



**METACRE**

**LAND OFF PARR LANE, ECCLESTON**

**PHASE 1 DESK STUDY**

**DECEMBER 2020**

**DATE ISSUED: DECEMBER 2020**  
**JOB NUMBER: GM11586**  
**REPORT NUMBER: 001**  
**VERSION: V0.1**  
**STATUS: FINAL**

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**DECEMBER 2020**

**PREPARED BY:**

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ENERGY AND CLIMATE CHANGE  
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## 1 INTRODUCTION

### 1.1 Instruction

1.1.1 Wardell Armstrong LLP (WA) have been commissioned to prepare this Desk Study following written confirmation on 1<sup>st</sup> December by Mr Louis Webb from De Pol Associates on behalf of Metacre. Commission of these work follows the proposal prepared by WA dated 30<sup>th</sup> November 2020.

### 1.2 Site Location

1.2.1 The application site comprises circa 1.5 ha of grassland on the north eastern edge of Eccleston. It lies to the south of Parr Lane, which runs east-to-west across the northern boundary of the site, and to the east of the housing estate along Sandringham Road and Richmond Road.

1.2.2 The proposed application boundary is shown below:



### 1.3 Scope and Objectives

1.3.1 The purpose of this report is to support the outline planning application for the development of land off Parr Lane, Eccleston for up to 34 dwellings and associated infrastructure by identifying and examining readily available documentary sources of information relating to the following:

- Past and current uses of the site and surrounding area and the nature of any hazards and physical constraints;

- Environmental setting including geology, geochemistry, mining, hydrogeology and hydrology;
- Potential contamination sources, pathways and receptors as part of a preliminary conceptual site model;
- Provide information on the preliminary risk assessment; and,
- Identify aspect of the site requiring immediate attention.

1.3.2 This report has been prepared in general accordance with compliance with BS 5930, BS 10175 and the Land Contamination Risk Management (LCRM).

#### **1.4 Proposed Site Use**

1.4.1 Outline planning permission is sought for the erection of up to 34 dwellings and other infrastructure associated with the development. At this stage a mixture of terraced, semi-detached and detached houses /bungalows together with apartments is envisaged, although may be subject to change as part of the detailed site design.

1.4.2 Two access points are proposed off Parr Lane and Sandringham Road. The Parr Lane access will serve a maximum of three dormer bungalows fronting the carriageway. The access off Sandringham Road will serve the remainder of the residential development. A 2m public footpath link also exists in the south west corner of the site.

1.4.3 Existing trees / hedgerows will be retained where possible and the existing landscaped boundaries will be enhanced. There will be a requirement to remove part of the westerly and northern hedgerows/trees to enable access onto the site, although replacement hedgerows and trees would be provided within the development.

#### **1.5 Limitations of Report**

1.5.1 The report does not constitute or contain a valuation nor is it a full rigorous environmental audit.

1.5.2 The opinions and findings of this report are given without the benefit of any physical site investigation, sampling or testing.

1.5.3 The findings and recommendations are considered to be valid and appropriate at the time of preparation and for the specific purpose or purposes intended. Wardell Armstrong LLP will not be liable if any findings are used by third parties, without the

written agreement of the company, or if an interpretation is made and action taken without further consultation.

1.5.4 The possibility of significant variation in ground conditions existing on site in comparison to those described within this report cannot be discounted.

## **1.6 Data Sources**

1.6.1 The following sources of information have been reviewed:

- A Groundsure Report dated 1<sup>st</sup> December 2020 and referenced GS-7331066, attached at Appendix A;
- Site walkover notes and photographs are attached at Appendix B;
- The BGS Onshore GeoIndex geological mapping interactive mapping database;
- BGS borehole database, selected borehole logs are attached at Appendix C;
- The Environment Agency Flood Risk Map Viewer – interactive online map;
- Zetica Unexploded Ordnance map attached at Appendix D;
- Consultants Coal Authority Mining Report dated 2<sup>nd</sup> December 2020 and referenced 51002333252001 attached at Appendix E.

