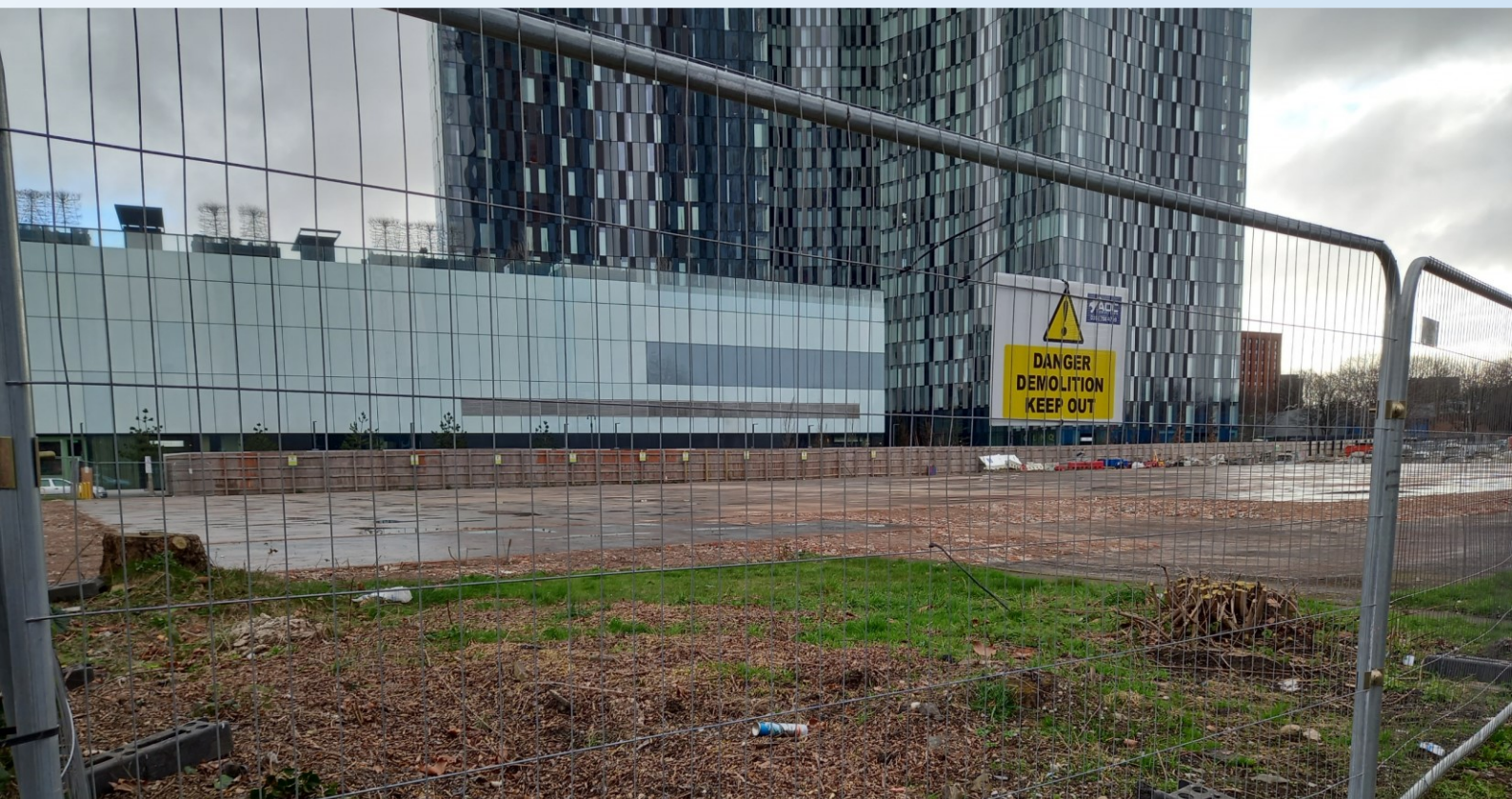




Renaker Build Ltd

CROWN STREET PHASE 3, MANCHESTER

Geo-environmental Preliminary Risk Assessment





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Geo-environmental Preliminary Risk Assessment

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1 INTRODUCTION

1.1 AUTHORISATION

WSP UK Ltd (WSP) was instructed by Renaker Build Ltd (Renaker) to undertake a Geo-environmental Preliminary Risk Assessment (PRA) for the proposed Crown Street Phase 3 development at Great Jackson Street in Manchester (the site).

1.2 SITE BACKGROUND

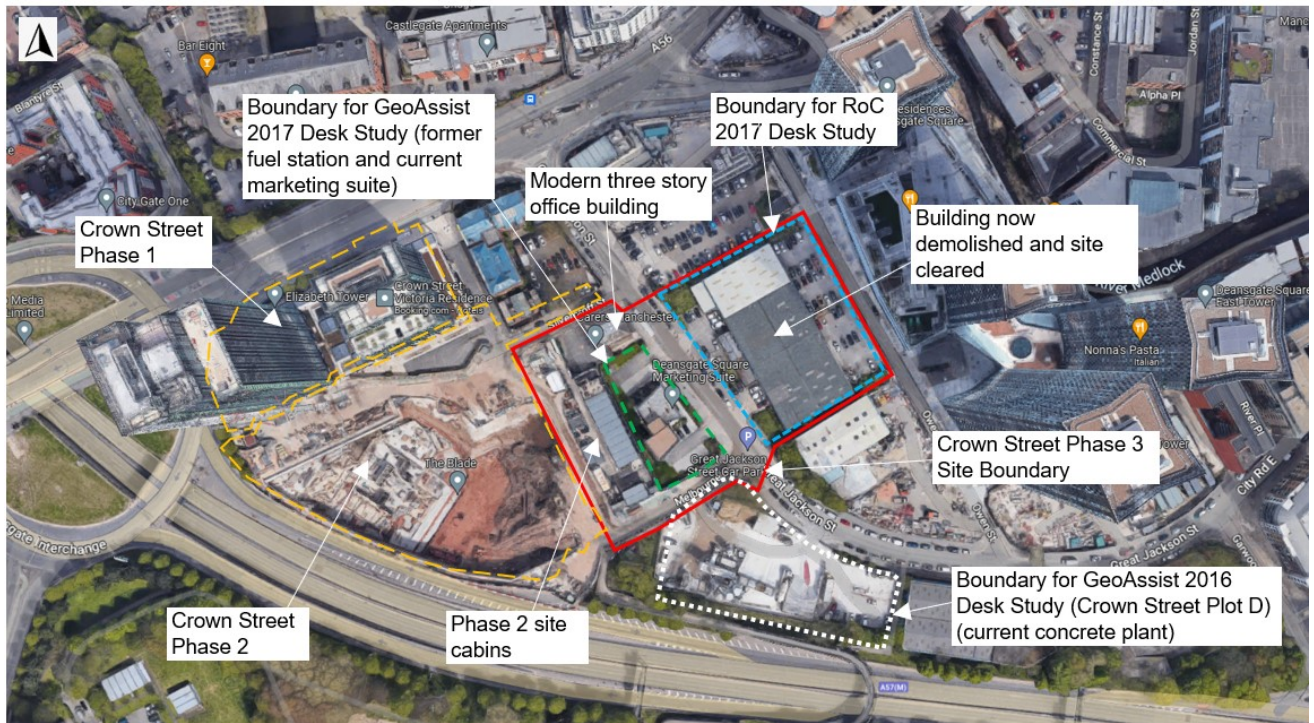
The site is the third phase in Renaker's Crown Street development. It is located adjacent to the northeast of Crown Street Phase 2 development (currently under construction) comprising three levels of below ground car parking, high rise residential apartments and a primary school.

The site includes a former fuel station in the west, which has been replaced with a two story contemporary marketing suite serving the earlier phases of the development. The area to the west of the marketing suite is occupied by construction cabins for Phase 2 and a recently constructed office building occupies the area to the north of the marketing suite.

Various previous reports are available for portions of the site; however, the report presented herein covers the whole of the Phase 3 area.

A site location plan and site layout plan are included as Figure 1 and Figure 2 respectively in Appendix A. The various site boundaries are also shown on an aerial image in Figure A below.

Figure A: Crown Street Phase 3 Site Boundary Plan (Google maps)



1.3 PROPOSED DEVELOPMENT

It is understood that the site is proposed to be redeveloped with a number of multi-storey residential blocks similar to those in Zone 2 and will likely include a basement car park, hardstanding and soft landscaping. A proposed development layout was not available at the time of writing.

It is assumed that the office building and marketing suite building in the northwest of the site will be retained within the Phase 3 development. WSP is not aware of the final intended use of the marketing suite.

1.4 OBJECTIVE AND SCOPE OF WORKS

The primary objective of this PRA is to identify potential ground contamination risks in relation to the proposed Phase 3 redevelopment for submission with a planning application. Information on other ground-related development constraints, which may be important for pricing the development is also provided.

The scope of the assessment comprises the following:

- A desk-based review of regulatory records, published geological and hydrogeological data, historical mapping, Coal Authority mapping and radon risk status for the site
- An initial unexploded ordnance (UXO) screen
- Production of a conceptual site model and qualitative assessment of risk
- Preliminary geotechnical assessment of expected ground conditions and preliminary recommendations for potential substructure/earthworks solutions.

1.5 SOURCES OF INFORMATION

The sources of information reviewed in the production of this report are summarised in Table 1-1. A summary of the findings of third-party reports 2 to 5 is provided in Appendix B.

