



**PHASE I GEO-
ENVIRONMENTAL
DESK STUDY**

**Proposed Development
18 – 24 Seel Street
Liverpool
L1 4BE**

**August 2017
Report Ref: 10/1065/001**

Prepared on Behalf of:

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PHASE 1 GEO-ENVIRONMENTAL DESK STUDY REPORT 18 – 24 SEEL STREET. LIVERPOOL

Report Reference: 10/1065/001

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EXECUTIVE SUMMARY

Client	HDCO EPL3 Ltd.
Location	Off Seel Street in Liverpool. OS Grid Reference 334770,390012.
Description	The site forms a roughly rectangular shaped parcel of land covering an area measuring approximately 2.0 hectares.
Development	The proposed development will comprise a 11 story building with 200 residential units, ground floor commercial units and roof terrace.
Site History	<p>The site has historically been occupied by unspecified buildings since the mid 1800s. These buildings were later identified as being warehouses along with a sugar mill. Post 1944, the buildings in the north of the site were no longer shown with ruins in the centre of the site. During the early to mid 1960s, the north of the site was re-developed as a spares warehouse and parts distributary with a ground nut warehouse in the south of the site. In the 1970s, the warehouse in the south of the site was demolished and became car parking with the north of the site becoming unspecified buildings.</p> <p>The surrounding area has been occupied by mix of residential and industrial land with mills, works, railway land, garages and petrol filling stations all located within close proximity to the site.</p>
Geology	<p>Geological maps indicate that the site is underlain by superficial deposits of Till (clay, sand, gravel and cobbles) with solid strata comprising sandstone of the Helsby Sandstone Formation.</p> <p>Made Ground deposits are shown 125m to the north, 300m to the west and 430m to the south west with an area of worked ground 450m to the south.</p>
Environmental Setting	The superficial deposits underlying the site are classified as a Secondary Aquifer (undifferentiated) whilst the solid strata located beneath the site (Helsby Sandstone) are classified as a Principal Aquifer. The site is not located within a Groundwater Source Protection Zone and there are no groundwater abstraction points within 500m of the site. The nearest surface water feature is a fountain located 370m to the west of the site and the closest tertiary watercourse is the River Mersey located 800m to the south west.
Landfilling	<p>Two registered waste transfer sites are located within 250m of the site receiving < 10,000 tonnes of waste per year. Both of these licenses have lapsed.</p> <p>No historical landfill sites, local authority recorded landfill sites or waste management facilities are located within 500m of the site. There are no potentially infilled areas relating to possible filled ponds, streams, rivers and marshes. located within 250m of the site.</p>
Unexploded Ordnance	Due to significant changes to the site and surrounding area before and after World War II it can be assumed that the area may have been affected by bombing during the war. A UXO risk assessment should be carried out for the site to identify any risks.
Further Works	<p>The Phase 1 Risk Assessment and Preliminary Conceptual Site Model have identified potential contamination sources, pathways and receptors. We would therefore recommend that the following Phase 2 investigations are undertaken:</p> <ul style="list-style-type: none"> • Carry out an Unexploded Ordnance Risk Assessment to assess the potential for UXO beneath the site. • A ground investigation should be carried out in the location of proposed new structures to characterise the nature and depth of any Made Ground soils present beneath the site. Exploratory holes should provide a good spatial coverage of the site with selected boreholes / trial pits targeting historical features such as the former paint / fuel stores and tank. • Soil samples should be recovered and submitted for chemical testing to comprise a minimum of pH and metals, asbestos screening, speciated PAH, speciated TPH and PCBs. • The ground investigation should allow for excavations / boreholes to be taken through any Made Ground soils and into the underlying

	<p>natural strata. In-situ testing should be carried out during drilling to provide adequate recommendations for foundation design.</p> <ul style="list-style-type: none">• We would recommend the installation of a minimum of three gas monitoring wells in the location of the proposed new apartment blocks, with provision for an initial 6 monitoring visits carried out over a 2 month period in accordance with CIRIA Report C665.
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1.0 INTRODUCTION

1.1 Background

Clancy Consulting Limited has been instructed by HDCO EPL3 Ltd to carry out a Geo-Environmental Desk Study for a site located off Seel Street in Liverpool. A site location plan is presented as 10/1065/001 in Appendix I.

