PHASE 1 CONTAMINATED LAND RISK ASSESSMENT - BUILDING 2

PROPOSED REPLACEMENT DWELLING

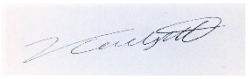
Land at Hill End Farm, Hill End Road, Mapplewell, Barnsley, S75 6DU

Report Ref: TH/Hill End/Bldng2/REP/PHASE1/02/Oct2022/v01

5th October 2022

T. M. Hyett MSc CEng MIEI, CGeol FGS, MCIOB
Chartered Engineer, Chartered Consultant Engineering Geologist
Earth-Tech Consulting Ltd
No. 5 Wentworth Terrace
Wakefield
West Yorkshire
WF1 3QW
T: 07790 581478
E: timhyett@hotmail.co.uk

Document Control

Project title	**PHASE 1 - Building 2, Replacement Dwelling - Hill End Farm, Mapplewell, S75 6DU.**	**Project Ref**	**TH/Prism/BD2/Rep 03**
Report prepared by			
	Tim Hyett LLM MSc CEng MIEI CGeol FGS Chartered Engineering Geologist		
Approved for issue by			
	Kane Hyett G.G. MA Director		

Issue No.	Status	Amendment Details	Approved for issue
1	Final	-	KT

Responsibility Statement: *Earth-Tech Consulting Ltd disclaims any responsibility to the Client and others in respect of any matters outside the scope of this work. This report has been prepared with reasonable skill, care and diligence within the terms of the contract with the Client and taking account of the manpower, resources, investigation and testing devoted to it in agreement with the Client. This report is confidential to the Client and Earth-Tech accepts no responsibility of whatsoever nature to third parties to whom this report or any part thereof is made known, unless formally agreed beforehand. Any such party relies upon the report at their own risk. This report may provide advice based on an interpretation of legislation, guidance notes and codes of practice. Earth-Tech does however provide legal advice in relation to Construction and Company Law. If specific legal advice is required in relation to this report, or any other related matter, a qualified lawyer within the Company should be consulted separately.*

CONTENTS

Appendices

1.0 INTRODUCTION

1.1 Terms of Reference

In early October 2022, on the instructions of the Planning Consultant (Mr Tom Warren, Prism Agriculture Ltd) acting for the owner (Mr Needham), and after the carrying out of a *Coal Mining Risk Assessment (CMRA)*, Earth-Tech Consulting Ltd were asked to prepare a **Phase 1 Contaminated Land & Preliminary Risk Assessment** (PRA) on land to the rear (south) and side (west) of the existing Farmhouse (Building 2) which is the subject of a proposal to demolish and replace with a new build dwelling at Hill End Farm, Hill End Road, Mapplewell, Barnsley S75 6DU.

Fig 1 - Aerial photographs: Hill End Farm, Mapplewell, S75 6DU & Topographical Survey of the land partcel

The development proposal consists of the demolition of the existing Farmhouse and a replacement dwelling situated to the side and rear, as shown below:

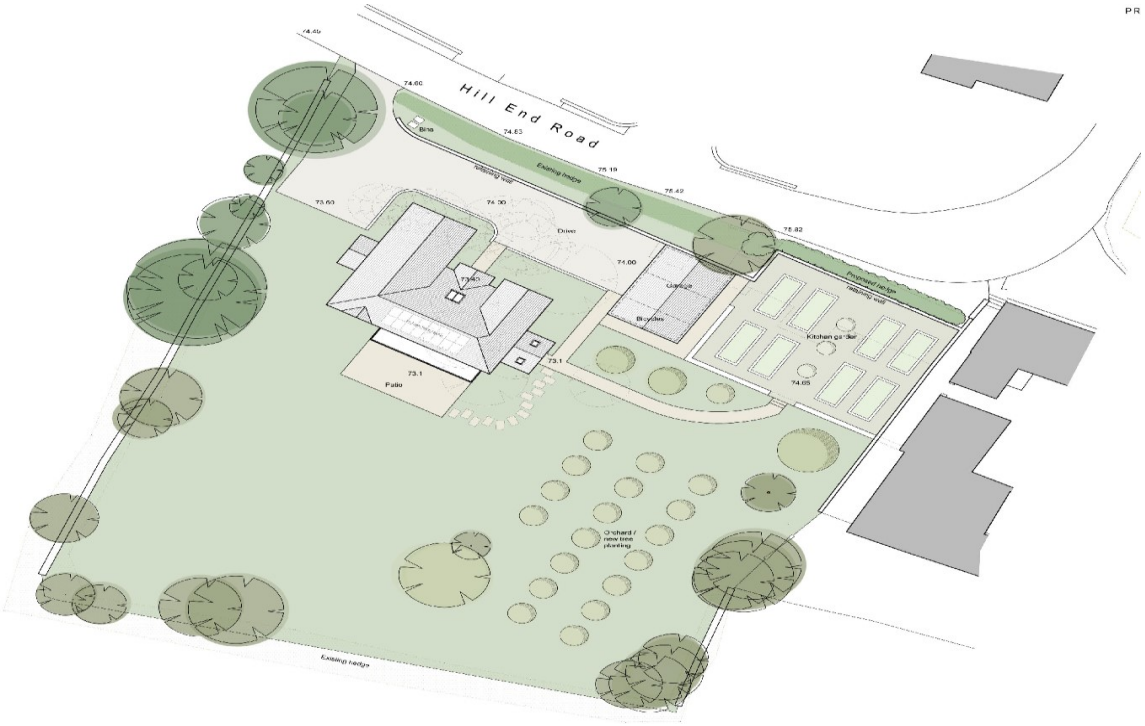


Fig 2 – Site Plan showing proposed new build within the grounds of the demolished Farmhouse – Hill End Farm, Mapplewell, S75 6DU.

The Planning Consultant has advised that the Local Planning Authority are likely to require further information regarding the suitability of the site for the proposed conversion: in particular, further details of the history of the site, specifically in relation to potential land contamination, ground stability, mining etc., are required. Generally, there are five recognised steps to making a preliminary assessment of this type:

- ***Desk Study*** - a brief search of available environmental information and historical maps to determine the physical characteristics of the site and to identify the likelihood of contamination, including information on the general characteristics of underlying soils and geological setting.

- ***Site Walkover & Trial Holes*** - a short survey to identify pollution leakages not obvious from the desk study and to identify what risk, if any, is present from ground instability, past coal mining and/or the presence of Radon.

- ***Conceptual Site Model (CSM)*** - to identify potential sources of contamination, the receptors that may be harmed, and possible pathways linking the two.

- ***Risk Assessment*** - to indicate what, if any, the risk of contamination is.

- ***Conclusion to the Assessment*** - to confirm to the local authority (and any other party) that the findings are satisfactory and that no further work is required (or) that there is no significant risk to human health (or) whether additional works (intrusive site investigation and risk assessment) are required to identify, quantify and confirm the presence of pollutant linkages in order to develop mitigation measures.

1.2 The Parties

Property	Existing Barn (Building 1): Hill End Farm, Mapplewell, Barnsley, S75 6DU
Client/Owner	Mr Needham
Planning Consultant	Prism Agriculture Ltd Mr Tom Warren
Mining Consultants	Earth-Tech Consulting Ltd Mr T. M. Hyett MSc BSc CGeol FGS, MCIOB Chartered Geologist & Building Consultant

1.3 Aims and Objectives of this Desk Study

The primary objective of the desk study is to **identify potential environmental issues** that may represent a constraint to the proposed conversion of the building. The findings of this assessment can be used to determine, if required, the scope of any follow-on *Phase 2 Intrusive Site Investigation*. The broader aims of the desk study are as follows:

- To provide information on past and current uses of the site and surrounding area and the nature of any hazards and physical constraints;
- To identify current and likely future receptors, potential sources of contamination and likely pathways and any features of immediate concern, including those that could be introduced in the future;
- To provide information on the geology, geochemistry, soil, hydrogeology and hydrology of the site;
- To identify potentially different sub-areas (zones) of a site, based on differing ground conditions; potential contamination; and past, present and future uses;
- To produce an initial conceptual model for the site as a whole and/or for zones within the site;
- To provide information for the preliminary risk assessment;
- To identify areas where informed decisions are to be made using specialist assessment techniques or advisors, e.g. if there are ecological, unexploded ordnance (UXO) or archaeological considerations;
- To provide data to assist in the design of potential subsequent exploratory and main investigations and to give an early indication of possible remedial requirements;

- To provide information relevant to worker health and safety and to the protection of the environment during field investigations;
- To identify the need to involve regulatory bodies prior to intrusive investigation.

The desk top study provides an initial view in respect of the status of the site with regard to:

- The potential impact on the site of interest from surrounding land uses and other environmental factors;
- Potential contamination of the site strata by historical and or current use;
- The potential impact on the wider environment by historical and or current use of the site of interest;
- Potential problems associated with geological features such as faulting, mineral extraction, mining and land instability;
- The location of above-surface features that may affect the proposed redevelopment.

This study includes a review of the available geological, historical and environmental information in order to establish the likely ground conditions at the site. The data collated in this study has been undertaken to allow the construction of a preliminary conceptual model, which represents the potential pollution linkages that have been identified on the site. This is used as a basis to develop a strategy for an intrusive investigation where required.

1.4 Scope of Desk Study

The scope of work for this report comprises of the following:

- Procurement of Groundsure Geo-Insight Report;
- Procurement of Groundsure Enviro-Insight Report;
- Procurement of Ordnance Survey maps;
- Review of published geology;
- Review of data available in the public domain (borehole section sheets etc.);
- Site walkover survey;
- Preparation of a Preliminarily Risk Assessment.