Table 1-1 – Sources of Information

Type	Source (and reference number)
Site Reconnaissance	1. Site walkover completed by WSP on 24 February 2023 (photographs included in Appendix B)
Third Party Information Provided	2. GeoAssist Ltd, Phase I Desk Study and Preliminary Contaminated Land Risk Assessment – 3M Site, Great Jackson Street, Manchester, Ref. 5818/RMS V1.00, August 2016 ('GeoAssist 2016' for Plot D – outside of site area) 3. RoC Consulting Ltd, Phase 1 Desk Study – Crown Street Phase 3, Ref. JB/AS/P1/3678, 29 June 2017 ('ROC 2017' for eastern portion of Phase 3). This report contains an Envirocheck report reference 127784717 (dated June 2017), the information from which has been utilised in the report presented herein. 4. GeoAssist Ltd, Phase I Desk Study and Preliminary Contaminated Land Risk Assessment – Crown Street - Zone 3, Great Jackson Street, Ref. 5894/GRL V1.00, November 2017 ('GeoAssist 2017' for proposed marketing suite) 5. Ramboll, Owen Street Marketing Suite – Contaminated Land Report, Ref. 1620004981, 04 October 2018 ('Ramboll 2018' report for ground investigation and tank pull on former petrol station)

Type	Source (and reference number)
	6. Manchester City Council Decision Notice for 18-26 Great Jackson Street (marketing suite site), dated 31 October 2018 – contaminated land condition discharged. This is presented in Appendix D.
Previous WSP Reports for Renaker	7. Crown Street Phase 2, Preliminary Risk Assessment, Ref 70059549-11451(1), dated February 2020 ('WSP PRA' for Crown Street Phase 2 area) – this report contains Groundsure report reference GS-6299586 (dated 10 Sept 2019), the information from which has been utilised in the report presented herein. 8. Crown Street Phase 2, Geo-Environmental Assessment Report, Ref 70059549-11515(4), dated September 2020 ('WSP GAR' report for a ground investigation on the Crown Street Phase 2 area)
Information obtained by WSP	9. Zetica Ltd, UXO Pre-Desk Study Assessment – Crown Street, Manchester, Greater Manchester, 20 February 2023.
Public Information	10. British Geological Survey (BGS) 1:50,000 scale geological data map sheet 085 Manchester, Bedrock & Superficial, 2011 11. BGS GeoIndex Viewer accessed via http://mapapps2.bgs.ac.uk/geindex/home.html 12. Coal Authority Interactive Map viewer accessed via https://mapapps2.bgs.ac.uk/coalauthority/home.html 13. UK Indicative Atlas of Radon in England and Wales accessed via http://www.ukradon.org/information/ukmaps.
Notes	This report contains British Geological Survey materials ©NERC 2019 and Environment Agency information ©Environment Agency.

1.6 CONFIDENTIALITY STATEMENT AND LIMITATIONS

The report is addressed to and may be relied upon by Renaker Build Ltd.

This report shall not be relied upon or transferred to any other parties without the express written authorisation of WSP. No responsibility will be accepted where this report is used in its entirety or in part, by any other party.

Information provided by others is taken in good faith as being accurate. WSP cannot and will not accept liability for any deficiencies in third party information. General Limitations are presented in Appendix C.

2 SITE DESCRIPTION AND ENVIRONMENTAL SETTING

2.1 SITE DESCRIPTION

The site is located in a mixed commercial and residential area southwest of Manchester city centre, approximately centred on National Grid Reference 383280E, 397290N. The relatively flat site covers an area of approximately 1.1ha and is bound by the Crown Street Zone 2 development to the west, Silvercroft Street in the north, Owen Street in the east, and Melbourne Street in the south. Great Jackson Street crosses the centre of the site from north-west to south-east.

The western portion of the site adjacent to Great Jackson Street has recently been developed by Renaker with a two-storey contemporary building used as a marketing suite (photographs 1 and 2, Appendix B). The area to the west of the marketing suite is currently used as site cabins for the Crown Street Zone 2 development. A three-storey office building is located in the northwest of the site, north of the present marketing suite (photograph 2, Appendix B).

The eastern half of the site (east of Great Jackson Street) is currently vacant land comprising concrete hardstanding across the footprint of a former warehouse building, tarmac and some soft landscaping (photograph 3, Appendix B). At the time of the site walkover the south-eastern part of this area was being used for storage of building materials and a temporary steel and glass structure (photograph 3, Appendix B). Heras fencing is present along Great Jackson Street and wooden panels along Owen Street. A site layout plan is included as Figure 2 in Appendix A.

Adjacent land uses comprise:

- Commercial buildings and a car park to the north
- Multi-storey residential buildings across Owen Street to the east.
- A commercial building and storage yard to the south-east
- A temporary concrete batching plant across Melbourne Street to the south (Plot D site)
- Multi-storey residential buildings under construction to the north-west and west

2.2 GEOLOGY AND MINING

2.2.1 PUBLISHED GEOLOGY

A review of the BGS geological maps for the site and the BGS GeoIndex (Refs. 10-11) was undertaken. The records indicate the site to be underlain by Glaciofluvial Sheet Deposits comprising sands and gravels. Made Ground is not recorded on site by the BGS. The underlying solid strata are indicated to comprise sandstone of the Chester Formation.

The nearest fault to the site is the West Manchester Fault located 680m to the east of the site, trending north-west to south-east with a downthrow to the north-east. The Pendleton Fault is located 1km to the west, trending north-west to south-east with a downthrow to the north-east.

BGS records are available for several historical boreholes located near the site. The following BGS borehole records have been reviewed:

- SJ89NW3977 (30m west)
- SJ89NW3978 (30m west)
- SJ89NW3974 (100m south)
- SJ89NW1219 (20m north-east)

- SJ89NW1220 (35m north-east)
- SJ89NW1221 (50m north-east)
- SJ89NW1222 (70m north-east)

The recorded ground conditions are summarised in Table 2-1.

Table 2-1 – Summary of BGS Historical Borehole Records

Stratum	Range of Depth to Base (m bgl)	Typical Description
Made Ground	1.52-3.00	Predominantly granular fill, locally containing bricks, timber and steel; Locally absent.
Glaciofluvial deposits	2.50-3.66	Medium dense to very dense, locally loose sand and gravel
Glacial Till	3.80-7.77	Stiff brown stony clay
Bedrock	Depth to rockhead 0.90-8.08 Base not proven	Red or red/brown weathered sandstone

2.2.2 RECORDED GROUND CONDITIONS

In their investigation of the former fuel station in the west of the site, Ramboll (Ref. 5) reported Made Ground of crushed brick, concrete and sandstone to depths of between 1.5m bgl and 4.0m bgl over silt, sandy clays and sandy gravels, which they interpret to be re-worked natural materials given the amount of development the site has experienced. Localised hydrocarbon odours were noted in soils prior to tank removal. The report states there was no visual or olfactory evidence of contamination beneath the tanks during tank removal, although there was a mild hydrocarbon odour noted during the works. There is no information on the imported materials used to backfill the excavations.

The ground investigation undertaken on the Crown Street Phase 2 area (Ref. 8) recorded Made Ground to depths of between 0.8m bgl and 3.5m bgl, comprising generally sand with variable content of ash, clinker, gravel and cobbles of brick, masonry and concrete; likely to be demolition rubble associated with former buildings. Beneath the Made Ground was a layer of sand (Glaciofluvial deposits), which was absent in places, over a firm, stiff and very stiff gravelly clay (Glacial Till). Sandstone bedrock was encountered at depths of between 7.4m bgl and 11.2m bgl. Observations of potential contamination were limited to ash within Made Ground and a bituminous material around surface stone setts.

2.2.3 MINING

The Coal Authority Interactive Map Viewer (Ref. 12) does not indicate the site to be located in a Development High Risk Area. No mine entries are recorded within at least 500m of the site. The site is not shown to be underlain by recorded or probably coal mine workings.

The reviewed coal mining reports included in the third-party desk studies do not record the site to be in area that could be affected by underground mining.

2.3 HYDROGEOLOGY

2.3.1 PUBLISHED INFORMATION

The natural superficial deposits (Glaciofluvial Sheet Deposits) are classified as a Secondary A Aquifer. The underlying sandstone (Chester Formation) is classified as a Principal Aquifer. The Principal Aquifer has a high permeability and is classified as highly vulnerable.

A Source Protection Zone (Total Catchment Zone 3) is located ca. 400m to the east of the site. There are no active water abstraction licenses recorded within 250m of the site.

2.3.2 RECORDED GROUNDWATER CONDITIONS

Ramboll (Ref. 5) report groundwater beneath the former fuel station area at depths of between 2.3m bgl and 2.8m bgl. The report does not contain details of visual olfactory evidence of contamination in groundwater.

The WSP investigation on the Crown Street Phase 2 area recorded perched water within the Made Ground and superficial soils at a depth of approximately 2.5m bgl and deeper water within the sandstone resting at a depth of between 6m and 10m bgl, with potentially limited connectivity between the two groundwater bodies as a result of a layer of cohesive Glacial Till. Several chemical concentrations in groundwater were noted to be elevated above quality standards; however, it was concluded that materials within the Made Ground were the likely source of these concentrations and removal of the Made Ground to construct a basement car park would remove this potential ongoing source of groundwater contamination.

2.4 HYDROLOGY

The River Medlock is located ca. 80m to the east and 135m to the north of the site. The water quality rating is recorded as 'poor'.

The WSP Groundsure report indicates the site is not located in a zone at risk of flooding from rivers or the sea.

