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DESK STUDY / PRELIMINARY RISK ASSESSMENT REPORT

222 ARCHWAY ROAD,
HIGHGATE,
LONDON,
N6 5AX



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EXECUTIVE SUMMARY

Papa Architects ('The client') commissioned Jomas Associates Ltd to undertake a desk study and preliminary risk assessment at 222 Archway Road, Highgate, London, N6 5AX.

It should be noted that the table below is an executive summary of the findings of this report and is for briefing purposes only. Reference should be made to the main report for detailed information and analysis.

Desk Study	
Current Site Use	Offices at ground floor and lower ground floor, with residential units at ground floor and above.
Proposed Site Use	Conversion of the existing ground floor and lower ground floor from offices to residential use.
Site History	A review of the earliest available historical maps (1864) indicates that the site was undeveloped and devoid of any features. By the map dated 1894, the site is shown to be occupied by a residential-style terraced building in the west, with an external area presumed to be an associated garden in the east. The site appears to remain unchanged through to the most recent map (2021), and is presently used at ground and lower ground floor level as offices. From the earliest map (1854), the site vicinity is primarily undeveloped, with ponds, a brick field and clay pits noted within 200m of the site. By 1870, a branch of the Great Northern Railway is present roughly 120m north-east of the site. The site vicinity is noted to have undergone dense residential-style development by 1894. A few industrial buildings are noted in the site vicinity through to the 1960s, following which no significant changes are noted through to the most recent map (2021).
Site Setting	The British Geological Survey indicates that the site is directly underlain by solid deposits of the Claygate Member. No artificial or superficial deposits are reported within the site. Borehole records from approximately 231m north-west of the site, indicated topsoil overlying clays which extended in excess of 10mbgl, with a thin band of claystone noted at 8.05mbgl. The solid deposits underlying the site are identified as a Secondary 'A' Aquifer. A review of the Enviro+Geosight Report indicates that there are no source protection zones within 500m of the site. There are no groundwater, surface water or potable water abstractions reported within 2km of the site. There are no surface water features reported within 250m of the site. There are no Environment Agency Zone 2 or 3 floodplains reported within 50m of the site.
Potential Sources	• Potential for contaminated ground associated with industrial use – off site (S1) - Published goods, 14m north-west - Garage, 96m north-west (1962 – 1996) - Laundry and associated tank, ~120m north

Desk Study	
	• Potential ground gas generation from infilled land – off site (S2) - Pond, ~50m north - Brick field, 70m south-east (1879) - Unspecified pit, 133m north-west (1879)
Potential Receptors	• Construction and maintenance workers • Neighbouring and future site users • Buried foundations and services • Controlled waters – Secondary ‘A’ Aquifer
Preliminary Risk Assessment	The risk estimation matrix indicates a moderate to low risk. It is recommended that an intrusive investigation is undertaken to assess the extent of Made Ground soils present at the site, and to conduct chemical testing to assess the suitability of the soils in the proposed soft landscaped area for residential end-use. A preliminary investigation may comprise a series of windowless sampler holes or trial pits.
Potential Geological Hazards	The Groundsure data identifies primarily very low to negligible risks. The risk of shrink swell clays beneath the site has been reported to be moderate. Should new structures be proposed at the site, a ground investigation should be undertaken to inform geotechnical design parameters.
Planning Comments	Following the recent decision of application ref: HGY/2021/1508 it was accepted within the officers report under chapter 5.2 ‘A Desk Study / Preliminary Risk Assessment Report has been submitted as part of the application which details that there is a moderate to low risk of contaminants at the site.’

1 INTRODUCTION

1.1 Terms of Reference

1.1.1 Papa Architects ("The Client") has commissioned Jomas Associates Ltd, to assess the risk of contamination posed by the ground conditions at a site referred to as 222 Archway Road, Highgate, London, N6 5AX, prior to redevelopment of the site.

1.1.2 To this end a desk based assessment has been undertaken in accordance with Jomas Associates Limited's email proposal dated 26 March 2021.

1.2 Proposed Development

1.2.1 The proposed development is to convert the existing ground floor and lower ground floor from offices to residential use. The proposed development contains a private garden.

1.2.2 Plans of the proposed development are included as Figures 4 & 5, Appendix 1.

1.2.3 For the purposes of the contamination risk assessment, the proposed development is classified as 'Residential with plant uptake'.

1.2.4 Following the recent decision of application ref: HGY/2021/1508, in which a version of this report was submitted, it was accepted within the officer's report under chapter 5.2 that 'A Desk Study / Preliminary Risk Assessment Report has been submitted as part of the application which details that there is a moderate to low risk of contaminants at the site.'

1.2.5 For the purpose of geotechnical assessment, it is considered that the project could be classified as a Geotechnical Category (GC) 2 site in accordance with BS EN 1997 Part 1. GC 2 projects are defined as involving:

- Conventional structures.
- Quantitative investigation and analysis.
- Normal risk.
- No difficult soil and site conditions.
- No difficult loading conditions.
- Routine design and construction methods.