1.5 Legislative Controls

This report has been completed to fulfil the requirements of the Phase I Desk Study in accordance with:

- *CLR11 'Model Procedures for the Management of Land Contamination';*
- *CIRIA Special Publication 102 - Remedial Treatment for Contaminated Land - Volume II: Decommissioning, Decontamination and Demolition (Jan 1995);*
- *Environment Agency (EA) Guidance on the Safe Development of Housing on Land affected by Contamination (Publication 66, dated 2008), and;*
- *EA Guidance on the Safe Development of Housing on Land affected by Contamination (Pub. 95, dated 2000).*

These procedures relate to 'past' contamination and assume that legislative controls such as H&S legislation and pollution prevention activities currently prevent potentially polluting activities on the site. This report includes **HAZARD IDENTIFICATION** and environmental **RISK ASSESSMENT** in line with the risk-based methods referred to in relevant UK legislation and guidance.

Government environmental policy is based upon a '*suitable for use approach*'. When considering the current use of land, **Part IIA of the Environment Protection Act 1990** (EPA 1990) provides the regulatory regime, which was introduced by Section 57 of the **Environment Act 1995**, which came into force in England on 1 April 2000. The main objective of introducing the Part IIA regime is to provide an improved system for the identification and remediation of land where contamination is causing unacceptable risks to human health or the wider environment given the current use and circumstances of the land. Part IIA provides a statutory definition of contaminated land under Section 78A (2) as:

"any 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:

Significant harm is being caused or there is a significant possibility of such harm being caused; or Pollution of controlled waters is being, or is likely to be, caused."

Harm is defined under section 78A of the Environmental Protection Act as meaning '*harm to the health of living organisms or other interference with the ecological systems of which they form part and, in the case of man, includes harm to his property*'. Part IIA provides a statutory definition of the pollution of controlled waters under Section 78A(9) as '*the entry into controlled waters of any poisonous, noxious or polluting matter or any solid waste matter*'.

Types of harm are related to specific receptors in order to determine whether they can be regarded as '*significant harm*' or '*significant possibility of significant harm*', as defined in Clause 4 of the DEFRA publication '*Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance*'.

1.6 Mandatory Guidance

- *DEVELOPMENT ON AND AFFECTED BY CONTAMINATION - Technical Guidance for Developers, Landowners and Consultants, YALPAG Version 10.3 – April 2019*
- *VERIFICATION REQUIREMENTS FOR GAS PROTECTION SYSTEMS - Technical Guidance for Developers, Landowners and Consultants - YALPAG Version 1.1 - December 2016*
- *VERIFICATION REQUIREMENTS FOR COVER SYSTEMS - Technical Guidance for Developers, Landowners and Consultants - YALPAG Version 3.4 – November 2017*
- *Cl: AIRE Research Bulleting RB17*
- *CIRIA Report C665 & British Standard BS 8485: 2007*
- *The Contaminated Land (England) Regulations 2000*
- *Contaminated Land (England)(Amendment) Regulations 2012*
- *The Environment Act 1995*
- *The Environmental Protection Act 1990*
- *Department for Environment, Food and Rural Affairs, April 2012.*
- *Environmental Protection Act 1990, Contaminated Land Statutory Guidance. The Stationery Office Ltd.*
- *Local authority guide to ground gas pub. by the Chartered Institute of Environmental Health (CIEH, 2008)*

1.7 Basis of Risk Assessment

This assessment has been undertaken with due regard to the Environmental Protection Act 1990, associated statutory guidance, *'Guidance for the Safe Development of Housing on Land Affected by Contamination'*, *'CLR 11 (Model Procedures for the Management of Land Contamination)'*, the Contaminated Land Guidance Documents issued by the Environment Agency. The methods used follow a risk-based approach with the potential risk assessed using the **SOURCE-PATHWAY-RECEPTOR** pollution linkage concept introduced by the Environmental Protection Act 1990.

1.8 Limitations and Exceptions of this report

This report was undertaken for the owner (Mr Needham) and as such should not be entrusted to any third party without written permission. This report has been compiled from a variety of sources, within the time constraints of the program, which we believe to be trustworthy. The findings and opinions provided in this document are made in good faith and are based on data provided by third parties (Groundsure, Environment Agency, The Coal Authority, and Regulatory Bodies). The accuracy of map extracts is reliable but cannot be guaranteed, and it should be recognised that different conditions on /adjacent to the site may have existed between and subsequent to the various mapsurveys. This report is prepared and written in the context of the purposes stated above and should not be used in a different context. Furthermore, new information, improved practices and legislation may necessitate an alteration to this report in whole or in part after its submission. The report should be read in its entirety, including all associated drawings and appendices. Earth-Tech Consulting Ltd cannot be held responsible for any misinterpretations arising from the use of extracts that are taken out of context.

2.0 SITE DESCRIPTION

2.1 Site Location

The site is situated in a semi-rural position off Wentworth Road / Hill End Road in Mapplewell, a former mining village in the metropolitan borough of Barnsley in South Yorkshire, England. Historically part of the West Riding of Yorkshire,

Fig 3 – General Location in South Yorkshire: Hill End Farm, Mapplewell, S75 6DU

Mapplewell is a medium sized village conurbation situated approximately 3 miles north of Barnsley, and 8 miles south of Wakefield at approximately 53°35'11"N - 1°30'9"W at an elevation of around 328 feet (100 m) above sea level. Mapplewell was historically a hamlet in the ancient *Wapentake of Staincross*. As it grew in size it began to merge with neighbouring hamlet, Staincross and ever since the histories of the villages have been linked together. As in Staincross, nail making was an important industry in Mapplewell in the 17th century. The village and its environs are traditionally associated with coal mining, and by the late 19th Century coal mining was the predominant source of employment, after the sinking of a deep mine in North Gawber.

2.2 Layout of Proposed Development

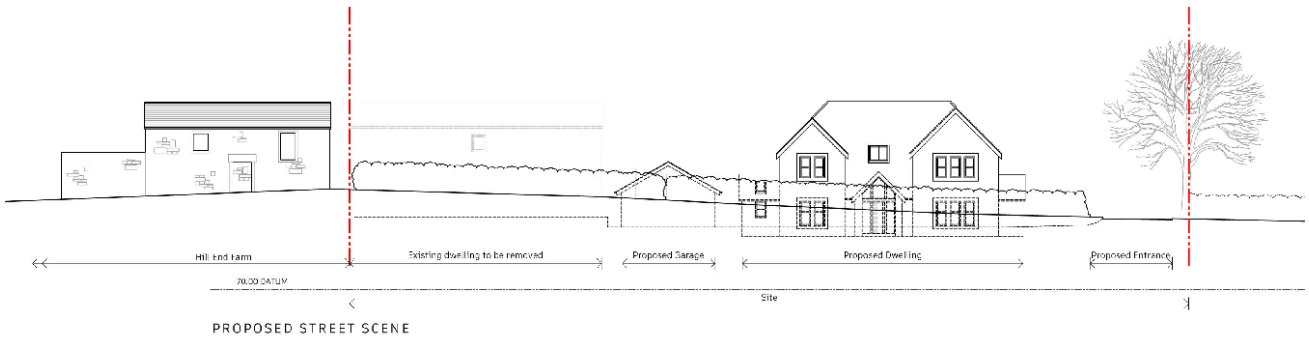


Fig 4 – Proposed Front Elevation

Fig 4 – Proposed Side Elevation

There is clear evidence that the site lies within the curtilage of the former farm and has been agricultural in the past (as the name *Hill End Farm* suggests). From inquiries with the planning consultant the existing dwelling house (Building 2) is to be demolished and is unoccupied and in general dilapidation. The existing, older stone barn to the east of the collection of buildings (Building 1) has already been approved for conversion to residential, and the overall site was/is understood to have been used predominantly for agriculture over the years. There is no indication (from local knowledge, our research, our observations in the field or otherwise) to suggest the site has had any other significant previous industrial or other usage.

2.3 Historical Aerial Photographs

Capture Date 19.04.2021

Capture Date 01.07.2018

Capture Date 26.03.2012

Capture Date 11.09.2009

Capture Date 10.07.1999

2.4 Landscape Character

According to the Barnsley District Landscape Character Assessment (2002) the subject site lies within **D1: Settled Arable Slopes** designated category of the wider landscape on northeast Barnsley:

D: SETTLED ARABLE SLOPES

The *Settled Arable Slopes* landscape type is largely characterised by its landform and land use patterns. The landform varies from stronger undulations to areas of gentle, even slopes with the latter particularly evident at lowland elevations close to the adjacent river valleys, and at higher elevations on the broader ridge tops. Land use activity is largely characterised by large scale arable farming and residential settlement. There are significant tracts of relatively intact arable farmland but many areas on the urban-rural interface exhibit signs of landscape decline. Settlements are typically former colliery villages or towns and are predominantly residential although recent light industrial estates are a feature. The settlements indicate the area's heavy industrial past, further emphasised by the presence of disused spoil heaps, workings, and railway lines found across the landscape. Field boundaries or divisions are inconsistent varying from stonewalls, and short flailed and overgrown hedgerows, to post and rail fencing or none at all. Low tree cover results in a sense of exposure. The dominance of infrastructure and built development, commonly located on ridge or hilltops, but often spreading down valley sides, compound a striking sense of urbanisation across much of the landscape.

Settled Arable Slopes is found is three areas:

D1 North East Barnsley Settled Arable Slopes

D2 East Dearne Settled Arable Slopes

D3 West Dearne Settled Arable Slopes

The 2002 Landscape Character Assessment study identified a landscape in a state of flux and changing character as a result of new industrial estates and residential developments. The landscape was therefore considered to be in decline due to present day land use activity most apparent at rural-urban interface. Strength of character was therefore deemed moderate and landscape condition poor.

In respect of the potential for built development recognised the scope for new development to potentially improve the urban edges, concentrating new built form within existing settlements to avoid development spilling out onto open and exposed arable slopes. It focussed on the potential for built development around Brierley, Shafton and Cudworth to the east and to the west:

- Land east of Carlton, between Royston & West Green.
- Land east of Lundwood
- Land north of Royston
- Land west of Staincross
- Land south of Staincross, Mapplewell and New Lodge
- Land between Staincross and Royston.

