

**GEO-ENVIRONMENTAL DESK STUDY /
PRELIMINARY RISK ASSESSMENT
REPORT**

FOR

**TASKERS, UNIT B,
LIVER INDUSTRIAL ESTATE,
LONG LANE,
AINTREE,
LIVERPOOL
L9 7DT**



Specialists in the investigation & reclamation of brownfield sites

Report Title: Geo-environmental Desk Study / Preliminary Risk Assessment
for Taskers, Unit B, Liver Industrial Estate, Long Lane, Aintree, Liverpool, L9 7DT.
Report Status: Final v1.0

Job No: P9218J805

Date: 29 February 2016

Quality Control: Previous Release

Version	Date	Issued By

Prepared by: JOMAS ASSOCIATES LTD For TASKERS DIY DIRECTORS PENSION SCHEME

Prepared by Stephanie Burns BSc (Hons)
Graduate Engineer

Checked by Marc Williams BSc (Hons) AIEMA
Principal Consultant

Approved by Roni Savage BEng (Hons), MSc, SiLC, CGeol, MCIWM, FGS
Technical Director

Should you have any queries relating to this report, please contact

Jomas Associates Ltd

 **www.jomasassociates.com**

 **0843 289 2187**

 **info@jomasassociates.com**

CONTENTS

	Page
EXECUTIVE SUMMARY	1
1 INTRODUCTION	4
1.1 Terms of Reference	4
1.2 Objectives	4
1.3 Scope of Works	4
1.4 Limitations	4
2 SITE SETTING & HISTORICAL INFORMATION	6
2.1 Site Information	6
2.2 Walkover Survey	6
2.3 Historical Mapping Information	7
2.4 Historical Industrial Sites	9
2.5 Previous Site Investigations.....	10
2.6 Local Authority Information	10
2.7 Proposed Development.....	10
3 ENVIRONMENTAL SETTING.....	11
3.2 Solid and Drift Geology.....	11
3.3 British Geological Survey (BGS) Borehole Data	11
3.4 Hydrogeology & Hydrology	11
3.5 Sensitive Land Uses	14
3.6 Industrial and Statutory Consents	14
3.7 Radon.....	15
3.8 Geological Hazards	15
4 QUALITATIVE RISK ASSESSMENT.....	18

4.1	Legislative Framework.....	18
4.2	Conceptual Site Model	19
4.3	Qualitative Risk Estimation	20
4.4	Outcome of Risk Assessment.....	23
4.5	List of Key Contaminants	23
5	REFERENCES	24

APPENDICES

APPENDIX 1 – FIGURES

APPENDIX 2 – GROUNDSURE REPORTS

APPENDIX 3 – OS HISTORICAL MAPS

APPENDIX 4 – QUALITATIVE RISK ASSESSMENT METHODOLOGY

APPENDIX 5 – BGS BOREHOLE RECORDS

EXECUTIVE SUMMARY

Taskers DIY Directors Pension Scheme ('The client') commissioned Jomas Associates Ltd ('JAL') to undertake a geo-environmental desk study at Taskers, Unit B, Liver Industrial Estate, Long Lane, Aintree, Liverpool. 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 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	<p>A review of historical maps indicates that the site originally (1851) comprised undeveloped agricultural land. Few significant changes occur until the 1960s, when an unidentified commercial style building is shown within the site, with a number of associated railway sidings and possible associated tanks or loading / storage bays. By the 1980s the building within the site appears to be redeveloped with a new commercial style building (no use is identified), with the railway sidings and possible tanks no longer shown. No significant changes then occur to the site until the present day.</p> <p>Historically the surrounding area has been utilised predominantly for agricultural purposes until the 1960s, when the area is developed for commercial uses. Uses of note within the vicinity include various Tanks and Railway Sidings.</p>
Current Site Use	Commercial building with associated vehicle parking
Proposed Site Use	Extension to the existing building to provide additional commercial accommodation.
Site Setting	<p>Information provided by the British Geological Survey indicates that the site is underlain by superficial Till deposits. These are underlain by solid deposits of the Wilmslow Sandstone Formation.</p> <p>Artificial deposits are not reported within the site.</p> <p>The superficial deposits underlying the site are identified as a Secondary (undifferentiated) Aquifer with the underlying solid deposits identified as a Principal Aquifer.</p> <p>A review of the EnviroInsight Report indicates that there are no source protection zones within 500m of the site.</p> <p>Nearest groundwater abstraction reported 244m north of the site, for general cooling. Nearest potable water abstraction reported 244m north of the site. No surface water abstraction are reported within 2000m of the site.</p> <p>There are no detailed river entries or surface water features reported within 500m or 250m of the site respectively.</p>