We understand that the site is being considered for redevelopment to include a 11 storey complex with 200 apartments, ground floor commercial units and roof terraces. A proposed site layout plans are presented as Falcon Chester Hall Drawings in Appendix I.

1.2 Objectives

The objectives of the study are summarised below:

- Provide a review of the sites land use history by reference to ordnance survey maps of the area.
- Assess the environmental setting, geology, hydrology, hydrogeology, mining and subsidence history of the site and surrounding area.
- Carry out an initial assessment of potential risk from hazardous ground gases.
- Develop a detailed 'conceptual site model' with regard to potential contamination sources, pathways and receptors.
- Consider the potential risk to end users of the site from hazardous ground gas.
- Provide recommendations regarding the requirement for further investigations, if required, to satisfy the Local Planning Authority.

1.3 Limitations of the Study

Clancy Consulting Limited cannot be held responsible for any omissions, misrepresentation, errors or inaccuracies with the supplied third party report information. The report is written in the context of an agreed scope of work and budget and should not be used in a different context. New information or improved practices and changes in legislation may require a reinterpretation of the report in whole or in part.

Clancy Consulting Limited reserves the right to amend either conclusions or recommendations in light of any further information that may become available. The report is provided for the sole use of HDCO EPL3 Ltd for the objectives discussed previously only, and is confidential to them.

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2.0 DESK STUDY

2.1 Sources of Information

Background information was sought from the following sources:

- Ordnance Survey historical maps and town plans (selected copies included in Appendix II).
- British Geological Survey (BGS) Sheets (Appendix III).
- Environment Agency Groundwater Vulnerability Maps (Appendix IV).
- Environmental datasheets (Appendix V).

2.2 Site Setting and Description

The site is located off Seel Street in Liverpool at OS Grid Reference 334770, 390012. The site forms a roughly rectangular shaped parcel of land covering an area of approximately 2.0 hectares which is currently occupied by a 2 to 3 storey commercial premises with associated car parking. The site is bound to the south west by Gradwell Street, to the west by David Lewis Street, to the north east by Seel Street and to the south east by a new residential development.

The surrounding area is occupied by a mix of residential, retail and commercial properties such as bars, restaurants, shops, hotels, cafes along with university campuses.

2.3 Site History

In order to investigate the development history and previous land uses at the site and surrounding area, historical Ordnance Survey (OS) maps were examined. Selected copies of the maps are presented in Appendix II.

Table 1 below is not intended to provide a comprehensive review of all the changes which have occurred at the site and instead provides a summary of the most salient points relating to the development history of the site. The most significant historical land uses are highlighted in bold text for ease of reference.

Table 1 – Site History

Date(s)	Site	Surrounding Land
1850 – 1851 1881 - 1882	The site is occupied by unspecified buildings .	The surrounding area is a mix of industrial and residential land use with a distillery and cooperage 20m to the north, timber yards 210m to the east and 230m to the north east, a foundry 160m to the south. Blue Coat Hospital is 80m to the north east and the Cathedral Church of St.Peter is 150m to the north west. Docks are located on the River Mersey 500m to the south west.
1891 - 1893	No significant change.	A flower mill is 20m to the east, a color works 55m to the east and a spice mill and mill are shown 45m to the north east. A Cigar manufactory is 120m to the south east. Mills are shown 40m to the north west, 90m to the north east, 150m to the south 190m to the south east, 230m to the east and 240m to the south east. There are additional foundries 100m to the south west and 210m to the east. A graveyard is shown at the Cathedral Church of St.Peter 150m to the north west. Tramlines are shown from 190m to the north. The