The bottom three bullets relate to the subject site at Hill End Farm, Hill End Road, Mapplewell, S75 6DU.
Land west of Staincross

The study did not recommend development immediately to the west of Staincross other than on small pockets of land that might be able to accommodate single or small pockets of land. This was principally a result of the relatively steep and complex landform. Nothing has changed since to warrant a different conclusion.

Land south of Staincross, Mapplewell and New Lodge

The study did not recommend new development on the sloping valley sides as it would be uncharacteristic of settlements within the character area as a whole. As with the land to the west of Staincross, nothing has changed within the locality to warrant a different conclusion.

Land between Staincross & Royston

The study generally discourages development that intrudes into arable farmland and onto relatively undeveloped valley sides. Nothing has changed within the locality to warrant a different conclusion although landscape character and condition has weakened to the west of Royston on the north side of Lee Lane as a result of poor management of land and the ad hoc construction of stable buildings and agricultural structures.

SUMMARY: The 2002 study concluded that the overall landscape capacity in the North East Barnsley Settled Arable Slopes character area was **medium** and this is considered to remain the case.

3.0 SITE HISTORY

3.1 General

Mapplewell as a village has long been associated with nearby Staincross and Darton, and today it is unclear where the original boundaries between the three villages lie. Staincross and Mapplewell was initially an area known for nail making, but the surrounding area has also experienced a significant amount of coal mining and ground excavation. Numerous former collieries are located in the wider district, the most notable being the North Gawber which emerged at a time coalmining was fast developing at the time when the nail making was on the decline, creating an almost continuous flow of incomers arriving from places such as Staffordshire, Wales, Lancashire and Derbyshire.

3.2 Prehistoric Period

By the early Bronze Age (c. 2500BC - 700BC) farming systems were being developed and extended onto moorland areas, and evidence for Bronze Age farmsteads, paddocks, fields, clearance cairns and burial monuments can be seen studded

across the landscape. During the Iron Age (c. 700BC to AD 43), a period of settlement reorganisation took place, with the open pattern of the Bronze Age fields abandoned in favour of settlement around fortified centres, usually termed hillforts, and the laying out of associated field systems and stock enclosures.

- There is no notable archaeological history relating to the prehistoric period of any significance in proximity or associated with the subject site.

3.3 Romano-British Period

The *Romano-British* period runs from AD43 to AD410, from Claudius' invasion until the final withdrawal of Roman troops to protect the Western Roman Empire in mainland Europe. At some point soon after the invasion the local tribe, the *Brigantes*, under their queen Catimandua, became a client of Rome. This did not last for long and civil war amongst the *Brigantes* ensued. Using the rescue of Cartimandua as their pretext, the Romans invaded under their governor Cerealis and *Brigantia* was subdued by around AD 70.

By AD 54 the Romans had already established advance forts at Derby and Templebrough. A fort was established at Doncaster by AD 70 by which time the region had become a permanent province of Roman Britain. The Roman period is characterised in the archaeological record by the arrival of a wide variety of imported material culture, increased agriculture, monumental stone buildings, roads and military structures markedly different to the earth, stone and timber constructions of the late prehistoric period.

- There is no notable archaeological history relating to the Romano-British period of any significance in proximity or associated with the subject site.

3.4 Medieval Period

The *Early Medieval* period began when the Romans withdrew from Britain. It is also known as the Anglo-Saxon period and is sometimes still referred to as the *Dark Ages*. The pattern of place-name elements provides a clue to the distribution of settlement and ethnic groups between the 4th and 9th centuries; 'Dore' for example has been suggested to mean 'narrow pass' which is more indicative of topographical elements (Cameron 1951, 240). Remains of this period are relatively rare in the region although the abundant settlements with Anglo-Saxon place names provides testament to the widespread settlement of this area during these times. There are Saxon remains in Sheffield Cathedral (Ryder 1982) and evidence for what was thought to be Saxon settlement below Sheffield Castle (Armstrong 1930).

The *Medieval* period (proper) runs from the Norman Conquest in 1066 and the accession of William I to the dissolution of the monasteries by Henry VIII in 1539. In this period, it is common to see the emergence in rural areas of a more familiar landscape and many of the place names and street layouts that are still there today. The majority of the medieval period saw 'single field' agriculture, leaving a distinctive archaeological trace visible from aerial photographs and quite often on the ground.

The nearby town of Barnsley is listed in the *Domesday Book*, in which it is called *Berneslai* and had a population of around 200. Similarly, *Staincross* is believed to derive its name from a Saxon stone cross (*'stane cross'*) that until the 18th Century occupied a position on the junction of Staincross Common - which in itself is an ancient trackway - and Greenside. The stone (long lost) is thought to have been the remains of a rural shrine, or possibly the remains of a typical *wapentake* meeting cross, now located in Cawthorne parish church grounds.

The area saw no noticeable development until the 1150s when much of the district was given to the Pontefract Priory and the monks built a town (later becoming *Barnsley*) where three roads met, connecting Sheffield to Wakefield; Rotherham to Huddersfield and Cheshire to Doncaster. The monks erected a chapel to Saint Mary (which survived until 1820) and established a market. In 1249, a Royal charter was granted to Barnsley permitting it to hold a weekly market on Wednesdays and annual four-day fair at Michaelmas. By the 1290s three annual fairs were held, and this promoted movement of people that fuelled trade, and created prosperity with the district becoming a principle centre for linen weaving, with Barnsley growing into an important manufacturing town.

- There is no notable archaeological history relating to the Romano-British period of any significance in proximity or associated with the subject site.

3.5 The Post-Medieval period

The *Post-Medieval* and *Modern* periods extend from the end of the medieval period up to the present day. The agricultural landscape underwent considerable change in this period. The break-up of the open field system was under way in some localities before the end of the medieval period and there was considerable *enclosure* in the Tudor period throughout the country.

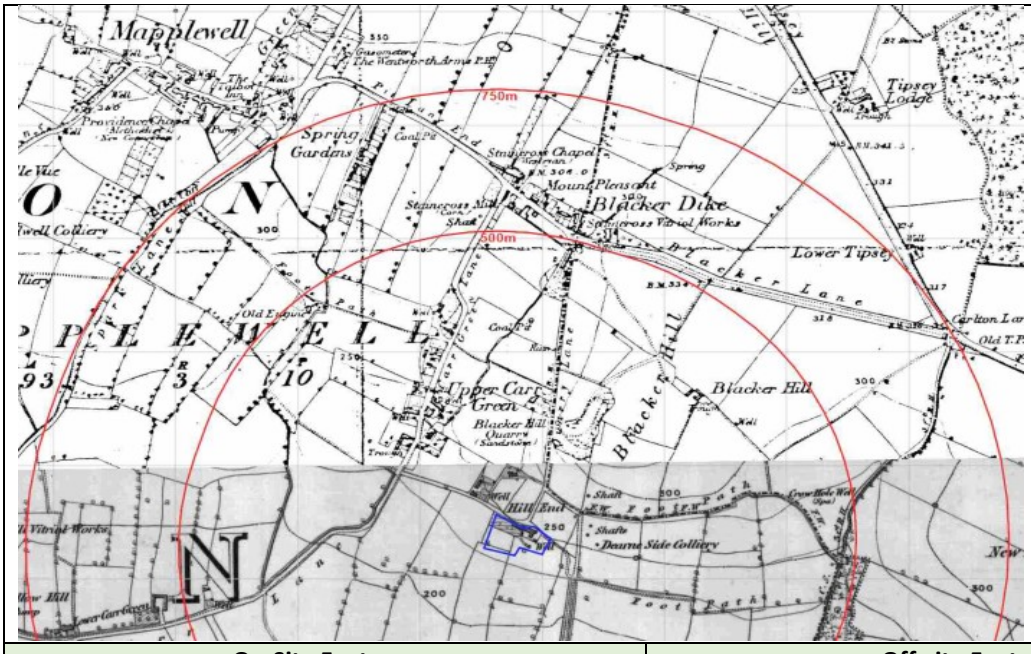
- The existing barn that is the subject of this desk study dates back to at least the 19th Century (and most likely was constructed in the 18th Century). It is essentially unchanged from that date.

3.6 Industrialisation and Urbanisation

The seventeenth and eighteenth centuries were periods of re-building of the common people's cottages and farms (increasingly of stone with stone roofs rather than timber and thatch) and the country houses of the gentry and aristocracy and prior to the arrival of the coal industry, the district was focussed on manufacturing: Barnsley and nearby villages were known for a thriving linen trade, with wire and glass manufacturing emerging. Specifically, the village of Mapplewell became synonymous with 'nailmaking'.

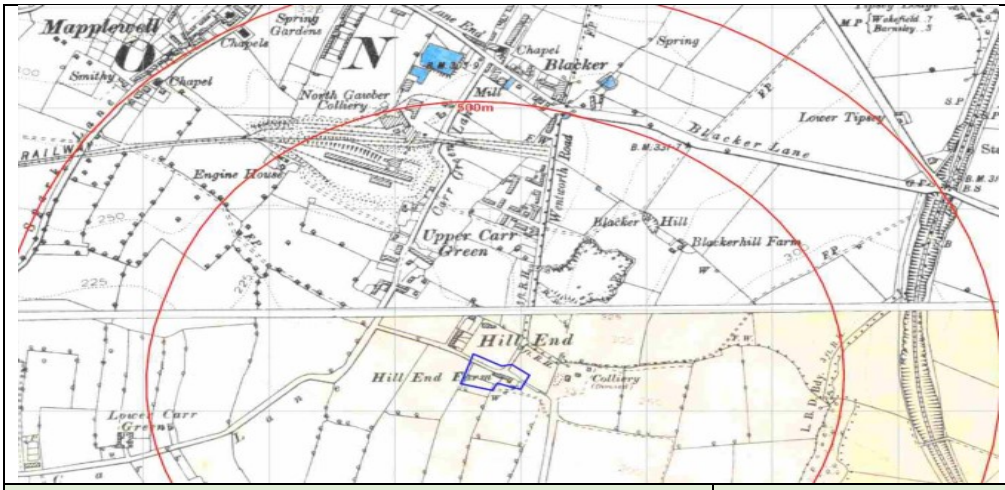
From the 1850s onwards, a large number of coal pits were opened, mostly in the villages surrounding Barnsley, especially those to the east, attracting incomers from across the country. In terms of proximity to the subject site at Hill End Farm, North Gawber Colliery was the biggest attraction, after it was sunk to the Barnsley seam between 1850 and 1852 by the Thorp family of Gawber Hall. The colliery was taken over by Fountain & Burnley (who also owned Woolley Colliery) in 1882. The pit, with its associated coke ovens, dominated the eastern side of the village of Mapplewell, reached via Blacker Road, near to the site until the late 1950s, when a long-term decline set in. After a short association with Woolley, North Gawber closed at the end of 1987. All the mines in the borough have sine closed, the last to shut being Goldthorpe Colliery in 1994.