1.2.6 This will be reviewed at each stage of the project.

1.3 Objectives

1.3.1 The objectives of Jomas Associates Limited's investigation were as follows:

- To present a description of the present site status, based upon the published geology, hydrogeology and hydrology of the site and surrounding area;

- To review readily available historical information (i.e., Ordnance Survey maps and database search information) for the site and surrounding areas, with respect to potentially contaminative land uses;
- To provide an assessment of the environmental sensitivity at the site and the surrounding area, in relation to any suspected or known contamination which may significantly affect the site and the proposed development;
- To assess the potential presence of significant pollutant linkages, in accordance with the procedures set out within Part IIA of the Environmental Protection Act 1990, associated statutory guidance and current best practice including the EA report R&D CLR 11;
- To identify and assess geotechnical issues that may affect the site.

1.4 Scope of Works

1.4.1 The following tasks were undertaken to achieve the objectives listed above:

- A walkover survey of the site;
- A desk study, which included the review of third party historical Ordnance Survey maps and an environmental database report (attached in Appendix 2 and Appendix 3);
- The compilation of this report, which collects and discusses the above data, and presents an assessment of the site conditions, conclusions and recommendations.

1.5 Supplied Documentation

1.5.1 Jomas Associates have not been supplied with any previously produced reports at the time of writing this report.

1.6 Limitations

1.6.1 Jomas Associates Ltd has prepared this report for the sole use of Papa Architects in accordance with the generally accepted consulting practices and for the intended purposes as stated in the agreement under which this work was completed. This report may not be relied upon by any other party without the explicit written agreement of Jomas Associates Limited. No other third-party warranty, expressed or implied, is made as to the professional advice included in this report. This report must be used in its entirety.

1.6.2 The records search was limited to information available from public sources; this information is changing continually and frequently incomplete. Unless Jomas Associates Limited has actual knowledge to the contrary, information obtained from public sources or provided to Jomas Associates Limited by site personnel and other information sources, have been assumed to be correct. Jomas Associates Limited does not assume any liability for the misinterpretation of information or for items not visible, accessible or present on the subject property at the time of this study.

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- 1.6.3 Whilst effort has been made to ensure the accuracy of the data supplied, and analysis derived from it, there may be conditions at the site that have not been disclosed by the investigation, and could not therefore be taken into account. As with any site, there may be differences in soil conditions between exploratory hole positions. Furthermore, it should be noted that groundwater conditions may vary due to seasonal and other effects and may at times be significantly different from those measured by the investigation. No liability can be accepted for any such variations in these conditions.
- 1.6.4 Any reports provided to Jomas Associates Limited have been reviewed in good faith. Jomas Associates Limited cannot be held liable for any errors or omissions in these reports, or for any incorrect interpretation contained within them.
- 1.6.5 This investigation and report has been carried out in accordance with the relevant standards and guidance in place at the time of the works. Future changes to these may require a re-assessment of the recommendations made within this report.
- 1.6.6 *Our investigations exclude surveys to identify the presence of injurious and invasive weeds.*
- 1.6.7 ***This report is not an engineering design and the figures and calculations contained in the report should be used by the Structural Engineer, taking note that variations may apply, depending on variations in design loading, in techniques used, and in site conditions. Our recommendations should therefore not supersede the Engineer's design.***

2 SITE SETTING

2.1 Site Information

2.1.1 The site location plan is appended to this report in Figure 1, Appendix 1.

Table 2.1: Site Information

Name of Site	-
Address of Site	222 Archway Road, Highgate, London, N6 5AX
Approx. National Grid Ref.	528897 187786
Site Area (Approx)	0.02ha
Site Occupation	Offices on ground floor and lower ground floor with residential use on floors above
Local Authority	London Borough of Haringey

2.2 Walkover Survey

2.2.1 A site walkover survey was undertaken by Jomas Associates on 07 May 2021.

Table 2.2: Site Description

Area	Item	Details
On-site:	Current Uses:	The site is occupied by a four-storey building, including a lower ground floor. An architects' practice offices at ground floor level and lower ground floor level. To the rear of the building is a small garden which contains a wooden shed.
	Evidence of historic uses:	There was no evidence of historic uses of the site.
	Surfaces:	The majority of the site is covered by the footprint of the building, with the rear garden comprising concrete hardstanding and soft landscaping.
	Vegetation:	There is an 8m tall tree in the rear garden, as well as bamboo plants along the rear boundary. In addition, the soft landscaped area is overgrown with weeds and small plants. None of the vegetation seen appeared to be exhibiting any evidence of distress.
	Topography/Slope Stability:	There is a reduction in height from the front door on Archway Road to the rear garden, which is set at lower ground floor level.
	Drainage:	The site appears to be connected to normal drainage facilities.

Area	Item	Details
	Services:	The site is assumed to be connected to all normal services.
	Controlled waters:	No controlled waters were noted on site.
	Tanks:	No tanks were noted on site.
Neighbouring land:	North:	High street retail.
	East:	Residential.
	South:	Residential and high street retail.
	West:	Residential.

2.2.2 Key features noted during the walkover are shown on a site walkover plan in Figure 2, together with site photos, in Figure 3.

2.3 Historical Mapping Information

2.3.1 The historical development of the site and its surrounding areas was evaluated following the review of a number of Ordnance Survey historic maps, procured from Groundsure, and provided in Appendix 3 of this report.

2.3.2 A summary produced from the review of the historical map is given in Table 2.3 below. Distances are taken from the site boundary.

