

# RB Geotechnical

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## Land Adjacent to 15 Lower Lark Hill

### Phase I Desk Study Report

June 2017



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RB Geotechnical

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Prepared and Issued by Ross Blake BSc MSc FGS, Engineer. Signed :

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**Contents Page**

<b>Disclaimer</b> .....	<b>5</b>
<b>1.0 Introduction</b> .....	<b>5</b>
1.1 Aims and Scope .....	5
1.2 Terms and Conditions.....	6
1.3 Sources of information .....	6
<b>2.0 Site Details</b> .....	<b>7</b>
2.1 Site Location and Description.....	7
2.2 Site Walkover Observations .....	8
2.3 Proposed Development.....	9
<b>3.0 Site History</b> .....	<b>9</b>
3.1 History of site and surrounding area.....	9
<b>4.0 Geology, Hydrogeology and Hydrology</b> .....	<b>11</b>
4.1 Geology.....	11
4.2 Hydrogeology .....	12
4.3 Hydrology .....	12
<b>5.0 Environmental Setting</b> .....	<b>13</b>
5.1 Waste Treatment and Disposal .....	13
5.2 Regulatory Permits, Incidents and Registers.....	13
5.3 Potentially Infilled Land .....	14
5.4 Sensitive Land Uses .....	14
<b>6.0 Potentially Contaminative Sites</b> .....	<b>14</b>
6.1 Potentially Contaminative Land Uses.....	14
6.2 Fuel Stations and Tanks .....	14
<b>7.0 Geotechnical Assessment</b> .....	<b>15</b>
7.1 Natural Hazards .....	15
7.2 Ground Workings .....	15

<b>8.0</b>	<b>Mining</b> .....	<b>15</b>
<b>9.0</b>	<b>Conceptual Site Model</b> .....	<b>16</b>
9.1	Introduction.....	16
9.2	Potential Contamination Sources.....	17
9.3	Potential Receptors .....	17
9.4	Potential Pathways.....	18
9.5	Preliminary Risk Assessment .....	19
<b>10.0</b>	<b>Conclusions</b> .....	<b>23</b>
<b>11.0</b>	<b>Recommendations</b> .....	<b>24</b>
<b>12.0</b>	<b>References</b> .....	<b>24</b>

**APPENDIX CONTENTS**

<b>Appendix A</b>	<b>EnviroInsight Groundsure Report</b>
<b>Appendix B</b>	<b>Historical Ordnance Survey Maps</b>
<b>Appendix C</b>	<b>Proposed Development Plan</b>
<b>Appendix D</b>	<b>Coal Authority Mining Report</b>
<b>Appendix E</b>	<b>Site Walkover Photographs</b>

## Phase I Desk Study Report

### Disclaimer

This report was produced by **RB Geotechnical** for Mr Will Yates of Quarters Developments Ltd, for the specific purposes of a Phase I Desk Study at the Land Adjacent to 15 Lower Lark Hill, in Cleckheaton, West Yorkshire. This report may not be used by anyone else other than Quarters Developments Ltd without their express permission. In any event, **RB Geotechnical** accepts no liability for any costs, liabilities or losses arising from the use of reliance upon the contents of this report by anyone other than Quarters Developments Ltd.

## 1.0 Introduction

**RB Geotechnical** was commissioned by Will Yates of Quarters Developments Ltd, to carry out a Phase I Desk Study for the land adjacent to 15 Lower Lark Hill, in Cleckheaton. This Phase I Desk Study is to form part of a planning application for the proposed development of a new detached residential dwelling. Therefore the final land use will be **Residential**.

### 1.1 Aims and Scope

The principal aims of this Phase I Desk Study is to interpret information pertaining to the site, obtained during a desk based review of available data and a site walkover survey of the site.

