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DESK STUDY / PRELIMINARY RISK ASSESSMENT REPORT

Raglan House, 1 Raglan Street, Kentish Town, London, NW5 3DB

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EXECUTIVE SUMMARY

Raglan House Ltd ('The client') commissioned Jomas Associates Ltd to undertake a desk study and preliminary risk assessment at Raglan House, Kentish Town, NW5 3DB. 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	Disused building (former day-care centre).
Proposed Site Use	*"Extension and change of use of existing day centre (Use Class D1) to create 6 (3 x 2 bed and 3 x 3-bed) residential dwellings (Use Class C3) comprising the demolition of the existing first floor conservatory and new first floor extension; two storey extension onto Anglers Lane; conversion and extension of the roof space including introduction of new dormer windows in the front and rear elevations; insertion of new doorways at ground floor level and associated minor alterations to the railings."*
Site History	A review of earliest available historical maps dated 1873-74 shows the site as comprising terraced housing. By the map dated 1952, the site is shown to have been redeveloped into a single larger building labelled as a welfare centre. Few significant changes then occur to the site until the present day. Historically, the surrounding area has comprised mainly residential and retail buildings. Historical industrial uses include a saw mill immediately north of site; a blacking works 10m north of site; a dental products factory (and later electrical works) 30m south of site; and a piano factory 50m north of site.
Site Setting	The British Geological Survey indicates that the site is directly underlain by solid deposits of the London Clay Formation. No artificial or superficial deposits are reported within the site, although a thickness of made ground should be expected given the site history. Borehole records from approximately 160m south of the site indicated the London Clay Formation to extend down to approximately 39mgbl; overlying deposits of Lambeth Group and Upper Chalk. The underlying solid deposits (London Clay Formation) are identified as Unproductive. A review of the EnviroInsight Report indicates that there are no source protection zones within 500m of the site. The nearest groundwater/potable water abstraction is located 186m south-west of site

Desk Study	
	(probably abstracting from a chalk aquifer). There nearest surface water abstraction is located 921m south-west of site. There are no surface water features or OS water networks reported in 250m of site.

Potential Sources	• Potential for Made Ground associated with previous development operations – on site (S1)
	• Potential for contaminated ground associated with previous land uses off-site (S2):
	  ○ Saw Mill (1m N)
	  ○ Blacking works (10m N)
	  ○ Dental products factory and electrical works (30m S)
	  ○ Piano factory (50m N)
	• Potential asbestos containing materials within existing buildings – on site (S3)
	• Potential asbestos impacted soils from demolition of previous buildings – on site (S4)

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 be undertaken to confirm geotechnical parameters for foundation design. The investigation should also assess the extent of made ground soils present at the site and assess the potential risks to the identified receptors from contaminants in soil. Access to the building was not granted during the walkover. It is therefore envisaged that a preliminary investigation might comprise a series of hand-held window sampler holes or hand-excavated trial pits. Alternatively, the investigation may take place post-demolition. A full site walkover survey may allude to alternative means of investigation. A significant risk of ground gas or vapour has not currently been identified and no additional assessment or gas protection measures are currently deemed to be necessary. However, this should be re-evaluated if deep Made Ground containing significant quantities of biodegradable material is identified during the investigation.
Potential Geological Hazards	The Groundsure data identifies a moderate risk of shrink/swell clays beneath the site. Plasticity Indices of underlying soil should be determined prior to new construction.

Desk Study	
	The presence of Made Ground derived from demolition material may be a source of elevated sulphate, associated with plaster from the previous structures. In addition, 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.
UXO	Publicly available information has been assessed regarding the risk of Unexploded Ordnance affecting the site. The data indicates there is a moderate risk. This does not constitute a formal UXO risk assessment. A formal UXO risk assessment is recommended prior to any below ground works.

1 INTRODUCTION

1.1 Terms of Reference

1.1.1 Raglan House Ltd ("The Client") has commissioned Jomas Associates Ltd, to assess the risk of contamination posed by the ground conditions at a site referred to as Raglan House, Kentish Town, NW5 3DB, 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 30th August 2019.

1.2 Proposed Development

1.2.1 The proposed development is to comprise the following:

"Extension and change of use of existing day centre (Use Class D1) to create 6 (3 x 2 bed and 3 x 3-bed) residential dwellings (Use Class C3) comprising the demolition of the existing first floor conservatory and new first floor extension; two storey extension onto Anglers Lane; conversion and extension of the roof space including introduction of new dormer windows in the front and rear elevations; insertion of new doorways at ground floor level and associated minor alterations to the railings."