Date(s)	Site	Surrounding Land
		buildings 190m to the south west have been demolished and Paradise St has been lengthened. The timber yard and surrounding buildings 230m to the north east has been replaced by Central Station , associated railways and tunnels .
1908	No significant change.	The flower mill 20m to the east is now shown as Victoria Works (milling) . The spice mill and mill 45m to the north east are now shown as being a cabinet works . The mill 90m to the north east is now shown as a laboratory . The cigar manufactory 120m to the south east is no longer shown. There is a smithy 200m to the east and an Electric Generating Station has been built 150m to the south west. Additional tramlines have been built to the north and west.
1927	No significant change.	The color works 55m to the east has expanded and Victoria Works (milling) 20m to the east is no longer shown. Chemical laboratories are shown 40m and 80m to the south. The smithy 200m and the foundry 210m to the east are no longer marked. The Blue Coat Hospital 80m to the north west is no longer marked and the Cathedral Church of St. Peter 150m to the north west has been replaced by unspecified buildings .
1944 (Town Plans)	The north of the site is shown as vacant buildings with coffee warehousing and a sugar mill occupying the centre of the site and dried fruit warehousing in the south of the site. A tobacco packing warehouse is in the south west. Basements are indicated in the south and west of the site.	The buildings immediately to the east are no longer shown along with one of the buildings to the south east and in the wider area. The buildings to the east are shown as being a drugs warehouse , fish stores and engineering works . Stores are also shown 10m to the south of the site with 'sunken petrol tanks' 15m to the south.
1954 -1955	The buildings in the north of the site are no longer shown and the buildings in the centre of the site are shown as ruins . The buildings in the souths of the site are shown as warehouses .	An electricity sub-station is shown 20m to the east and tanks are shown 10m to the west. The Electricity Generating Station 150m to the south west is now shown as a power station . Numerous buildings within 250m of the site are no longer shown or shown as ruins and car parks including the distillery 20m to the north, chemical works 40m to the south and mill 40m to the west. The foundry 160m to the south is now shown as housing . Several buildings in the local area are now marked as being warehouses , works , factories and garages . The closest of these are immediately to the south east, 10m to the south west and 40m to the west. The tramways to the west are no longer shown.
1959 – 1962	No significant change.	No significant change.
1963 - 1969 (Town Plans)	The warehouses in the south of the site are shown as ground nut warehousing and shipping before becoming vacant . The ruins in the centre of the site are no longer shown and the north of the site has been developed with spares warehouse and parts distributary . Paint stores , oil fuel shelter and tank and electrical stores are shown in the central east of the site.	A garage is shown 10m to the south with associated 'sunk petrol tank' with further 'sunk petrol tanks' indicated at the garage 15m to the south and petrol filling station 30m to the north. The buildings immediately to the north west of the site are shown as motors showrooms , garages with associated basements . The buildings to the west of the site are shown as a plastic foam and cotton warehouse with associated oil fuel sores and

Date(s)	Site	Surrounding Land
		pump house . Immediately to the south east is a asphalters yard and paper warehouse .
1970 - 1977	The warehouses in the south of the site and ruins in the centre of the site are no longer shown. The north of the site has been developed with an unspecified building .	The warehouse immediately to the south east is no longer shown. The land 25m to the north has been developed as a multistory car park with the land 30m to the north west now shown as Austin House and the land 20m to the south developed as a warehouse . The power station 150m to the south west is now shown as an Electrical Industrial Development Centre . The land 170m to the south west has been developed as housing . All of the tramlines within the local area have been demolished.
1984 - 1989	The south of the site is shown as a car park .	The buildings 190m to the north have been replaced by Clayton Square . The Electrical Industrial Development Centre 150m to the south west is no longer marked and the housing 160m to the south east has been demolished. The land associated with Central Station 200m to the north east has been re-landscaped.
1993	No significant change.	The former housing and warehouse buildings 160m to the south east has been redeveloped as housing .
2006 - 2017	No significant change.	No significant change.

2.4 Unexploded Ordnance (UXO) Risk Assessment

From a review of the sites development history (detailed in Table 1) there have been significant changes to the site and surrounding area before and after World War II and it can therefore be assumed that the area may have been subject to bombing during the war. The risk of unexploded ordnance being present on the site is therefore considered to be moderate to high.

2.5 Geology

The 1:50,000 British Geological Survey (BGS) scale map for the area indicates that the site is underlain by superficial deposits of Till (clay, sand, gravel and cobbles) with the solid strata underlying the site indicated to comprise of sandstone of the Helsby Sandstone Formation.

A historical BGS borehole record located approximately 25m to the north of the site dated 1961 has identified Made Ground to a depth of 12ft (3.5m) underlain by marl and sandstone with marl bands to a depth of 50ft (15m).

The BGS 1:10,000 artificial ground map indicates an area of Made Ground 125m to the north of the site and 300m to the west and 430m to the south west. An area of worked ground is also indicated 450m to the south.

Copies of the geological plans are attached in Appendix III.