2.5 LANDFILLS

There are no historic, recent or current landfills recorded within 500m of the site.

2.6 GROUND STABILITY HAZARDS

Ground stability hazards recorded in the reviewed desk studies are summarised in Table 2-2.

Table 2-2 – Summary of Ground Stability Hazards

Stability Hazard	Hazard Risk Level
Potential for collapsible ground	Very low
Potential for compressible ground	No hazard
Potential for dissolution	No hazard
Potential for landslides	Very low

Stability Hazard	Hazard Risk Level
Potential for running sands	Very low
Potential for swelling or shrinking clays	Very low

2.7 RADON GAS

The UK Radon Atlas (Ref. 13) shows the site in an area in which less than 1% of homes are affected by radon gas above the action level.

Radon gas protection measures are therefore not required for new buildings on the site.

2.8 UNEXPLODED ORDNANCE HAZARDS

An Unexploded Ordnance (UXO) Pre Desk Study Assessment was obtained from Zetica Ltd (Ref. 9, Appendix D) to assess the risk from UXO on the site. The assessment identifies a number of potential historical bombing targets in the vicinity of the site. Reviewed records indicate that several bombs fell in close proximity of the site. The assessment therefore recommends that a detailed UXO desk study is undertaken to assess, and potentially zone, the UXO risk on the site.

Information from the Manchester Blitz maps (presented in the WSP Crown Street Phase 2 Phase 1 report) is reproduced in Figure B, below. This shows a high explosive strike within the eastern part of the site and several strikes in the surrounding area. Historical maps (discussed in Section 2) show most of the terraced houses that occupied the site prior to World War II (WWII) were no longer shown in post-war mapping.

Given the highly developed nature of the site it is considered unlikely that unexploded ordnance would have fallen on the site and remained undetected, particularly since the site would have been cleared following bomb damage and redeveloped after WWII. However, although this is considered likely to reduce the likelihood of encountering UXO, it is anticipated that redevelopment would have involved relatively shallow excavations for foundations and services and there is a potential for deeper as yet undisturbed UXO to remain.

2.9 SENSITIVE LAND USES

There are no environmentally sensitive or designated sites recorded within 1km of the site.

2.10 OTHER REGULATORY INFORMATION

The RoC Envirocheck report records an historic fuel station at the centre of the site to the west of Great Jackson Street (Castlefield Service Station), corresponding to the position on historical maps. The next closest record of a fuel station is a historical fuel station ca. 470m to the west of the site.

2.11 RELEVANT PLANNING RECORDS

A search of the planning portal for Manchester City Council was undertaken on 21 February 2023 for planning records relevant to the site.

A planning application for the erection of a two-storey marketing suite to the west of Great Jackson Street (18-26 Great Jackson Street, Manchester, M15 4NG) is recorded under ref. No. 118626/FO/2017.

The available documents for this planning application include a decision by Manchester City Council to discharge 'Condition 3 – Contaminated Land' for the planning application. The decision references the Ramboll ground investigation report from 2018 (Ref. 5).

Figure B Manchester Bomb Map (Blue circle = high explosive, Red circle = fire bomb, Pink shading = damaged building & Red shading = demolished building)

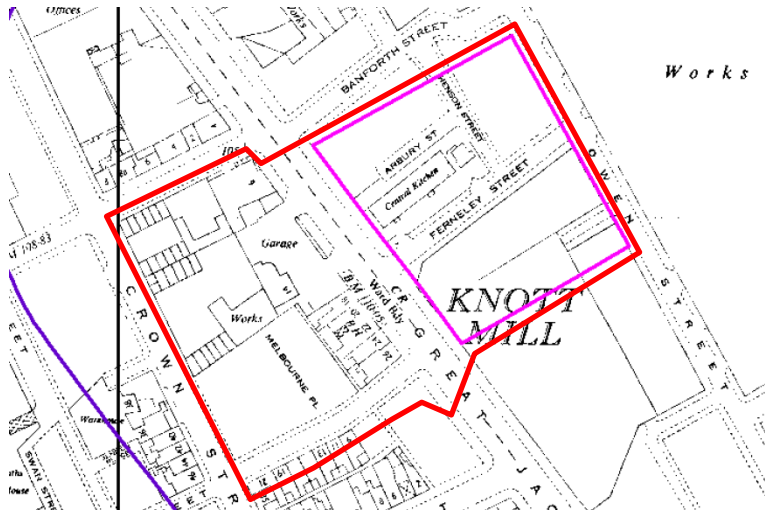


3 SITE HISTORY

Historical land uses of the site have been identified by reviewing historical Ordnance Survey (OS) maps included in the RoC Envirocheck report (Ref. 3) and the WSP Groundsure report (Ref. 7) listed in Table 1-1.

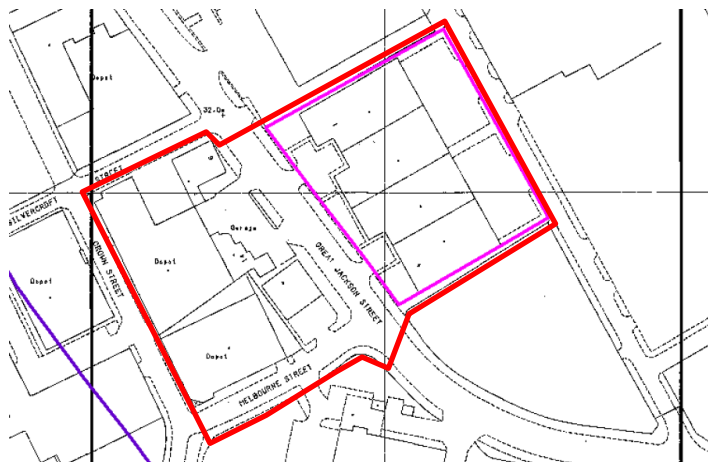
3.1 ON-SITE LAND USES

The earliest large scale OS map dated 1908 (RoC Envirocheck) shows predominantly residential terraced houses across the entire site on both sides of Great Jackson Street, which crosses the site at the centre. Most of the residential buildings are no longer shown on maps from 1948-1954, likely as a result of bomb damage during World War II. By 1954 a garage is shown in the western part of the site to the west of Great Jackson Street, with a works in the west by 1960, as indicated in the map extract presented below:



Map extract dated 1960
(Phase 3 boundary in red)

Maps from 1960-1980 show buildings associated with the Knott Mill engineering works in the south-east of the site. Two depot buildings are shown to occupy the site between the garage and Crown Street to the west on maps from 1969-1988. Maps from 1984-1990 show a building comprising four separate units occupying the eastern half of the site. These buildings appear to have remained until recently demolition. An extract from the map dated 1990 is provided below:



Map extract dated 1990
(Phase 3 boundary in red)

The most recent maps included in the third-party desk studies dated 2000 still show the garage and the two depots in the western half of the site.

3.2 OFF-SITE LAND USES

The area surrounding the site was formerly predominantly residential, becoming increasingly industrial/commercial after the 1950s. Residential buildings are present immediately to the west, north and south of the site in the mid-19th century. The Knott Mill iron works (later labelled automobile engineering works) are present ca. 10m to the east of the site across Owen Street. By 1948, engineering works are shown 10m to the north, and a mill and starch works ca. 50m to the north-west.

By 1969, the A57 is shown ca. 60m to the south of the site; engineering works and warehouses are shown 15m to the west.

By 1972, a warehouse is shown on the Plot D site ca. 20m to the south. The Knott Mill works to the east are no longer shown by 1985.

3.3 TANK PULL EXERCISE

The Ramboll 2018 report (Ref. 5) provides information on a ground investigation on the former fuel station area and the tank pull that was undertaken prior to construction of the marketing suite. A summary of the report is included in Appendix B. There is limited information in the report regarding the tanks and infrastructure that were removed, if any remains and what was used to backfill the excavation. However, on the basis of the Ramboll 2018 report the contaminated land planning condition for the marketing suite area was discharged as evidenced by the Decision Notice presented in Appendix D.

WSP is not aware of the final intention for the marketing suite area; i.e., if the building will be re-purposed or the site redeveloped.

4 INITIAL CONCEPTUAL SITE MODEL

4.1 INTRODUCTION

Risks from contamination within soils and groundwater have been assessed based on the environmental setting of the site, anticipated ground conditions, potential sources of contamination associated with former on-site and off-site land uses and the proposed future use of the site.

The source-pathway-receptor model forms the basis of the risk assessment; potential risks are only considered to exist where there is a credible source (e.g., chemical substance capable of causing harm); a viable pathway for migration of source to reception, and a sensitive receptor that could be affected (e.g., aquifer or site users). A source-pathway-receptor contaminant linkage assessment is termed a conceptual site model (CSM). An initial CSM is produced prior to intrusive ground investigation and is updated following collection of site-specific data where appropriate.

An initial CSM has been prepared based on an assumed redevelopment of the site with multi-storey residential buildings and landscaped recreational areas.

4.2 GROUND MODEL

The ground conditions beneath the site are anticipated to comprise a generally granular Made Ground to depths of between 1.5m to 3.0m bgl, locally greater than 4.0m bgl, likely to include demolition type materials.

The natural superficial deposits directly beneath the Made Ground are likely to comprise relatively permeable silts, sandy clays and gravels (Glaciofluvial Sheet Deposits - Secondary A Aquifer), potentially underlain by less permeable cohesive (clay) deposits, which may offer some protection from contaminant migration to the underlying sandstone (Principal Aquifer), anticipated at a depth of 7-8m bgl.