3.7 Site Usage from Historical Maps



Date / Scale
Site Details: WENTWORTH ROAD, MAPPLEWELL, BARNSLEY, S75 6DU Client Ref: Hill_End_Farm_Mapplewell Report Ref: GS-8828403 Grid Ref: 433358, 409277 Map Name: County Series Map date: 1850-1854 Scale: 1:10,560 Printed at: 1:10,560

On-Site Features	Off-site Features
• Existing farm buildings present, surrounded by open fields (farmland)	• Bounded by open fields in all directions. • Blacker Hill old quarry to north • Shafts and Dearne Side Colliery to the east



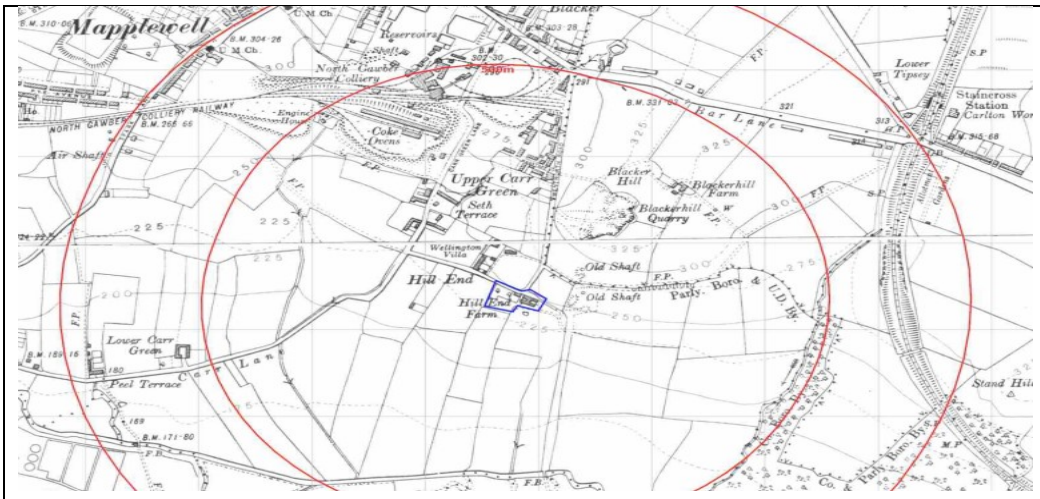
Date / Scale

Site Details:
WENTWORTH ROAD,
MAPPLEWELL, BARNSLEY, S75 6DU

Client Ref: Hill_End_Farm_Mapplewell
Report Ref: GS-8828403
Grid Ref: 433358, 409277

Map Name: County Series
Map date: 1890-1891
Scale: 1:10,560
Printed at: 1:10,560

On-Site Features	Off-site Features
• No significant change	• Bounded by open fields in all directions . • Colliery to the east now listed as 'disused'. • Emergence of North Gawber Colliery to the north



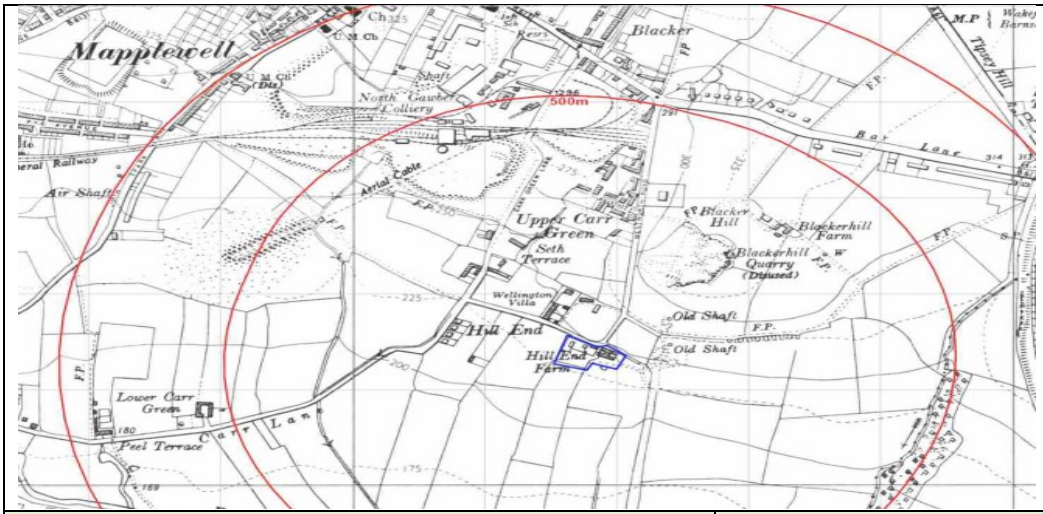
Date / Scale

Site Details:
WENTWORTH ROAD,
MAPPLEWELL, BARNSLEY, S75 6DU

Client Ref: Hill_End_Farm_Mapplewell
Report Ref: GS-8828403
Grid Ref: 433358, 409277

Map Name: County Series
Map date: 1929-1930
Scale: 1:10,560
Printed at: 1:10,560

On-Site Features	Off-site Features
• No significant change	• No significant change



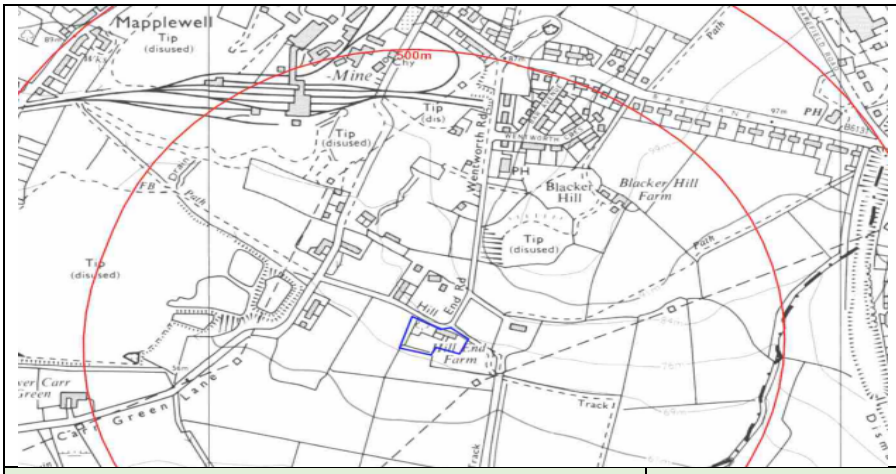
Date / Scale

Site Details:
WENTWORTH ROAD,
MAPPLEWELL, BARNSLEY, S75 6DU

Client Ref: Hill_End_Farm_Mapplewell
Report Ref: GS-8828403
Grid Ref: 433358, 409277

Map Name: Provisional
Map date: 1951-1956
Scale: 1:10,560
Printed at: 1:10,560

On-Site Features	Off-site Features
• No significant change	• No significant change



Date / Scale
Site Details: WENTWORTH ROAD, MAPPLEWELL, BARNSLEY, S75 6DU Client Ref: Hill_End_Farm_Mapplewell Report Ref: GS-8828403 Grid Ref: 433358, 409277 Map Name: National Grid Map date: 1973-1978 Scale: 1:10,000 Printed at: 1:10,000

On-Site Features	Off-site Features
• No significant change	• No significant change • Emergence of HV Transmission OHLs to the south and southeast.

3.7 Summary of ON-SITE Features

Dates	Features (within 250m)	Distance	Direction
1850 - present	Farm and farm buildings (Hill End Farm) Agricultural Land / Fields in all directions	On site	All

3.8 Summary of OFF-SITE Features

Dates	Features (within 250m)	Distance	Direction
1850 - 1890	Blacker Hill old quarry to north Shafts and Dearne Side Colliery to the east	<500m <500m	North East
1890 – 1990	Development of North Gawber Colliery to north & subsequent restoration of slag heaps / tips	>500m	North
1973 – present	Emeregence of HV transmission lines (OHLs)	<50m	South

Research confirms the site was existing farm buildings surrounded by open fields as far back as the records exist, which have remained largely unchanged since then. There is evidence of historic mining immediately adjacent to the east with shafts and the Dearne Side Colliery shown pre-dating the current historical maps available. These sites were shown as disused by 1891. The major North Gawber Colliery is shown to the north and northwest emerging in the late 1800s (we know the initial shafts were sunk in 1854). This expanded progressively over the next century and closed in 1980s and is now fully restored and the site areas given up to development and local housing. High Voltage (HV) transmission lines were erected as OHLs within 50m of the existing barn in the early 1970s

There is no evidence from the historical maps, from previous owners (or anecdotally) to suggest that the site and the position within the adjoining land parcel proposed for redevelopment (Building 2) was used directly for any other industrial or mechanical processes other than that which might be associated with farming and agriculture (and latterly gardens) within a well-established rural setting.