## 2 SITE HISTORY AND CURRENT SITE USE

### 2.1 Site History

2.1.1 Historic maps provided in the Groundsure Report can be located within Appendix A. The history of the site and surrounding area from 1849 to the present day has been reviewed in order to identify any previous land uses including any significant potentially contaminative land uses or those that could impact future development and are summarised below in Table 2.1.

2.1.2 The site has remained undeveloped since the earliest published maps with a stream being displayed flowing south-north adjacent to the eastern site boundary.

<b>Mapping Date</b>	<b>Developable Site Land Use</b>	<b>Adjacent Land Use</b>
1849/1893	<ul style="list-style-type: none"> <li>The site comprises an undeveloped field bordered to the north by Moons Lane (now Parr Lane).</li> <li>A stream runs along the eastern site boundary south to north, flowing north.</li> </ul>	<ul style="list-style-type: none"> <li>Largely open agricultural land and woodland, divided into separate fields. Farms are located to the north of Moons Lane. A pond is located immediately adjacent to the north west corner of the site. Several other ponds are located around the farm buildings to the north.</li> <li>The stream that runs along the eastern site boundary, turns westwards at Moons Lane, before crossing beneath the road and continuing to the north.</li> </ul>
1909/1910	<ul style="list-style-type: none"> <li>A pond is now shown onsite in the north western area, adjacent to Moons Lane.</li> </ul>	<ul style="list-style-type: none"> <li>Eccleston Mill is shown c.100m south west of the site</li> </ul>
1928/1929	<ul style="list-style-type: none"> <li>The pond in the north western area (and the one located adjacent to the north western boundary) has been infilled</li> </ul>	<ul style="list-style-type: none"> <li>No significant change</li> </ul>
1955	<ul style="list-style-type: none"> <li>The stream previously shown as running parallel to, but within the eastern site boundary is now shown on the boundary line. There doesn't appear to be</li> </ul>	<ul style="list-style-type: none"> <li>There has been some infilling of the ponds located c. 50 to 100 north of the site associated with the farms</li> </ul>
1959/1961	<ul style="list-style-type: none"> <li>Moons lane that forms the northern boundary is now named Parr Lane</li> </ul>	<ul style="list-style-type: none"> <li>No significant change</li> </ul>
1968/1969	<ul style="list-style-type: none"> <li>No significant change</li> </ul>	<ul style="list-style-type: none"> <li>Residential development is now shown adjacent to the western boundary</li> </ul>
1982/1985	<ul style="list-style-type: none"> <li>No significant change</li> </ul>	<ul style="list-style-type: none"> <li>The fields located to the south and south east of the site are labelled as playing field.</li> </ul>
2003	<ul style="list-style-type: none"> <li>Two structures are shown in the north eastern area of the site. These appear to be in the same location as the existing wooden shelter for horses that is currently present.</li> </ul>	<ul style="list-style-type: none"> <li>No significant change</li> </ul>
2010	<ul style="list-style-type: none"> <li>No significant change</li> </ul>	<ul style="list-style-type: none"> <li>4 pond are now shown c. 150m north east of the site at the location now known as Cunneries Fishery</li> </ul>

Table 2.1 Summary of Land Use		
Mapping Date	Developable Site Land Use	Adjacent Land Use
2020	<ul style="list-style-type: none"><li>No significant changes</li></ul>	<ul style="list-style-type: none"><li>Cunneries Fishery has now expanded, with 12 ponds now being shown</li></ul>

## 2.2 Site Use

2.2.1 A site walkover was carried out on 3<sup>rd</sup> December 2020 by a WA Environmental Scientist. Photographs and the site walkover record are attached at Appendix B.