Perched groundwater is anticipated within granular Made Ground and superficial deposits at depths of 2-3m bgl. Deeper groundwater within the sandstone aquifer is expected at a depth of approximately 10m bgl.

In-ground concrete obstructions have been encountered in the area formerly occupied by the fuel station. The presence of remnant below ground structures and the nature of the materials used to infill the area of the former fuel station following tank removal are unknown. The presence of other in-ground obstructions such as relict foundations or floor slabs associated with previous and existing structures across the site is likely.

Hydrocarbon odours were encountered within Made Ground and natural superficial deposits in five of the Ramboll boreholes within the footprint of the former fuel station, suggesting that localised hydrocarbon impact may be present in this area.

4.3 FUTURE USE

It is assumed that the future use will be high rise apartments with potential below ground car parking, areas of hardstanding and soft landscaping.

4.4 POTENTIAL SOURCES

The following historical activities / land uses are considered to have the potential to give rise to contamination:

- On-site Made Ground deposits associated with former and current developments on the site
- On-site historical fuel station including underground fuel storage tanks, fuel station infrastructure and any residual petroleum hydrocarbon contamination
- On-site potentially contaminative industrial activities (industrial units in eastern half of the site)
- Off-site historical industrial land uses (Knott Mill automobile works).

The following potential sources of contamination have been identified:

- Buried UXO (not strictly a contaminant but included here for completeness)
- A range of contaminants of potential concern within Made Ground materials including:
 - Asbestos (e.g. associated with demolition materials)
 - Heavy metals (e.g. associated with ash)
 - Polycyclic aromatic hydrocarbons (PAH) (e.g. associated with bitumen and ash)
- Contaminants of potential concern associated with Made Ground and soil in relation to historical chemical spills / leaks, including:
 - Petroleum hydrocarbons (TPH) including volatile benzene, toluene, ethylbenzene, xylenes (BTEX) and methyl tert-butyl ether (MTBE)
 - Other volatile and semi volatile compounds (VOC and SVOC)
- Hazardous ground gases arising from putrescible / organic rich Made Ground on or within close proximity to the site, including.
 - Methane
 - Carbon dioxide
 - Carbon monoxide
 - Hydrogen sulphide
 - Oxygen depleted air

4.5 POTENTIAL PATHWAYS

Relevant potential exposure pathways are considered to be:

- Direct contact or ingestion or inhalation of soil-bound contaminants of concern
- Inhalation of dust-bound or airborne contaminants of concern
- Migration of leachable or mobile contaminants through soil and groundwater
- Migration of hazardous ground gases through unsaturated pore spaces within superficial strata, followed by accumulation in enclosed spaces and inhalation or ignition.
- Permeation of organic contaminants into potable water supply pipes and ingestion

4.6 POTENTIAL RECEPTORS

Relevant potential receptors are considered to include:

- Construction workers during redevelopment
- Adjacent site users during redevelopment

- Future site users (residents and workers)
- Off-site surface watercourses (River Medlock)
- Secondary A Aquifer (Glaciofluvial Sheet Deposits)
- Principal Aquifer (Chester Formation).

4.7 PLAUSIBLE CONTAMINANT LINKAGES

The identified potential source-pathway-receptor contaminant linkages are summarised in Table 4-1:

A qualitative risk ranking has been applied to the potentially complete contaminant linkages (based on CIRIA C552 'Contaminated Land Risk Assessment: A Guide to Good practice', 2001), which considers a combination of the potential severity of the harm and the likelihood of the harm occurring. The CIRIA risk ranking summary table is summarised in Figure C, below.

Figure C - CIRIA Risk Ranking for Source-Pathway-Receptor Linkages

Classification	Definition
Very High Risk	Severe harm to a receptor may already be occurring, or a high likelihood severe harm will arise to a receptor, unless immediate remedial works / mitigation measures are undertaken.
High Risk	Harm is likely to arise to a receptor, and is likely to be severe, unless appropriate remedial actions / mitigation measures are undertaken. Remedial works may be required in the short-term, but likely to be required over the long-term.
Moderate Risk	Possible that harm could arise to a receptor, but low likelihood that such harm would be severe. Harm is likely to be mild. Some remedial works may be required in the long-term.
Moderate / Low Risk	Possible that harm could arise to a receptor, but where a combination of likelihood and consequence results in a risk that is above low, but is not of sufficient concern to be classified as mild. Limited further investigation may be required to clarify the risk. If necessary, remediation works are likely to be limited in extent.
Low Risk	Possible that harm could arise to a receptor. Such harm, at worst, would normally be mild.
Very Low Risk	Low likelihood that harm could arise to a receptor. Such harm is unlikely to be any worse than mild.

4.8 NEXT STEPS

The potentially plausible contaminant linkages identified in Table 4-1 will need to be investigated via an appropriate ground investigation, laboratory testing regime and monitoring programme.

Table 4-1 - Potential Source-Pathway-Receptor Linkages (Initial CSM)

Potential Source	Potential Pathway	Potential Receptor	Likelihood of Complete Linkage	Severity	Risk	Comment
UXO	Encountering UXO during intrusive ground investigation works or construction (disturbance and explosion)	Ground investigation personnel Construction workers Adjacent site users	Low	Severe	Moderate	A potential for unrecorded UXO on the site has been identified. A detailed UXO desk study is recommended prior to any intrusive ground investigation or construction works.
Contaminants of concern within soil or groundwater associated with Made Ground or historical land uses	Direct contact or ingestion	Future site users	Low	Medium	Low/Moderate	Contamination of soil or groundwater originating from past land uses may be present on the site; however, the likelihood of widespread contamination being present is considered as low.
		Construction workers	Low	Medium	Low/Moderate	Exposure to the anticipated contaminants may cause chronic damage to human health over a long period. Acute risks to human health are not considered likely.
	Inhalation of dust-bound or airborne contaminants (particularly asbestos)	Future site users	Low	Medium	Low/Moderate	Asbestos fibres or asbestos containing materials may be present within Made Ground in areas of former development and demolition fill.
		Construction workers	High	Medium	Moderate	
		Adjacent site users	Unlikely	Medium	Low	A significant impact on adjacent site users (predominantly airborne asbestos fibres) during earthworks is considered unlikely at this stage.

Potential Source	Potential Pathway	Potential Receptor	Likelihood of Complete Linkage	Severity	Risk	Comment
Contaminants of concern within soil or groundwater associated with historical land uses	Migration of leachable or mobile contaminants through soil and groundwater	Surface watercourses (River Medlock)	Low	Medium	Low/Moderate	Leachable or mobile contaminants of concern may be present on the site; however, gross contamination of soils or groundwater from past commercial/industrial activities is not anticipated. Based on available ground investigation information and observations made during the tank removal exercise, significant residual petroleum hydrocarbon contamination originating from the former fuel station is not anticipated. The likelihood of significant impacts on controlled waters is therefore considered as low.
		Secondary A Aquifer (Glaciofluvial Sheet Deposits)	Low	Mild	Low	
		Principal Aquifer (and Chester Formation)	Low	Medium	Low/Moderate	
	Permeation of organic contaminants into potable water supply pipes	Future site users	Low	Medium	Low/Moderate	Organic contaminants may be present within Made Ground on the site with the potential to enter the potable water supply of the proposed development where conventional pipes are installed within contaminated soils.
Hazardous ground gases/ arising from on-site or off-site Made Ground deposits	Migration of hazardous ground gases, followed by accumulation in enclosed and inhalation or ignition	Future site users	Low	Severe	Moderate	Made Ground deposits with the potential to generate hazardous gases may be present on, or within close proximity of, the site; although the potential for high gas concentrations and sustained gas flows that could cause severe harm to human health or explosion is considered to be low.

5 PRELIMINARY GEOTECHNICAL ASSESSMENT

5.1 INTRODUCTION

A preliminary assessment of potential geotechnical constraints to the proposed development has been undertaken. The assessment and recommendations will need to be reviewed based on the findings of future ground investigations, proposed layout, structural loadings and earthworks.

5.2 GROUND CONDITIONS AND FOUNDATIONS

Made Ground is anticipated across the site and may locally extend to depths of approximately 4m bgl.

Based on the information reviewed, it is considered likely that the site is underlain by a sequence of Made Ground, Glaciofluvial Deposits, Glacial Till and sandstone bedrock, expected at a depth of approximately 7-8m bgl.

Given the likely depth of any basement excavation and the likely depth of the sandstone bedrock it is considered likely that pad or raft foundations could be adopted. If the rock proves to be deeper following a ground investigation, then the use of piled foundation may be required.

Any basement construction will likely require the use of a contiguous or secant bored pile wall and propping of the basement will likely required to control deflections and ground movement on the site boundaries.

The above is subject to confirmation of the ground conditions through ground investigation works and confirmation of the development proposals.

5.3 OBSTRUCTIONS AND GROUNDWATER

In-ground obstructions from former and existing structures are likely present on the site and may significantly hinder the installation of bearing piles and groundworks in general. A detailed strategy will be required for managing in-ground obstructions to minimise potential delays on site and associated abnormal costs.

The stability of the Made Ground or natural granular soils should not be relied upon in unsupported excavations. Excavations should be stabilised by the use of ground support or battering back to a safe angle. Consideration should be given to the stability of adjacent structures and infrastructure when designing temporary works.

Significant groundwater ingress is not anticipated within shallow excavations although inflows of perched water within the Made Ground may be a problem, particular during periods of wet weather. The main groundwater table could be encountered during excavation of deep basements and dewatering techniques may be required on the advice of a suitably qualified temporary works designer.