2.6 Soil Geochemistry

According to the BGS National Geoscience Information Service no elevated background concentrations of arsenic, cadmium, lead or nickel are anticipated in the natural soils beneath the site. Slightly elevated naturally occurring chromium concentrations may however be present at concentrations between 60mg/kg and 90mg/kg.

2.7 Mining & Ground Stability

According to Coal Authority records the site is not located in an area affected by coal mining.

There are no BGS recorded mineral sites located within 500m of the site.

2.8 Hydrogeology

According to the Environment Agency groundwater vulnerability maps the superficial deposits underlying the site are classified as a Secondary Aquifer (undifferentiated) whilst the solid strata located beneath the site (Helsby Sandstone) are classified as a Principal Aquifer.

The site is not located within a Groundwater Source Protection Zone. There are no groundwater abstraction points within 500m of the site.

Copies of the hydrological site sensitivity maps are included in Appendix IV.

2.9 Hydrology

The nearest surface water feature is a fountain located 370m to the west of the site. The nearest tertiary watercourse is the River Mersey located 800m to the south west with associated dockyards 440m to the south west.

There is one recorded Pollution Incidents to Controlled Waters located 280m to the north of the site. It has been recorded as a Category 3 - Minor Incidents relating to a dry cleaning fluid spill in December 1998. The receiving water was land within the Mersey catchment area.

There are no discharge consents located within 500m of the site.

2.10 Flood Risk

According to Environment Agency records the site is located in an area with limited potential for groundwater flooding to occur.

2.11 Radon Risk Potential

The Radon Guidance on protective measures for new dwellings indicates that the site is not in an area affected by radon. Basic radon gas protective measures are therefore not required.

2.12 Landfill Sites

No historical landfill sites, local authority recorded landfill sites or waste management facilities are located within 500m of the site.

Two registered waste transfer sites are located within 250m of the site. One is located 75m to the south associated with J.C.B Factors Ltd, receiving < 10,000 tons of waste per year. The accepted waste is recorded as paint, solvents, thinners and finish. The second is 250m to the south east associated with Liverpool City Council Cleansing Depot, accepting < 10,000 tons of waste per year. The accepted waste is recorded as gully emptyings and street sweepings. Both licence statuses have lapsed.

There are no potentially infilled areas relating to possible filled ponds, streams, rivers and marshes located within 250m of the site.

2.13 Industrial Land Uses

A number of industrial and commercial directory entries are located within 250m of the site including sports equipment, electrical goods, fuel dealers, MOT test centres, printers and other light industrial and commercial premises.

One Local Authority Pollution Prevention and Control is located 85m to the west. The process type is listed as Local Authority Air Pollution Control associated with wood coating. The licence has been revoked.

No Integrated Pollution Prevention and Controls, Local Authority Integrated Pollution Prevention and Controls or Local Authority Pollution Prevention and Control Enforcements are recorded within 250m of the site.

A review of the historic land use of the area in section 2.3 above has identified historic petrol filling stations and 'sunk petrol tanks' 10m to the south, 15m to the south east and 30m to the north of the site.

A comprehensive list of the waste management and industrial sites located within 1km of the site are presented in the Environmental Datasheets in Appendix V.

2.14 Sensitive Land Uses

According to Historic England, the site is located within Liverpool – Maritime Mercantile City world heritage site buffer zone.

3.0 PHASE 1 RISK ASSESSMENT

3.1 General

The "suitable for use" approach is adopted for the assessment of contaminated land and remedial measures are only undertaken where unacceptable risk to human health or the environment can be proven when taking into account the proposed use of the site and environmental setting.

A risk assessment process should be carried out to determine potential hazards to human health and the environment and be based on the "source" "pathway" "receptor" principal. For a potential risk to be present there must be a viable pollutant linkage whereby a contamination source may impact upon a receptor. The absence of one or more of these key components (source, pathway or receptor) prohibits a viable pollution linkage being formed.

3.2 Preliminary Conceptual Site Model

In accordance with CLR11 "Model Procedures for the Management of Land Contamination" (2004) and BSI 10175 "Code of Practice for Investigation of Potentially Contaminated Land" (2011), a Preliminary Conceptual Site Model was developed to identify potential contamination sources, migration pathways and receptors within the study area.