2.2.2 The following observations were made:

- The site is currently comprises open grassland that is understood to be grazed by horses (although no horses were present at the time of inspection). The ground was noted to be damp and marshy in places, with pockets of reeds. This is particularly true in the northern area where standing water was observed;
- A wooden stable structure is located in the north eastern area adjacent to Parr Lane. This adjacent to the gated site entrance. This stable had a corrugated metal roof and no evidence of any made ground was present in the area;
- The southern site boundary is formed by mature hedgerows with several trees, with the eastern and northern boundaries being marked by scrub vegetation with several mature trees. The western boundary with the residential properties is a mix of hedgerows and garden fences.
- The site is generally flat lying and similar in topography to the surrounding site, although there appears to be a slight fall to the east towards the stream. The northern area of the site, however, is lower than the main body of the site, being at a similar level to Parr Lane.
- The stream is located on the eastern boundary. The stream contained water at the time of inspection and was flowing in a northerly direction. No visual or olfactory evidence of contamination was noted.
- No visual evidence of made ground was present at the site surface any where on site.
- No visual evidence remains of the former infilled pond that was historically located in the north eastern corner of the site.

## **Asbestos**

- 2.2.3 During the site walkover no visual evidence of asbestos was recorded. The stable was wooden in construction with a corrugated metal roof. If previous shelters for grazing horses were present on the site the potential that they contained asbestos cannot be discounted. There is a potential for made ground associated with the infilling of the former pond. The source of the material used to infill this pond is not known and the potential for it to contain asbestos cannot be discounted.
- 2.2.4 With regards to the Health and Safety at Work Act and Control of Asbestos Regulations and Construction (Design and Management) Regulations, where works are proposed an appropriate survey should be carried out to identify where and in what condition the asbestos is in. Any works undertaken in areas, where asbestos is known or suspected to be present should be done in accordance with the Control of Asbestos Regulation (2012).

## **2.3 Ecology**

- 2.3.1 This desk study has not been prepared for ecological purposes and reference should be made to the supporting Ecological Impact Assessment that has been prepared for the planning application. We understand that this assessment concludes:

*“that there are no habitats or vegetation communities of significance on site nor are there likely to be any adversely affected by the proposals. With mitigation to compensate for the loss of any semi-natural habitat and the implementation of minor precautions in respect of breeding birds / bats, there would be no negative ecological impact of any significance.”*

## **2.4 Archaeology**

- 2.4.1 There are no Scheduled Monuments or Listed Buildings on or within 250m the site. It is beyond the scope of this report to comment on archaeological issues.

## **2.5 Environmental Management**

- 2.5.1 Overall the standard of housekeeping and environmental management for site was good. There was no significant areas of fly tipping or debris on the site. No visual or olfactory evidence of contamination was noted on site.

### 3 GEOLOGICAL AND HYDROGEOLOGICAL INFORMATION

#### 3.1 Geology

3.1.1 The assessment of the geology of the site is based on the published geological mapping supplemented by topographical plans and site visit. Online data from the British Geological Survey (BGS) has been researched and relevant borehole records are attached (Appendix C). A summary of relevant geological information is provided in Table 4.1. this information has been supplemented by information contained within the Groundsure Report.

<b>Table 4.1 Summary of Relevant Geological Data</b>	
<b>Strata</b>	<b>Description</b>
Made Ground	The site is not shown to be underlain by Made Ground. However, historical mapping has shown a former pond to have been infilled on the site. In addition the potential for made ground associated with the stable structures and around the site entrance. The route of the stream on the eastern boundary has altered on historical plans, although it appears that this most likely relates to plotting errors rather than the re-routing of the stream channel.
Superficial Deposits	The site is underlain by Devensian Till, described as clay with sands, gravels and silts.
Solid Geology	The majority of the site is shown to be underlain by Sherwood Sandstone. The northern part of the site, however, is recorded as being underlain by Tarporley Siltstone.
Geological Structures	The site is located within a coal mining referral area, although it does not lie within a development high risk area. There are no faults on or within 250m of the site
<b>Geohazards</b>	<b>Description</b>
Natural cavities	None reported
Landslides	Very Low
Collapsible deposits	Very Low
Compressible deposits	Negligible
Ground dissolution	Negligible
Running sands	Very Low
Shrinkage/swelling clay	Very Low

3.1.2 There are no recorded natural cavities, surface or underground mining recorded on or within influencing distance of the site.