4.0 SITE CONTEXT

4.1 Site Visit & Walkover Survey

A site walkover survey was undertaken on Tuesday 4th October 2022, in general accordance with CLEA CLR 2, after a review of relevant historical and environmental data. The aims of the walkover were to determine whether there were any obvious potential sources of contamination, pathways and receptors on or near the site and whether there were any obvious geotechnical difficulties with the site. The observations of the walkover are presented below:

SUMMARY OF WALKOVER SURVEY		
Topic		**Discussion**
Site Description / Use		The overall site for development associated with the replacement dwelling is c. 0.3a situated off Hill End Road just outside the village of Mapplewell, Barnsley. The plot broadly square, and generally sloping gently towards the south and south-west: 
Description of surrounding area		Semi-rural villages of Mapplewell and Staincross immediately to the north and northwest and open farmland to the south, west and east. Various recent housing to the north and northwest on the outskirts of conurbations of Mapplewell on restored former tip sites from North Gawber Colliery.
Surrounding Land Usage	**North**	Housing
	East	Open fields with occasional farmsteads
	South	Open fields
	West	Open fields, towards Scotton, National Griod substation + new housing
Access		Off Hill End Road
Structures		Various existing stone-built structures including main farmhouse (to be demolished) and an older, stone barn (Building 1) to be converted to residential, with some minor dilapidated timber garage type structures (to be removed) - timber framed and with corrugated roofs in the courtyard areas and curtilage of the main farmhouse site.
Surfacing		The entrance to the site is off Hill End Road via a short track. The areas surrounding the structure are variously concrete and hard-standing with different coverings for previous materials storage areas - the topography is generally flat. The access track off Hill End Road and the current access into the site is suggestive of some minor historic and localised infilling with what appears to be broadly inert soils, hardcore elements and rubble which regularises the site and creates a generally level curtilage.
Vegetation		Vegetation on site is mixed comprising trees, bushes, and hedgerows leading to and around the residential farmhouse with and agricultural land beyond to the south, west and east.
Storage Tanks		There was no evidence of fuel storage tanks and no other evidence was observed of any storage vessels for fuels or oils, and no evidence of any previous historic tank stands for oils or other liquids.
Chemicals & raw materials		No evidence of chemical storage, and buildings did not look to have been in any existing usage other than for storage.

Solid Wastes	No evidence of solid wastes was observed at the site
Hazardous and Industrial Wastes	No evidence of hazardous wastes was observed, and no evidence of any industrial activity sometimes associated with light farming machinery; no evidence of an incinerator or any past burning of wastes.
Air emissions	No evidence of significant sources of air emissions were observed at the site
Asbestos containing materials	No asbestos containing materials were observed at the site.
Spills and releases	No evidence of excessive spills or pollutant releases were observed.
Fly Tipping	No evidence of fly-tipping was observed and the site is generally secure.

4.2 Walkover Summary - Geology

From the walkover survey: the examination of various Geological Map Extracts from the BGS - British Geological Survey (specifically 1:10,000 scale geology data sheet Yorkshire 262SE (1932) and from observations of the site the following prevalent geological sequence can be assumed:

Superficial: Medium sandy loam TOPSOILS over intermittent layers of '*brown, soft to firm, sandy, silty CLAY*' (GLACIOLACUSTRINE DEPOSITS). No *Made Ground* is identified beneath the study area by research and/or observation.

Solid geology: Predominantly a rough sandstone and millstone grit formation, and the *Pennine Lower Coal Measures Formation (PLCM-MDSS)* of the Langsettian Sub-age, which is a mixture of mudstone, siltstone and sandstone containing coal measures and marine fossils. The sandstone within the area may have historically been quarried in locations off-site, and the location is well known to be dominated by historic coal mining activity in all directions. Possible presence of Rough Stone Sandstone and Millstone Grit, Mudstone, Siltstone and Sandstone.

The development site sits upon the Pennine Middle Coal Measures Formation. From the CMRA commissioned by the Planning Consultant the closest BGS borehole to the site, SE30NW547, located approximately c.350m northeast of the site, records 10ft 8in (3.25m) of top soil and clay; however local ground deposits may vary. No faults, fissures or break lines are known to affect the development site.

4.3 Contamination

There was no evidence from the observations during the walkover that the site had any contemporaneous previous industrial use other than typically associated with farming and agriculture; there was no evidence that the site itself had been surface mined and/or infilled extensively to agricultural fields, and no visual indicators to suggest the presence of hazardous contaminants in high concentrations within the surface soils, or any physical evidence of high concentrations of *oils, lubricants, sulphates, asbestos (chrysotile, amosite, tremolite, actinolite or ferroactinolite), radon gas, methane, high concentrations of carbon monoxide, hydrogen sulphide* or *carbon dioxide*. Asbestos sheeting was observed on one of the buildings (see below).

4.4 Asbestos

Asbestos was used extensively as a building material in England and Wales from the 1950's through to the mid 1980's. Although some of this material has been removed over the years, there are many thousands of tonnes of asbestos still present in buildings.

All duty holders are therefore required to acknowledge their obligation to ensure that all the buildings involved in a proposed scheme of work are free from asbestos containing materials (Ref: *The Control of Asbestos Regulations 2012*).

- No evidence of asbestos was observed during the site inspection.

4.5 Photographic Record

4.6 Trees

Advice on arboricultural issues is generally considered to be outside the scope of this report except for their effect on the foundations to proposed buildings. This scheme is a conversion of existing buildings with no new foundations proposed. Where identification of any species is made, especially invasive plants such as Japanese Knotweed, Himalayan Balsam or Giant Hogweed, this should only be considered as a preliminary assessment and subject to confirmation by a professional Arboriculturist.

- Trees are not considered to adversely affect the development as proposed.

4.7 Invasive Species

Under the Weeds Act 1959, the Secretary of State may serve an enforcement notice on the occupier of land on which injurious weeds are growing, requiring the occupier to take action to prevent the spread of injurious weeds. The Weeds Act specifies five Injurious weeds: Common Ragwort, Spear Thistle, Creeping of Field Thistle, Broad-leaved Dock and Curled Dock. The Wildlife and Countryside act 1981 provides the primary controls on the release of non-native species into the wild in Great Britain. It is an offence under section 14(2) of the act to 'plant or otherwise cause to grow in the wild' any plants listed in schedule 9, part II. The only flowering plants currently listed are Japanese Knotweed and Giant Knotweed. The presence of such weeds on site may have considerable effects on the cost / timescale.

- No apparent invasive weed species were observed during the Site Walkover.

4.8 Japanese Knotweed

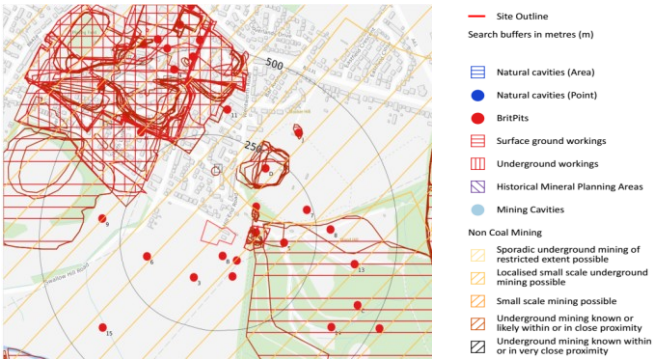
During the site walkover, we did not notice the presence of any Japanese Knotweed, however this plant can be difficult to identify in the early stages of growth and therefore it is not always possible to identify its presence at certain times of the year. It should be noted that we are not ecologists and as such cannot guarantee the absence of Knotweed or other invasive vegetation.

5.0 GEO-ENVIRONMENTAL SETTING

This section is based principally upon a search of information available on public registers through a GroundSure Enviro-Insight Report attached at Appendix A. There is evident Coal Mining legacy in this area, and it is therefore considered necessary to produce a separate *Coal Mining Risk Assessment (CMRA)*.

5.1 Geology and Mining

Additional sources of information	British Geological Survey (BGS) – 1:10,000 scale geology data sheets and 1:50,000 scale geology data sheet Yorkshire 262SE (1932) BGS 1:10,000, County Series BGS and Coal Authority internet-based information
Made ground	A review of published geological plans indicates there is some minor potential for made ground materials on site or within close proximity, which is present will be variable in depth and could consist of a mixture of disturbed natural materials (clay, sand, gravel) but no evidence of any anthropogenic debris, ash, brick, clinker, etc.
Superficial deposits	TOPSOILS over intermittent layers of '*brown, soft to firm, sandy, silty CLAY*' (GLACIOLACUSTRINE DEPOSITS). No *Made Ground* is identified beneath the study area by research - typically to depths of between 2.0m and 3.0m.
Solid geology	Predominantly Pennine Middle Coal Measures (PSMCM) which consist mudstone, siltstone and sandstone with occasional coal, ironstone etc.
BGS borehole records	The BGS holds records of 21No. boreholes carried out by various bodies (many associated with Bleach Ground SST quarry immediately south of the subject site as referenced and shown below. This is listed as being unavailable.

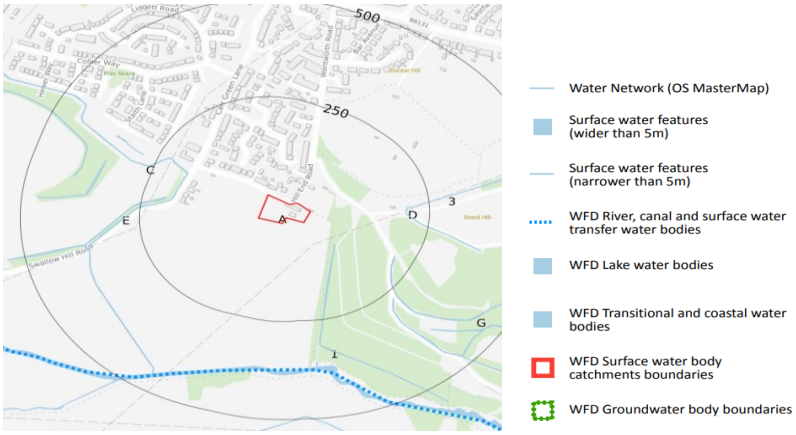
Coal Mining - YES	The site is located within a coal mining area as defined by the Coal Authority. There numerous conspicuous entries featured in the Geo-insight report(s) within 250m of the site relating to former coal mine related industrial activities: 

5.2 Hydrology & Hydrogeology

The existing Farmhouse appears to be connected to an established drainage system which is understood to be connected to the main drainage network on Hill End Road - presumably supplemented with soakaway drainage to the south. Groundwater was not observable in any locations surrounding the site during the walkover, and from local knowledge of the area ground water can be reliably assumed to be well below the zone of influence of the existing building's foundations and/or below any new drainage connection trenches.