1.2.2 A plan of the proposed development is included in 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 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 environmental database reports (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 Raglan House Ltd 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	Raglan House
Address of Site	1 Raglan Street, Kentish Town, London, NW5 3DB
Approx. National Grid Ref.	528921, 184852
Site Area (Approx)	0.039ha
Site Occupation	Disused (formerly a day-care centre)
Local Authority	London Borough of Camden

2.2 Walkover Survey

2.2.1 A site walkover survey was undertaken by Jomas Associates on 6th September 2019.

Table 2.2: Site Description

Area	Item	Details
On-site:	**Current Uses:**	Site comprises a two-storey brick-built building with conservatory at rear. Internal access was not permitted at the time of walkover. Information from the client indicates the site was formerly a day-care centre but is no longer in-use.
	Evidence of historic uses:	There was no evidence of historic uses of the site.
	Surfaces:	The site is entirely hard-cover, mainly by the building footprint.
	Vegetation:	No trees noted on site. Three trees ~6m tall noted on public pavement outside of site boundary.
	Topography/Slope Stability:	Overall, the site is generally flat and level.
	Drainage:	The site appears to be connected to normal drainage facilities.
	Services:	The site is assumed to be connected to normal services.
	Controlled waters:	No controlled waters were noted on site.
	Tanks:	No tanks were noted on site.

Area	Item	Details
Neighbouring land:	**North:**	Residential and retail.
	East:	Residential and retail.
	South:	Residential and retail.
	West:	Residential and retail.

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

2.3 Anecdotal Information

2.3.1 Jomas have been informed by the client that the site was formally used as a day-care centre, but has been disused since August 2017.

2.4 Historical Mapping Information

2.4.1 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.

2.4.2 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**
1873/74 1:1,056 1:10,560	Site comprises a series of terraced houses on Raglan Street.	Gardens/small park north of site. Tooth **manufactory** shown 30m south of site. Surrounding area is of residential nature. Kentish Town **Shed** (railway) shown 500m.
1879/82 1:2,500 1:10,560	Site labelled 'Alpha Place'.	No significant change.
1894/96 1:1,056 1:2,500 1:10,560	No significant change.	Blacking **works** immediately north of site. Piano **factory** 50m north of site. **Chimney** associated with Tooth manufactory shown 70m south of site. Bus **depot** 200m north-west of site. Timber **yard** 200m south of site. Coal **depot** 500m north-west of site.
1916/20 1:2,500 1:10,560	No significant change.	Police station 200m north. Public baths 150m south-west of site. Industry within 100m no longer labelled but buildings remain.
1938 1:10,560	No significant change.	No significant change.

Dates and Scale of Map	Relevant Historical Information	
	On Site	Off Site
1952/54 1:1,250 1:2,500 1;10,560	Site is now occupied by a single building labelled 'welfare centre'.	Ruin immediately north of site and 75m north-east. Tooth manufactory shown 30m south of site is now a dental products **factory**. **Dairy** 100m north of site. **Laundry** 250m north-west of site. Many small gaps in mapping - assumed to be damage caused by aerial bombardment during WWII.
1954 Goad Fire Insurance Plan	Site is a welfare centre.	**Saw Mill** immediately north of site. Residential dwellings to west of site. Retail and offices on Kentish Town Road 50m east of site. **Car sales yard** 50m north-east of site.
1962 1:10,560	No significant change.	WWII ruins no longer shown.
1968 1:1,250 1:2,500 1;10,560	No significant change.	Large area immediately north of site redeveloped to residential buildings. Dental products factory shown 30m south of site is now an electrical **works**. **Tanks** associated with Royal Mail **yard** and bus **depot** shown 225m north-west of site.
1975 1:10,000	No significant change.	Large parts of railway 250-700m north-west of site dismantled.
1980/82 1:1,250	No significant change.	Royal Mail yard and bus depot shown 225m is now **warehouses**.
1987/91/94 1:1,250 1:10,000	No significant change.	Electrical works no longer present 30m south of site. **Tank** 200m north of site.
2001/03 1:1,250 1:10,000	No significant change.	Dairy no longer present 100m north of site.
2010/19 1:10,000	No significant change.	No significant change.