3.1.3 A review of the boreholes on site and in the vicinity of the site has been carried out The closest records are located approx. 250m south east of the site is attached at Appendix C. The borehole logs report clays with gravels to circa. 14mbgl above Sandstone. A log approximately 1km to the north west of the site records topsoil over clay to 22.86mbgl onto sandstone.

## **3.2 Hydrogeology**

- 3.2.1 Hydrogeological information provided in the Groundsure report indicates the superficial deposits are designated as a Secondary Undifferentiated aquifer.
- 3.2.2 Secondary Undifferentiated is assigned where it is not possible to attribute either category A or B to a rock type. In general these layers have previously been designated as both minor and nonaquifer in different locations due to the variable characteristics of the rock type.
- 3.2.3 The Sherwood Sandstone underlying the southern area of the site is designated as a Principal Aquifer. Principal Aquifers are areas of high intergranular and/or fracture permeability, usually providing a high level of water storage and may support water supply/river base flow on a strategic scale. Generally principal aquifers were previously major aquifers.
- 3.2.4 The Tarpoley Siltstone underlying the northern area of the site is designated as a Secondary B Aquifer. Secondary B Aquifers are predominantly lower permeability layers which may store/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.
- 3.2.5 It is stated within the Groundsure report that the site lies within an area that is considered to be at a low risk of groundwater flooding.
- 3.2.6 There are no groundwater or surface water abstraction points, potable abstractions or source protection zones within 500m of the site.

## **3.3 Hydrology**

### *Watercourses*

- 3.3.1 An unnamed stream runs along the eastern boundary of the site, flowing in a northerly direction towards the River Yarrow approximately 900m from the site. This stream is recorded as an inland river that is not influenced by normal tidal action.
- 3.3.2 Several ponds are located in the vicinity of the site. The most significant are located c. 150m north east of the site and form part of Cunneries Fishery.

### *Groundwater bodies*

- 3.3.3 The Rufford Permo-Triassic Sandstone Aquifer, has been assigned a poor chemical rating and quantitative good rating by the Environment Agency.

### *Flooding*

- 3.3.4 The flood maps show the predicted likelihood of flooding in an area in the context of current and also the proposed land use considered in development planning.
- 3.3.5 The site lies within an Environment Agency Flood Zone 1 with a low risk of flooding from rivers and sea.
- 3.3.6 The highest risk from surface water flooding is reported to occur on a 1 in 30 year event at localised areas within the immediate vicinity of the brook that runs along the eastern site boundary.
- 3.3.7 Further consideration of flooding and site drainage would be undertaken in support of any future development.

## **3.4 Coal Mining**

- 3.4.1 The site is located within a coal mining area as defined by the Coal Authority based on records detailing the site could have been affected by past, current or future coal mining. A Consultants Coal Authority Mining Report is has been obtained for the site and is attached within Appendix E.
- 3.4.2 The Coal Authority Mining Report states that there are no records of any past underground or open cast mining, and no records of “probable unrecorded shallow workings”. No mine entries are recorded within 100m of the application boundary and there are no records of any coal mining related issues such as subsistence claims or mines gas.
- 3.4.3 The risks associated with coal mining can be sensibly discounted.

## **3.5 Non-Coal Mining**

- 3.5.1 The Groundsure report highlights that no non-coal mining activities are recorded on site or within 500m of the site boundary. The nearest non-coalmining activity recorded is sporadic underground mining of “vein material” 659m east of the site.

## **4 ENVIRONMENTAL SETTINGS AND CONSULTATION**

### **4.1 Introduction**

4.1.1 Information from various statutory sources has been summarised from the Groundsure report (Appendix A).

### **4.2 Agricultural Land Classification**

4.2.1 The site is classified as Grade 3 Agricultural Land. This is defined as good to moderate quality agricultural land. Land with moderate limitations which affect the choice of crops, timing and type of cultivation, harvesting or the level of yield.

### **4.3 Contaminated Land Register Entries and Notices**

4.3.1 The site or an area within 500m of the site has not been identified as potentially contaminated by the Local Authority under the Part IIA of the Environmental Protection Act 1990.