5.4 BELOW GROUND CONCRETE

Whilst specialist testing will be required to determine the requirements for below ground concrete, it is considered unlikely that the ground conditions will require a concrete class in excess of DS4/AC4 as defined by BRE Special Digest 1, 'Concrete in Aggressive Ground' 2005.

6 CONCLUSIONS AND RECOMMENDATIONS

6.1 GEO- ENVIRONMENTAL

A potential for unrecorded UXO on the site has been identified. A detailed UXO desk study is recommended prior to undertaking any intrusive ground investigation or construction works.

Contaminants of potential concern associated with former land uses may be present in soil or groundwater beneath the site, including asbestos, metals, hydrocarbons or volatile/semi-volatile organic compounds. These contaminants of potential concern may present a moderate/low risk to human health or controlled waters. Deep Made Ground deposits on the site may have the potential to generate hazardous ground gases.

Subject to the findings from further intrusive ground investigation, laboratory testing and monitoring, remedial measures may be required to break the identified source-pathway-receptor linkages. Possible remedial measures may include removal of contaminated soils, provision of cover above contaminated soils, and incorporation of ground gas protection measures into the design of the proposed structures.

6.2 GEOTECHNICAL

The depth of Made Ground and superficial soils will control foundation type. If competent rock is encountered at a level commensurate with any proposed basement level, then consideration could be given to the use of pad foundations, or a raft. If the depth to rock precludes such foundations, then continuous flight auger piles may provide a suitable solution.

Below ground obstructions should be anticipated and may present a significant risk to the installation of foundations, basement retention system and basement excavation. Excavations are likely to extend to rockhead and hard digging, possibly with the use of hydraulic breakers and ripping techniques may be required.

Significant groundwater ingress would not be anticipated in shallow excavations, although inflows of perched water within the Made Ground may be encountered. Deeper excavations may require dewatering.

6.3 RECOMMENDATIONS

It is recommended that a combined geo-environmental and geotechnical ground investigation is undertaken to provide further information on contamination risks and foundation requirements. The Phase 2 investigation should be designed to:

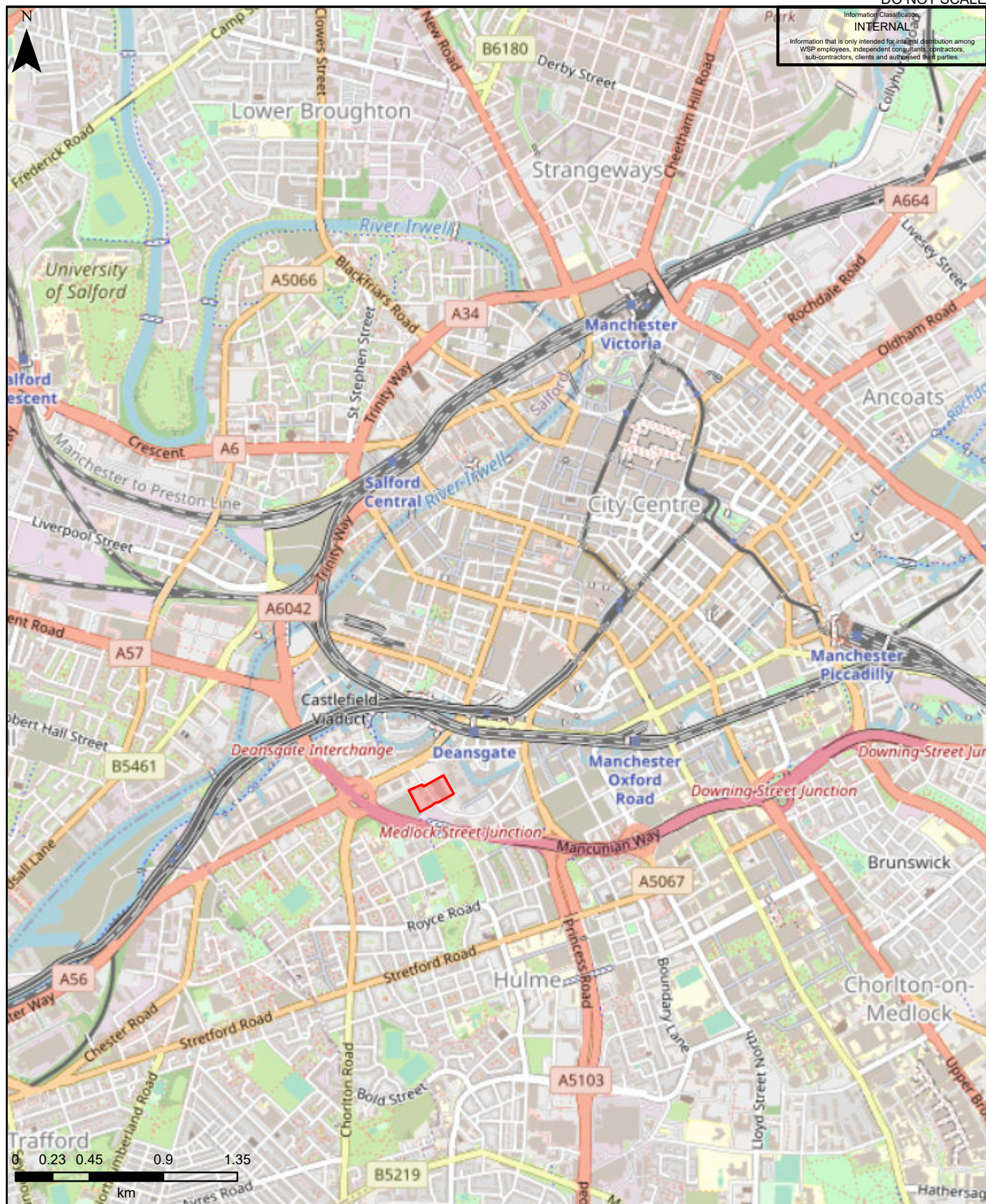
- Confirm anticipated ground conditions
- Identify the presence of potential sources of contamination that could pose a risk to the proposed development and its users
- Obtain geotechnical parameters to inform the design of the proposed development
- Assess the requirement for remedial measures to protect sensitive receptors

Prior to intrusive works a detailed UXO desk study should be undertaken to assess and potentially zone, the UXO risk on the site. The scope of the ground investigation should be designed to meet the requirements of the proposed development, which will need to be confirmed by the developer in advance.

Appendix A

FIGURES 1 AND 2



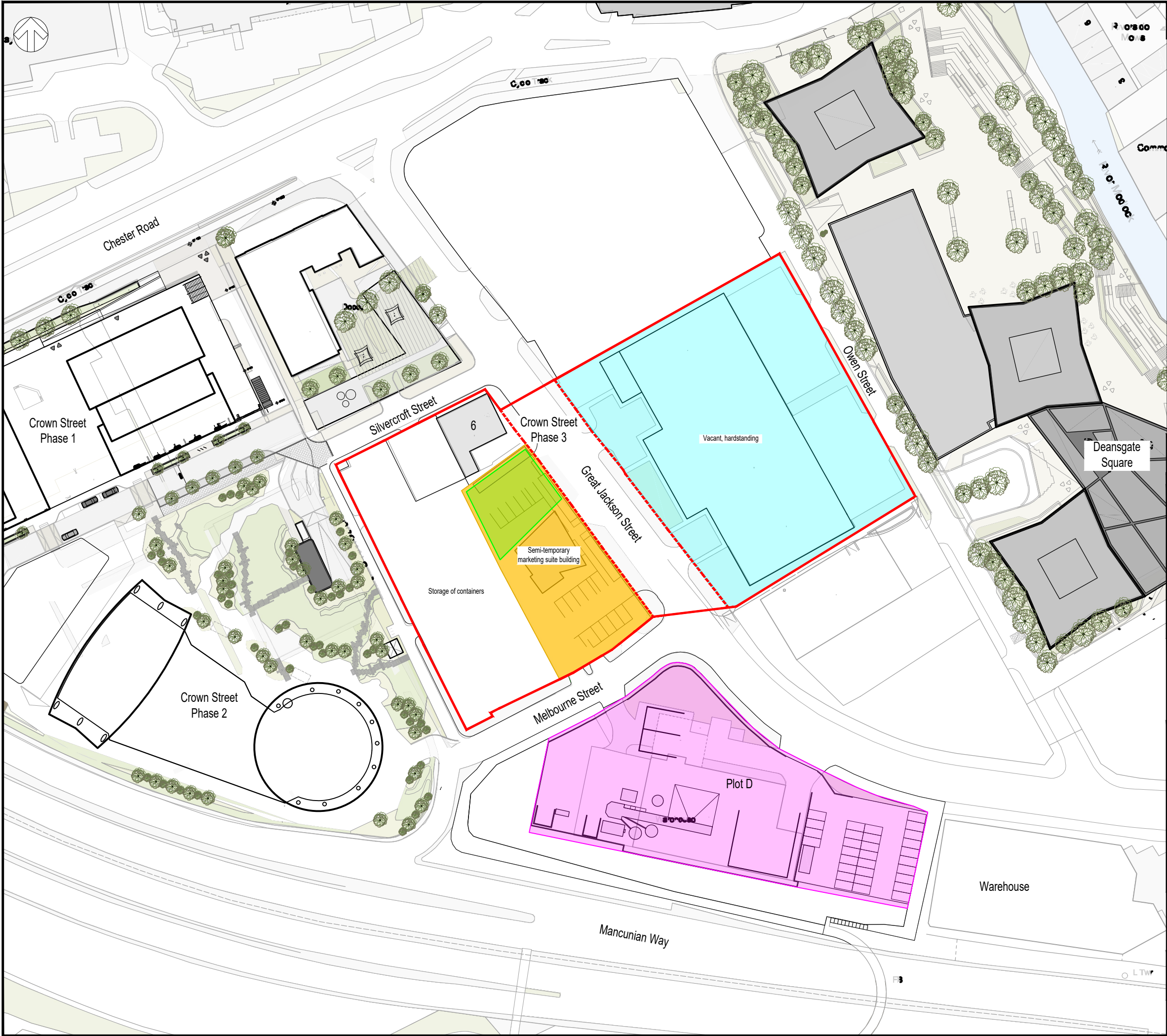


Site Location

Figure 1 - Site Location Plan

Scale : 1:30,000

File name \\UK.WSPGROUP.COM\CENTRAL DATA\PROJECTS\70106XXX\70106908 - CROWN STREET PHASE 3 AREA - PHASE 1 GROUND03 WIP1 FIGURES\CROWN STREET DRAWING.DWG, printed on 27 February 2023 14:18:14, by Duchene, Tobin