Table 2.3: Historical Development

Dates and Scale of Map	Relevant Historical Information	
	On Site	Off Site
1864 1:2,500	Site appears to be undeveloped and devoid of any features.	The site vicinity is primarily undeveloped land, with small-scale residential development from approximately 100m north-west of site. A number of small ponds are located in the site vicinity; the nearest being ~50m north, ~100m east and ~150m south-east. Just over 100m south-east of site is a brick field . An old clay pit is located roughly 150m north-west of site, and a clay pit roughly 180m west.
1870 1:2,500 1873, 1879 1:10,560	No significant changes.	A ' Great Northern Railway ' railway line runs roughly north-west to south-east and is located roughly 120m north-east of site, and sits both of an embankment and within a cutting. With the exception of the railway line and some small-scale residential development, the areas within 500m of site are primarily undeveloped.

Dates and Scale of Map	Relevant Historical Information	
	On Site	Off Site
1894 1:10,560 1896 1:1,056 1:2,500 1:10,560	The site contains a small residential-style terraced building in the west, with an external area presumed to be an associated garden in the east. The site appears to be in its current configuration.	The immediate site vicinity has undergone dense residential-style development. The ponds, brick field, clay pits and any associated groundworkings within 250m of site are no longer present, and the areas have generally been built upon. Approximately 50m south-west of site is a large industrial-style building.
1914 1:2,500 1920 1:10,560	No significant changes.	Further residential-style development in the site vicinity. Buildings associated with a nursery are located roughly 400m south-west of site.
1935 1:2,500 1938 1:10,560	No significant changes.	A laundry is located approximately 120m north of the site.
1950 – 1951 1:2,500 1950 – 1952 1:1,250 1951 – 1952 1:10,560	No significant changes.	A tank is present adjacent to the laundry building.
1958 – 1962 1:10,560 1962 – 1964 1:1,250	No significant changes.	A garage is located just under 100m north-west of site. Laundry building now shown to be a works.
1965 – 1967 1:10,560 1967 – 1970 1:2,500	No significant changes.	No significant changes.
1972 – 1985 1:1,250 1974 – 1975 1:10,000	No significant changes.	No significant changes.
1991 1:1,250	No significant changes.	No significant changes.
2001 1:10,000 2003 1:1,250	No significant changes.	No significant changes.
2010 10,000	No significant changes.	No significant changes.

Dates and Scale of Map	Relevant Historical Information	
	On Site	Off Site
2021 1:10,000	No significant changes.	No significant changes.

Potentially polluting/contaminating uses/activities shown in **bold**

- 2.3.3 Aerial photographs supplied as part of the Groundsure Enviro+GeoInsight report range from 1999 to 2019. These generally show the site and its surrounding to be in the same configuration as the historic maps from a similar time.

2.4 Past Land Use

- 2.4.1 Groundsure provide some information on past land use on and in the vicinity of the site. Table 2.4 below summarises the information provided, which is presented in further detail in the Enviro+Geoinsight in Appendix 2. Where the identified features have appeared on more than one map they have been counted multiple times and therefore the reported numbers may be higher than the actual count.

Table 2.4: Past Land Use

Type of Use	On site	Off-site (within 500m of site, unless stated otherwise)	Potential to Impact Site*
Historical Industrial Land Uses	None reported	63No reported; the nearest entry is recorded as brick field (1879) located 70m south-east. Other entries include unspecified pit (1879) 133m north-west and cuttings (1879) 139m north	✓
Historical Tanks	None reported	7No reported; the nearest entry is recorded as unspecified tank (1951) located 127m north	X
Historical Energy Features	None reported	20No reported; the nearest entry is recorded as electricity substation (1951) located 163m north	X
Historical Petrol Stations	None reported	None reported	X
Historical Garages	None reported	12No reported; the nearest entry is recorded as garage (1962-1996) located 96m north-west	✓
Historical Military Land	None reported	None reported	X

* From a land contamination/site development perspective

2.5 Landfill, Waste and Potentially Infilled Surface Ground Workings

- 2.5.1 The Groundsure Enviro+Geoinsight Report provides information on active and historical landfills and waste sites. It also provides information on historical land uses identified from Ordnance Survey mapping that involved ground excavation at the surface; these features may or may not have been subsequently infilled. The following section summarises the information collected from the available sources.

Table 2.5: Landfill, Waste and Potentially Infilled Ground Surface Workings

Type of Consent/Authorisation	On site	Off-site (within 500m of site, unless stated otherwise)	Potential to Impact Site*
Active or Recent Landfill	None reported	None reported	X
Historical Landfill	None reported	None reported	X
Historical Waste Sites	None reported	1No reported; recorded as recycling facility located 343m south	X
Licensed Waste Sites	None reported	None reported	X
Waste Exemptions	None reported	None reported	X
Potentially Infilled Surface Ground Workings	None reported	18No reported; the nearest entry is recorded as brick field (1879) located 70m south-east. Other entries include unspecified pit (1879) 133m north-west and cuttings (1879) 139m north	✓

* From a land contamination/site development perspective

2.6 Current Industrial Land Use

2.6.1 The Groundsure Enviro+Geoinsight Report also provides information on various records relating to current industrial land use on and in the vicinity of the site. The following section summarises the information collected from the available sources.