### **4.4 Waste Management**

4.4.1 There are no historical landfill or waste sites recorded by the BGS or Environment Agency within 500m of the site, although the Local Authority records show a refuse tip 478m north of the site. Winterview Farm, located c.50m north of the site is reported as having 3 waste exemptions relating to the treating of waste (cleaning, washing, spraying or coating), burning waste in the open, and the use of waste in construction.

### **4.5 Radon**

4.5.1 The Health Protection Agency and British Geological Survey document entitled Indicative Atlas of Radon in England and Wales, dated 2007, summarises the number of homes in a given area above the "Action Level" for radon. This is a standard classification - it is acknowledged that the proposed development is not residential.

4.5.2 The site is located in an area where less than 1% of homes are above the action level and therefore there is no requirement for Radon Protection Measures.

### **4.6 Environmental Issues**

4.6.1 The following environmental issues for the site and adjacent land have been reviewed:

- There are no pollution incidents within 250m of the site. The nearest incidents relate to the release of petrol 300m from the site, with the magnitude being described as "minor";

- There are no recorded Integrated Pollution Prevention Controls (Part A1, A2 / B) activities and enforcement within 500m of the site;
- There are no records of regulated explosive sites, hazardous substance storage and / or usage, list 1 or list 2 dangerous substances, control of major accident hazards (COMAH) and radioactive substance authorisations within 500m of the site; and,
- There are no records of pollutant release to surface water or public sewer, pollution inventory substances, waste transfers and radioactive waste records within a 500m radius of the site.

#### **4.7 Unexploded Ordnance**

- 4.7.1 A Zetica unexploded bomb (UXB) risk map for the site has been reviewed and suggests that the risk on site is Low – areas indicated as having 15 bombs per 1000 acres or less. The map is attached at Appendix D.

## 5 PRELIMINARY CONCEPTUAL SITE MODEL

### 5.1 Background

5.1.1 Following a review of the information presented in this report a preliminary conceptual site model has been prepared to show the characteristics of the site and show the relationships between possible contaminants, pathways and receptors. The Preliminary Conceptual Site model is based upon an assumed future residential with home grown produce end use. This should be refined when the detailed development layout and / or proposals are available and on the ground conditions present.

#### 5.1.2 Potential Sources of Contamination

##### *On-Site*

- Historical records show a former pond was infilled in the north western area of the site, adjacent to Parr Lane. The nature and source of the infill materials is not known and consequently could contain a range of contaminants including metals, TPH (CWG), PAHs, asbestos, etc.
- Significant volumes of made ground elsewhere on the site are not expected, however, they may be present in localised areas should there have been any infilling of localised depressions or associated with the adjacent housing development.
- It is understood that the land was used for the grazing of horses, with historical mapping appearing to show some structures (thought to be stables) in the north eastern area. There may be some made ground associated with the construction and any demolition of these materials;
- Given the setting of the site, there is a potential that the site may have been in agricultural use in the past. There is a potential that agrochemicals (pesticides, herbicides, insecticides) some of which may be persistent in the environment may have been applied.
- Ground gas associated with potential on and off site Made Ground, and any organic materials within the near surface deposits.

##### *Off-site*

- Historic records show a former pond to have been infilled adjacent to the north west corner of the site. The nature and source of any fill material is not known and consequently there is potential for it to contain contaminants and produce ground gas.

- Industrial uses are limited in the area, although the farm located to the broth of the site has various processes and waste exemptions.

### 5.1.3 Potential Pathways

- Human health - inhalation, ingestion, dermal;
- Controlled waters - leaching, migration, over ground (stream adjacent to eastern boundary)
- Buildings/infrastructure - gas migration, direct contact; and,
- Flora and Fauna - ingestion, root uptake.

### 5.1.4 Potential Receptors

- Human health – current site users, future site users, construction workers and adjacent site users;
- Controlled water – groundwater (Secondary aquifers within the superficial deposits and siltstone and principal aquifer within the sandstone), surface water (adjacent stream)–; and,
- Buildings/infrastructure (proposed).