The site has a varied development history with the following potential contamination sources identified:

- Made Ground associated with the construction and subsequent demolition of the historical buildings on site and potential infilled basements. Potential for any Made Ground soils to contain organic or inorganic contamination along with asbestos.
- Potential presence of inorganic and organic contaminants beneath the site associated with historic land use and tanks, oil fuel shelter and paint stores on site.
- Possible migration of mobile contamination from off-site sources including fuel stations and petrol tanks, mills, works, warehouses, garages, railways, tramways and sub-stations within the surrounding area.
- Possible generation of hazardous ground gas from Made Ground on-site and nearby infilled ground / basements and grave yard.
- Potential for Unexploded Ordnance (UXO) beneath the site.

We have referred to CLR 8 “Potential Contaminants for the Assessment of Contaminated Land” but there are no specific entries for the sites former land uses. A broad suite of chemical analysis are therefore recommended during any intrusive investigations, with samples tested for asbestos in areas where demolition has taken place, hydrocarbons (PAHs and TPHs) and metals in areas where fuels have previously been stored, PCBs adjacent to former sub-stations.

Potential pollutant pathways include:

- Dermal contact.
- Inhalation of particulates.
- Migration of leachable contaminants.
- Migration of hazardous ground gases into new structures.
- Acidic ground conditions affecting building infrastructure.

The following contamination receptors have been identified:

- Future site users.
- Construction workers.
- Controlled waters (surface water courses and aquifer).
- Buildings and infrastructure.

A preliminary risk assessment can be carried out using guidance outlined in Section 6.3 of CIRIA Document C552 “Contaminated Land Risk Assessment – A Guide to Good Practice” (2001).

For a risk to be present there must be a viable pollutant linkage whereby a contamination source can impact on a receptor via a pathway. To carry out the risk assessment an estimate must be made of the potential severity of the risk and the likelihood of the risk occurring. The following Tables set out the criteria for this principal.

Table 2 - Severity of Risk

Severity	Description
Severe	Acute risk to human health likely to result in ‘significant harm’ i.e. very high concentrations of contamination or ground gases. Catastrophic damage to building i.e. by explosion from high gassing sites or VOC concentrations. Major pollution of controlled waters i.e. surface watercourses and Principal aquifers, source protection zones. Short term damage to ecosystems.
Medium	Long term risk to human health likely to result in ‘significant harm’ i.e. elevated concentrations of contaminants or ground gases. Pollution of sensitive controlled watercourses i.e. Principal or Secondary Aquifers. Significant effects on sensitive ecosystems or species.

Mild	Pollution of non-sensitive waters i.e. smaller surface watercourses or unproductive strata. Significant damage to crops, buildings, structures or services i.e. by explosion from sites with medium gassing potential, elevated concentrations of contaminants.
Minor	Non-permanent human health effects i.e. requirement for protective equipment during site works to mitigate health effects. Damage to non-sensitive ecosystems or species. Minor damage to buildings, structures or services.

Table 3 - Probability of Risk Occurring

Probability	Description
High Likelihood	Pollutant linkage may be present that appears very likely in the short term and risk is almost certain to occur in long term or evidence of harm to receptor exists.
Likely	Pollutant linkage may be present and is likely that the risk will occur over the long term.
Low Likelihood	Pollutant linkage may be present and there is a possibility of the risk occurring although no certainty that it will do so.
Unlikely	Pollutant linkage may be present but the circumstances under which harm would occur even in the long term are improbable.

Table 4 - Comparison of Risk & Probability

Probability	Severity			
	Severe	Medium	Mild	Minor
High Likelihood	Very High	High	Moderate	Moderate/Low
Likely	High	Moderate	Moderate/Low	Low
Low Likelihood	Moderate	Moderate/Low	Low	Very Low
Unlikely	Moderate/Low	Low	Very Low	Very Low

A summary of potential pollutant linkages and perceived risks for this site are outlined in the Table below:

Table 5 - Pollutant Linkages & Perceived Risk

Sources of Contamination	Pathways	Receptors	Risk
Possible inorganic and organic contaminants and asbestos from demolition of former buildings on site and fuel oil storage / tanks on site.	Inhalation and dermal contact of soil particles during site construction works and by future end users.	Current site users	Very Low
		Future site users	Low / Moderate
		Construction workers during development	Low / Moderate
Migration of mobile contaminants from off-site sources including mills, works, garages petrol filling stations, railways and tanks. Potential generation of hazardous gas from Made Ground on site and within the local area along with grave yard.	Potential movement of mobile contaminants through underlying strata to controlled waters.	Principal aquifer and Secondary aquifers (solid and drift)	Moderate
		Future Site Users	Moderate
	Migration of ground gases into proposed new structures at the site.	Construction Workers During Development	Low / Moderate
		Building Infrastructure	Low

