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DESK STUDY / PRELIMINARY RISK ASSESSMENT REPORT

PARTRIDGE WAY
WOOD GREEN
N22 8DT



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EXECUTIVE SUMMARY

Malcolm McPherson ('The client') commissioned Jomas Associates Ltd to undertake a desk study and preliminary risk assessment at Partridge Way, Wood Green, N22 8DT. The principal objectives of the study were as follows:

-) To determine the nature and where possible the extent of contaminants potentially present at the site;
-) To establish the presence of significant contaminant linkages, in accordance with the procedures set out within the Environment Agency (EA) report R&D CLR11 and relevant guidance within the National Planning Policy Framework (NPPF);
-) To assess whether the site is safe and suitable for the purpose for which it is intended, or can be made so by remedial action.

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	18No single-storey domestic lock-up garages of concrete construction.
Proposed Site Use	Residential development consisting of 15no. residential units in a 7-storey block which may increase to 17 units in an 8-storey block. No private gardens or extensive areas of soft landscaping are anticipated.
Site History	A review of earliest available (1864) historical maps indicates the majority of the site forms part of a roadway identified as Commerce Road at that time. The southern corner of the site was undeveloped and formed part of an agricultural field. By the map dated 1896, the southern corner of the site had been developed and formed a verge way for the adjacent Bounds Green Lane. By 1935 a building identified as a Club encroaches in to the southern corner of site from the southeast. By 1952 this building is no longer identified as a Club. By the map dated 1971, the site had been redeveloped and is shown to be occupied by a row of domestic lock-up garages along the northern site boundary. The site appears to have remained in this configuration until present. The surrounding area has been predominantly residential use with occasional industrial features. The industrial features identified are considered to be sufficient distance that the potential impact to site is negligible.
Site Setting	The British Geological Survey indicates that the site is directly underlain by solid deposits of the London Clay Formation. No artificial deposits are reported within the site. The solid deposits directly underlying the site are identified as Unproductive. A review of the Enviro+Geosight Report indicates that the site is located within an EA Source Protection Zone 1 (SPZ1). 20No groundwater abstractions are reported within 2km of the site, 18No of which are for potable use. The closest is identified as an active potable water abstraction 478m

Desk Study	
	south of the site. 1No detailed river entry and surface water feature is reported within 250m of the site, identified as an inland river 68m east 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 previous site use (roadway / verge, lock-up garages) – on site (S1) ✓ Potential for Made Ground associated with previous development operations – on site (S2) ✓ Potential asbestos containing materials within existing buildings – on site (S3)
Potential Receptors	✓ 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)
Preliminary Risk Assessment	The risk estimation matrix indicates a moderate to low risk. Due to the potential presence of asbestos containing materials, an asbestos survey should be undertaken, with any asbestos containing materials found, removed under suitably controlled conditions. There should be no risk to end users from asbestos if the potential asbestos containing materials are removed by suitably qualified and experienced specialists under controlled conditions. It is recommended that an intrusive investigation is undertaken to clarify potential risks to the identified receptors, and assess the extent of made ground soils present at the site. A preliminary investigation may comprise a series of window sampler holes or trial pits.
Potential Geological Hazards	Existing hardstanding and foundations will need to be removed and grubbed out ahead of the development. This may require the use of hydraulic breaking. The clearance of the site, including removal of foundations and services is likely to increase the depth of Made Ground on the site. Foundations should not be formed within Made Ground or organic rich material (e.g. Topsoil) due to the unacceptable risk of total and differential settlement. Foundations must be designed so as not to load nor undermine adjacent boundary walls and buildings. The presence of Made Ground derived from demolition material may be a source of elevated sulphate, associated with plaster from the previous structures. If such levels are noted then sulphate resistant concrete may be required. The BGS notes disseminated pyrite within the London Clay Formation and as such may be a source of elevated sulphate results. If such levels are noted then sulphate resistant concrete may be required.

Desk Study	
	The resultant thickness of Made Ground and the potential for clays beneath the proposed footprint may mean that a suspended floor slab would be required. A geotechnical investigation is recommended to inform foundation design.
UXO	Publicly available information has been assessed regarding the risk of Unexploded Ordnance affecting the site. The data indicates there is a moderate risk.
Recommended Further Work	An intrusive investigation is recommended to confirm the preliminary geo-environmental risks identified and to provide geotechnical information for use in design. A UXO Risk Assessment is recommended.