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

2.4.3 An aerial photograph supplied as part of the GroundSure EnviroInsight report and taken in 2015 generally shows the site and surrounding area to comprise a mixture of residential and retail (high-street) style buildings.

2.5 Historical Industrial Sites

2.5.1 Groundsure have provided some information on historical industrial sites on and in the vicinity of the site. Table 2.4 below summarises the information provided, which is presented in further detail in the Enviroinsight 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 are higher than the actual count.

Table 2.4: Industrial and Statutory Consents

Type of Consent/Authorisation	On site	Off-site (within 500m of site, unless stated otherwise)	Potential to Impact Site*
Potentially Contaminative Uses identified from 1:10,000 scale mapping	None reported.	117No. entries; nearest reported 154m north of site for an unspecified works.	X
Historical Tank Database	None reported.	59No. entries; nearest reported 76m south-west of site for an unspecified tank.	X
Historical Energy Features Database	None reported.	89No. entries; nearest reported 73m south-east of site for an electricity sub-station.	X
Historical Petrol & Fuel Site Database	None reported.	None reported.	X
Historical Garage & Motor Vehicle Repair Database	None reported.	63No. entries; nearest reported 176m north-east of site for a garage.	X
Potentially infilled land	None reported.	2No. entries; nearest reported 373m north of site for cuttings.	X
Tunnels	None reported.	London Underground (Northern Line) reported 33m east of site.	X

2.6 Industrial and Statutory Consents

2.6.1 The Groundsure EnviroInsight Report also provides information on various statutory and industrial consents on and in the vicinity of the site. The following section summarises the information collected from the available sources.

Table 2.5: Industrial and Statutory Consents

Type of Consent/Authorisation	On site	Off-site (within 500m of site, unless stated otherwise)	Potential to Impact Site*
Discharge Consents	None reported	None reported	X
Water Industry Act Referrals	None reported	None reported	X
Red List Discharges	None reported	None reported	X
List 1 and List 2 Dangerous Substances	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
Planning Hazardous Substance Consents	None reported	None reported	X
Category 3 or 4 Radioactive substances Authorisations	None reported	None reported	X
Pollution Incidents (List 2)	None reported	1No. entry reported as household waste causing a Category 3 (minor) impact on land 385m west of site in 2001.	X
Pollution Incidents (List 1)	None reported	None reported	X

Type of Consent/Authorisation	On site	Off-site (within 500m of site, unless stated otherwise)	Potential to Impact Site*
Contaminated Land Register Entries and Notices	None reported	1No. entry reported as 'formerly contaminated land' 494m north of site.	X
Registered Landfill Sites	None reported	None reported	X
Waste Treatment and/or Transfer Sites	None reported	18No. waste sites; nearest reported 299m north-west of site for a recycling centre.	X
Fuel Station Entries	None reported	None reported	X
Current Industrial Site Data	None reported	23No. entries; including electrical features and vehicle repair, testing and servicing within 100m.	✓

* *From a land contamination perspective*

2.7 Previous Site Investigations

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

2.8 Planning Information

2.8.1 A review of the local authority's planning portal was undertaken on 11th September 2019 at https://planningrecords.camden.gov.uk

2.8.2 Only 1No. planning application was found within NW5 3DB. This related to the study site under reference 2013/6025/P for:

"Change of use of existing day centre (Class D1) to provide 5 (1 x 1 bed and 4 x 2-bed) residential flats (Class C3) and associated external works including the demolition of the existing first floor conservatory to provide private amenity space"

2.8.3 The following pertinent information relating to the site was found within associated documents:

The existing building was constructed as a maternity and child welfare centre in the late 1930s.

The Council's records identify the following planning history for the existing building:

- 14575 – Erection of a building, maternity and child welfare centre (granted 30 April 1937).
- 14575 – Deviation from the plan for the erection of a building (Maternity and Child Welfare Centre) up a site at the corner of Raglan Street and Angler's Lane (granted 29 June 1937).
- 16575 – The erection of a perambulator shed at the rear of the premises known as the Maternity and Child Welfare Centre, Raglan Street and Angler's Lane, St Pancras (Granted 8 December 1939).

- G11/7/4/14572 – Conversion of clinic for use as psycho-geriatric day centre, incorporating internal alterations and minor external works (granted 11 September 1972).