Table 2.6: Current Industrial Land Use

Type of Consent/Authorisation	On site	Off-site (within 500m of site, unless stated otherwise)	Potential to Impact Site*
Recent Industrial Land Uses	None reported	11No reported within 250m; the nearest entry is recorded as published goods located 14m north-west. Other entries include electronic equipment, clearance and salvage dealers and electrical equipment	✓
Current or Recent Petrol Stations	None reported	None reported	X
High Voltage Electricity Cables	None reported	2No reported; the nearest entry is recorded as decommissioned cable section 24, located 482m south-west	X
High Pressure Gas Pipelines	None reported	None reported	X
Sites Determined as Contaminated Land	None reported	None reported	X
Control of Major Accident Hazards (COMAH) and Notification of Installations Handling Hazardous Substances (NIHHS) Sites	None reported	None reported	X
Regulated Explosive Sites	None reported	None reported	X
Hazardous Substance Storage/Usage	None reported	None reported	X
Historical Licensed Industrial Activities	None reported	None reported	X

Type of Consent/Authorisation	On site	Off-site (within 500m of site, unless stated otherwise)	Potential to Impact Site*
Licensed Industrial Activities	None reported	None reported	X
Licensed Pollutant Release	None reported	3No reported; the nearest entry is recorded as dry cleaning located 62m north-west	X
Radioactive Substance Authorisations	None reported	None reported	X
Licensed Discharge to Controlled Waters	None reported	None reported	X
Pollutant Release to Surface Waters (Red List)	None reported	None reported	X
Pollutant Release to Public Sewer	None reported	1No reported; recorded as being located 285m north-west	X
List 1 and List 2 Dangerous Substances	None reported	None reported	X
Pollution Incidents	None reported	1No reported; recorded as inert materials and wastes Water, land and air impact: Category 4 (no impact)	X
Pollution Inventory Substances	None reported	None reported	X
Pollution Inventory Waste Transfers	None reported	None reported	X
Pollution Inventory Radioactive Waste	None reported	None reported	X

* From a land contamination/site development perspective

2.7 Tunnels and Railways

2.7.1 The Groundsure Enviro+Geosight Report provides information on railway tunnels and railways on and within the vicinity of the site, as summarised in the table below.

Table 2.7: Tunnels and Railways

Feature	On site	Off-site (within 250m of site, unless stated otherwise)	Potential to Impact Site*
Underground Railways (London)	None reported	1No reported; recorded as Northern Line tunnel located 9m south-west	X
Underground Railways (Non-London)	None reported	None reported	X
Railway Tunnels	None reported	None reported	X
Historical Railway and Tunnel Features	None reported	1No reported; recorded as railway (1914) located 122m north-east	X
Royal Mail Tunnels	None reported	None reported	X
Railways, Crossrail and HS2	None reported	None reported	X

* From a land contamination/site development perspective

2.8 Previous Site Investigations

- 2.8.1 Jomas Associates are not aware of any previous site investigations undertaken at the site prior to the writing of this report.

2.9 Local Authority Information

- 2.9.1 Jomas have made a request to London Borough of Haringey for information relating to contamination on the site and surrounding areas. A copy of the correspondence is included in Appendix 6.

- 2.9.2 A response is pending.

2.10 Planning Information

- 2.10.1 A review of the local authority's planning portal was undertaken on 24 May 2021 at <http://www.planningservices.haringey.gov.uk/portal/servlets/ApplicationSearchServlet>.

- 2.10.2 No planning applications deemed to be of relevance with regards to contaminated land were identified.

2.11 Unexploded Ordnance

- 2.11.1 Publicly available information indicates a moderate potential risk.

- 2.11.2 Potential moderate-risk regions are those that show a bomb density of between 11 and 50 bombs per 1km² and that may contain potential WWII targets.

- 2.11.3 This does not comprise a full UXO risk assessment. A UXO threat assessment is recommended.

3 GEOLOGICAL & ENVIRONMENTAL SETTING

3.1.1 The following section summarises the principal environmental resources (geological, hydrogeological and hydrological) of the site and its surroundings.

3.1.2 The data discussed herein is generally based on the information given within the Enviro+Geoinsight Report and published information provided by the Environment Agency and British Geological Survey.

3.2 Solid and Drift Geology

3.2.1 The British Geological Survey indicates that the site is directly underlain by solid deposits of the Claygate Member.

3.2.2 The BGS describes the Claygate Member as consisting of:

“...dark grey clays with sand laminae, passing up into thin alternations of clays, silts and fine-grained sand, with beds of bioturbated silt. Ferruginous concretions and septarian nodules occur in places.”

3.2.3 The London Clay Formation is a parent unit of the Claygate Member.

3.2.4 No artificial or superficial deposits are reported within the site boundary.

3.3 British Geological Survey (BGS) Borehole Data

3.3.1 As part of the assessment, publicly available BGS borehole records were obtained and reviewed from the surrounding area. The local records obtained are presented in Appendix 5.

3.3.2 The nearest such record was located approximately 231m north-west of the site, in February 1978.

3.3.3 This showed the underlying ground conditions to comprise topsoil to a depth of 0.25mbgl, overlying a sandy silty clay to 0.6mbgl. Beneath this were varying deposits of silty clay extending down to the base of the borehole (10mbgl), with a band of claystone noted from 8.05mbgl to 8.15mbgl.

3.3.4 During the drilling of the borehole groundwater was noted at 8.05mbgl.

3.3.5 All depths and measurements should be viewed as approximate, due to the age of the borehole and corresponding use of imperial measurements.