The scope of this study is as follows:

- To carry out a site walkover;
- To provide general information on the site such as location and description;
- To discuss the geology, hydrogeology and hydrology at, and in the vicinity of, the site;
- To summarise the environmental setting of the site; e.g. landfills, permits and sensitive land uses;
- To summarise potential geotechnical risks associated with the site;
- To provide a preliminary summary of potential coal mining risks to the site;
- To discuss and summarise any historical development that have occurred at the site and in the surrounding area;
- To assess potential contamination issues pertaining to the site with consideration of the site's historic use;
- To develop an initial conceptual model linking sources of potential contamination with pathways

## Phase I Desk Study Report

and receptors; and

- To provide a preliminary risk assessment for the current and proposed end use of the site.

Please note that this Phase I Desk Study excludes an assessment of risks arising from asbestos, unexploded ordnance and/or invasive species.

### 1.2 Terms and Conditions

This report has been prepared for Quarters Developments Ltd in support of a planning application relating to the proposed development on the land adjacent to 15 Lower Lark Hill.

### 1.3 Sources of information

A site walkover survey was carried out on the 30<sup>th</sup> May 2017. Information on the site layout and current land use of the site is mainly based on information collected during this walkover.

An environmental database search was undertaken by GroundSure to provide supplementary Environmental information for the site and surrounding area. This was collated into an Insight Report by Ground Sure and as such the potential for further data to exist cannot be ruled out.

The existing database and other sources of which this study is based comprise:

- GroundSure EnviroInsight Report, Land adjacent to 15 Lower Lark Hill , 26<sup>th</sup> May 2017– Appendix A
- GroundSure 1:10,000 Historical Maps, Land adjacent to 15 Lower Lark Hill , 26<sup>th</sup> May 2017 Appendix B
- GroundSure 1:2,500 Historical Maps, Land adjacent to 15 Lower Lark Hill , 26<sup>th</sup> May 2017– Appendix B
- Coal Authority Report, Land adjacent to 15 Lower Lark Hill, 1<sup>st</sup> June 2017 – Appendix D
- **RB Geotechnical** Site walkover survey carried out on 30<sup>th</sup> May 2017
- Environment Agency website ([www.environment-agency.gov.uk](http://www.environment-agency.gov.uk));
- British Geological Survey (BGS) Geoindex website ([www.bgs.ac.uk/geoindex](http://www.bgs.ac.uk/geoindex))

## Phase I Desk Study Report

- Coal Authority Interactive Viewer ([www.mapapps2.bgs.ac.uk/coalauthority/home.html](http://www.mapapps2.bgs.ac.uk/coalauthority/home.html))

Although every effort has been made to ensure the accuracy of the information contained herein, no checks have been carried out to ensure the accuracy of information obtained from third parties and no liability can be accepted for any errors or misinterpretation of the third party information where it has been incorporated into this report.

## 2.0 Site Details

### 2.1 Site Location and Description

The site is situated approximately 1400m to the South West of Cleckheaton town centre, at an irregular shaped plot of land covering an area of approximately 0.09ha off Lower Lark Hill. The National Grid Reference for the centre of the site is 417688, 425022.

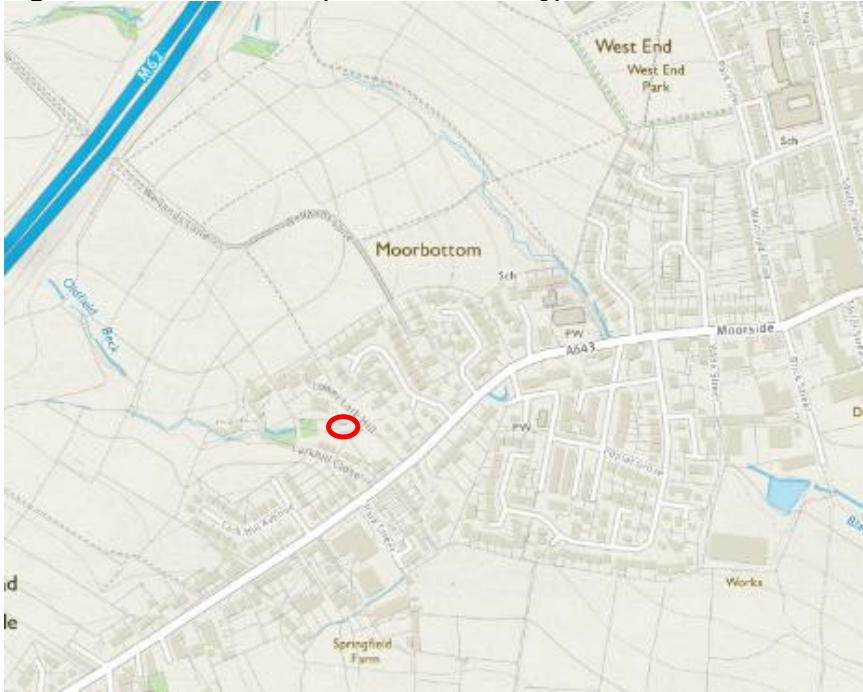
Access to the site is through some herras fencing in the South East corner of the site, off Lower Lark Hill. The site itself has a largely tarmac/concrete hardstanding surfacing, with areas of overgrown weeds, bushes and trees growing on top of this hardstanding. No buildings exist on site, however the areas of hardstanding are indications of where buildings used to exist.