Desk Study	
Potential Sources	<ul style="list-style-type: none"> • Potential for contaminated ground associated with existing and previous site use – on site (S1) • Potential for Made Ground associated with previous development operations – on site (S2) • Current and previous industrial use – on and off site (S3) • Potential asbestos containing materials within existing buildings – on site (S4) • Potential asbestos impacted soils from demolition of previous buildings – on site (S5) • Potential contamination from tanks in the vicinity (around 5m north of the site) – off site (S6) • Potential contamination from Cemetery located 300m north of the site – off site (S7) • Infilled pit located 33m from site – off site (S8)
Potential Receptors	Construction and maintenance workers, neighbouring and future site users, buried foundations and services, controlled waters (Aquifer, Abstraction).
Preliminary Risk Assessment	<p>The risk estimation matrix indicates a moderate risk as defined above. A high risk has been designated due to possible asbestos.</p> <p>It is understood that the proposed development comprises of an extension to the existing building to provide additional commercial accommodation.</p> <p>A review of historical maps indicates that the site originally (1851) comprised undeveloped agricultural land. Few significant changes occur until the 1960s, when an unidentified commercial style building is shown within the site, with a number of associated railway sidings and possible associated tanks or loading / storage bays. By the 1980s the building within the site appears to be redeveloped with a new commercial style building (no use is identified), with the railway sidings and possible tanks no longer shown. No significant changes then occur to the site until the present day.</p> <p>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. The investigation should also incorporate a geotechnical element to permit foundation design for the proposed extension.</p> <p>In view of the reported presence of an infilled unspecified Pit in close proximity to the site, the investigation should include an element of soil gas monitoring.. This should be undertaken in accordance with CIRIA C665.</p> <p>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.</p> <p>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:</p> <ul style="list-style-type: none"> • <i>Metals</i>: cadmium, chromium, copper, lead, mercury, nickel, zinc; • <i>Semi-metals and non-metals</i>: arsenic, boron, sulphur; • <i>Inorganic chemicals</i>: cyanide, nitrate, sulphate and sulphide; • <i>Organic chemicals</i>: aromatic hydrocarbons, aliphatic hydrocarbons, petroleum hydrocarbons, phenol, polyaromatic hydrocarbon; • <i>Others</i>: pH, Asbestos
Potential	The Groundsure data identifies only very low to negligible risks – for full details see

Desk Study	
Geological Hazards	Section 3.8

1 INTRODUCTION

1.1 Terms of Reference

1.1.1 Taskers DIY Directors Pension Scheme ("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 Taskers, Unit B, Liver Industrial Estate, Long Lane, Aintree, Liverpool prior to a proposed extension.

1.1.2 To this end a desk based review has been undertaken in accordance with JAL's proposal dated 19 August 2015.

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 contaminant 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 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 Taskers DIY Directors Pension Scheme 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 & HISTORICAL INFORMATION

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	Taskers, Unit B
Address of Site	Liver Industrial Estate Long Lane Aintree Liverpool L9 7DT
Approx. National Grid Ref.	337341, 395486
Site Area (Approx)	0.91ha
Site Ownership	Unknown
Site Occupation	Commercial
Local Authority	Liverpool City Council
Proposed Site Use	Proposed extension to the existing building

2.2 Walkover Survey

2.2.1 A site walkover survey was undertaken by Jomas Associates on 25th February 2016.

Table 2.2: Site Description

Area	Item	Details
On-site:	Current Uses:	The site is located in industrial setting, with a large single unit (approx. 100m x 25m) centrally occupying the site. The unit comprises of a steel framed building approximately 15m high (to the apex of the unit) and is used for the storage of home and garden products. Several steel shipping containers are present to the rear of the site, but was unable to confirm contents
	Evidence of historic uses:	There was no evidence of historic uses of the site.
	Surfaces:	External site areas are covered by a combination of concrete and tarmac in moderate to poor condition with occasional cracking and staining.
	Vegetation:	No vegetation present on site
	Topography/Slope Stability:	The site was noted to be largely level.
	Drainage:	The site appears to be connected to normal drainage facilities. Drain covers are situated around the site.

