GEO-ENVIRONMENTAL DESK STUDY

FOR

7 ST PANCRAS WAY,
LONDON

Specialists in the investigation & reclamation of brownfield sites

Report Title	**: Geo-environmental Desk Study for 7 St Pancras Way, London**
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EXECUTIVE SUMMARY

Wells Mackereth ('The client') commissioned Jomas Associates Ltd ('JAL') to undertake a geo-environmental desk study at the site 7 St Pancras Way, London. The principle 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 pollutant 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 obtain documentary or other information to assess whether the land appears to be contaminated land, under the definition set out in Part IIA of the Environmental Protection Act 1990;
- 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	
Site History	A review of historical maps indicates that buildings were present on site from at least 1870, when the site is occupied by 2 No. buildings in a courtyard style arrangement. Only minor changes to the building footprint occur over time, with the buildings occasionally being identified as a Stables, or of no identified use. Historically, the surrounding area has been utilised for a combination of industrial and residential uses, with notable nearby industrial uses including a stables and an engineering depot.
Current Site Use	2 No. buildings in live/work and commercial use, in a courtyard style arrangement.
Proposed Site Use	Renovation and remodelling of the existing buildings for residential and office purposes
Site Setting	Information provided by the British Geological Survey indicates the site to be directly underlain by solid deposits of the London Clay Formation. Artificial and superficial deposits are not reported within the site. The solid deposits underlying the site are identified as Unproductive. A review of the Groundsure Report indicates that there are no Source Protection Zones within 500m of the site. The nearest groundwater abstraction is reported 545m north east of the site for general use relating to Secondary Category. The nearest surface water abstraction is reported 148m east of the site for make up or top up water. There are no potable water abstractions reported within 1km of the site. The nearest detailed river entry is reported 73m south west of the site, identified as

	Regents Canal, within an extended culvert There are no Environment Agency Zone 2 or Zone 3 floodplains reported within 250m of the site. The Groundsure report indicates that 'no radon protective measures are necessary' at the site.
Potential Sources	• Made Ground associated with existing development – on site (S1) • Previous industrial use (scrap yard) – on site (S2) • Potential asbestos containing materials within existing building – on site (S3) • Electrical substation – off site (S4) • Radioactive waste – 57m NW – off site (S5)
Potential Receptors	Construction and maintenance workers, neighbouring and future site users, buried foundations and services, Regents canal
Preliminary Risk Assessment	The risk estimation matrix indicates a generally moderate to low risk as defined above. It is understood that the proposed development comprises renovation and remodelling of the existing buildings, for residential and office use. As the site is proposed to be covered with hardstanding, it is expected that potential direct contact pathways to humans using the site post development, will be severed. Potential linkages to construction workers, neighbouring users and buried foundations and services may however be present. A basic intrusive investigation is recommended to clarify potential risks to the identified receptors. In view of the identified potential sources, general site conditions etc, it is recommended that the investigation comprise a number of window sample boreholes in order to determine the near surface soil conditions and thickness of any made ground (if present). A programme of soil gas monitoring may be required should extensive made ground deposits be revealed. The Local Planning Authority and Environmental Agency should be consulted for information regarding the deposit of radioactive waste approximately 57m from the site. The potential impact of the activities on the study site should subsequently be determined. It is expected that these activities would have been undertaken in a controlled manner, with no impact to local properties. An asbestos survey should be undertaken before any refurbishment works commence, with any asbestos containing materials identified, removed in a control manner to avoid contamination. 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, PCBs

1 INTRODUCTION

1.1 Terms of Reference

1.1.1 Wells Mackereth ("The Client") has commissioned Jomas Associates Ltd ('JAL'), to assess the risk of contamination posed by the ground conditions at a site referred to as 7 St Pancras Way, London

1.1.2 To this end a desk based review has been undertaken in accordance with JAL's email proposal dated 27 February 2013.