Topographically, the site is at a lower elevation than the road along the Eastern boundary and the land occupied by 15 Lower Lark Hill, adjacent to the North of the site. The site itself, slopes down from the South East corner towards the North West and North East corner of the site.

The Northern and Eastern site boundaries are marked by brick retaining walls, and the Southern and Western site boundaries by mature trees.

The immediate surrounding area consists of residential houses and roads. open farmland and woodland, with semi-detached houses to the West and the large Oak Cottage to the East. The approximate site location is shown by the red circle in Figure 2.1.

**Figure 2.1 Site Location (Ordnance Survey)**



## 2.2 Site Walkover Observations

A site walkover was carried out on 30<sup>th</sup> May 2017 by RB Geotechnical to assess the current site condition. Photographs from this site walkover are included in Appendix E.

The following observations were made during the site walkover:

- The site is occupied by a plot of land with a largely hardstanding surfacing, covered by overgrown weeds and bushes, with a number of trees lining the site boundaries;
- The site is at a lower elevation to Lower Lark Hill and the land occupied by 15 Lower Lark Hill to the North;
- Access to the site is good for most construction plant;
- Although no signs of visual contamination was identified, there was some evidence of dumped rubbish;

## Phase I Desk Study Report

- The visible hard standing areas may be old building footprints, and therefore old foundations are likely to exist.

### **2.3 Proposed Development**

The proposed development is to comprise a new detached house to be constructed in the North East corner of the site, with a new detached garage in the South of the site and private gardens. The final development will be Residential. Proposed development plan is shown in Appendix C.

## **3.0 Site History**

### **3.1 History of site and surrounding area**

Information relating to the historical development of the site and the surrounding area has been obtained from Historical Ordnance Survey Maps (1:10,000 and 1:2,500). These are presented in Appendix B.

Historical maps show the site to initially comprise an irregular shaped plot of land, with a small rectangular building in the West. The site remained this way up until the early 1920s, when an additional small square building was added. By the early 1930s, what looks like a wide access road is shown on the site, coming off the narrow access road which runs along the Eastern site boundary. By the early 1970s all building on site are shown to have been demolished, and by 1985 the site is clear of all buildings.

The earliest available map of 1854 showed two mine shafts from Moor Bottom Colliery to be situated approximately 50m to the North East of the site boundary, with a shaft also shown nearby. A large works building was mapped approximately 80m to the East up until the 1930s when it is shown to have been demolished. Throughout the years, this colliery is no longer shown and the surrounding area largely comprises residential streets and houses, with occasional farms.