- 9301221 – Enclosure of rear yards, first floor extension, new conservatory, new entrance and bay window and new fire escape stairs (granted 7 December 1993).

2.8.4 The planning permission for the above was granted on 18th June 2014.

2.9 Unexploded Ordnance

2.9.1 The initial data indicates that there is a moderate risk.

2.9.2 Moderate-risk regions are those that show a bomb density of between 11 and 50 bombs per 1km^2 and that may contain potential WWII targets.

2.9.3 Ruins were noted on the historic OS maps from the 1950's; the closest being immediately north of site.

2.9.4 A watching brief should be maintained during below ground works, with site personnel made aware that there remains a potential, if negligible, risk of unexploded ordnance. Any suspicious item uncovered during site works should be reported immediately.

2.9.5 This does not comprise a full UXO risk assessment. A detailed UXO threat assessment is recommended prior to any below ground works.

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 EnviroInsight Report and published information provided by the Environment Agency and British Geological Survey.

3.2 Solid and Drift Geology

3.2.1 Information provided by the British Geological Survey indicates that the site is directly underlain by solid deposits of London Clay Formation.

3.2.2 The BGS describes the London Clay Formation as consisting 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. It also includes a few thin beds of shells and fine sand partings or pockets of sand, which commonly increase towards the base and towards the top of the formation. At the base, and at some other levels, thin beds of black rounded flint gravel occurs in places."*

3.2.3 No superficial deposits are reported within 500m of site.

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

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 160m south-west of the site, drilled in 1906.

3.3.3 This showed the underlying ground conditions to comprise 'London Clay' to approximately 39.32mbgl; overlying 'Reading Beds' [Lambeth Group] to approximately 59.13mbgl; overlying 'Thanet Sand' [Thanet Formation] to approximately 61.87mbgl; overlying 'Upper Chalk' to the base of the borehole at approximately 137.16mbgl.

3.3.4 Water was reported as being struck at approximately 54.86mbgl (within the Lambeth Group).

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:**	N/A	N/A	**-**
	Solid:	Unproductive	Unproductive	**X**
Source Protection Zone		None reported	None reported	**X**
Abstractions	**Groundwater**	None reported	14No. entries within 2000m. Nearest reported as an active abstraction 186m south-west of site for process water, drinking, sanitary, washing.	**X**
	Surface water	None reported	5No. entries within 2000m. Nearest reported as an active abstraction 921m south-west of site for non-evaporative cooling.	**X**
	Potable	None reported	5No. entries within 2000m. Nearest reported as an active abstraction 186m south-west of site.	**X**
Surface Waters		None	No surface water features reported in 250m of site. No OS water networks reported within 500m of site.	**X**
Flood Risk	**EA Flood Zone 2**	No	-	-
	EA Flood Zone 3	No	-	-
	RoFRaS	Very low	-	-
	Flood Defences	There are no areas benefiting from Flood Defences within 250m of the study site.		-
	BGS	The BGS does not consider the area to be prone to groundwater flooding based on rock type.		-

3.4.13 The potable water abstraction from 186m south-west of site is likely to be the historic borehole discussed in Section 3.3 of this report. The reported borehole log indicates that water is being abstracted from the chalk and therefore the abstraction is not

considered to be a likely potential receptor, given the significant thickness of overlying low-permeability London Clay.

3.5 Sensitive Land Uses

3.5.1 No sensitive land uses were identified within 1000m 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 GeoInsight 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	Moderate	Ground conditions predominantly high plasticity. Do not plant or remove trees or shrubs near to buildings without expert advice about their effect and management. For new build, consideration should be given to advice published by the National House Building Council (NHBC) and the Building Research Establishment (BRE). There is a probable increase in construction cost to reduce potential shrink-swell problems. For existing property, there is a probable increase in insurance risk during droughts or where vegetation with high moisture demands is present.	Yes
Landslides	Very low	Slope instability problems are unlikely to be present. No special actions required to avoid problems due to landslides. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with landslides.	No
Ground dissolution soluble rocks	Negligible	Soluble rocks are present, but unlikely to cause problems except under exceptional conditions. No special actions required to avoid problems due to soluble rocks. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with soluble rocks.	No
Compressible deposits	Negligible	No indicators for compressible deposits identified. No special actions required to avoid problems due to compressible deposits. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with compressible deposits.	No
Collapsible Rock	Very low	Deposits with potential to collapse when loaded and saturated are unlikely to be present. No special ground investigation required or increased construction costs or increased financial risk due to potential problems with collapsible deposits.	No
Running sand	Very low	Very low potential for running sand problems if water table rises or if sandy strata are exposed to water. No special actions required, to avoid problems due to running sand. No special ground	No