1.2 Objectives

1.2.1 The objectives of JAL'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.

1.3 Scope of Works

1.3.1 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 a database search report (EnviroInsight and GeoInsight Report, attached in Appendix 2) and historical Ordnance Survey maps (attached in 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.

1.4 Limitations

1.4.1 Jomas Associates Ltd ('JAL') has prepared this report for the sole use of Wells Mackereth, 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 JAL. 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.

1.4.2 The records search was limited to information available from public sources; this information is changing continually and frequently incomplete. Unless JAL has actual knowledge to the contrary, information obtained from public sources or provided to

JAL by site personnel and other information sources, have been assumed to be correct. JAL 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.

1.4.3 Whilst every effort has been made to ensure the accuracy of the data supplied, and any 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.

2 SITE SETTING

2.1 Site Information

2.1.1 The site location plan is appended to this report as Figure 1.

Table 2.1: Site Information

Name of Site	7 St Pancras Way
Address of Site	7 St Pancras Way, London, NW1 0PB
Approx. National Grid Ref.	529588, 183586
Site Ownership	Unknown
Site Occupation	Live/Work and Commercial buildings with associated courtyard.
Local Authority	Camden London Borough Council
Proposed Site Use	Redevelopment and remodelling of existing buildings to provide 1 Nr residential house, 1 Nr residential flat and office space.

2.2 Walkover Survey

2.2.1 A site walkover survey was conducted by JAL on 05 March 2013. The site was accessed via a gated entrance off St Pancras Way.

2.2.2 At the time of the site walkover, the site was occupied by 2 No. 1 to 2 storey buildings of brick construction, constructed in a courtyard type arrangement.

2.2.3 The brick structures were noted to be in moderately poor condition, with evidence of localised cracking and occasional areas of loose brickwork. Potential asbestos roofing materials were noted within the existing structures.

2.2.4 The external site areas were noted to be covered by a hard surfacing of cobble stones and was in broadly good condition, with no significant staining observed.

2.2.5 The interior of one of the 2 No. buildings comprised an open plan area, with a floor of cobble stones similar to the external site area. It is understood from information supplied by the client that this building and external site area were previously utilised as a scrap metal yard and stables. The live/work unit is currently occupied, but neither of the commercial units are occupied.

2.2.6 The presence of 2 No. small concrete plinths was noted within this building. The former function of these plinths is unknown.

2.2.7 The interior of the second building had been renovated to provide office accommodation. No sources of potential contamination were observed within the second building.

2.2.8 The site was bounded to the north by a construction site, to the east by a hospital building, to the south by an unidentified commercial building and to the west by buildings associated with the Royal Veterinary College.

2.2.9 Photos taken during the site walkover are provided in Appendix 1.

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 2.2 below. Distances are taken from the site boundary.

Table 2.2: Historical Development

Dates and Scale of Map	Relevant Historical Information	
	On Site	Off Site
1870 - 71 1:1,056	The site is occupied by 2 No. unidentified, industrial style buildings, possibly associated with the buildings immediately north of the site, which are identified as Stables. A Trough is shown within the site.	The surrounding area is heavily developed. Stables and a Public House are shown immediately north and south of the site respectively. A large building identified as St Pancras Workhouse is shown approximately 40m east of the site. Terraced housing is shown approximately 60m west of the site, with a large building identified as the Royal Veterinary College shown approximately 80m north west of the site.
1875-76 1:2,500	No significant changes noted to the site	A Burial Ground is shown approximately 80m south east of the site. An Ale Stores is shown approximately 90m north of the site.
1894 1:1,056	The buildings within the site have expanded slightly and appear to have been subdivided. The Trough is no longer shown.	The workhouse has expanded and now encroaches to within approximately 30m east of the site. A possible small cutting is shown immediately west of the site.
1896 1:2,500	No significant changes noted to the site	The burial ground is now shown as St Pancras Gardens.
1916 1:2,500	No significant changes noted to the site	The building immediately north of the site appears to have been subdivided into a number of smaller structures, and is no longer identified as a Stables. The building to the south is no longer identified as a public house. The Workhouse is now identified as St Pancras House. An Infirmary is now shown approximately 80m south east of the site.