## Phase I Desk Study Report

**Table 3.1 Summary of on-site and surrounding area history**

Date	On-Site Features	Surrounding Area
1854 - 1893	The site comprises an irregular shaped plot of land, with a rectangular building situated in the West, extending towards the centre of the site.	A narrow access road runs along the Eastern site boundary up towards houses situated to the North of the site. Two mine shafts related to Moor Bottom Colliery are mapped approximately 50m to the North East of the site. Moor Bottom Tannery is mapped approximately 80m to the East of the site. The rest of the surrounding area largely comprises open farmland.
1893 - 1922	The site remains unchanged.	The shafts are no longer shown, and the Tannery mapped 80m to the East is now labelled as Boiler Works. Residential development has taken place to the East of the site from around 500m.
1922 - 1933	A smaller square building has been added to the site, in the centre.	Further residential development to the East and South East of the site.
1933 - 1938	The site remains unchanged.	The Boiler Works once mapped from 80m to the East of the site is no longer shown, and has been demolished.
1938 - 1956	A wide rectangular access road is now shown coming into the site from the South East corner of the narrow access road that runs along the Eastern site boundary.	Further residential development in all directions.
1956 - 1973	The site remains unchanged.	Further residential development in all directions. A small engineering works is mapped approximately 120m to the South West of the site. An Iron Foundry and Wire Mill is mapped 250m to the East of the site.
1973 - 1983	All buildings have been demolished, and the site is shown to be clear.	The surrounding area remains largely unchanged.
1983 - 1985	The site remains undeveloped, however it is shown to have some form of access road running through it from the South East corner.	A new detached property is shown approximately 10m to the North West of the site.
1985 - Present Day	The site remains unchanged	The surrounding area remains largely unchanged.

## **4.0 Geology, Hydrogeology and Hydrology**

### **4.1 Geology**

Information relating to the geology of the site has primarily been sourced from the EnviroInsight Report and the BGS Geoindex website.

#### **4.1.1 Made Ground**

According to the published geological maps and information on the BGS GeoIndex website, Made Ground is not mapped beneath the site. However, historical maps indicate that the site historically contained buildings, and is largely covered now by hardstanding. Therefore Made Ground will exist in the soils beneath this site.

#### **4.1.2 Superficial Deposits**

No superficial deposits are mapped beneath the site.

#### **4.1.3 Solid Geology**

Geological maps indicate that the site is underlain by Mudstone, Siltstone and Sandstone of the Pennine Lower Coal Measures Formation.

#### **4.1.4 BGS Boreholes**

No historical BGS boreholes exist within 250m of the site boundary.

#### **4.1.5 Faults and Seams**

A fault is mapped roughly adjacent to the Southern site boundary trending in an East to West direction. Additionally a coal seam is mapped approximately 130m to the North of the site, also trending in a general East to West direction.

#### **4.1.6 Radon**

The EnviroInsight Report indicates that the property is not in a Radon Affected Area as less than 1% of properties are above the Action Level. No radon protective measures are deemed necessary by EnviroInsight.

## **4.2 Hydrogeology**

### **4.2.1 Aquifers**

The underlying Pennine Lower Coal Measures Formation is classified as being a Secondary A Aquifer. This indicates 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.

### **4.2.2 Groundwater, Surface Water and Potable Water Abstraction Licences**

The EnviroInsight Report indicates that there are no Groundwater, Surface Water or Potable Water Abstraction Licences within 1000m of the site.

### **4.2.3 Soil Leaching Potential**

The EnviroInsight Report indicates that the underlying soils have a High Urban Leaching Potential, whereby the underlying soils are assumed to be highly permeable in the absence of site-specific information.

### **4.2.4 Discharge Consents**

No records of Licensed Discharge Consents are stated within the EnviroInsight Report to be within 250m of the site.

### **4.2.5 Pollution Incidents to Controlled Waters**

The EnviroInsight Report shows no pollution incidents to controlled waters on site or within 500m of the site.

## **4.3 Hydrology**

No surface water features exist on site, however a culverted river is mapped running across the centre of the site from West to East. A number of secondary and tertiary rivers are mapped within 250m of the site boundary, mainly becks and drains.

### **4.3.1 Water Quality**

The EnviroInsight Report indicates that there is no biological or chemical water quality data available for any rivers within 1000m of the site.

#### 4.3.2 Flood Risk

The EnviroInsight Report states that the site is not within a floodplain area and is at a **Very Low** risk of flooding from rivers and sea. It also states that there is the potential for at surface groundwater flooding beneath the site, whereby a groundwater flooding hazard should be considered in all planning decisions.