3.4 Hydrogeology & Hydrology

3.4.1 General information about the hydrogeology of the site was obtained from the EnviroInsight and / or the DEFRA “MAGIC” website.

Groundwater Vulnerability

3.4.2 The EA operates a classification system to categorise the importance of groundwater resources (aquifers) and their sensitivity to contamination. Aquifers were formerly

classified as major, minor and non-aquifers, based on the amenity value of the resource. A major aquifer is a significant resource capable of producing large quantities of water suitable for potable supply. Minor aquifers produce water in varying quantities or qualities, and if utilised are of local importance. Non aquifers are low permeability strata, which contain no significant exploitable groundwater and have very limited capacity to transmit contaminants.

3.4.3 Since 1 April 2010, the EA's Groundwater Protection Policy uses aquifer designations that are consistent with the Water Framework Directive. This comprises;

- **Secondary A** - permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers;
- **Secondary B** - predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers.
- **Secondary Undifferentiated** - has been assigned in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.
- **Principal Aquifer** – this is a formation with a high primary permeability, supplying large quantities of water for public supply abstraction.
- **Unproductive Strata** - These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.

Source Protection Zones (SPZ)

3.4.4 In terms of aquifer protection, the EA generally adopts a three-fold classification of SPZs for public water supply abstraction wells.

- Zone I - or 'Inner Protection Zone' is located immediately adjacent to the groundwater source and is based on a 50-day travel time. It is designed to protect against the effects of human activity and biological/chemical contaminants that may have an immediate effect on the source.
- Zone II - or 'Outer Protection Zone' is defined by a 400-day travel time to the source. The travel time is designed to provide delay and attenuation of slowly degrading pollutants.
- Zone III - or 'Total Catchment' is the total area needed to support removal of water from the borehole, and to support any discharge from the borehole.

Hydrology

3.4.5 The hydrology of the site and the area covers water abstractions, rivers, streams, other water bodies and flooding.

- 3.4.6 The Environment Agency defines a floodplain as the area that would naturally be affected by flooding if a river rises above its banks, or high tides and stormy seas cause flooding in coastal areas.
- 3.4.7 There are two different kinds of area shown on the Flood Map for Planning. They can be described as follows:
- Areas that could be affected by flooding, either from rivers or the sea, if there were no flood defences. This area could be flooded:
- from the sea by a flood that has a 0.5 per cent (1 in 200) or greater chance of happening each year;
 - or from a river by a flood that has a 1 per cent (1 in 100) or greater chance of happening each year.
- (For planning and development purposes, this is the same as Flood Zone 3, in England only.)
- The additional extent of an extreme flood from rivers or the sea. These outlying areas are likely to be affected by a major flood, with up to a 0.1 per cent (1 in 1000) chance of occurring each year.
- (For planning and development purposes, this is the same as Flood Zone 2, in England only.)
- 3.4.8 These two areas show the extent of the natural floodplain if there were no flood defences or certain other manmade structures and channel improvements.
- 3.4.9 Outside of these areas flooding from rivers and the sea is very unlikely. There is less than a 0.1 per cent (1 in 1000) chance of flooding occurring each year. The majority of England and Wales falls within this area. (For planning and development purposes, this is the same as Flood Zone 1, in England only.)
- 3.4.10 Some areas benefit from flood defences and these are detailed on Environment Agency mapping.
- 3.4.11 Flood defences do not completely remove the chance of flooding, however, and can be overtopped or fail in extreme weather conditions.

Table 3.1: Summary of Hydrogeology & Hydrology

Feature		On Site	Off Site	Potential Receptor?
Aquifer	Superficial:	-	-	X
	Solid:	Secondary 'A' Aquifer	Unproductive – 27m east	✓
Abstractions	Groundwater	None	None reported within 2km	X
	Surface water	None	None reported within 2km	X
	Potable	None	None reported within 2km	X
Source Protection Zone		-	-	X

Feature	On Site	Off Site	Potential Receptor?
Surface Water Features	None reported	None reported within 250m	X
EA Flood Zone 2	No	-	-
EA Flood Zone 3	No	-	-
RoFRaS	None	-	-
Flood Risk	Flood Defences	There are no areas benefiting from Flood Defences within 250m of the study site	-
	BGS	There is a negligible risk of groundwater flooding on the site	-

3.5 Sensitive Land Uses

- 3.5.1 The site is not located within a Nitrate Vulnerable Zone.
- 3.5.2 There are 2No Sites of Special Scientific Interest (SSSI) reported within 2km of the site; the nearest is recorded as Hampstead Heath Woods, located 1645m south-west.
- 3.5.3 There are 4No Local Nature Reserves (LNR) reported within 2km of the site; the nearest is recorded as Parkland Walk, located 124m north-east.
- 3.5.4 In addition, 3No Designated Ancient Woodlands are reported within 2km of the site; the nearest is recorded as Queens Wood, located 487m north.
- 3.5.5 No other sensitive land uses were identified within 2km of the site.

3.6 Radon

- 3.6.1 As reported, the site is not within a Radon affected area, as less than 1% of properties are above the action level.
- 3.6.2 Consequently, no radon protective measures are necessary in the construction of new dwellings or extensions as described in publication BR211 (BRE, 2015).