During the site walkover there was no evidence of soils of high leaching potential, no evidence of abstractions or springs within or close to the site, and no evidence of a perched water table and/or artesian pressure within the soil at shallow depth. Vegetation on the site is sparse and consists mainly of trees and shrubbery occurring as overgrowth around the perimeter of the site and there are no established trees or vegetation within the site that might be affected by the proposed works, nor is the vegetation likely to adversely affect the development as proposed.

Evidence suggests a reasonably level water table at depth with a stable, consistent soil type comprising mainly COHESIVE SOIL (Clay) overlying BEDROCK of *Sandstone, Siltstone and Mudstone.* No problems are envisaged with swelling or shrinkage of soil due to the movement of groundwater and the propagation of trees, vegetation and flora. Groundwater, whilst not observed in any significant quantity (or at all), if found to be present at deeper elevations (if applicable) can reliably be estimated from empirical data to be in the region of between pH 5.5 – 7.0 representing a *low risk* in terms of acidic ground and potential sulphate attack on existing concrete and cement mortars.

Additional sources of information	Environment Agency; internet-based information. D1: Settled Arable Slopes - Barnsley District Landscape Character Assessment (2002)
Watercourses	There are 10No. surface water features listed in the records. All are minor. 

WFD Surface water bodies	There is 1No. recorded surface water bodies under the Directive within 1000m. ID: A; Location: On site; Type: River; Water body catchment: Dearne from Cawthorne Dyke to Lundwood STW; Water body ID: GB104027063171; Operational catchment: Dearne; Management catchment: Don and Rother
WFD Groundwater bodies	There is 1No. recorded Groundwater documented under the Directive within 1000m of the site: ID: 9; Location: 373m S; Type: River; Name: Dearne from Cawthorne Dyke to Lundwood STW; Water body ID: GB104027063171; Overall rating: Moderate; Chemical rating: Fail; Ecological rating: Moderate; Year: 2019
Groundwater classification	Solid Geology: Multi-layered; 2 minor / superficial aquifers, 1 bedrock aquifer.
Source protection zones	None recorded
Springs	None recorded
Wells	None recorded
Licensed water abstractions	None recorded
Discharge consents to Controlled Waters	None recorded

The *Pennine Middle Coal Measures* solid geology that dominates the location constitute a multi-layered aquifer in which the thick, massive grit and sandstone horizons effectively act as separate aquifers with the intervening mudstones and mudstones acting as aquicludes or aquitards - although faulting may locally juxtapose them into hydraulic connection. Groundwater storage and movement in the well-cemented grits and sandstones is predominantly through fractures and joints with only minor contributions from the rock matrix.

Little or no water is normally obtainable from mudstone horizons although small quantities may be present in thin interbedded sandstones. The groundwater potential of the main water-bearing horizons is variable, and some horizons may only be of local importance. Yields are in consequence highly variable even over short distances. Initial yields are not however always sustainable, sometimes declining with time as storage is depleted by pumping. Abundant springs are frequently located at junctions between sandstone and mudstone horizons.

5.3 Landfill sites and waste management

Additional sources of information	Environment Agency; internet-based information
Local authority recorded landfills	None within 500 metres
BGS/EA recorded landfills	1No. known historical (closed) landfill site within 250m of thesite ID: 1; Location: 127m NE; Details: Site Address: Blacker Hill Quarry, Wentworth Road, Mapplewell, Barnsley Licence Holder Address: 114 Wentworth Road, Mapplewell, Barnsley Waste Licence: Yes Site Reference: WD20 B278 Waste Type: Inert, Industrial, Commercial Environmental Permitting Regulations (Waste) Reference: - Licence Issue: 01/04/1980 Licence Surrender: 06/07/1984 Operator: Mr R Smith Licence Holder: Blacker Hill Quarry Limited First Recorded 01/04/1980 Last Recorded: 31/12/1984

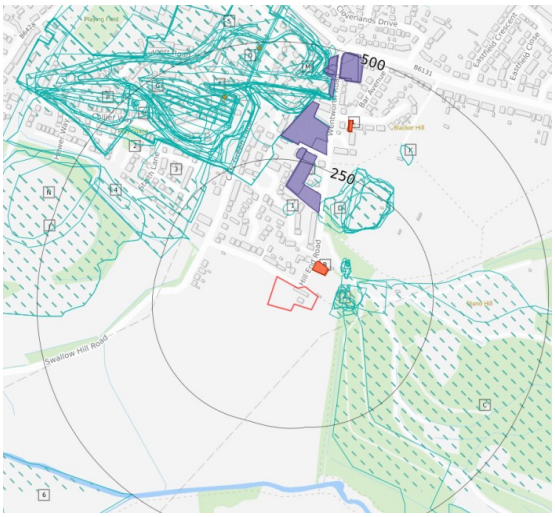
Other Historical Records of Unspecified Heaps / Wastes	

ID	Location	Address	Further Details	Date
A	159m N	Site Address: N/A	Type of Site: Vehicle Scrap Yard Planning application reference: N/A Description: N/A Data source: Historic Mapping Data Type: Polygon	1988
A	159m N	Site Address: N/A	Type of Site: Vehicle Scrap Yard Planning application reference: N/A Description: N/A Data source: Historic Mapping Data Type: Polygon	1988
A	159m N	Site Address: N/A	Type of Site: Vehicle Scrap Yard Planning application reference: N/A Description: N/A Data source: Historic Mapping Data Type: Polygon	1989
A	159m N	Site Address: N/A	Type of Site: Vehicle Scrap Yard Planning application reference: N/A Description: N/A Data source: Historic Mapping Data Type: Polygon	1989

Other waste management facilities	None within 500m

5.4 Pollution controls and industrial land use

Industrial Land Uses	There are 144No. recorded industrial land uses within 500m of the site. These are referenced as being potentially contaminative and include features digitised from historical Ordnance Survey mapping at 1:10,000 and 10,560 scale.



The majority of these relate to historic quarrying, coal mining and mineral extraction:

Recent industrial land uses

ID	Location	Company	Address	Activity	Category
2	51m NE	Electricity Sub Station	South Yorkshire, S75	Electrical Features	Infrastructure and Facilities
3	59m S	Pylon	South Yorkshire, S75	Electrical Features	Infrastructure and Facilities
4	164m NE	Electricity Sub Station	South Yorkshire, S75	Electrical Features	Infrastructure and Facilities

Integrated pollution controls (IPC)	None within 250 metres
Integrated pollution prevention and control (IPPC)	None within 250 metres
Pollution prevention and controls (PPC)	None within 250 metres
Petrol filling stations	None within 250 metres

5.5 Radon

Additional sources of information	BRE publication BR211 (2007), "Radon: Guidance on protective measures for new buildings"
Radon precautions – YES	**Professional opinion** POTENTIAL RISK **Site plan** 

5.6 Sites of Special Scientific Interests (SSSI) – Impact Zones

These are sites providing statutory protection for the best examples of UK flora, fauna, or geological or physiographical features. Originally notified under the National Parks and Access to the Countryside Act 1949, SSSIs were renotified under the Wildlife and Countryside Act 1981. Improved provisions for the protection and management of SSSIs were introduced by the Countryside and Rights of Way Act 2000 (in England and Wales) and (in Scotland) by the Nature Conservation (Scotland) Act 2004 and the Wildlife and Natural Environment (Scotland) Act 2010.

Records on site	1

ID	Location	Type of developments requiring consultation
1	On site	Infrastructure - Airports, helipads and other aviation proposals. Air pollution - Livestock & poultry units with floorspace > 500m², slurry lagoons & digestate stores > 750m², manure stores > 3500t. Combustion - General combustion processes >50mw energy input. incl: energy from waste incineration, other incineration, landfill gas generation plant, pyrolysis/gasification, anaerobic digestion, sewage treatment works, other incineration/ combustion. Discharges - Any discharge of water or liquid waste of more than 20m³/day to ground (ie to seep away) or to surface water, such as a beck or stream.

5.7 Sites of Special Scientific Interests (SSSI) within 2000m

Records within 2000m	0

5.8 Designated Ancient Woodland

Ancient woodlands are classified as areas which have been wooded continuously since at least 1600 AD. This includes semi-natural woodland and plantations on ancient woodland sites. 'Wooded continuously' does not mean there is or has previously been continuous tree cover across the whole site, and not all trees within the woodland have to be old.

ID	Location	Name	Woodland Type
-	1961m N	Notton Park	Ancient Replanted Woodland

6.0 GEOTECHNICAL & ENGINEERING CONSIDERATIONS

Potential for Ground Instability

6.1 Superficial Soils / Drift Geology

The geological information derived from 1:10,000 scale BGS Geological mapping 1.2.1 Superficial Deposits/ Drift Geology shows there are no records of landslips within 500m of the site (the geology map for the site and surrounding area are extracted from the BGS Digital Geological Map of Great Britain at 1:10,000 scale).