#### 4.3.3 Source Protection Zones

There are no Source Protection Zones within 500m of the site boundary.

## 5.0 Environmental Setting

### 5.1 Waste Treatment and Disposal

#### 5.1.1 Landfill Sites

The only form of landfill site mapped within 1000m of the site is a historical refuse tip once mapped 676m to the North East and 968m to the South West.

#### 5.1.2 Waste Management, Waste Treatment, Waste Transfer Facilities or Disposal Sites

Two Waste Transfer and Management Stations are mapped within 500m of the site boundary, situated 415m to the East and 455m to the East. There are no other licensed waste sites situated within 500m of the site.

### 5.2 Regulatory Permits, Incidents and Registers

#### 5.2.1 Control of Major Hazard Sites /Notification of Installations Handling Substances

The EnviroInsight Report lists no Control of Major Hazard sites (COMAH) or Notification of Installations Handling Substances (NIHHS) within 500m of the site.

#### 5.2.2 Planning Hazardous Substance Consents

There are no records of Planning Hazardous Substance Consents and Enforcements located within 500m of the site.

### **5.2.3 Recorded Pollution Incidents**

There are three recorded pollution incidents within 500m of the site. These are inert construction waste situated 317m to the South West, contaminated water 375m to the East and oils and fuels situated 433m to the North.

### **5.3 Potentially Infilled Land**

Apart from the old Colliery mapped 50m to the North East of the site, the EnviroInsight Report does not identify any other possible areas of infilled land within 250m of the site boundary.

### **5.4 Sensitive Land Uses**

The site is in a Nitrate Vulnerable Zone. An area of green belt is mapped 41m to the South West and 690m to the South West. No other Designated Environmentally Sensitive Sites are mapped within 1000m of the site boundary.

## **6.0 Potentially Contaminative Sites**

### **6.1 Potentially Contaminative Land Uses**

Approximately twenty contaminative historic land uses have been mapped within 500m of the site boundary, these include the old mine shafts situated from 20m to the North East of the site, garages, a number of works buildings, pits, factories and sewage works. Two current potentially contaminative land uses have been mapped within 250m of the site boundary, these are a vehicle components yard situated 110m to the North East and an electricity sub-station mapped 173m to the South.

### **6.2 Fuel Stations and Tanks**

Four historical tanks are mapped within 250m of the site boundary, situated from 76m to the East to 244m to the East.

## 7.0 Geotechnical Assessment

### 7.1 Natural Hazards

The EnviroInsight Report states that the site has a **Negligible** risk of Compressible Deposits, Soluble Rocks and Running Sands, a **Very Low** risk of Natural Ground Subsidence, Shrink Swell Clay and Collapsible Rocks, and a **Low** risk of Landslides.

### 7.2 Ground Workings

The Moor Bottom Colliery one mapped 50m to the North East may represent a historic ground working. Additionally an unspecified ground working was historically mapped 398m to the North East of the site.

## 8.0 Mining

The Groundsure reports indicate that the site is within a coal mining area. A residential Coal Mining Report was therefore obtained from the Coal Authority. It states the following:

- The site is not within a surface area that could be affected by past underground working, however the site is in an area where coal is at or close to the surface, and therefore the potential for coal workings at or close to the surface should be considered;
- One mine entry is mapped within 20m of the site boundary, and is known to have been located and capped by developers in 1987;
- The Coal Authority is not aware of any damage due to geological faults and is not in an area of potential open cast mining;
- The Coal Authority has not received any damage notice or claim for the subject property; and
- The Coal Authority has no record of mine gas emissions.

## 9.0 Conceptual Site Model

### 9.1 Introduction

A preliminary **Conceptual Site Model** (CSM) has been developed for the site, to assess any constraints on the proposed development arising from contamination which may be present. The CSM describes the relationship between contamination which may be present from past and current activities, both on and off site, along with potential receptors of that contamination.

The site has been assessed in line with current UK guidelines, namely the Contaminated Land (England) Regulations 2000 and Part IIA of the Environmental Protection Act 1990 and follows the procedures set out in the Environmental Agency 'Model Procedures for the Management of Land Contamination – Contamination Land Report (CLR).11'.