4 POSSIBLE GEOLOGICAL HAZARDS

4.1 Database Information Review

4.1.1 The following are brief findings extracted from the Groundsure Enviro+Geosight Report, that relate to factors that may have a potential impact upon the engineering of the proposed development.

Table 4.1: Geological Hazards

Potential Hazard	Site check Hazard Rating	Details	Further Action Required?
Shrink swell clays	Moderate	Ground conditions predominantly high plasticity	Yes
Running sands	Very low	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly	No
Compressible deposits	Negligible	Compressible strata are not thought to occur	No
Collapsible Deposits	Very low	Deposits with potential to collapse when loaded and saturated are unlikely to be present	No
Landslides	Very low	Slope instability problems are not likely to occur but consideration to potential problems of adjacent areas impacting on the site should always be considered	No
Ground dissolution soluble rocks	Negligible	Soluble rocks are either not thought to be present within the ground, or not prone to dissolution. Dissolution features are unlikely to be present	No
Coal mining	None	The study site is not located within the specified search distance of an identified coal mining area.	No
Non-coal mining	None	The study site is not located within the specified search distance of an identified non-coal mining area.	No

4.1.2 In addition, the Enviro+GeolInsight report notes the following:

- 18No historical surface ground working features within 250m of the site. The nearest is reported as a brick field located 70m south-east, in 1879
- 17No historical underground working features within 1km of the site. The nearest is reported as a tunnel located 269m south-west, in 1869

4.1.3 Should new structures be proposed at the site, a ground investigation should be undertaken to inform geotechnical design parameters.

5 QUALITATIVE RISK ASSESSMENT

5.1 Legislative Framework

5.1.1 A qualitative risk assessment has been prepared for the site, based on the information collated. This highlights the potential sources, pathways and receptors. Intrusive investigations will be required to confirm the actual site conditions and risks.

5.1.2 Under Part IIA of the Environmental Protection Act 1990, the statutory definition of contaminated land is:

"land which appears to the local authority in whose area it is situated to be in such a condition, by reason of substances in, on or under the land, that:

(a) significant harm is being caused or there is a significant possibility of such harm being caused; or

(b) significant pollution of controlled waters is being caused, or there is significant possibility of such pollution being caused."

5.1.3 The Statutory Guidance provided in the DEFRA Circular 04/2012 lists the following categories of significant harm to **human health**:

- death; life threatening diseases (e.g. cancers); other diseases likely to have serious impacts on health; serious injury; birth defects; and impairment of reproductive functions.

5.1.4 Other health effects may also be considered by the local authority to constitute significant harm with a wide range of conditions that may or may not constitute significant harm (alone or in combination) including: physical injury; gastrointestinal disturbances; respiratory tract effects; cardio-vascular effects; central nervous system effects; skin ailments; effects on organs such as the liver or kidneys; or a wide range of other health impacts.

5.1.5 In deciding whether or not land is contaminated land on grounds of significant possibility of significant harm to human health there are four categories to be considered. Categories 1 and 2 would encompass land which is capable of being determined as contaminated land on grounds of significant possibility of significant harm to human health. Categories 3 and 4 would encompass land which is not capable of being determined on such grounds.

5.1.6 For non-human receptors the following types of harm should be considered to be significant harm:

Ecological System Effects

- Harm which results in an irreversible adverse change, or in some other substantial adverse change, in the functioning of the ecological system within any substantial part of that location; or
- Harm which significantly affects any species of special interest within that location and which endangers the long-term maintenance of the population of that species at that location.

- In the case of European sites, harm should also be considered to be significant harm if it endangers the favourable conservation status of natural habitats at such locations or species typically found there. In deciding what constitutes such harm, the local authority should have regard to the advice of Natural England and to the requirements of the Conservation of Habitats and Species Regulations 2010.

Property Effects

- Crops: A substantial diminution in yield or other substantial loss in their value resulting from death, disease or other physical damage. For domestic pets, death, serious disease or serious physical damage. For other property in this category, a substantial loss in its value resulting from death, disease or other serious physical damage.
- Buildings: Structural failure, substantial damage or substantial interference with any right of occupation. The local authority should regard substantial damage or substantial interference as occurring when any part of the building ceases to be capable of being used for the purpose for which it is or was intended. In the case of a scheduled Ancient Monument, substantial damage should also be regarded as occurring when the damage significantly impairs the historic, architectural, traditional, artistic or archaeological interest by reason of which the monument was scheduled.

- 5.1.7 Contaminated land will only be identified when a 'pollutant linkage' has been established.
- 5.1.8 A 'pollutant linkage' is defined in Part IIA as:
"A linkage between a contaminant Source and a Receptor by means of a Pathway".
- 5.1.9 Therefore, this report presents an assessment of the potential pollutant linkages that may be associated with the site, in order to determine whether additional investigations are required to assess their significance.
- 5.1.10 In accordance with the National Planning Policy Framework, where development is proposed, the developer is responsible for ensuring that the development is safe and suitable for use for the purpose for which it is intended, or can be made so by remedial action. In particular, the developer should carry out an adequate investigation to inform a risk assessment to determine:
- whether the land in question is already affected by contamination through source – pathway – receptor pollutant linkages and how those linkages are represented in a conceptual model;
 - whether the development proposed will create new linkages, e.g. new pathways by which existing contaminants might reach existing or proposed receptors and whether it will introduce new vulnerable receptors; and
 - what action is needed to break those linkages and avoid new ones, deal with any unacceptable risks and enable development and future occupancy of the site and neighbouring land.