The historical OS maps of the area indicate that the site was occupied by unspecified buildings since the mid 1800s. These buildings were later identified as being coffee, dried fruit and tobacco packing warehouses along with a sugar mill. Post 1944, the buildings in the north of the site were no longer shown with ruins in the centre of the site. During the early to mid 1960s, the north of the site was re-developed as a spares warehouse and parts distributary with a ground nut warehouse in the south of the site. In the 1970s, the warehouse in the south of the site was demolished and became car parking with the north of the site becoming unspecified buildings.

The surrounding area has been occupied by mixed residential and industrial land with mills, works, railway land, garages and petrol filling stations all located within close proximity to the site.

Due to significant changes to the site and surrounding area before and after World War II it can be assumed that the area may have been effected by bombing during the war. A UXO risk assessment should be carried out for the site to characterise the risk.

Given the development history of the site and surrounding area it is possible that some ground contamination will be present. Made Ground soils have been indicated on the BGS artificial ground maps within the local area with boreholes from 35m to the north showing up to 3.5m of Made Ground. Historic basements have also been noted during a review of historical town plans to be present on site. These possible and known sources of Made Ground could be viewed as potential sources of heavy metals, hydrocarbons, PCBs and asbestos contamination.

Geological maps indicate that the site is underlain by superficial deposits comprising Till (clay, sand, gravel and cobbles) with solid strata indicated to by sandstone of the Helsby Sandstone Formation. The superficial deposits are classified as a Secondary Aquifer (undifferentiated) with the solid strata (Helsby Sandstone) classified as a Principal Aquifer though the site is not located within a Groundwater Source Protection Zone and there are no groundwater abstraction points within 500m of the site. The nearest surface water feature is a fountain located 370m to the west of the site and the closest tertiary watercourse is the River Mersey located 800m to the south west with associated docks 440m to the south west.

According to Environment Agency records the site is located in an area with limited potential for groundwater flooding to occur.

The site has been developed since the mid 1800s and as previously stated, Made Ground deposits are anticipated to be present on site and within the surrounding area. Any Made Ground could potentially contain organic materials or timber with the potential to generate hazardous ground gases. A historic grave yard is also located 150m to the north west which could also be a potential source of hazardous ground gases. Given the potential presence of granular soils beneath the site and surround area, it is plausible that off-site ground gas sources could have the potential to migrate to beneath the site, presenting a risk to the end users. As such, a gas monitoring program will be required as part of any future investigations and should be carried out in accordance with guidance presented in CIRIA C665 to appropriately characterise the potential gas risk.

Based on the desk study information the environmental setting of the site is considered to be of 'moderate' risk due to the presence of the underlying aquifers. Given the predominantly residential nature of the development, the risk to human health can be considered as 'high'.

4.0 CONCLUSIONS AND RECOMMENDATIONS

The Phase 1 Risk Assessment and Preliminary Conceptual Site Model have identified potential contamination sources, pathways and receptors. We would therefore recommend that the following Phase 2 investigations are undertaken:

- Carry out an Unexploded Ordnance Risk Assessment to assess the potential for UXO beneath the site.
- A ground investigation should be carried out in the location of proposed new structures to characterise the nature and depth of any Made Ground soils present beneath the site. Exploratory holes should provide a good spatial coverage of the site with selected boreholes / trial pits targeting historical features such as the former paint / fuel stores and tank.
- Soil samples should be recovered and submitted for chemical testing to comprise a minimum of pH and metals, asbestos screening, speciated PAH, speciated TPH and PCBs.
- The ground investigation should allow for excavations / boreholes to be taken through any Made Ground soils and into the underlying natural strata. In-situ testing should be carried out during drilling to provide adequate recommendations for foundation design.
- We would recommend the installation of a minimum of three gas monitoring wells in the location of the proposed new apartment blocks, with provision for an initial 6 monitoring visits carried out over a 2 month period in accordance with CIRIA Report C665.

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