Area	Item	Details
	Services:	The site is assumed to be connected to normal business services. An electrical substation is noted immediately off site
	Controlled waters:	No controlled waters were noted on site.
	Tanks:	No tanks were noted on site, although a number of likely former bunds / tank bases of brick and concrete construction were noted, with the bunds / bases in broadly good condition with no significant staining.
Neighbouring land:	North:	Large industrial storage unit
	East:	Liver Industrial estate road
	South:	Target scaffolding Ltd
	West:	Redundant / wasteland.

2.2.2 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 2.3 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
1850 - 1851 – 1:10,560	On the earliest available maps the site appears to consist of agricultural land. A road named Lodge Lane, runs through the centre of the site.	The area surrounding the site is currently utilized as agricultural land. A number of ponds appear to be located in the surrounding area. A small river named Tue Brook runs approximately 170m south west of the site.
1890 - 1891 – 1:10,560	The road running through the site remains but is no longer named.	The Cheshire Lines Railway has been constructed around 100m south west of the site. Some of the surrounding area has also undergone development. A Slaughter House has been reported approximately 250m north west of the site. A large cemetery , reported as Everton Cemetery, is identified as being around 300m north east of the site.
1893 – 1:2,500	No significant changes noted to the site.	An area of potential surface workings can be noted around 100m west of the site.

**SECTION 2
SITE SETTING & HISTORICAL
INFORMATION**



Dates and Scale of Map	Relevant Historical Information	
	On Site	Off Site
1906 - 1907 – 1:10,560	No significant changes noted to the site.	The area over 500m west of the site has been developed with a mixture of industrial, commercial and residential land uses. Industrial uses include a Rubber Works , a Jam Works and an Electrical Generating Station . Beyond the Cemetery north east of the site is a building noted as the Fazakerley Annexe (Fever Wards).
1908 – 1:2,500	No significant changes noted to the site.	No significant changes.
1925 - 1928 – 1:2,500; 1:10,560	No significant changes noted to the site.	The area 100m west of the site has been reported as Allotment Gardens . A Jam Factory and Provision Factory have been constructed around 250m north of the site. Beyond this is a Sports Ground and a Biscuit Factory . A number of residential buildings appear to have been constructed around 500m south of the site. The Fazakerley Annexe (Fever Wards) has been renamed as the Fazakerley Annexe Hospital . A number of Railway Sidings are now shown approximately 80m south west of the site.
1938 – 1:10,560	No significant changes noted to the site.	The area over 400m east of the site has undergone development. The majority of the area appears to now be utilised as residential and commercial land. The Jam Factory has undergone expansion and now appears to consist of a cluster of buildings which encroach to within approximately 150m north west of the site.
1954 – 1:1,250; 1:2,500	The access road/path is no longer reported running through the site.	A drain can be found running around 50m south west, parallel to the site. The area approximately 60m south east of the site has undergone development. A number of tanks have been reported, as well as an electricity substation . Industrial uses include a Paint Factory , a Mineral Water Bottling Works and Paula Works (Clothing) . A ruin is also noted in the area. A Coal Bunker can be noted in the Jam Factory north of the site. The Railway Sidings have expanded.
1956 - 1957 – 1:10,560	No significant changes noted to the site.	No significant changes noted.

Dates and Scale of Map	Relevant Historical Information	
	On Site	Off Site
1962 – 1:1,250	The site has now been developed and appears to now contain an industrial building, though the specific use is not reported. The site indicates possible railway lines leading from the main tracks onto site and a number of small, unidentified structures, possibly tanks or loading bays.	The entire surrounding area has been developed with potential industrial buildings, the majority of which do not have specific uses reported. An area of water is reported approximately 30m south of the site. The tanks south of the site are no longer noted.
1967 - 1968 – 1:10,560	No significant changes noted to the site.	The majority of the area surrounding the site is now developed, with the exception of a number of playing fields and an area around 300m south west of the site which is reported to be Walton Hall Park.
1973 - 1977 – 1:1,250; 1:10,000	No significant changes noted to the site. Partial coverage on large scale map.	A tank can be noted around 5m north east of the site. A second tank is reported approximately 20m west of the site. A cluster of tanks are also reported 180m north west of the site.
1980 - 1984 – 1:1,250	Site is now labelled as a Warehouse and a Works. The building on site has either been altered or a new building has been constructed. An electricity substation is now reported in the southern corner of the site.	A Depot is reported around 80m south east of the site. The tank around 20m west of the site is no longer reported. New light industrial style buildings are shown to the south of the site. The railway lines and associated sidings to the south are no longer shown. With the area occupied by vacant land.
1987 - 1989 – 1:10,000	No significant changes noted to the site.	The industrial buildings immediately surrounding the site appear to now be labelled as Liver Industrial Estate.
1989 - 1993 – 1:2,500	No significant changes noted to the site.	Additional tanks are reported north of the site. A number of tanks are reported approximately 100m east of the site.
2002 – 1:10,000	No significant changes noted to the site.	The building immediately north east of the site appears to have been demolished.
2010 – 1:10,000	No significant changes noted to the site.	No significant changes noted.
2014 – 1:10,000	No significant changes noted to the site.	No significant changes noted.