1 INTRODUCTION

1.1 Terms of Reference

1.1.1 Malcolm McPherson ("The Client") has commissioned Jomas Associates Ltd, to assess the risk of contamination posed by the ground conditions at a site referred to as Partridge Way, Wood Green, N22 8DT, 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 02 June 2020.

1.2 Proposed Development

1.2.1 The proposed development is understood to comprise redevelopment of the existing garages to accommodate a residential development consisting of 15no. residential units in a 7-storey block which may increase to 17 units in an 8-storey block. Private gardens or extensive areas of soft landscaping are not anticipated.

1.2.2 A plan of the proposed development is included in Figure 2.

1.2.3 For the purposes of the contamination risk assessment, the proposed development is classified as 'Residential without plant uptake'.

1.2.4 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.

1.2.5 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 Malcolm McPherson 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.

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	Partridge Way Wood Green N22 8DT
Approx. National Grid Ref.	530422 190898
Site Area (Approx.)	0.05ha
Site Occupation	Lock-up garages
Local Authority	London Borough of Haringey

2.2 Walkover Survey

2.2.1 A site walkover survey was undertaken by Jomas Associates on 04 September 2020.

Table 2.2: Site Description

Area	Item	Details
On-site:	Current Uses:	The site is occupied by a row of 18No single-storey domestic lock-up garages of concrete construction. The roof of the garages appear to be constructed with possible asbestos containing materials (ACMs). There is a paved area to the south of the garages which appears to be a public pavement.
	Evidence of historic uses:	There was no evidence of historic uses of the site.
	Surfaces:	The vast majority of the site is hard-covered by way of the building footprint and paved area to the south. The hardcover comprises concrete and concrete paving. The only softcover present is a small island of turf in the paved area to the south of the garages.
	Vegetation:	The only vegetation present onsite is a small island of turf in the paved area to the south of the garages.
	Topography/Slope Stability:	Overall, the site reduces in elevation from east to west but there are no significant changes.
	Drainage:	The site appears to be connected to normal drainage facilities. Drain covers are situated around the site.

Area	Item	Details
	Services:	A number of manholes were noted indicating buried services traverse the site. The garages do not appear to be connected to services although this could not be confirmed as there was no internal access at the time of the walkover.
	Controlled waters:	No controlled waters were noted on site.
	Tanks:	No tanks were noted on site.
Neighbouring land:	North:	The site is bounded to the north by Partridge Way, with residential property further north. .
	East:	Residential property.
	South:	Immediately adjacent is a Trinity Road, Bounds Green Road , with residential property further south .
	West:	The site is bounded to the west by the junction of Partridge Way and Trinity Road. Further west is residential property.

- 2.2.2 Key features noted during the walkover are shown on a site walkover plan in Figure 3, together with site photos, in Figure 4.

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	The majority of the site forms part of a roadway identified as Commerce Road. The southern corner of the site is undeveloped and forms part of and agricultural field.	A row of residential-style buildings in terrace arrangement along Commerce Road bounds the site to the north. The site is bounded to the east by Commerce Road, to the west by an unnamed road and to the south by the unnamed road and agricultural land. A large residential property identified as Nightingale Hall is located 50m SW. A tunnel is indicated 70m E. Woodgreen Nursery is shown 220m E. A railway is shown 300m SW.