CLR.11 provides the technical framework for structured decision making about land contamination and builds on previous work carried out under the Contaminated Land Research Programme of the former Department of the Environment. CLR 11 has adopted and refined the methodology and terminology that has been used in contaminated land risk assessment for a number of years.

CLR.11 defines the three essential elements to any risk:

- **A contaminant source** - a substance that is in, on or under land and has the potential to cause harm or to cause pollution of controlled waters;
- **A receptor** – in general terms, something that could be adversely affected by a contaminant, such as people, an ecological system, property or a water body; and
- **A pathway** - a route or means by which a receptor can be exposed to, or affected by a contaminant.

Each of these elements can exist independently, but they create a risk only where they are linked together, so that a particular contaminant affects a particular receptor through a particular pathway. This kind of linked combination of source-pathway-receptor is described as a **Potential Pollutant Linkage (PPL)**.

It should be noted that at this preliminary stage, the assessment is based only on a desk-based study and site walkover survey. A quantitative assessment of the potential risk is not possible at this stage of the assessment.

This report presents a Preliminary Conceptual Site Model and Preliminary Risk Assessments for the site, based on the proposed **Residential** end use.

## **9.2 Potential Contamination Sources**

### **9.2.1 On Site Sources**

Historical maps show historical development on the site, whereby buildings have previously existed but have now been demolished. The site is now largely covered by rough hardstanding showing evidence of the old building footprints and old parking areas.

Therefore, on-site sources of contamination identified are in the form of potentially contaminated Made Ground soils on the site, mainly around the areas of the old building footprints and the current hardstanding areas.

### **9.2.2 Off Site Sources**

Two historical mine shafts were mapped from approximately 50m to the North East of the site. They have since been backfilled, and have been constructed upon with houses and a road. These mine shafts, although considered a potential off-site source of contamination, are not thought to pose much risk to the actual site (in terms of contamination).

## **9.3 Potential Receptors**

### **9.3.1 Human Receptors**

Based on the proposed use of the site, on-site receptors include:

- Residents living in the new property and using the new landscaped areas.
- Construction workers involved in the proposed development. Note that potential contamination risks to construction workers will be mitigated by appropriate risk assessments and mitigation

measures required by Control of Substances Hazardous to Health (COSHH) and Construction, Design and Management (CDM) regulations.

#### **9.3.2 Controlled Waters Receptors**

The following on-site controlled waters receptors include:

- Groundwater within the underlying (Secondary A Aquifers).

#### **9.3.3 Buildings Receptors**

The proposed new dwelling is a potential receptor.

### **9.4 Potential Pathways**

#### **9.4.1 On-Site Human Receptors**

Potential pathways to future human receptors on site include:

- Dermal contact or ingestion with contaminated soils;
- Inhalation of contaminants in soil derived dust;
- Migration and inhalation of gases and vapours outdoors or indoors;
- Contamination of drinking water pipes by contaminated soils/water leading to the ingestion of contaminated drinking water.

#### **9.4.2 Controlled Waters**

Potential pathways to on-site controlled water receptors (groundwater) include:

- Leaching of contaminants and/or migration of contaminants from the unsaturated zone of soils to groundwater (Secondary A Aquifer) in natural strata;
- Vertical migration of contaminants in shallow groundwater to deeper strata and aquifers;
- Lateral migration of impacted water through service conduits, drainage systems and possible perched groundwater pathways to surface water receptors.

**9.4.3 Buildings**

Potential pathways from off-site sources to the on-site property receptor include:

- Migration and accumulation of ground gas or vapours in buildings or structures.

**9.5 Preliminary Risk Assessment**

Based on the stated potential sources of contaminants identified and the receptors and pathways described, an assessment of the environmental risks has been made with reference to the significance and degree of risk. This assessment is based on consideration of whether the source contamination can reach a receptor and hence whether it is of a major or minor significance.

A preliminary Conceptual Site Model (CSM) of the Potential Pollutant Linkages (PPL) has been developed based on the information derived from this desk study for the site. This CSM has been used to identify potentially Relevant PPL's for the current and proposed end uses which have been assessed qualitatively using CIRIA 552 guidance, as described in Table 9.1 and Table 9.2.