## 5.2 Preliminary Conceptual Site Model

5.2.1 Table 5.1 summaries the conceptual site model and potential pollution linkages.

TABLE 5.1: Conceptual Site Model & Potential Pollutant Linkages		
Source (Contaminant)	Pathway	Receptor
Contaminants within on-site Made Ground associated with infill of the former pond, stables and any localised areas of infill on site.	1. Inhalation 2. Dermal contact 3. Ingestion 4. Surface runoff/overland flow 5. Groundwater migration 6. Direct contact (aggressive attack) 7. Gas migration	1. Current occupiers 2. Future occupiers 3. Adjacent site users 4. Construction workers 5. Groundwater 6. Surface water 7. Building materials (substructure) 8. Water supply pipes 9. Flora and fauna
Potential application of agrochemicals on the site	1. Inhalation 2. Dermal contact 3. Ingestion	1. Current occupiers 2. Future occupiers 3. Adjacent site users

**TABLE 5.1: Conceptual Site Model & Potential Pollutant Linkages**

Source (Contaminant)	Pathway	Receptor
	4. Surface runoff/overland flow 5. Groundwater migration 6. Direct contact (aggressive attack) 7. Gas migration	4. Construction workers 5. Groundwater 6. Surface water 7. Building materials (substructure) 8. Water supply pipes 9. Flora and fauna
Off site made ground associated with features such as the infilled pond adjacent to the NW corner of the site, the farm to the north, etc	1. Inhalation 2. Dermal contact 3. Ingestion 4. Surface runoff/overland flow 5. Groundwater migration 6. Direct contact (aggressive attack) 7. Gas migration	1. Current occupiers 2. Future occupiers 3. Adjacent site users 4. Construction workers 5. Groundwater 6. Surface water 7. Building materials (substructure) 8. Water supply pipes 9. Flora and fauna
Ground gas associated with potential on and off site Made Ground, potential mine gas and naturally occurring ground gas.	1. Inhalation (indoor and outdoor) 2. Gas migration	1. Current occupiers 2. Future occupiers 3. Adjacent site users 4. Construction workers 5. Building materials (substructure)

## 6 PRELIMINARY ENVIRONMENTAL RISK ASSESSMENT

### 6.1 Introduction

6.1.1 In line with EA guidance Land Contamination: Risk Management June 2019 (LCRM) the information gathered throughout this report can be used to carry out a Preliminary Risk Assessment. The Risk Assessment is provided for each identified source, pathway, receptor linkage in Table 6.5.

6.1.2 The CIRIA document Contaminated Land Risk Assessment – a guide to good practice C552, 2001 defines the Consequence of Risk, Probability of Risk Being Realised and Risk Classification Definition. These definitions are provided in Tables 6.1, 6.2 and 6.3, and the Risk Classification Matrix (Table 6.4) is used to provide a qualitative Risk Assessment for each identified source, pathway, receptor linkage.

**Table 6.1 – Consequence of Risk Being Realised (based on CIRIA C552 2001)**

Classification	Category	Definition	Examples (Not necessarily specific to this site)
<b>Severe</b> short-term (acute) risks only	Humans	Short-term (acute) risk to human health likely to result in “significant harm” as defined by the Environment Protection Act 1990, Part 2A.	High concentrations of cyanide on the surface of an informal recreation area.
	Controlled Waters	Short-term risk of pollution (note: Water Resources Act contains no scope for considering significance of pollution) of sensitive water resource.	Major spillage of contaminants from site into controlled water.
	Property	Catastrophic damage to buildings/property.	Explosion causing building collapse (can also equate to a short-term human health risk if buildings are occupied).
	Ecological System	A short-term risk to a particular ecosystem, or organism forming part of such ecosystem.	
<b>Medium</b> chronic (long term) risks; “significant harm”	Humans	Chronic damage to Human Health (“significant harm” as defined in Defra 2006).	Concentrations of a contaminant from site exceed the generic, or site-specific assessment criteria
	Controlled Waters	Pollution of sensitive water resources (note: Water Resources Act contains no scope for considering significance of pollution).	Leaching of contaminants from a site into a major or minor aquifer.
	Ecological System	A significant change in a particular ecosystem	Death of a species within a designated nature reserve.
<b>Mild</b> chronic (long term) risks; less sensitive receptors	Controlled Waters	Pollution of non-sensitive water resources.	Pollution of non-classified groundwater
	Property	Significant damage to buildings, structures and services (“significant harm” as defined in Circular on Contaminated Land, Defra, 2006). Damage to sensitive buildings/structures/services	Damage to building rendering it unsafe to occupy (e.g., foundation damage resulting in instability)
	Ecological System	Significant damage to crops. Damage to the environment.	