Dates and Scale of Map	Relevant Historical Information	
	On Site	Off Site
1873 - 1879 1:10,560	No significant changes.	The road bounding the site to the west and south is identified as a Boundsgreen Lane. Woodgreen Station is located 500m S. Reservoirs are shown 750m S. Boundsgreen Brickworks is located 800m NW.
1896 – 1897 1:1,056 1:2,500 1:10,560	The southern corner has been developed and now appears to form a verge way for the adjacent Boundsgreen Lane.	The field adjacent to the south of site has been developed and is now occupied by terrace housing. There has been significant urbanisation of the Wood Green area to the north, east and southeast. An engine shed is shown 230m W Palace Gates Station has been developed 250m S
1914 -1920 1:2,500 1:10,560	No significant changes.	Some houses have been demolished along Boundsgreen Lane 40m – 70m SE. Boundsgreen Lane is now shown to be a tramway . Nightingale Hall 50m SW and the surrounding land has been redeveloped into a number of streets of terrace housing. There has been other residential redevelopment in the surrounding area.
1935 – 1938 1:2,500 1:10,560	A building identified as a Club encroaches in to the southern corner of site from the southeast.	The houses adjacent to the east have been demolished and 2No possible commercial buildings have been developed. One of these buildings is identified as a Club. Allotment gardens are shown 80m NE. A fire station has been constructed 200m NW. A number of terrace houses have been developed 210m – 300m NW.
1952 - 1957 1:1,250 1:2,500 1:10,560	The building encroaching site from the southeast is no longer identified as a club.	Finsbury works is shown 60m E. A foundry is located 80m E. A garage and engineering works are shown 160m NE. A factory has been developed 190m NE.

Dates and Scale of Map	Relevant Historical Information	
	On Site	Off Site
1971 - 1979 1:1,250 1:2,500 1:10,000	The site has been redeveloped and is now shown to be occupied by a row of domestic lock-up garages along the northern site boundary. The site appears to have remained in this configuration until present	Commerce Road and the houses to the north have been redeveloped into two residential blocks identified as Finsbury House and Newbury House. The garages onsite appear to be associated with this development. The building adjacent to the east of site have been redeveloped in to new terrace housing. An electricity substation is shown 60m SE. There has been other residential redevelopment in the surrounding area.
1983 - 1987 1:1,250 1:2,500 1:10,000	No significant change.	There has been redevelopment 100m – 170m E where Nightingale Primary School has been constructed.
1991 1:1,250 1:10,000	No significant change.	No significant change.
2001 - 2010 1:1,250 1:10,000	No significant change.	There appears to have been some minor residential redevelopment of the surrounding area.
2020 1:10,000	No significant change.	No significant change.

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 show the site to be occupied by a row of domestic lock-up garages along the northern site boundary, with the remainder of the site forming the access road. These appear to be associated with the high rise blocks to the north.

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	134No reported – closest identified as a nursery 123m E – 1869	X

Type of Use	On site	Off-site (within 500m of site, unless stated otherwise)	Potential to Impact Site*
Historical Tanks	None reported	7No reported – closest identified as an unspecified tank 202m NW - 1896	X
Historical Energy Features	None reported	24No reported – closest identified as an electricity substation 42m SE	X
Historical Petrol Stations	None reported	None reported	X
Historical Garages	None reported	13No reported – closest identified as a garage 150m NE – 1956	X
Historical Military Land	None reported	None reported	X

2.5 Landfill, Waste and Potentially Infilled Surface Ground Workings

2.5.1 The Groundsure Enviro+Geosight 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 – identified as a waste storage shed 252m NE	X
Licensed Waste Sites	None reported	None reported	X
Waste Exemptions	None reported	6No reported – closest identified 327m NE	X
Potentially Infilled Surface Ground Workings	None reported	1No reported – identified as an unspecified ground working 231m W, likely associated with railway land	X

2.6 Current Industrial Land Use

2.6.1 The Groundsure Enviro+Geosight 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	8No reported, including electricity substations, and ambulance station, depot and a tank	X

Type of Consent/Authorisation	On site	Off-site (within 500m of site, unless stated otherwise)	Potential to Impact Site*
Current or Recent Petrol Stations	None reported	2No reported – closest identified 180m NE. Both entries are identified as obsolete.	X
High Voltage Electricity Cables	None reported	None reported	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
Licensed Industrial Activities	None reported	None reported	X
Licensed Pollutant Release	None reported	6No reported – closest identified as a dry cleaners 313m E	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	None reported	X
List 1 and List 2 Dangerous Substances	None reported	None reported	X
Pollution Incidents	None reported	1No reported – identified as firefighting runoff 393m S	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

2.7 Tunnels and Railways

2.7.1 The Groundsure Enviro+Geoinsight 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 – identified as the Piccadilly Line 7m SW	✓
Underground Railways (Non-London)	None reported	None reported	X
Railway Tunnels	None reported	None reported	X
Historical Railway and Tunnel Features	None reported	23No reported – closest identified as a tunnel 64m E - 1896	X
Royal Mail Tunnels	None reported	None reported	X
Railways, Crossrail and HS2	None reported	10No reproetd – closest identified as a railway 191m SW	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 September 2020 at <http://www.planningservices.haringey.gov.uk/portal>

2.10.2 No planning applications made at the study site could be identified during the portal search.

2.10.3 A planning application (HGY/1991/0559) was made at the northerly adjacent Finsbury & Newbury Houses in May 1991 for the following:

"Provision of concierge/reception area and community room in ground floor of each block and alterations to elevations at ground floor level."