- 5.1.11 A potential developer will need to satisfy the Local Authority that unacceptable risk from contamination will be successfully addressed through remediation without undue environmental impact during and following the development.

5.2 Conceptual Site Model

- 5.2.1 On the basis of the information summarised above, a conceptual site model (CSM) has been developed for the site. The CSM is used to guide the investigation activities at the site and identifies potential contamination sources, receptors (both on and off-site) and exposure pathways that may be present. The identification of such potential “pollutant linkages” is a key aspect of the evaluation of potentially contaminated land.
- 5.2.2 The site investigation is then undertaken in order to prove or disprove the presence of these potential source-pathway-receptor linkages. Under current legislation an environmental risk is only deemed to exist if there are proven linkages between all three elements (source, pathway and receptor).
- 5.2.3 This part of the report lists the potential sources, pathways and receptors at the site, and assesses based on current and future land use, whether pollution linkages are possible.
- 5.2.4 Potential pollutant linkages identified at the site are detailed below:

Table 5.1: Potential Sources, Pathways and Receptors

Source(s)	Pathway(s)	Receptor(s)
- Potential for contaminated ground associated with industrial use – off site (S1) - Published goods, 14m north-west - Garage, 96m north-west (1962 – 1996) - Laundry and associated tank, ~120m north - Potential ground gas generation from infilled land – off site (S2) - Pond, ~50m north - Brick field, 70m south-east (1879) - Unspecified pit, 133m north-west (1879)	- Ingestion and dermal contact with contaminated soil (P1) - Inhalation or contact with potentially contaminated dust and vapours (P2) - Leaching through permeable soils, migration within the vadose zone (i.e., unsaturated soil above the water table) and/or lateral migration within surface water, as a result of cracked hardstanding or via service pipe/corridors and surface water runoff. (P3) - Horizontal and vertical migration of contaminants within groundwater (P4) - Accumulation and Migration of Soil Gases (P5) - Permeation of water pipes and attack on concrete foundations by aggressive soil conditions (P6)	- Construction workers (R1) - Maintenance workers (R2) - Neighbouring site users (R3) - Future site users (R4) - Building foundations and on site buried services (water mains, electricity and sewer) (R5) - Controlled waters (R6) - Secondary A aquifer, on site

5.3 Qualitative Risk Estimation

- 5.3.1 Based on information previously presented in this report, a qualitative risk estimation was undertaken.

5.3.2 For each potential pollutant linkage identified in the conceptual model, the potential risk can be evaluated, based on the following principle:

Overall contamination risk = Probability of event occurring x Consequence of event occurring

5.3.3 In accordance with CIRIA C552, the consequence of a risk occurring has been classified into the following categories:

- Severe
- Medium
- Mild
- Minor

5.3.4 The probability of a risk occurring has been classified into the following categories:

- High Likelihood
- Likely
- Low Likelihood
- Unlikely

5.3.5 This relationship can be represented graphically as a matrix (Table 5.2).

Table 5.2: Overall Contamination Risk Matrix

		Consequence			
		Severe	Medium	Mild	Minor
Probability	High Likelihood	Very High Risk	High Risk	Moderate Risk	Low Risk
	Likely	High Risk	Moderate Risk	Moderate Risk	Low Risk
	Low Likelihood	Moderate Risk	Moderate Risk	Low Risk	Very Low Risk
	Unlikely	Low Risk	Low Risk	Very Low Risk	Very Low Risk

5.3.6 The risk assessment process is based on guidance provided in CIRIA C552 (2001) *Contaminated Land Risk Assessment – A Guide to Good Practice*. Further information including definitions of descriptive terms used in the risk assessment process is included in Appendix 4.

5.3.7 The degree of risk is based on a combination of the potential sources and the sensitivity of the environment. The risk classifications can be cross checked with reference to Table A4.4 in Appendix 4.

5.3.8 Hazard assessment was also carried out, the outcome of which could be:

- Urgent Action (UA) required to break existing source-pathway-receptor link.
- Ground Investigation (GI) required to gather more information
- Watching Brief there is no evidence of potential contamination but the possibility of it exists and so the site should be monitored for local and olfactory evidence of contamination.
- No action required (NA)

5.3.9 The preliminary risk assessment for the site is presented in Table 5.3 below.

SECTION 5

QUALITATIVE RISK ASSESSMENT

Table 5.3: Preliminary Risk Assessment for the Site

Sources	Pathways (P)	Receptors	Consequence of Impact	Probability of Impact	Risk Estimation	Hazard Assessment
• Potential for contaminated ground associated with industrial use – off site (S1) - Published goods, 14m north-west - Garage, 96m north-west (1962 – 1996) - Laundry and associated tank, ~120m north • Potential ground gas generation from infilled land – off site (S2) - Pond, ~50m north - Brick field, 70m south-east (1879) - Unspecified pit, 133m north-west (1879)	• Ingestion and dermal contact with contaminated soil (P1) • Inhalation or contact with potentially contaminated dust and vapours (P2) • Permeation of water pipes and attack on concrete foundations by aggressive soil conditions (P6)	• Construction workers (R1) • Maintenance workers (R2) • Neighbouring site users (R3) • Future site users (R4) • Building foundations and on site buried services (water mains, electricity and sewer) (R5)	Medium	Low	Moderate	Ground Investigation
			Severe for Asbestos			
		• Accumulation and migration of soil gases (P5)		Severe	Unlikely	
	• Leaching through permeable soils, migration within the vadose zone (i.e., unsaturated soil above the water table) and/or lateral migration within surface water, as a result of cracked hardstanding or via service pipe/corridors and surface water runoff. (P3) • Horizontal and vertical migration of contaminants within groundwater (P4)	• Neighbouring site users (R3) • Building foundations and on site buried services (water mains, electricity and sewer) (R5) • Controlled waters (R6) - Secondary A aquifer, on site	Medium	Unlikely	Low	