Table 2.2: Historical Development

Dates and Scale of Map	Relevant Historical Information	
	On Site	Off Site
1952 1:2,500	No significant changes noted to the site	The buildings to the north of the site are identified as a Stable Yard. The buildings associated with the Royal Veterinary College have expanded and are now shown immediately west of the site. A Warehouse is now shown immediately south of the site. An Electrical substation is now shown approximately 15m east of the site. Several of the buildings previously identified as St Pancras House are no longer shown – possible World War 2 bomb damage, with a Ruin also shown to the east – and the area is identified as University College Hospital. A group of buildings identified as the Britannia Works is shown approximately 200m north of the site.
1968 1:2,500	The site is now identified as a Stables	The area of the stables to the north is now occupied by a large building identified as a GPO Engineering Depot. The Warehouse to the south has expanded.
1982 1:2,500	No significant changes noted to the site	The buildings associated with the University College Hospital have expanded.
1984 - 87 1:2,500	No significant changes noted to the site.	The area of the GPO Engineering Depot is now occupied by 2 No. industrial style buildings, with an area between the two identified as a Timber Yard.
1986 – 91 1:2,500	The buildings within the site are no longer identified as a Stables	The Timber Yard is no longer identified. The electrical substation to the east has increased in size. Mapping detail poor.
1993 1:2,500	No significant changes noted to the site.	No significant changes noted.
2012 1:1,250	No significant changes noted to the site	No significant changes noted.

2.4 Previous Site Investigations

2.4.1 No previous site investigation reports were made available for review.

2.5 Local Authority Information

2.5.1 Any consultation with the local authority was outside the scope of this report.

2.6 Proposed Development

2.6.1 The proposed development is understood to comprise renovation and remodelling of the existing structure for residential and office use. It is understood that, while areas of ornamental planting are proposed, such planting will be undertaken off the site slab.

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

3 ENVIRONMENTAL SETTING

3.1.1 The following section summarises the principal environmental resources (geological, hydrogeological and hydrological) of the site and its surroundings. The data discussed herein is generally based on the information given within the EnviroInsight and GeoInsight Report (reproduced as Appendix 2) 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 the London Clay Formation.

3.2.2 Artificial and superficial deposits are not reported within the site.

3.3 Hydrogeology

3.3.1 General information about the hydrogeology of the site was obtained from the Groundsure EnviroInsight Report.

Groundwater Vulnerability

3.3.2 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.

3.3.3 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.

3.3.4 The solid deposits directly underlying the site are identified as Unproductive.

Source Protection Zones (SPZ)

3.3.5 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.

3.3.6 A review of the Groundsure Report indicates that there are no Source Protection Zones within 500m of the site.

3.4 Hydrology

3.4.1 The nearest groundwater abstraction is reported 545m north east of the site for general use relating to Secondary Category.

3.4.2 The nearest surface water abstraction is reported 148m east of the site for make up or top up water.

3.4.3 There are no potable water abstractions reported within 1km of the site.

3.4.4 The nearest detailed river entry is reported 73m south west of the site, identified as Regents Canal, within an extended culvert.

3.4.5 There are no Environment Agency Zone 2 or Zone 3 floodplains reported within 250m of the site.

3.5 Sensitive Land Uses

3.5.1 A Nature Reserve is reported 305m east of the site.

3.5.2 No other environmentally sensitive sites are reported within 1km of the site.

3.6 Industrial and Statutory Consents

3.6.1 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 3.1: Industrial and Statutory Consents