ID	Location	LEX Code	Description	Rock description
1	286m S	ALV-XCZ	Alluvium - Clay And Silt	Clay And Silt
2	429m NE	TILMP-DMTN	Till, Mid Pleistocene - Diamicton	Diamicton

5.3 Solid Geology (bedrock)

ID	Location	LEX Code	Description	Rock age
1	**On site**	**PMCM-MDSS**	**Pennine Middle Coal Measures Formation - Mudstone, Siltstone And Sandstone**	**Bolsovian Sub-age - Duckmantian Sub-age**
8	37m NE	PMCM-SDST	Pennine Middle Coal Measures Formation - Sandstone	Bolsovian Sub-age - Duckmantian Sub-age

5.4 Linear Features – (faults)

ID	Location	Category	Description
2	**On site**	**ROCK**	**Coal seam, observed**
3	11m NE	ROCK	Coal seam, inferred
4	18m SW	ROCK	Coal seam, inferred
5	20m NE	FOSSIL_HORIZON	Fossil horizon, marine band
6	21m SW	ROCK	Coal seam, observed
7	33m E	ROCK	Coal seam, observed
10	47m SW	FAULT	Normal fault, inferred

5.5 Permeability

The following Permeability information on the *Superficial Geology* is provided by the British Geological Survey:

Location	Flow type	Maximum permeability	Minimum permeability
30m E	Mixed	Very High	Low

The following Permeability information on the *Solid Geology* is provided by the British Geological Survey:

Location	Flow type	Maximum permeability	Minimum permeability
On site	**Fracture**	**Moderate**	**Low**
34m E	Fracture	High	Moderate

The following *Shrink Swell* information on the Superficial Soils is provided by the British Geological Survey:

Location	Hazard rating	Details
On site	**Very low**	**Ground conditions predominantly low plasticity.**
34m NE	Negligible	Ground conditions predominantly non-plastic.

The following *Landslides* information is provided by the British Geological Survey:

Location	Hazard rating	Details
On site	**Very low**	**Slope instability problems are not likely to occur but consideration to potential problems of adjacent areas impacting on the site should always be considered.**

The following *Ground Dissolution* information is provided by the British Geological Survey:

Location	Hazard rating	Details
On site	**Negligible**	**Soluble rocks are either not thought to be present within the ground, or not prone to dissolution. Dissolution features are unlikely to be present.**

The following *Collapsible Deposits* information is provided by the British Geological Survey:

Location	Hazard rating	Details
On site	**Very low**	**Deposits with potential to collapse when loaded and saturated are unlikely to be present.**

The following *Running Sands* information is provided by the British Geological Survey:

Location	Hazard rating	Details
On site	**Negligible**	**Running sand conditions are not thought to occur whatever the position of the water table. No identified constraints on lands use due to running conditions.**

What does this mean?

This means that there are no significant natural ground instability issues indicated in the vicinity of the site: namely weak or unstable rocks that could slip downhill on steep slopes (greater than c. 5 degrees) or into excavations ('Landslides (slope instability)') (LEVEL C). There is no evidence of *running sands*, and no specific need to check for *plasticity of clay soils* (PI). It is not likely that any *collapsible* (loessic) deposits will be encountered, and the buildings' foundation loads are unlikely to exceed the *safe bearing capacity* of the soil during or after construction as observed i.e. the site is considered to be a **LOW HAZARD POTENTIAL SITE** for the purposes of **Construction** on the project site**.**

5.6 Historical Underground Working Features

The site is within a coal mining area as defined by the Coal Authority, and there are recorded underground workings in the vicinity of the site with a MEDIUM risk of unrecorded shallow workings.

Records within 1000m	**23**

ID	Location	Land Use	Year of mapping	Mapping scale
A	36m E	Disused Colliery	1890	1:10560
A	64m E	Unspecified Old Shaft	1948	1:10560
A	68m E	Unspecified Old Shaft	1951	1:10560
A	90m NE	Unspecified Old Shaft	1948	1:10560
A	90m NE	Unspecified Old Shaft	1904	1:10560
A	98m NE	Unspecified Old Shaft	1951	1:10560
E	206m NW	Colliery	1982	1:10000
E	244m NW	Colliery	1951	1:10560

5.7 Historical Surface Working Features

The following *Surface Working Features* are provided by the British Geological Survey:

Records within 250m				**42**
ID	Location	Land Use	Year of mapping	Mapping scale
A	36m E	Unspecified Heaps	1938	1:10560
A	36m E	Unspecified Heaps	1938	1:10560
A	36m E	Unspecified Heaps	1948	1:10560
A	36m E	Refuse Heap	1904	1:10560
A	36m E	Refuse Heap	1890	1:10560
A	36m E	Disused Colliery	1890	1:10560
A	39m E	Unspecified Heap	1951	1:10560
A	49m E	Colliery	1850	1:10560
A	61m E	Refuse Heap	1890	1:10560
A	61m E	Unspecified Heap	1951	1:10560

5.7 Historical Mineral Planning Areas

The following *Current Ground Workings* are provided by the British Geological Survey:

Records within 500m	**0**

5.8 Non-Coal Mining & Other Underground

The following *Non-Coal Mining* data are provided by the British Geological Survey:

Records within 1000m					**5**
ID	Location	Name	Commodity	Class	Likelihood
1	**On site**	**Not available**	**Iron Ore (Bedded)**	**B**	**Localised small scale underground mining may have occurred. Potential for difficult ground conditions are unlikely or localised and are at a level where they need not be considered**

What does this mean?

This means that, for the purposes of the proposed development the site can be considered a **MEDIUM HAZARD POTENTIAL SITE** for the purposes of *shallow mining risk*. On this basis, in-conjunction with our own detailed assessment of related geohazards there is a requirement to prepare a separate *Coal Mining Risk Assessment* (CMRA) and a likely requirement to probe drill or carry out deep borehole drilling on the project site to investigate for shallow workings.

7.0 PRELIMINARY CONTAMINATION CONSIDERATIONS

7.1 Potential for Contamination

A review of the Geo-Insight & Enviro-Insight data confirms that the site is not currently recorded as *Contaminated Land* under Part IIA of the Environmental Protection Act 1990. Potentially Contaminative Uses Identified within 250m include various historic heap and waste sites (scrap yard). There are numerous minor entries associated with unspecified commercial / industrial usage thought to be associated with coal mining legacy, and all are sufficiently distanced from the proposed site not to be considered a significant risk.

7.2 Contamination Objectives

The aim of the desk study and site walkover was to make a preliminarily assessment of the level of contamination on the site in order to determine if there was any significant risk associated with contaminants in respect of both human health and the environment, including controlled waters. All the visible soils (where observable) were screened for visual or olfactory evidence of contamination including the presence of VOCs. The approach adopted in this desk study regarding preliminary **Hazard Identification** and **Assessment**, follows the recognized steps shown below (courtesy on NHBC):

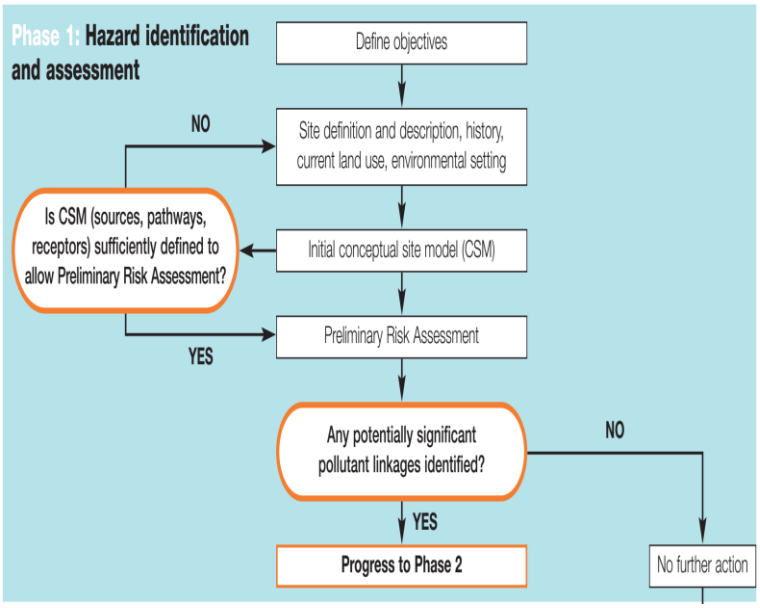


Table from NHBC 'Guidance for the Safe Development of Housing on Land Affected by Contamination R&D66: 2008 Vol.1

7.3 Contamination Assessment & Approach.

In April 2012, Defra published new Statutory Guidance which forms a major part of their contaminated land regimes under *Part 2A of the Environment Protection Act 1990*. The regime provides a means of dealing with contaminated land which poses a significant risk to human health or the environment where there is no alternative solution. It also works alongside planning rules and building regulations to help ensure that affected land is made suitable for use when it is redeveloped.

In the past there has been considerable uncertainty over how to decide when land is, and is not, contaminated land on grounds of the legal test of significant possibility of significant harm to human health or the environment – to help address this, one of the main changes set out in the new *Statutory Guidance*, is the introduction of a new four category test to help decide when land is, and is not, contaminated land on grounds of significant possibility of significant harm to human health. Under the new four category test:

- Category 1 - describes land that is clearly contaminated land, for example because similar land is known to have caused significant harm in the past.

- Categories 2 and 3 - cover less straightforward land where more detailed consideration is needed before the regulator can decide either:

  (a) that there is a strong case for regulatory action, in which case the land would be in Category 2 and be classified as contaminated land under Part 2A; or

  (b) that such a case does not exist, in which case the land would be in Category 3 and not be classified as contaminated land under Part 2A.

- Category 4 - describes land that is clearly not contaminated land, as discussed below.