2.10.4 No site investigation reports for the site or site vicinity could be identified during the portal search.

2.11 Unexploded Ordnance

- 2.11.1 The initial data indicates that there is a moderate risk.
- 2.11.2 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 A preliminary UXO risk assessment has also been undertaken. This identified that during the Second World War the site was located within the Municipal Borough of Wood Green, which officially recorded 195No high explosive bombs with a bombing density of 121.3 bombs per 405 hectares. Records suggest that several high explosive bombs fell in close proximity to the site.
- 2.11.4 The full preliminary assessment is provided in Appendix 7.
- 2.11.5 A detailed 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+Geosight 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 London Clay Formation. These are indicated by the BGS to consist of

“bioturbated or poorly laminated, blue-grey or grey-brown, slightly calcareous, silty to very silty clay, clayey silt and sometimes silt, with some layers of sandy clay. It commonly contains thin courses of carbonate concretions (‘cementstone nodules’) and disseminated pyrite.”

3.2.2 Although artificial deposits are not reported within the site, given the identified site history a thickness of Made Ground should be expected.

3.2.3 No faults are reported in close proximity to the site.

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.

3.3.2 No such records from within the site vicinity could be identified.

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:	None reported	None reported within 500m	X
	Solid:	Unproductive	Unproductive	X
Abstractions	Ground water	None reported	20No reported within 2km – closest identified 478m S for potable use. Status active.	✓
	Surface water	None reported	None reported within 2km.	X
	Potable	None reported	18No reported within 2km – closest identified 478m S. Status active.	✓
Source Protection Zone		SPZ1	SPZ2 – 200m N	✓

Feature	On Site	Off Site	Potential Receptor?
Surface Water Features	None reported	1No reported – identified as an New River 68m E, which from online mapping appears to be culverted	X
EA Flood Zone 2	None reported	None reported within 50m	-
EA Flood Zone 3	None reported	None reported within 50m	-
Flood Risk	RoFRaS	N/A	-
	Flood Defences	There are no areas benefiting from Flood Defences within 250m of the study site.	-
	Groundwater Flooding	Negligible risk.	-

3.4.13 The nearest reported potable water abstraction was undertaken at Station Road, 478m south of the site, for Thames Water in July 1992.

3.4.14 The borehole record for his abstraction has been identified and showed the underlying ground to comprise “*Made Ground*” to a depth of around 5m bgl, overlying the “*London Clay*” to around 32.5m bgl over “*Woolwich and Reading Beds*” (The Lambeth Group) to around 44.25m bgl underlain “*Thanet Sand*” to approximately 52m bgl. Resting water level is reported at 42.84m bgl and the water is abstracted from the basal sands of the Lambeth Group. This borehole record is presented in Appendix 5.

3.4.15 On the basis of the above, the potable water abstractions are not considered to be viable receptors due to the thickness of overlying impermeable London Clay acting as an aquiclude prevent downward migration of mobile contaminants.

3.4.16 The New River lies some 60m east of the site, and from online mapping it appears that it is culverted. It is therefore considered unlikely to be in hydraulic continuity with groundwater beneath the site.

3.5 Sensitive Land Uses

3.5.1 The site is located within a Nitrate Vulnerable Zone.

3.5.2 A Nitrate Vulnerable Zone (NVZ) is a conservation designation of the Environment Agency for areas of land that drain into nitrate polluted waters, or waters which could become polluted by nitrates. Nitrate Vulnerable Zones were introduced by the UK government in response to the EU mandate that all EU countries must reduce the nitrate in Drinking Water to a maximum of 50 mg/l.

3.5.3 The NVZs cover large areas of land that have been identified as exceeding or being at risk of exceeding 50 mg NO₃/l.