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

2.4 Historical Industrial Sites

2.4.1 Groundsure have provided some information on historical industrial sites on and in the vicinity of the site. Table 2.3 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 2.3: 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	4 No. reported on site. They have been identified as Railway Sidings, Unspecified Works and an Industrial Estate	59 No. identified within 500m of the site. Nearest reported 8m north west of the site, identified as an Unspecified Works. Other uses include an Unspecified Pit, Unspecified Factories, Unspecified Ground Workings, Refuse Heaps and a Cemetery.	✓
Additional Information - Historical Tank Database	None	52 No. records reported within 500m of the site. Nearest reported 6m north east of the site, for an unspecified Tank. No specific usage of the various tanks is identified.	✓
Historical Energy Features Database	2 No. Electricity Substations are reported on site.	43 No. records identified within 500m of the site. Nearest reported 37m south west of the site and identified as an Electricity Substation. Other energy features include Electricity Substations and Gas Governors.	✓
Historical Petrol & Fuel Site Database	None	None reported within 500m of the site.	X
Historical Garage & Motor Vehicle Repair Database	None	2 No. records identified within 500m of the site. Both are reported 296m north of the site and identified as a Garage.	✓
Potentially infilled land	None	44 No. records identified within 500m of the site. Nearest reported 33m south east of the site, identified as an Unspecified Pit.	✓

2.5 Previous Site Investigations

2.5.1 No previous site investigation reports have been provided at the time of writing.

2.6 Local Authority Information

2.6.1 Any consultation with the Local Authority was outside the scope of this report.

2.7 Proposed Development

2.7.1 The proposed development is to comprise an extension to the existing buildings on the site.

2.7.2 For the purposes of the contamination risk assessment, the proposed development is classified as 'Commercial'.

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 Groundsure Reports (in Appendix 2).

3.2 Solid and Drift Geology

- 3.2.1 Information provided by the British Geological Survey indicates that the site is underlain by superficial Till deposits. These are underlain by solid deposits of the Wilmslow Sandstone Formation.

- 3.2.2 Artificial deposits are not reported within 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. The local records obtained are presented in Appendix 5.

- 3.3.2 The nearest such record was located approximately 105m south east of the site, and showed the underlying ground conditions to comprise made ground to 0.6m bgl. This was underlain by sandy boulder clay to a depth of around 9.7m bgl. The sandy boulder clay was overlay a horizon of Sand encountered to a depth of 13.3m bgl, followed by a horizon of brown Sandstone, encountered to the base of the borehole at 14.5m bgl.

3.4 Hydrogeology & Hydrology

- 3.4.1 General information about the hydrogeology of the site was obtained from the Environment Agency 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 Hydrogeological & Hydrology

Feature	On Site	Off Site	Potential Receptor?
Aquifer	Superficial:	Secondary (undifferentiated) Aquifer	✓
	Solid:	Principal Aquifer	✓
Source Protection Zone	None	None reported within 500m	x
Abstractions		Nearest groundwater abstraction reported 244m north of the site, for general cooling. Nearest potable water abstraction reported 244m north of the site. No surface water abstraction are reported within 2000m of the site.	✓
Surface Waters		There are no Detailed River Entries reported within 500m of the site. No surface water features are reported within 250m of the site.	x

Feature	On Site	Off Site	Potential Receptor?
Flood Risk	Very low	A River and Coastal Zone 2 is reported 199m south of the site. A River and Coastal Zone 3 is reported 210m south of the site.	✓

3.5 Sensitive Land Uses

- 3.5.1 Information provided by DEFRA indicates that the site is within a Nitrate Vulnerable Zone.
- 3.5.2 The site is reported to lie within a Nitrate Vulnerable Zone.
- 3.5.3 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.
- 3.5.4 The NVZs cover large areas of land that have been identified as exceeding or being at risk of exceeding 50 mg NO₃/l.