Type of Consent/Authorisation	On site	Off-site (within 500m of site, unless stated otherwise)	Potential to Impact on Site from a land contamination perspective
Industrial Sites holding licences and/or authorisations.	None	6 No. Part A/B authorisations reported within 500m of the site. Nearest reported 100m south west of the site for Dry Cleaners.	✓
Discharge Consents.	None	2 No. reported within 500m of the site. Nearest identified 467m north west of the site, identified as Trade Discharges – cooling water.	X
Water Industry Act Referrals	None	None reported within 500m of the site.	X
Red List Discharges	None	None reported within 500m of the site.	X
List 1 and List 2 Dangerous Substances	None	None reported within 500m of the site.	X
Control of Major Accident Hazards (COMAH) and Notification of Installations Handling Hazardous Substances (NIHHS) Sites.	None	None reported within 500m of the site.	X
Planning Hazardous Substance Consents	None	None reported within 500m of the site.	X
Category 3 or 4 Radioactive substances Authorisations	None	17 No. reported within 500m of the site. Nearest reported 57m north west of the site, for the disposal of radioactive waste.	✓
Pollution Incidents (List 2).	None	1 No. reported 206m north west of the site, identified as fire fighting runoff. Minor impact reported to water, no impact reported to land or air.	X
Pollution Incidents (List 1)	None	None reported within 500m of the site.	X
Contaminated Land Register Entries and Notices.	None	None reported within 500m of the site.	X
Registered Landfill Sites.	None	None reported within 500m of the site.	X
Waste Treatment and/or Transfer Sites.	1 No. on site, identified as a Scrapyard *(no longer present)*	15 No. reported within 500m of the site, although some entries may relate to multiple reportings. Nearest reported 8m north of the site, identified as a metal recycling site.	✓
Fuel Station Entries	None	1 No. reported 426m south west of the site, identified as Obsolete	X
Current Industrial Site Data.	None	5 No. reported within 100m. Nearest reported 14m south of the site for a warehouse. Other uses include electrical features and unspecified works or factories.	✓

3.7 Radon

As shown in the GeoInsight Report, the site is not in a Radon affected area, as less than 1% of properties are above the Action level.

Consequently, no radon protective measures are necessary in the construction of new dwellings or extensions as described in publication BR211 (BRE, 2007).

3.8 Geological Hazards

3.8.1 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 3.2 – Geological Hazards

Potential Hazard	GroundSure Hazard Rating
Shrink swell	Moderate
Landslides	Very Low
Ground dissolution soluble rocks	Null-Negligible
Compressible deposits	Negligible
Collapsible Rock	Very Low
Running sand	Negligible
Coal mining	None reported within 75m
Shallow mine workings	Negligible
Brine affected areas	None reported within 75m

3.8.2 In addition, the GeoInsight Report notes the following:

- 12 No. historical surface ground working features are reported within 250m of the site. The nearest is reported 73m south east of the site, identified as a Burial Ground.
- 42 No. historical underground workings are reported within 1km of the site, although some may relate to multiple reportings. The nearest is reported 253m east of the site, identified as a Tunnel.
- 3 No. current BGS ground workings are reported within 1km of the site. The nearest is reported 528m north east of the site, identified as producing sand and gravel. The operational status is given as Active.

4 QUALITATIVE RISK ASSESSMENT

4.1 Legislative Framework

4.1.1 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.

4.1.2 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) pollution of controlled waters is being, or is likely to be, caused."

4.1.3 The Statutory Guidance provided in the DEFRA Circular 01/2006 lists the following categories of significant harm:

- death, disease, serious injury, genetic mutation, birth defects or the impairment of reproduction functions in human beings;
- irreversible adverse change, or threat to endangered species, affecting an ecosystem in a protected area (i.e. site of special scientific interest);
- death, serious disease or serious physical damage to pets, livestock, game animals or fish;
- a substantial loss in yield or value of crops, timber or produce; and
- structural failure, substantial damage or substantial interference with right of occupation to any building.

4.1.4 Contaminated land will only be identified when a 'pollutant linkage' has been established.

4.1.5 A 'pollutant linkage' is defined in Part IIA as:

"A linkage between a contaminant Source and a Receptor by means of a Pathway".

4.1.6 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.