**Table 9.1 Classification of Consequence**

<b>Consequence</b>	<b>Criteria</b>
<b>Severe</b>	Short term (acute) risk to Human Health likely to result in "significant harm" as defined by the Environmental Protection Act 1990, Part IIa. Short term risk of pollution of sensitive water resource. Catastrophic damage to buildings / property
<b>Moderate</b>	Chronic damage to Human Health likely, over a long term, to result in "significant harm" as defined by the Environmental Protection Act 1990, Part IIa. Pollution of sensitive water resources
<b>Mild</b>	Health effects to Human Health that are unlikely to result in "significant harm" as defined by the Environmental Protection Act 1990, Part IIa. Pollution of non-sensitive water resources. Significant damage to crops, buildings, structures and services. Damage to sensitive buildings / structures / services or the environment
<b>Negligible</b>	Non-permanent health effects to Human Health that are unlikely to result in "significant harm" as defined by the Environmental Protection Act 1990, Part IIa. Those that are easily prevented by means such as personal protective clothing. Harm, although not necessarily significant harm, which may result in a financial loss, or expenditure to resolve.

**Table 9.2 Classification of Probability**

Probability	Criteria
<b>Almost Certain</b>	Circumstances are such that an event either appears very likely in the short term and almost inevitable over the long term or there is evidence of currently harm occurring
<b>Likely</b>	Circumstances are such that an event, whilst not inevitable, is possible in the short term and is likely to occur over the long term
<b>Unlikely</b>	Circumstances are such that it is possible an event could occur but it is by no means certain to occur even over a longer period, and it is less likely in the shorter term
<b>Very Unlikely</b>	Pollutant linkage may be present, but the circumstances under which harm would occur are improbable even in the medium to long term
<b>Extremely Unlikely</b>	Pollutant linkage may be present, but the circumstances under which harm would occur are highly improbable even in the long term

Once the consequence and probability have been classified, these can then be compared to produce a risk category (using Table 9.3), ranging from **Very High Risk** to **Very Low Risk**, with the definitions summarised in Table 9.4.

**Table 9.3 Comparison of Consequence against Probability**

Consequence \ Probability	Severe	Moderate	Mild	Negligible
<b>Almost Certain</b>	Very High Risk	High Risk	Moderate Risk	Low Risk
<b>Likely</b>	High Risk	Moderate Risk	Moderate/ Low Risk	Low Risk
<b>Unlikely</b>	Moderate Risk	Moderate/ Low Risk	Low Risk	Very Low Risk
<b>Very Unlikely</b>	Low Risk	Low Risk	Very Low Risk	Very Low Risk
<b>Extremely Unlikely</b>	Very Low Risk	Very Low Risk	Very Low Risk	Very Low Risk

**Table 9.4 Description of the Classified Risks and Likely Action Required**

<b>Risk</b>	<b>Criteria</b>
<b>Very High</b>	There is a high probability that severe harm could arise to a designated receptor from an identified hazard at the site without appropriate remediation action
<b>High</b>	Harm is likely to arise to a designated receptor from an identified hazard at the site without appropriate remediation action.
<b>Moderate</b>	It is possible that without appropriate remediation action, harm could arise to a designated receptor. It is relatively unlikely that any such harm would be severe, and if any harm were to occur it is more likely that such harm would be relatively mild
<b>Low</b>	It is possible that harm could arise to a designated receptor from an identified hazard. It is likely that, at works, if any harm were to be realised, any such effects would be mild.
<b>Very Low</b>	There is very low possibility that harm could arise to the receptor, but it is likely that this harm, if realised, would be mild at worst

In accordance with CLR11, professional judgement has been employed to evaluate the risk on a qualitative basis using available information.

A summary of the pollution linkages identified during the desk study are provided in Table 9.5.