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 3.2: Industrial and Statutory Consents

Type of Consent/Authorisation	On site	Off-site (within 500m of site, unless stated otherwise)	Potential to Impact Site*
Industrial Sites holding licences and/or authorisations.	1 No. reported on site as a historical permit for coating and enamelling processes	2 No. reported within 500m of the site. Nearest reported 85m west of the site as a current permit for metal coating.	✓
Discharge Consents.	None	None reported within 500m of the site.	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	None	1 No. reported 446m of the site as a Historical NIHHS Site.	✓

Type of Consent/Authorisation	On site	Off-site (within 500m of site, unless stated otherwise)	Potential to Impact Site*
Notification of Installations Handling Hazardous Substances (NIHHS) Sites.			
Planning Hazardous Substance Consents	None	None reported within 500m of the site.	X
Category 3 or 4 Radioactive substances Authorisations	None	None reported within 500m of the site	X
Pollution Incidents (List 2).	None	6 No. reported within 500m of the site. Nearest reported 146m south east of the site, waste materials (tyres). Minor impact reported to land, no impact reported to air or water	✓
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.	None	4 No. Environment Agency licensed waste sites are reported within 1500m of the site. Nearest is reported 194m north west of the site as a material recycling treatment facility.	✓
Fuel Station Entries	None	None reported within 500m of the site.	X
Current Industrial Site Data.	1 No. reported on site as an Electricity Substation.	18 No. reported within 250m of the site. Nearest reported 39m south west of the site for an Electricity Substation. Other uses include Demolition Services, Construction and Tool Hire, Tanks, Packaging services and Baking and Confectionary services.	✓

* From a land contamination perspective

3.7 Radon

3.7.1 As reported, the site is not within a Radon affected area, as less than 1% of properties are above the action level.

3.7.2 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 GeolInsight Report, that relate to factors that may have a potential impact upon the engineering of the proposed development.

Table 3.3: Geological Hazards

Potential Hazard	Site check Hazard Rating	Details	Further Action Required?
Shrink swell	Very Low	Ground conditions predominately low plasticity. No special actions required to avoid problems due to shrink-swell clays. No special ground investigation required and increased construction costs or increased financial risks are unlikely due to potential problems with shrink-swell clays.	No
Landslides	Very low	Slope instability problems are unlikely to be present. No special actions required to avoid problems due to 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 the potential to collapse when loaded and saturated are unlikely to be present.	No
Running sand	Very low	Very low potential for running sand problems if water rises or if sandy strata are exposed to water. No special actions required to avoid problems due to running sand. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with running sand.	No
Coal mining	No	-	No
Non-coal Mining	No	-	No
Brine affected areas	No	-	No

3.8.2 In addition, the GeolInsight report notes the following:

- 9 No. historical surface ground working features are reported within 250m of the site. The nearest is reported 33m south east of the site and identified as an Unspecified Pit. Other historical ground working features include a Cemetery and a Refuse Heap.

- 1 No. current ground working is reported by the BGS, 924m north west of the site and identified as producing clay and shale though activity is reported to have ceased.
- No historical underground working features are reported within 1km of the site.
- There are no Johnson Poole and Bloomer Mining areas within 1000m of the site.
- 27 No. historical railway and tunnel features are reported within 250m of the site. The nearest are reported on site from 1962 to 1974 and identified as railway sidings.
- 2 No. historical railways are reported within 250m of the site. The nearest is reported 90m south west of the site and reported as abandoned.

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

4.1.3 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.

4.1.4 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.

4.1.5 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.

4.1.6 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.

4.1.7 Contaminated land will only be identified when a 'contaminant linkage' has been established.

4.1.8 A 'contaminant linkage' is defined in Part IIA as:

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

4.1.9 Therefore, this report presents an assessment of the potential contaminant linkages that may be associated with the site, in order to determine whether additional investigations are required to assess their significance.

4.1.10 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 contaminant 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.

4.1.11 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.