3.5.4 The Alexandra Palace & Park Local Nature Reserves (LNR) is located 532m south.

3.5.5 No other sensitive land use was identified within 1km 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 GI recommended
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	No	The study site is not located within the specified search distance of an identified coal mining area.	No
Non-coal mining	No	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 GeoInsight report notes the following:

-) 1 No historical surface ground working features are reported within 250m of the site, identified as unspecified ground workings 231m west in 1894.
-) 12 No. historical underground working features are reported within 1km of the site. The closest is identified as a tunnel 167m NE. It should be noted a London Underground tunnel is also reported 7m southwest of the site.
-) No BritPits (database maintained by the British Geological Survey of currently active and closed surface and underground mineral workings) are reported within 1km of the site.

- 4.1.3 Existing hardstanding and foundations will need to be removed and grubbed out ahead of the development. This may require the use of hydraulic breaking.
- 4.1.4 The clearance of the site, including removal of foundations and services is likely to increase the depth of Made Ground on the site.
- 4.1.5 Foundations should not be formed within Made Ground or organic rich material (e.g. Topsoil) due to the unacceptable risk of total and differential settlement.
- 4.1.6 Foundations must be designed so as not to load nor undermine adjacent boundary walls and buildings.
- 4.1.7 The presence of Made Ground derived from demolition material may be a source of elevated sulphate, associated with plaster from the previous structures. If such levels are noted then sulphate resistant concrete may be required.
- 4.1.8 The BGS notes disseminated pyrite within the London Clay Formation and as such may be a source of elevated sulphate results. If such levels are noted then sulphate resistant concrete may be required.
- 4.1.9 The resultant thickness of Made Ground and the potential for clays beneath the proposed footprint may mean that a suspended floor slab would be required.
- 4.1.10 A geotechnical investigation is recommended to inform foundation design.

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 previous site use (roadway / verge, lock-up garages) – on site (S1))] Potential for Made Ground associated with previous development operations – on site (S2))] Potential asbestos containing materials within existing buildings – on site (S3)	)] 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)

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 previous site use (roadway / verge, lock-up garages) – on site (S1) ⌋ Potential for Made Ground associated with previous development operations – on site (S2) ⌋ Potential asbestos containing materials within existing buildings – on site (S3)	⌋ 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	GI – Ground Investigation
			Severe for Asbestos	Low	Moderate	
	⌋ Accumulation and migration of soil gases (P5)		Severe	Unlikely	Low	
	⌋ 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)	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 to low risk as defined above.
- 5.4.2 It is understood that the proposed development comprises redevelopment of the existing garages to accommodate a residential development consisting of 15no. residential units in a 7-storey block which may increase to 17 units in an 8-storey block. No private gardens or extensive areas of soft landscaping are anticipated.
- 5.4.3 Due to the potential presence of asbestos containing materials within the existing buildings on site, an asbestos survey should be undertaken, with any asbestos containing materials found, and removed under suitably controlled conditions. There should be no risk to end users from asbestos within the fabric of the existing building if the potential asbestos containing materials are removed by suitably qualified and experienced specialists under controlled conditions.
- 5.4.4 A review of earliest available (1864) historical maps indicates the majority of the site forms part of a roadway identified as Commerce Road at that time. The southern corner of the site was undeveloped and formed part of an agricultural field. By the map dated 1896, the southern corner of the site had been developed and formed a verge way for the adjacent Boundsgreen Lane. By 1935 a building identified as a Club encroaches in to the southern corner of site from the southeast. By 1952 this building is no longer identified as a Club. By the map dated 1971, the site had been redeveloped and is shown to be occupied by a row of domestic lock-up garages along the northern site boundary. The site appears to have remained in this configuration until present.
- 5.4.5 The surrounding area has been predominantly residential use with occasional industrial features. The industrial features identified are considered to be sufficient distance that the potential impact to site is negligible.
- 5.4.6 It is recommended that an intrusive investigation is undertaken to clarify potential risks to the identified receptors, and assess the extent of made ground soils present at the site.
- 5.4.7 A preliminary investigation may comprise a series of window 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

Department of Environment Industry Profiles (1996) - Miscellaneous Land ISBN 1 85112 313 X

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

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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

APPENDIX 7 – PRELIMINARY UXO ASSESSMENT

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