DO NOT SCALE

LEGEND:

- Site Boundary Crown Street Phase 3
- Investigation Boundary GeoAssist Desk Study Plot D (2016)
- Investigation Boundary GeoAssist Desk Study (2017)
- Investigation Boundary RoC Desk Study (2017)
- Investigation Boundary Ramboll Ground Investigation (2018)

DRAWING STATUS: S2 - FOR INFORMATION



8 First Street, Manchester, M15 4RP, UK
T+ 44 (0) 161 200 5000
wsp.com

CLIENT: RENAKER BUILD LTD

ARCHITECT:

PROJECT: CROWN STREET PHASE 3, MANCHESTER

TITLE: SITE LAYOUT PLAN

SCALE @ A3: 1 : 1,000	CHECKED: PG	APPROVED: PG
PROJECT No: 70059549	DESIGNED:	DRAWN: TD
DRAWING No:	FIGURE 2	
	© WSP UK Ltd	

REV:
P01

Appendix B

SUMMARY OF PREVIOUS REPORTS



1 APPENDIX B – SUMMARY OF PREVIOUS REPORTS

Parts of the Crown Street Phase 3 area and surrounding land have previously been subject to desk-based assessments undertaken by others. The reports are listed in Table 1-1 of the PRA report and the areas covered by the reports are indicated on Figure 2 in **Error! Reference source not found.** Information from the reports which is relevant to the Phase 3 site is summarised below.

1.1 GEOASSIST PHASE 1 DESK STUDY 2016 – PLOT D (OFF-SITE)

GeoAssist Ltd (GeoAssist) undertook a Phase 1 preliminary contaminated land risk assessment for the Plot D site to the south of the Phase 3 site area across Melbourne Street in 2016 (Ref. **Error! Reference source not found.**). Plot D is located outside the current site boundary; however, where relevant the desk study for Plot D has been used to inform the assessment of the Phase 3 site.

The assessment was undertaken to inform a proposed development of the Plot D site into a temporary concrete batching plant.

During a site walkover undertaken as part of the assessment, the Plot D site was encountered as disused and covered with concrete hardstanding. A commercial building and a small electrical transformer were noted.

The report identifies residential buildings on the site since the mid-19th century, and the presence of a warehouse from the 1970s.

Natural superficial deposits underlying the site are indicated to comprise fluvio-glacial deposits and boulder clay to depths between 4-9m below ground level (bgl). The underlying solid strata are stated to comprise Bunter Sandstone.

The report assesses the following risks to the proposed use of the Plot D site as a temporary concrete batching plant:

- i Low risk from ground contamination associated with Made Ground deposits and former on-site or off-site land uses
- i Low risk from hazardous ground gases arising from on-site or off-site Made Ground deposits, or from underground coal mine workings
- i Low risk from geotechnical hazards associated with underground mine workings or ground stability
- i Low risk from unexploded ordnance on the site.

1.2 ROC PHASE 1 DESK STUDY 2017 – LAND EAST OF GREAT JACKSON STREET (ON-SITE)

RoC Consulting Ltd (RoC) undertook a Phase 1 desk study of the eastern half of the site to (east of Great Jackson Street) in 2017 (Ref. **Error! Reference source not found.**).

The assessment was undertaken to inform a proposed development of the area with three multi-storey residential apartment blocks.

During a site walkover undertaken as part of the assessment, the area was occupied by two light industrial units and car parking.

The report indicates natural superficial deposits beneath the site to comprise glaciofluvial sheet deposits (sand and gravel). Solid strata are indicated to be sandstone of the Chester Pebble Beds Formation.

The report assesses the following risks to the proposed residential use of the area:

- i Medium risk from ground contamination associated with Made Ground deposits and former and current industrial land uses (including use of lubricants, oils and propane gas)
- i Low risk from mobile contamination associated with off-site former industrial activities (engineering works)
- i Medium risk from hazardous ground gases arising from on-site or off-site Made Ground deposits
- i Low/medium risk from hazardous ground gases arising from off-site Made Ground deposits.

1.3 GEOASSIST PHASE 1 DESK STUDY 2017 – FORMER FUEL STATION (ON-SITE)

GeoAssist undertook a desk-based Phase 1 preliminary contaminated land risk assessment for the area to the west of Great Jackson Street in the western half of the site in 2017 (Ref. **Error! Reference source not found.**).

The assessment was undertaken to inform a proposed semi temporary two-storey building for use as a marketing suite.

At the time of the site walkover undertaken as part of the assessment, the site was used as a car park and evidence of a former use as a fuel station was noted including fuel pump fittings and ventilation pipes.

The report identifies residential buildings on the site since the mid-19th century. A fuel garage is identified on the site from 1955, and a car park from 2006. The report references records from the Greater Manchester Fire and Rescue Service which indicate up to eight underground fuel storage tanks were present on the site by 1986. No information on their status or condition is provided.

The report contains a drawing (A3) which shows the infrastructure of the former fuel station including eight underground fuel tanks (one 8,000gal, three 2,000gal, four 500gal), fuel pump islands, vent pipes and an interceptor.

Natural superficial deposits underlying the site are indicated to comprise fluvio-glacial deposits and boulder clay (Glacial Till). Made Ground and terrace deposits of 2-4m thickness are indicated to the west of the site. The underlying solid strata are reported to comprise sandstone of the Chester Pebble Beds (Sherwood) Sandstone.

The report assesses the following risks to the proposed use of the Plot D site as a temporary concrete batching plant:

- i Moderate to high risk from ground contamination associated with former use as a fuel station including underground storage tanks
- i Low risk from ground contamination associated with former off-site land uses
- i Moderate to high risk from hazardous ground gases arising from on-site Made Ground deposits
- i Low risk from hazardous ground gases arising from underground coal mining

- ‡ Low risk from geotechnical hazards associated with underground mine workings or ground stability
- ‡ Low to very low risk from unexploded ordnance on the site.

1.4 RAMBOLL GROUND INVESTIGATION 2018 – FORMER FUEL STATION (ON-SITE)

Ramboll undertook an intrusive ground investigation in 2018 of an area to the west of Great Jackson Street which was formerly occupied by a fuel station (Ref. **Error! Reference source not found.**). The intention of the investigation was to assess potential liabilities and risks associated with potential contaminants in the ground and groundwater.

The investigation area appears to extend from the existing commercial building in the north to the newly constructed marketing suite in the south. The investigation comprised the drilling of 14 window sample boreholes in two phases and the report contains some information about the excavation and removal of underground fuel storage tanks. The report states the following:

- ‡ Underground fuel storage tanks were removed by a third party in April 2018.
- ‡ Visual evidence of contamination was not reported during the tank removal.

The information available on the tank pull exercise is limited. There is no clearly stated information on the following:

- ‡ Who undertook the tank removal works
- ‡ The number of tanks removed
- ‡ The tank locations and condition
- ‡ Removal of other related infrastructure
- ‡ Concrete bund removal
- ‡ Verification soil sample locations
- ‡ The backfill method and details of the backfill material

1.4.1.1 Ground Conditions

Reported ground conditions comprised granular Made Ground (sandy gravel of brick, concrete and sandstone) to depths of between 1.5m and >4.0m bgl. Superficial deposits (that they conclude must be reworked) beneath the obvious Made Ground comprising silt, sandy clays and gravels. A concrete obstruction was encountered at 1m bgl in one borehole. The underground storage tanks were noted to be set in concrete bunds.

Groundwater was encountered in the exploratory holes at depths of 2.3-2.8m bgl.

Hydrocarbon odours were encountered within Made Ground and natural superficial deposits in five exploratory holes within the footprint of the former fuel station.

1.4.1.2 Soil Contamination

Samples of Made Ground and natural superficial deposits were analysed for a suite of contaminants of potential concern including asbestos, metals, polycyclic aromatic hydrocarbons (PAH), petroleum hydrocarbons, volatile (VOC) and semi-volatile organic compounds (SVOC). The results were screened against generic assessment criteria derived by Ramboll for an assumed commercial/ industrial land use scenario. None of the screened contaminants exceeded the assessment criteria. No asbestos fibres were detected in any of the analysed samples.