<b>Minor chronic (long term) risks; mild</b>	Financial / project	Harm, although not necessarily significant harm, which may result in a financial loss, or expenditure to resolve.	
	Humans	Non-permanent health effects to human health (easily prevented by means such as personal protective clothing, etc).	The presence of contaminants at such concentrations that protective equipment is required during site works.
	Property	Easily repairable effects of damage to buildings, structures and services	The loss of plants in a landscaping scheme. Discolouration of concrete.

**TABLE 6.2: Probability of Risk Being Realised (C552 CIRIA, 2001)**

Classification	Definition
<b>High Likelihood</b>	There is a pollution linkage and an event that either appears very likely in the short term and almost inevitable over the long term, or there is evidence at the receptor of harm or pollution.
<b>Likely</b>	There is a pollution linkage and all the elements are present and in the right place, which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short term and likely over the long term.
<b>Low Likelihood</b>	There is a pollution linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such event would take place, and is less likely in the shorter term.
<b>Unlikely</b>	There is a pollution linkage but circumstances are such that it is improbable that an event would occur even in the very long term.

**TABLE 6.3: Risk Classification Definitions (C552 CIRIA, 2001)**

<b>Very High</b>	There is a high probability that severe harm could arise to a designated receptor from an identified hazard, OR, there is evidence that severe harm to a designated receptor is currently happening. This risk, if realised, is likely to result in a substantial liability. Urgent investigation (if not undertaken already) and remediation are likely to be required.
<b>High</b>	Harm is likely to arise to a designated receptor from an identified hazard. Realisation of the risk is likely to present a substantial liability. Urgent investigation (if not undertaken already) is required and remedial works may be necessary in the short term and are likely over the longer term.
<b>Moderate</b>	It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild. Investigation (if not already undertaken) is normally required to clarify the risk and to determine the potential liability. Some remedial works may be required in the longer term.
<b>Moderate / Low</b>	
<b>Low</b>	It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst normally be mild.
<b>Very Low</b>	There is a low possibility that harm could arise to a receptor. In the event of such harm being realised it is not likely to be severe.

<b>TABLE 6.4: Risk Classification Matrix (C552 CIRIA, 2001)</b>					
		<b>Consequence</b>			
		<b>Severe</b>	<b>Medium</b>	<b>Mild</b>	<b>Minor</b>
<b>Probability</b>	<b>High Likelihood</b>	Very High	High	Moderate	Moderate/Low
	<b>Likely</b>	High	Moderate	Moderate/Low	Low
	<b>Low Likelihood</b>	Moderate	Moderate/Low	Low	Very Low
	<b>Unlikely</b>	Moderate/Low	Low	Very Low	Very Low

**TABLE 6.5: Preliminary Qualitative Risk Assessment**

Source / Contaminant	Pathway(s)	Receptor	Consequence of Risk Being Realised	Probability of Risk Being Realised	Risk Classification	Necessary Actions / Commentary
Contaminants within any Made Ground associated with the former infilled pond, the existing and former stable structures, any localised fill, application of agrochemicals.	Inhalation, Dermal Contact, Ingestion, Migration via water pipes	Future occupiers, adjacent site users construction workers.	Medium	Low Likelihood	Low / Moderate	No evidence of significant volumes of made ground or surface contamination was noted during the site walkover. It is possible isolated pockets of made ground may be present, particularly associated with the historic pond. If present the nature any made ground is currently unknown and therefore, there is potential for it to present a risk to human health and the surrounding environment. It is recommended that an intrusive investigation is undertaken in order to determine the nature and composition of the near surface deposits.
	Surface water run off, migration via field drains and infiltrating water	Surface water , ground water (Principal and Secondary Aquifer)	Medium	Low Likelihood	Low / Moderate	
	Direct contact (aggressive attack)	Future buildings and water pipes	Minor	Low Likelihood	Very Low	
Ground gas associated with potential on and off site Made Ground potential mine gas, and naturally occurring ground gas.	Inhalation (indoor and outdoor) and migration of ground gas.	Future occupiers (students), adjacent occupiers (students and commercial), future maintenance workers, buildings and services	Severe	Low Likelihood	Moderate	Any made ground and organic natural soils are a potential source of ground gas on the site. As the nature of the infill material of the former ponds both on and off site are unknown they could contain organic material. It is recommended that an intrusive investigation is undertaken and a ground gas assessment carried out to support any future design.