4.1.7 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.

4.1.8 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.

4.2 Conceptual Site Model

4.2.1 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.

4.2.2 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).

4.2.3 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.

4.2.4 Potential pollutant linkages identified at the site are detailed below:

Table 4.1: Potential Sources, Pathways and Receptors

Source(s)	Pathway(s)	Receptor(s)
• Potential for Made Ground associated with development – on site (S1) • Previous industrial use (scrap yard) – on site (S2) • Potential asbestos containing materials within existing building – on site (S3) • Electrical substation – off site (S4) • Radioactive waste – 57m NW – off site (S5)	• 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)	• 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) • Regents Canal (R6)

4.3 Qualitative Risk Estimation

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

4.3.2 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

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

- Severe
- Medium
- Mild
- Minor

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

- High Likelihood
- Likely
- Low Likelihood
- Unlikely

4.3.5 This relationship can be represented graphically as a matrix (Table 4.2).

Table 4.2: 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

4.3.6 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.

4.3.7 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.

4.3.8 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
- No action required (NA)

4.3.9 The preliminary risk assessment for the site is presented in Table 4.3 below.

Table 4.3: Preliminary Risk Assessment for the Site

Sources	Pathways (P)	Receptors	Consequence	Probability of pollutant linkage	Risk Estimation	Hazard Assessment
• Made Ground associated with existing development – on site (S1) • Previous industrial use (scrap yard) – on site (S2) • Potential asbestos containing materials within existing building – on site (S3) • Electrical substation – off site (S4) • Radioactive waste – 57m NW – off site (S5)	• Ingestion and dermal contact with contaminated soil (P1) • Inhalation or contact with potentially contaminated dust and vapours (P2)	• 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 (buildings present since 1871, and site appears to have been predominantly covered with hardstanding. No gardens proposed)	Moderate	GI – Basic Ground investigation comprising window sample boreholes to assess depth and makeup of any made ground soils. See 4.4 below
	• Accumulation and migration of soil gases (P5)		Medium	Unlikely (impermeable soils anticipated)	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) • Regents Canal (R6)	Medium	Unlikely (impermeable soils anticipated)	Low	

4.3.10 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.

4.4 Outcome of Risk Assessment

4.4.1 The risk estimation matrix indicates a generally moderate to low risk as defined above.

4.4.1 It is understood that the proposed development comprises renovation and remodelling of the existing buildings, to provide 1 No. residential house, 1 No. residential flat and 1 No. office building. As the site is to be covered with hardstanding, it is expected that potential direct contact pathways to humans using the site post development, will be severed. Potential linkages to construction workers, neighbouring users and buried foundations and services may however be present.

4.4.2 A basic intrusive investigation is recommended to clarify potential risks to the identified receptors. In view of the identified potential sources, general site conditions etc, it is recommended that the investigation comprise a number of window sample boreholes in order to determine the near surface soil conditions and thickness of any made ground (if present).

4.4.3 A programme of soil gas monitoring may be required should extensive made ground deposits be revealed.

4.4.4 The Local Planning Authority and Environmental Agency should be consulted for information regarding the deposit of radioactive waste approximately 57m from the site. The potential impact of the activities on the study site should subsequently be determined. It is expected that these activities would have been undertaken in a controlled manner, with no impact to local properties.

4.4.5 An asbestos survey should be undertaken before any refurbishment works commence, with any asbestos containing materials identified, removed in a control manner to avoid contamination.

4.5 List of Key Contaminants

4.5.1 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.

4.5.2 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, PCBs

5 REFERENCES

BRE Report BR211 ;Radon: Protective measures for new dwellings, 2007

Code of Practice for Site Investigations BS5930: 1999

Groundsure EnviroInsight Report Ref HMD-377-634939 March 2013

Groundsure GeoInsight Report Ref HMD-377-634940 March 2013

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

Model Procedures for the Management of Contaminated Land, Contaminated Land Report 11, (CLR11) Environment Agency, September 2004