1.4.1.3 Groundwater Contamination

Samples of groundwater were obtained from nine monitoring wells on three occasions and were analysed for a suite of contaminants of potential concern including metals, PAH, petroleum hydrocarbons, phenols, VOC and SVOC. The results were screened against water quality threshold concentrations protective of drinking water resources. Exceeding concentrations were recorded for PAH and petroleum hydrocarbons in groundwater from seven of nine monitoring wells.

1.4.1.4 Ground Gas Monitoring

A single round of ground gas monitoring was carried out in 2018. Monitoring was undertaken in four monitoring wells within the footprint of the former fuel station. The following ground gas conditions were recorded:

- i Flow rate <0.1l/hr
- i Methane <0.1% v/v
- i Carbon dioxide 0.1% v/v
- i Oxygen 20.8% v/v.

Appendix C

SITE PHOTOGRAPHS





Photo 1: Facing west, showing western half of the site with semi-temporary marketing suite building (left), commercial building (No. 6 Great Jackson Street) and storage containers (back).



Photo 2: Facing west, showing Silvercroft Street along north-western site boundary and commercial building on site (No. 6 Great Jackson Street).



Photo 3: Facing south-east, showing eastern half of the site formerly occupied by commercial units which are now demolished. Storage of materials including traffic management, spare building equipment along the eastern and south-eastern site boundary.

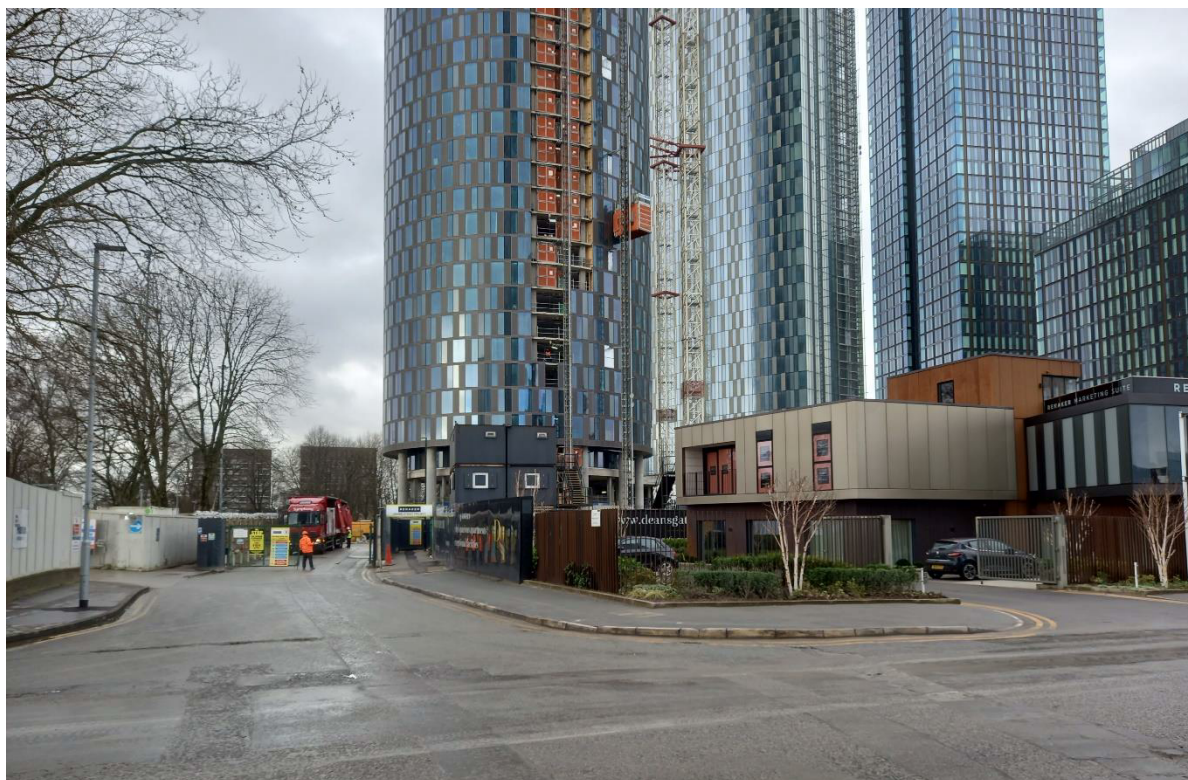


Photo 4: Facing west, showing western half of the site occupied with semi-temporary marketing suite building and entrance to adjacent construction site 'Crown Street Phase 2 via Melbourne Road along the south-western site boundary.

Appendix D

MANCHESTER CITY COUNCIL DECISION NOTICE



Town & Country Planning Act 1990 (as amended)
Planning (Listed Building & Conservation Area) Act 1990 (as amended)

Approval of details reserved by condition

Applicant

Mr John Messer
Renaker Build Ltd
1st Floor NQ Building
47 Bengal Street
Manchester
M4 6BB

Agent (if used)

Part 1 – Particulars of the application/development

Proposal: Application for the discharge of Condition 3 (contaminated land) attached to planning permission 118626/FO2017.

Location: 18 - 26 Great Jackson Street, Manchester, M15 4NG

Date of application: 25 July 2018

Application number: CDN/18/0558

Part 2 – Particulars of decision

Manchester City Council gives notice that the detail(s) referred to in Part 1 are **Approved** in accordance with the information set out below.

Condition 3 - Contaminated Land

Condition 3 - Contaminated Land

Condition 3 is discharged on the basis of the following submitted information:

The Contaminated Land Report by Ramboll revision V2 dated 4.10.18;
Analytical Report Number: 18-81686 by I2 Analytical; and
the waste transfer certificates received by the City Council as local planning authority on 17 October 2018.

Date: 31 October 2018

Signed:



Julie Roscoe
Head of Planning, Building Control & Licensing

Manchester City Council, P O Box 532, Town Hall, Manchester M60 2LA

Notes

1. This permission refers only to that required under the Town and Country Planning Act 1990 (as amended) or Planning (Listed Building & Conservation Area) Act 1990 (as amended) does not include any consent or approval under any other enactment, byelaw, order or regulation.

2 If the applicant is aggrieved by the decision of the local planning authority to refuse permission or approval for the proposed development, or to grant permission or approval subject to conditions, they may appeal to the Secretary of State in accordance with Section 78(1) of the Town and Country Planning Act 1990 or sections 20 and 21 of the Planning (Listed Building & Conservation Area) Act 1990 within six months of the date of the notice of the decision.

The Planning Inspectorate have introduced an online appeals service that can be used to make appeals online. This service is available through the gov.uk website – www.gov.uk/appeal-planning-inspectorate. The Inspectorate will publish details of your appeal on the internet.

Alternatively, appeals can be made on a form which is obtainable from Planning Inspectorate, Customer Support Unit, Room 3/15, Eagle Wing, Temple Quay House, 2 The Square, Temple Quay, Bristol BS1 or by telephone 0117 372 6372.

The Secretary of State has power to allow a longer period for the giving of a notice of appeal but they will not normally be prepared to exercise this power unless there are special circumstances that excuse the delay in giving notice of appeal.

3. The statutory requirements are those set out in Section 79(6) of the Town and Country Planning Act 1990, namely Sections 70(1) and 72(1) of the Act.

4. If either the local planning authority or the Secretary of State refuses permission to develop land or grants it subject to conditions, the owner may claim that they can neither put the land to a reasonably beneficial use in its existing state nor render the land capable of a reasonably beneficial use by the carrying out of any development which has been or would be permitted.

In these circumstances, the owner may serve a purchase notice on the Council in whose area the land is situated. This notice will require the Council to purchase his interest in the land in accordance with the provisions of Part VI of the Town and Country Planning Act 1990

5. In certain circumstances, a claim may be made against the local planning authority for compensation, where permission is refused or granted subject to conditions by the Secretary of State on appeal or on a reference of the application to them. The circumstances in which such compensation is payable are set out in Section 114 of the Town and Country Planning Act 1990.

Appendix E

ZETICA UXO PDSA



Pre-Desk Study Assessment

Site:	Crown Street, Manchester, Greater Manchester
Client:	WSP
Contact:	Tobi Duchene
Date:	20 th February 2023
Pre-WWI Military Activity on or Affecting the Site	None identified.
WWI Military Activity on or Affecting the Site	None identified.
WWI Strategic Targets (within 5km of Site)	The following strategic targets were located in the vicinity of the Site: ■ Manchester Ship Canal and Salford Docks. ■ Transport infrastructure and public utilities. ■ Industries important to the war effort, including munitions factories, aircraft manufacturing and engineering works. ■ Military barracks and training areas. ■ Anti-Aircraft (AA) guns.
WWI Bombing	None identified on the Site.
Interwar Military Activity on or Affecting the Site	None identified.
WWII Military Activity on or Affecting the Site	None identified.
WWII Strategic Targets (within 5km of Site)	The following strategic targets were located in the vicinity of the Site: ■ Manchester Ship Canal and Salford Docks. ■ Transport infrastructure and public utilities. ■ Industries important to the war effort, including aircraft manufacturing and engineering works. ■ Military barracks and training areas. ■ AA and anti-invasion defences.
WWII Bombing Decoys (within 5km of Site)	None identified.
WWII Bombing	During WWII the Site was situated in the County Borough (CB) of Manchester, which officially recorded 737No. High Explosive (HE) bombs with a bombing density of 27.1 bombs per 405 hectares (ha). The Manchester (and Salford) area was heavily bombed between the 22nd and 24th December 1940 (the 'Manchester Blitz'). Over 400No. HE bombs and more than 30,000No. Incendiary Bombs (IBs) fell across the region. Readily available records have been found to indicate that several HE bombs fell in close proximity to the Site.
Post-WWII Military Activity on or Affecting the Site	None identified.