Potential Hazard	Site check Hazard Rating	Details	Further Action Required?
		investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with running sand.	
Coal mining	N/A	The study site is not located within the specified search distance of an identified coal mining area.	No
Shallow mine workings	N/A	The study site is not located within the specified search distance of an identified shallow mine workings area.	No
Brine affected areas	N/A	The study site is not located within the specified search distance of an identified brine affected area.	No

4.1.2 In addition, the GeoInsight report notes the following:

- No historical surface ground working features are reported within 250m of the site.
- 34No. historical underground working features are reported within 1000m of the site. The nearest is reported 600m east of the site, identified as a tunnel.
- No BGS Current Ground Working Features are reported within 1000m of the site.

4.1.3 Any site clearance, including removal of foundations and services, is likely to increase the depth of Made Ground on the site.

4.1.4 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.

4.1.5 The presence of Made Ground derived from demolition material may be a source of elevated sulphate, associated with plaster from the previous structures. In addition, 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.

4.1.6 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.

4.1.7 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 Made Ground associated with previous development operations – on site (S1)
• Potential for contaminated ground associated with previous land uses off-site (S2):
  ○ Saw Mill (1m N)
  ○ Blacking works (10m N)
  ○ Dental products factory and electrical works (30m S)
  ○ Piano factory (50m N)
• Potential asbestos containing materials within existing buildings – on site (S3)
• Potential asbestos impacted soils from demolition of previous buildings – on site (S4)
	• 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.

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 Made Ground associated with previous development operations – on site (S1)
• Potential for contaminated ground associated with previous land uses off-site (S2):
  ○ Saw Mill (1m N)
  ○ Blacking works (10m N)
  ○ Dental products factory and electrical works (30m S)
  ○ Piano factory (50m N)
• Potential asbestos containing materials within existing buildings – on site (S3)
• Potential asbestos impacted soils from demolition of previous buildings – on site (S4)
	• 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 for Asbestos	
	• 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 risk as defined above.

5.4.2 It is understood that the proposed development will comprise:

"Extension and change of use of existing day centre (Use Class D1) to create 6 (3 x 2 bed and 3 x 3-bed) residential dwellings (Use Class C3) comprising the demolition of the existing first floor conservatory and new first floor extension; two storey extension onto Anglers Lane; conversion and extension of the roof space including introduction of new dormer windows in the front and rear elevations; insertion of new doorways at ground floor level and associated minor alterations to the railings."

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 historical maps dated 1873-74 shows the site as comprising terraced housing. By the map dated 1952, the site is shown to have been redeveloped into a single larger building labelled as a welfare centre. Few significant changes then occur to the site until the present day.

5.4.5 Historically, the surrounding area has comprised mainly residential and retail buildings. Historical industrial uses include a saw mill immediately north of site; a blacking works 10m north of site; a dental products factory (and later electrical works) 30m south of site; and a piano factory 50m north of site.

5.4.6 It is recommended that an intrusive investigation be undertaken to confirm geotechnical parameters for use in foundation design. The investigation should also assess the extent of made ground soils present at the site and assess the potential risks to the identified receptors from contaminants in soil.

5.4.7 Access to the building was not granted during the walkover. It is therefore envisaged that a preliminary investigation might comprise a series of hand-held window sampler holes or hand-excavated trial pits. Alternatively, the investigation may take place post-demolition. A full site walkover survey may allude to alternative means of investigation.

5.4.8 A significant risk of ground gas or vapour has not currently been identified and no additional assessment or gas protection measures are currently deemed to be necessary. However, this should be re-evaluated if deep Made Ground containing significant quantities of biodegradable material is identified during the investigation.

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 hydrocarbon;
- *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

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APPENDICES

APPENDIX 1 – FIGURES

APPENDIX 2 – GROUNDSURE REPORTS

APPENDIX 3 – OS HISTORICAL MAPS

APPENDIX 4 – QUALITATIVE RISK ASSESSMENT METHODOLOGY

APPENDIX 5 – BGS BOREHOLE RECORDS

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