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 "contaminant 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

SECTION 4

QUALITATIVE RISK ASSESSMENT

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 contaminant linkages identified at the site are detailed below:

Table 4.1: Potential Sources, Pathways and Receptors

Source(s)	Pathway(s)	Receptor(s)
<ul style="list-style-type: none"> Potential for contaminated ground associated with existing and previous site use – on site (S1) Potential for Made Ground associated with previous development operations – on site (S2) Current and previous industrial use – on and off site (S3) Potential asbestos containing materials within existing buildings – on site (S4) Potential asbestos impacted soils from demolition of previous buildings – on site (S5) Potential contamination from tanks in the vicinity (around 5m north of the site) – off site (S6) Potential contamination from Cemetery located 300m north of the site – off site (S7) Infilled pit located 33m from site – off site (S8) 	<ul style="list-style-type: none"> 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) 	<ul style="list-style-type: none"> Construction workers (R1) Maintenance workers (R2) Neighbouring site users (R3) Future site users (R4) Building foundations and on site buried services (water mains, electricity and sewer) (R5) Controlled waters – Aquifer, Abstraction (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 contaminant 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

SECTION 4

QUALITATIVE RISK ASSESSMENT

- 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.

SECTION 4 QUALITATIVE RISK ASSESSMENT



Table 4.3: Preliminary Risk Assessment for the Site

Sources	Pathways (P)	Receptors	Consequence	Probability of contaminant linkage	Risk Estimation	Hazard Assessment
<ul style="list-style-type: none"> Potential for contaminated ground associated with existing and previous site use – on site (S1) Potential for Made Ground associated with previous development operations – on site (S2) Current and previous industrial use – on and off site (S3) Potential asbestos containing materials within existing buildings – on site (S4) Potential asbestos impacted soils from demolition of previous buildings – on site (S5) Potential contamination from tanks in the vicinity (around 5m north of the site) – off site (S6) Potential contamination from Cemetery located 300m north of the site – off site (S7) Infilled pit located 33m from site – off site (S8) 	<ul style="list-style-type: none"> 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) 	<ul style="list-style-type: none"> 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 Severe for Asbestos	Likely	Moderate High for Asbestos	<p>GI – Ground Investigation</p> <p>Due to the presence of a reported infilled sand pit, and potential for hydrocarbon impacted ground within the site from reported former use as a fuel station, a programme of soil gas monitoring should be undertaken.</p>
	<ul style="list-style-type: none"> Accumulation and migration of soil gases (P5) 		Medium	Likely	Moderate	
	<ul style="list-style-type: none"> 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) 	<ul style="list-style-type: none"> Neighbouring site users (R3) Controlled Waters (Aquifer) (R6) Building foundations and on site buried services (water mains, electricity and sewer) (R5) 	Medium	Low	Low/moderate	

- 4.3.10 It should be noted that the identification of potential contaminant 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 moderate risk as defined above. A high risk has been designated due to possible asbestos.
- 4.4.2 It is understood that the proposed development comprises of an extension to the existing building to provide additional commercial accommodation.
- 4.4.3 A review of historical maps indicates that the site originally (1851) comprised undeveloped agricultural land. Few significant changes occur until the 1960s, when an unidentified commercial style building is shown within the site, with a number of associated railway sidings and possible associated tanks or loading / storage bays. By the 1980s the building within the site appears to be redeveloped with a new commercial style building (no use is identified), with the railway sidings and possible tanks no longer shown. No significant changes then occur to the site until the present day.
- 4.4.4 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. The investigation should also incorporate a geotechnical element to permit foundation design for the proposed extension.
- 4.4.5 In view of the reported presence of an infilled unspecified Pit in close proximity to the site, the investigation should include an element of soil gas monitoring.. This should be undertaken in accordance with CIRIA C665.

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

5 REFERENCES

Groundsure EnviroInsight Report Ref HMD-377-2769395 February 2016

Groundsure GeoInsight Report Ref HMD-377-2769396 February 2016

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

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

National Planning Policy Framework. Department for Communities and Local Government, March 2012

Code of Practice for Site Investigations BS5930: 2015

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

APPENDICES

APPENDIX 1 – FIGURES

APPENDIX 2 – GROUNDSURE REPORTS

APPENDIX 3 – OS HISTORICAL MAPS

APPENDIX 4 – QUALITATIVE RISK ASSESSMENT METHODOLOGY

APPENDIX 5 – BGS BOREHOLE RECORDS