Recommendation	It is recommended that a detailed desk study is commissioned to assess, and potentially zone, the Unexploded Ordnance (UXO) hazard level on the Site.
Further information	For information about Zetica's detailed UXO desk studies and other UXO services, please visit our website: www.zeticauxo.com. Details and downloadable resources covering the most common sources of UXO hazard affecting sites in the UK can be found here. If you have any further queries, please don't hesitate to get in contact with us at uxo@zetica.com or 01993 886 682.
This summary is based on a cursory review of readily available records. Caution is advised if you plan to action work based on this summary. It should be noted that where a potentially significant source of UXO hazard has been identified on the Site, the requirement for a detailed desk study and risk assessment has been confirmed and no further research will be undertaken at this stage. It is possible that further in-depth research as part of a detailed UXO desk study and risk assessment may identify other potential sources of UXO hazard on the Site.	

Appendix F

GENERAL LIMITATIONS



REPORT LIMITATIONS - GROUND RISK AND REMEDIATION

GENERAL

1. WSP UK Limited 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 and outlined in the body of the report.
2. Unless explicitly agreed otherwise, in writing, this report has been prepared under WSP UK Limited standard Terms and Conditions as included within our proposal to the Client.
3. Project specific appointment documents may be agreed at our discretion and a charge may be levied for both the time to review and finalise appointments documents and also for associated changes to the appointment terms. WSP UK Limited reserves the right to amend the fee should any changes to the appointment terms create an increase risk to WSP UK Limited.
4. The report needs to be considered in the light of the WSP UK Limited proposal and associated limitations of scope. The report needs to be read in full and isolated sections cannot be used without full reference to other elements of the report and any previous works referenced within the report.

PHASE 1 GEO ENVIRONMENTAL AND PRELIMINARY RISK ASSESSMENTS

Coverage: *This section covers reports with the following titles or combination of titles: phase 1; desk top study; geo environmental assessment; development appraisal; preliminary environmental risk assessment; constraints report; due diligence report; geotechnical development review; environmental statement; environmental chapter; project scope summary report (PSSR), program environmental impact report (PEIR), geotechnical development risk register; and, baseline environmental assessment.*

5. The works undertaken to prepare this report comprised a study of available and easily documented information from a variety of sources (including the Client), together with (where appropriate) a brief walk over inspection of the Site and correspondence with relevant authorities and other interested parties. Due to the short timescales associated with these projects responses may not have been received from all parties. WSP UK Limited cannot be held responsible for any disclosures that are provided post production of our report and will not automatically update our report.
6. The opinions given in this report have been dictated by the finite data on which they are based and are relevant only for the purpose for which the report was commissioned. The information reviewed should not be considered exhaustive and has been accepted in good faith as providing true and representative data pertaining to site conditions. Should additional information become available which may affect the opinions expressed in this report, WSP UK Limited reserves the right to review such information and, if warranted, to modify the opinions accordingly.
7. It should be noted that any risks identified in this report are perceived risks based on the information reviewed. Actual risks can only be assessed following intrusive investigations of the site.
8. WSP UK Limited does not warrant work / data undertaken / provided by others.

REPORT LIMITATIONS - GROUND RISK AND REMEDIATION

INTRUSIVE INVESTIGATION REPORTS

Coverage: *The following report titles (or combination) may cover this category of work: geo environmental site investigation; geotechnical assessment; GIR (Ground Investigation reports); preliminary environmental and geotechnical risk assessment; and, geotechnical risk register.*

9. The investigation has been undertaken to provide information concerning either:
 - i. The type and degree of contamination present at the site in order to allow a generic quantitative risk assessment to be undertaken; or
 - ii. Information on the soil properties present at the site to allow for geotechnical development constraints to be considered.
10. The scope of the investigation was selected on the basis of the specific development and land use scenario proposed by the Client and may be inappropriate to another form of development or scheme. If the development layout was not known at the time of the investigation the report findings may need revisiting once the development layout is confirmed.
11. For contamination purposes, the objectives of the investigation are limited to establishing the risks associated with potential contamination sources with the potential to cause harm to human health, building materials, the environment (including adjacent land), or controlled waters.
12. For geotechnical investigations the purpose is to broadly consider potential development constraints associated with the physical property of the soils underlying the site within the context of the proposed future or continued use of the site, as stated within the report.
13. The amount of exploratory work, soil property testing and chemical testing undertaken has necessarily been restricted by various factors which may include accessibility, the presence of services; existing buildings; current site usage or short timescales. The exploratory holes completed assess only a small percentage of the area in relation to the overall size of the Site, and as such can only provide a general indication of conditions.
14. The number of sampling points and the methods of sampling and testing do not preclude the possible existence of contamination where concentrations may be significantly higher than those actually encountered or ground conditions that vary from those identified. In addition, there may be exceptional ground conditions elsewhere on the site which have not been disclosed by this investigation and which have therefore not been taken into account in this report.
15. The inspection, testing and monitoring records relate specifically to the investigation points and the timeframe that the works were undertaken. They will also be limited by the techniques employed. As part of this assessment, WSP UK Limited has used reasonable skill and care to extrapolate conditions between these points based upon assumptions to develop our interpretation and conclusions. The assumption made in forming our conclusions is that the ground and groundwater conditions (both chemically and physically) are the same as have been encountered during the works undertaken at the specific points of investigation. Conditions can change between investigation points and these interpretations should be considered indicative.
16. The risk assessment and opinions provided are based on currently available guidance relating to acceptable contamination concentrations; no liability can be accepted for the retrospective effects of any future changes or amendments to these values. Specific assumptions associated

REPORT LIMITATIONS - GROUND RISK AND REMEDIATION

with the WSP UK Limited risk assessment process have been outlined within the body or associated appendix of the report.

17. Additional investigations may be required in order to satisfy relevant planning conditions or to resolve any engineering and environmental issues.
18. Where soil contamination concentrations recorded as part of this investigation are used for commentary on potential waste classification of soils for disposal purposes, these should be classed as indicative only. Due consideration should be given to the variability of contaminant concentrations taken from targeted samples versus bulk excavated soils and the potential variability of contaminant concentrations between sampling locations. Where major waste disposal operations are considered, targeted waste classification investigations should be designed.
19. The results of the asbestos testing are factually reported and interpretation given as to how this relates to the previous use of the site, the types of ground encountered and site conceptualisation. This does not however constitute a formal asbestos assessment. These results should be treated cautiously and should not be relied upon to provide detailed and representative information on the delineation, type and extent of bulk ACMs and / or trace loose asbestos fibres within the soil matrix at the site.
20. If costs have been included in relation to additional site works, and / or site remediation works these must be considered as indicative only and must be confirmed by a qualified quantity surveyor.

EUROCODE 7: GEOTECHNICAL DESIGN

21. On 1st April 2010, BS EN 1997-1:2004 (Eurocode 7: Geotechnical Design – Part 1) became the mandatory baseline standard for geotechnical ground investigations.
22. In terms of geotechnical design for foundations, slopes, retaining walls and earthworks, EC7 sets guidance on design procedures including specific guidance on the numbers and spacings of boreholes for geotechnical design, there are limits to methods of ground investigation and the quality of data obtained and there are also prescriptive methods of assessing soil strengths and methods of design. Unless otherwise explicitly stated, the work has not been undertaken in accordance with EC7. A standard geotechnical interpretative report will not meet the requirements of the Geotechnical Design Report (GDR) under Eurocode 7. The GDR can only be prepared following confirmation of all structural loads and serviceability requirements. The report is likely to represent a Ground Investigation Report (GIR) under the Eurocode 7 guidance.

DETAILED QUANTITATIVE RISK ASSESSMENTS AND REMEDIAL STRATEGY REPORTS

23. These reports build upon previous report versions and associated notes. The scope of the investigation, further testing and monitoring and associated risk assessments were selected on the basis of the specific development and land use scenario proposed by the Client and may not be appropriate to another form of development or scheme layout. The risk assessment and opinions provided are based on currently available approaches in the generation of Site Specific Assessment Criteria relating to contamination concentrations and are not considered to represent a risk in a specific land use scenario to a specific receptor. No liability can be accepted for the retrospective effects of any future changes or amendments to these values, associated models or associated guidance.



REPORT LIMITATIONS - GROUND RISK AND REMEDIATION

- 24. The outputs of the Detailed Quantitative Risk Assessments are based upon WSP UK Limited manipulation of standard risk assessment models. These are our interpretation of the risk assessment criteria.
- 25. Prior to adoption on site they will need discussing and agreeing with the Regulatory Authorities prior to adoption on site. The regulatory discussion and engagement process may result in an alternative interpretation being determined and agreed. The process and timescales associated with the Regulatory Authority engagement are not within the control of WSP UK Limited. All costs and programmes presented as a result of this process should be validated by a quantity surveyor and should be presumed to be indicative.

GEOTECHNICAL DESIGN REPORT (GDR)

- 26. The GDR can only be prepared following confirmation of all structural loads and serviceability requirements. All the relevant information needs to be provided to allow for a GDR to be produced.

MONITORING (INCLUDING REMEDIATION MONITORING REPORTS)

- 27. These reports are factual in nature and comprise monitoring, normally groundwater and ground gas and data provided by contractors as part of an earthworks or remedial works.
- 28. The data is presented and will be compared with assessment criteria.



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