## **7 PRELIMINARY GEOTECHNICAL RISK ASSESSMENT**

- 7.1.1 The desk study researches suggest a generally low geotechnical risk to the proposed development.
- 7.1.2 The geology on site is shown to comprise Devensian Till underlain by the either sandstone or siltstone. Made ground may be present in the area of the former infilled pond in the northern part of the site. Compressible ground may be present due to the anticipated Made Ground and Till deposits, particularly in the area of the infilled pond. The potential for excessive total and differential settlement of the proposed development should be considered at the detailed design stage.
- 7.1.3 The main area of the site is generally flat; however, the northern area of the site is lower than the main body and there is a general fall to the east. Depending on the proposed development, regrading works may be necessary. It is recommended that chemical and geotechnical testing is undertaken on site in order to determine the suitability for re-use of materials.
- 7.1.4 In terms of the impact of coal mining legacy, overall the site represents a Low Risk
- 7.1.5 It is recommended that a detailed ground investigation is undertaken to support the geotechnical and foundation design of the project.

## 8 CONCLUSIONS AND RECOMMENDATIONS

### 8.1 Conclusions

8.1.1 Based on available information summarised in this report the ground conditions beneath the site are considered to present an overall Low risk to future development. There are number of potential environmental and geotechnical constraints that need to be fully investigated and assessed once the final development proposals and layout are known. It is possible that some mitigation measures will be necessary in the final scheme design.

8.1.2 At this stage there is no fixed development layout or proposals and therefore the scope of any protection measures in relation to ground contamination cannot be determined. A residential development will have a high sensitivity to any contaminants present in made ground deposits and to any ground gases being generated beneath, or migrating onto the site. This is particularly true in the area of the former pond and around the stable structures. With the exception of the potential for a deeper area of made ground in the area of the former pond, no significant geotechnical risks have been identified by the desk study researches.

### 8.2 Recommendations

8.2.1 It is recommended that a Phase 2 Ground Investigation is carried out to determine the geological conditions on site, geotechnical parameters and the potential contamination.

8.2.2 Table 8.1 outlines the preliminary objectives that the ground investigation would be anticipated to target. The list presented in Table 8.1 is not exhaustive and general investigation, sampling and testing across the site will be required to better understand the overall risk posed by the site.

Table 8.1 Preliminary Ground Investigation Objectives	
Geo-environmental Objectives	Geotechnical Objectives
<ul style="list-style-type: none"> <li>To reduce uncertainty in knowledge of the site, enabling the initial conceptual model to be refined and reassessment of risk;</li> <li>Target sampling and chemical testing across the site particularly in the area of the former pond and stable structures;</li> <li>Undertake groundwater and gas monitoring;</li> <li>Provide sufficient data to design remediation approach.</li> </ul>	<ul style="list-style-type: none"> <li>To reduce uncertainty in knowledge of the site, enabling review of the Geotechnical Risk Assessment;</li> <li>To identify the nature and parameters of the ground strata and groundwater;</li> <li>Establish parameters prior to design of foundations, temporary and permanent works;</li> <li>Provide sufficient information to target further ground investigation or design a suitable remediation approach;</li> </ul>

	<ul style="list-style-type: none"><li>• Locate, map and investigate underground obstructions and identify potential construction difficulties;</li></ul>
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