<p>Contaminants in soil, soil-derived dust, surface water run-off, groundwater, and as vapour/ground gas</p>	<p>Residential Home Owner</p>	<ul style="list-style-type: none"> <li>• Dermal contact or ingestion contaminants in soil-derived dust and entrained surface water run-off from areas where soil is exposed at the surface or where excavation takes place and in shallow groundwater in the natural strata if excavation takes place below the water table.</li> </ul>	<p>Mo</p>
	<p>Construction Workers</p>	<ul style="list-style-type: none"> <li>• Inhalation of contaminants in soil derived dust from areas where soil is exposed at the surface of where excavation takes place.</li> <li>• Inhalation of soil and water derived vapours and ground gas outdoors</li> <li>• Inhalation of soil derived and water derived vapours and ground gas indoors where it may have accumulated in buildings and enclosed spaces.</li> </ul>	
<p>Contaminants in Soil</p>	<p>Groundwater within the underlying soils and bedrock (Secondary A Aquifers)</p>	<ul style="list-style-type: none"> <li>• Leaching of contaminants and/or migration of free phase contaminants from the unsaturated zone soils to groundwater in the natural strata</li> <li>• Vertical migration of contaminants in shallow groundwater to deeper strata and aquifer</li> </ul>	
<p>Contaminants in soil, surface water runoff, groundwater and as vapour/ground gas</p>	<p>Surface Water</p>	<ul style="list-style-type: none"> <li>• Lateral migration of contaminants and/or migration of free phase contaminants present in the Made Ground via groundwater to surface water discharge</li> <li>• Lateral migration of contaminants and/or migration of free phase contaminants present in the Made Ground and entrained in surface water runoff</li> </ul>	
<p>Contaminants in soil, surface water and as vapour/ground gas</p>	<p>Building</p>	<ul style="list-style-type: none"> <li>• Accumulation of soil and water derived vapours/and or ground gas in enclosed spaces</li> </ul>	

## 10.0 Conclusions

The proposed development plan is to comprise the construction of one new detached house with private back garden and detached garage.

Historical maps show the site to have comprised initially a parcel of land containing a rectangular building, which was demolished during the early 1980s. The site has remained undeveloped since this date. The only on-site sources of contamination identified are in the form of any potentially contaminated Made Ground which exists beneath the historic building footprints and current hardstanding areas which exist today.

Although historic mine shafts are mapped from approximately 20m from the site, they have been noted as being capped and have been constructed over. These mine shafts are not thought to pose any real risk of contamination to the site. Therefore, no off-site sources of contamination have been identified.

In summary, on the basis of the above listed contaminant sources it is concluded that:

- Contaminants may be present in, on or under the land at the site from on site sources; and
- Future on site receptors to any form of contamination have been identified as the construction workers, new residents, the new buildings, surface water and the groundwater.

A qualitative risk assessment of the identified potential pathways of contamination to the site have been summarised in Table 9.5. The following risks have been designated:

- Future Human Receptors – Moderate/Low Risk
- Construction Workers –Low Risk
- Groundwater –Low Risk
- Surface Water –Low Risk
- New Buildings – Low Risk

Based on the review of all available historical data, and the site walkover survey, it has been established that overall a **MODERATE/LOW** risk of potential pollutant linkage to the site exists. This risk has been identified due to the potential for contaminated Made Ground beneath the hardstanding areas on site.

Given the lack of site-specific quantitative information about ground conditions, the true estimated risks are difficult to confirm.

## 11.0 Recommendations

Due to the potential for on-site sources of contamination beneath the site, an intrusive ground investigation is recommended. This is recommended to allow suitable samples of the shallow soils across the site to be collected and tested for a range of potential contaminants.

Additionally, it is recommended that a detailed desk based coal mining risk assessment be carried out for the site, as it is in a very close proximity to historic mine shafts, and there is the potential for mine workings. This coal mining risk assessment may result in a requirement for additional intrusive investigation to assess potential mine workings.

## 12.0 References

- BS 5930: (2015) Code of Practice for Site Investigations. British Standards Institution.
- BS 10175: (2011) Code of Practice for the Investigation of Potentially Contaminated Sites. British Standard Institution.
- CIRIA 552: (2001) Contaminated Land Risk Assessment, A guide to good practice