- 5.3.10 It should be noted that the identification of potential pollutant linkages does not necessarily signify that the site is unsuitable for its current or proposed land use. It does however act as a way of focussing data collection at the site in accordance with regulatory guidance in CLR 11.

5.4 Outcome of Risk Assessment

- 5.4.1 The risk estimation matrix indicates a moderate low risk as defined above.
- 5.4.2 It is understood that the proposed development comprises the conversion the existing ground floor and lower ground floor from offices to residential use. The proposed development contains a private garden.
- 5.4.3 A review of the earliest available historical maps (1864) indicates that the site was undeveloped and devoid of any features. By the map dated 1894, the site is shown to be occupied by a residential-style terraced building in the west, with an external area presumed to be an associated garden in the east. The site appears to remain unchanged through to the most recent map (2021), and is presently used at ground and lower ground floor level as offices.
- 5.4.4 From the earliest map (1854), the site vicinity is primarily undeveloped, with ponds, a brick field and clay pits noted within 200m of the site. By 1870, a branch of the Great Northern Railway is present roughly 120m north-east of the site. The site vicinity is noted to have undergone dense residential-style development by 1894. A few industrial buildings are noted in the site vicinity through to the 1960s, following which no significant changes are noted through to the most recent map (2021).
- 5.4.5 The site is underlain by the Claygate Member, which consists of primarily low permeability clays, with beds and laminae of higher permeability. Although the Claygate Member is deemed to be a Secondary 'A' Aquifer, there are no abstractions or surface water features reported in site vicinity, and therefore, the risk to controlled waters posed by the site has been determined to be low.
- 5.4.6 The areas of possible infilled land in the site vicinity (ponds, brick field and clay pits), appeared to have all been infilled by the 1890s, and the majority of them had been developed upon by this point. Due to their generally small size, the age since potential infilling, and the anticipated low permeability soils underlying the site, risks to the proposed development associated with hazardous ground gases are considered to be low, and no ground gas monitoring is considered necessary.
- 5.4.7 Due to the predominant building cover at the site, pathways for exposure to residential end users are considered to be limited. The desk study has not identified any significant uses of potentially volatile contaminants at the site, and although a historical garage and a laundry have been identified in the site vicinity, given the distance from the site and the anticipated low permeability soils, vapour intrusion risks are considered to be negligible.

5.4.8 It is recommended that an intrusive investigation is undertaken to assess the extent of Made Ground soils present at the site, and to conduct chemical testing to assess the suitability of the soils in the proposed soft landscaped area for residential end-use.

5.4.9 A preliminary investigation may comprise a series of windowless sampler holes or trial pits.

5.5 List of Key Contaminants

5.5.1 The possible contamination implications for both on-site and off-site sources have been assessed based on the information presented in the report. This has been achieved using guidance publications by the Environment Agency, together with other sources.

5.5.2 In the case of the site uses identified as part of the desk study research, reference to DoE industry profiles would not indicate a specific use reference, although reference has been made to the miscellaneous industries profile.

5.5.3 Based on recommendations within the guidance publications, an initial soil and water chemical testing suite would need to consider a range of contaminants as follows:

- *Metals*: cadmium, chromium, copper, lead, mercury, nickel, zinc;
- *Semi-metals and non-metals*: arsenic, boron, sulphur;
- *Inorganic chemicals*: cyanide, nitrate, sulphate and sulphide;
- *Organic chemicals*: aromatic hydrocarbons, aliphatic hydrocarbons, petroleum hydrocarbons, phenol, polyaromatic hydrocarbons;
- *Others*: pH, Asbestos.

6 REFERENCES

BRE Report BR211; Radon: Guidance on protective measures for new buildings, 2015

Code of Practice for Ground Investigations BS5930: 2015

CL:AIRE; Petroleum Hydrocarbons in Groundwater, 2017

Environment Agency (2004) *Model procedures for the management of land contamination*. CLR11. Bristol: Environment Agency

Groundsure Enviro+Geoinsight Report Ref HMD-377-7838349 May 2021

Investigation of Potentially Contaminated Sites – Code of Practice BS10175: 2011

Ministry of Housing, Communities & Local Government: *National Planning Policy Framework*. February 2019

APPENDICES

APPENDIX 1 – FIGURES

APPENDIX 2 – GROUNDSURE REPORT

APPENDIX 3 – OS HISTORICAL MAPS

APPENDIX 4 – QUALITATIVE RISK ASSESSMENT METHODOLOGY

APPENDIX 5 – BGS BOREHOLE RECORDS

APPENDIX 6 – LOCAL AUTHORITY CORRESPONDENCE

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