One of the main purposes of including the Categories in the Statutory Guidance is to provide a legal framework against which new technical tools can be developed by the land contamination sector to describe the Categories in more detail with regard to specific substances and/or situations. The new Category 4 (C4SLs) test is particularly important in terms of reducing uncertainty over when land is definitely not caught by the regime. The new Statutory Guidance makes clear what land should be placed into Category 4, for example:

a. Land where no relevant contaminant linkage has been established.

b. Land where there are only normal levels of contaminants in soil (as explained in Section 3 of the guidance), unless there is a particular reason to consider otherwise i.e. land with normal background concentrations.

c. Land that has been excluded from the need for further inspection and assessment under Part 2A because contaminant levels do not exceed relevant generic assessment criteria in accordance with Section 3 of the guidance, or relevant technical tools or advice that may be developed in accordance with paragraph 3.30 of the guidance, e.g. Category 4 Screening Levels.

d. Land where estimated levels of exposure to contaminants in soil are likely to form only a small proportion of what a receptor might be exposed to anyway through other sources of environmental exposure (e.g. in relation to average estimated national levels of exposure to substances commonly found in the environment, to which receptors are likely to be exposed to in the normal course of their lives).

For the purposes of this report, it is taken that the C4SLs are intended as 'relevant technical tools' to help local authorities and others when deciding to stop further assessment of a site, on the grounds that it falls within Category 4 (Human Health).

The Impact Assessment which accompanied the revised Statutory Guidance (Defra, 2012b) provides further information on the nature and potential role of the C4SLs. Paragraph 47(h) of the IA states that: *'The new statutory guidance with bring about a situation where the current SGVs/GACs are replaced with more pragmatic (but still strongly precautionary) Category 4 screening levels (C4SLs) which will provide a higher simple test for deciding that land is suitable for use and definitely not contaminated land'.*

A key distinction between the previous guidance (i.e. using *Soil Guideline Values* (SGVs)) and the C4SLs is the level of risk that they describe. The Environment Agency (EA) consider that; 'SGVs are guidelines on the level of long-term human exposure to individual chemicals in soils that, unless stated otherwise, are tolerable or pose a minimal risk to human health'. C4SLs, therefore, should not be used as a legal trigger for the determination of land under Part 2A.

As such, the approach taken in this report follows the **2014 CL:AIRE (Contaminated Land: Application in Real Environments)** guidance published in the reference document '*Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination*' which lists the following C4SLs;

Analyte	Residential (with home grown produce) (mg/kg)	Residential (without home grown produce) (mg/kg)	Allotments (mg/kg)	Commercial (mg/kg)	PoS (mg/kg)
Arsenic	37	40	49	640	79
Benzene	0.87	3.3	0.18	98	140
Benzo(a)Pyrene	5.0	5.3	5.7	77	10
Cadmium	22	150	3.9	410	880
Chromium (vi)	21	21	170	49	21
Lead	200	310	80	2300	630

7.4 Estimated Background Soil Chemistry (within 50m).

From research (the Geo-Insight Report) the *Estimated Background Soil Chemistry* within 50m of the study area boundary confirms the following:

Location	Arsenic	Bioaccessible Arsenic	Lead	Bioaccessible Lead	Cadmium	Chromium	Nickel
On site	15 - 25 mg/kg	No data	200 - 300 mg/kg	120 - 240 mg/kg	1.8 mg/kg	120 - 180 mg/kg	30 - 45 mg/kg
On site	15 - 25 mg/kg	No data	200 - 300 mg/kg	120 - 240 mg/kg	1.8 mg/kg	120 - 180 mg/kg	30 - 45 mg/kg

7.5 Estimated Urban Soil Chemistry (within 50m)

From research (the Geo-Insight Report) the *Estimated Urban Soil Chemistry* within 50m of the study area boundary suggests the following:

Records within 50m	0

Estimated topsoil chemistry of Arsenic, Cadmium, Chromium, Copper, Nickel, Lead, Tin and Zinc and bioaccessible Arsenic and Lead in 23 urban centres across Great Britain. These estimates are derived from interpolation of the measured urban topsoil data referred to above and provide information across each city between the measured sample locations (4 per km^2).

7.6 Summary of Screening Levels.

Both the *background soil chemistry* and the *indicative soil chemistry from observation during the site walkover* indicate levels of contaminants likely to be within the accepted range contained in the guidance in 2014 CL:AIRE (Contaminated Land: Application in Real Environments) '*Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination*' based on the six C4SLs.

8.0 PRELIMINARY CONCEPTUAL SITE MODEL

8.1 Conceptual Site Model

A quantitative health and environmental risk assessment forms part of this report: the process of risk assessment follows the guidance contained in **Part 2A of the Environment Protection Act 1990**, which defines contaminated land as:

'any 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 there is a significant possibility of significant harm being caused, or that significant pollution of controlled waters is being caused or there is a significant possibility of such pollution being caused'.

The guidance introduces the concept of a *pollution linkage*: this consists of (A) a pollution source or hazard, and (B) a receptor, together with (C) an established pathway between the two. For land to be regarded as being 'contaminated' a pollution linkage (*hazard-pathway-receptor*) must exist, which creates the so-called 'conceptual model' of the site. Examples of pathways and effects (after PPS 23) include:

8.2 Human Health (Pathways 1-5, Receptors A–C)

- ***Uptake of contaminants*** by food plants grown in contaminated soil - Uptake will depend on concentration in soil, its chemical form, soil pH, plant species and prominence in diet.

- ***Ingestion and inhalation*** - Substances may be ingested directly by young children playing on contaminated soil, by eating plants which have absorbed metals or are contaminated with soil or dust. Ingestion may also occur via contaminated water supplies. Metals, some organic materials and radioactive substances may be inhaled from dusts and soils.

- ***Skin contact*** - Soil containing tars, oils and corrosive substances may cause irritation to the skin through direct contact. Some substances (e.g. phenols) may be absorbed into the body through the skin or through cuts and abrasions.

- ***Irradiation*** - As well as being inhaled and absorbed through the skin, radioactive materials emitting gamma rays can cause a radiation response.

- ***Fire and explosion*** - Materials such as coal, coke particles, oil, tar, pitch, rubber, plastic and domestic waste are all combustible. Both underground fires and biodegradation of organic materials may produce toxic or flammable gases. Methane and other gases may explode if allowed to accumulate in confined spaces.

8.3 Buildings (Pathways 7 and 8)

- ***Fire and explosion*** - Underground fires may cause ground subsidence and cause structural damage. Accumulations of flammable gases in confined space leads to a risk of explosion. Underground fires may damage services.

- ***Chemical attack on building materials and services*** - Sulphates may attack concrete structures. Acids, oils and tarry substances may accelerate corrosion of metals or attack plastics, rubber and other polymeric materials used in pipework and service conduits or as jointing seals and protective coatings to concrete and metals.

- ***Physical*** - Blast-furnace and steel-making slag (and some natural materials) may expand. Degradation of fills may cause settlement and voids in buried tanks and drums may collapse as corrosion occurs or under loading.

8.4 Natural Environment (Pathway 6, Receptors D-E)

- ***Phytotoxicity*** (prevention/inhibition of plant growth) - Some metals essential for plant growth at low levels are phytotoxic at higher concentrations. Methane and other gases may give rise to phytotoxic effects.

- ***Contamination of water resources*** - Soil has a limited capacity to absorb, degrade or attenuate the effects of pollutants. When this is exceeded, polluting substances may enter into surface and groundwaters.

- ***Ecotoxological effects*** - Contaminants in soil may affect microbial, animal and plant populations. Ecosystems or individual species on the site, in surface waters or areas affected by migration from the site may be affected.

8.5 Assessment Methodology

For any potential contaminant source identified, professional judgement is required to assess the probability of a pollution linkage occurring and to quantify the possible consequences of that linkage. Based on the probability and likely consequences, the overall risk (significance) can then be established. This is based on a standard risk assessment model:

Hazard (H) is something with a potential to cause *harm*.
Severity (S) is the *magnitude* of the harm the hazard could cause.
Probability (P) is the *likelihood* the hazard will occur.
Risk (R) is the likelihood of the hazard (x) the severity of the harm it could cause.

Risk Rating (RR) = Severity (S) x Probability(P)

Probability (P)

Probability of Risk	1. Remote 2. Possible 3. Probable	Unlikely but conceivable May occur, could well occur May occur several times, occurs frequently

Severity (S)

	1. Negligible	*Human Health:* no chance of injury *Environment:* no chance of harm to the environment *Project:* no impact on construction works
	2. Minor	*Human Health:* minor harm with short term effects *Environment:* nuisance and minor disturbance to flora and fauna *Project:* minor changes required to achieve construction objectives with low costs and/or delivery implications
	3. Moderate	*Human Health:* major injury or disability or ill-health with long term effects *Environment:* potentially fatal to flora and fauna for days / weeks *Project:* major changes required to achieve construction objectives with significant costs and/or delivery implications
	4. Severe	*Human Health:* permanent disability / death *Environment:* detrimental to local eco-systems for months / years *Project:* catastrophic impact on construction objectives

Risk Rating (RR)

PROBABILITY	MINOR	SEVERE	EXTREME
Remote	1	2	3
Possible	2	4	6
Probable	3	6	9

1	VERY LOW	*Risk is negligible – no action required*
1-2	LOW	*Risk is controlled as far as is reasonably practicable, no further control measures necessary*
3-4	MODERATE	*Risk should be evaluated and controlled as far as is reasonably practicable*
6-9	HIGH	*Hazard should be avoided – Ground remedial measures required*

8.6 Potential Sources

The site has had some previous light industrial aspects relating farming and agriculture (only) - but no heavy industrial or engineering use - and was previously an existing agricultural barn since its construction in the 19th Century (or earlier) surrounded by open fields / farmland. As such there are some residual *low risk* potential sources:

i. Animal wastes - heavy metals.
ii. Possibility of hydrocarbons due to past use of former buildings.
iii. Possibility of fertilisers and other chemicals in the sediments and near surface soils.

In addition, due to the past use the near surface soils in this location *could* potentially be found to contain a range of substances and pathogens which *could* pose a minor hazard to health, such as heavy metals and metalloids, especially lead, zinc, copper and cadmium; organic pollutants such as PAHs and pesticides; asbestos and pathogens, and further consideration should be given to;

i. Previous use of the site (low)
ii. Atmospheric deposition (low)
iii. Composts and fertilizers (medium)

8.7 Summary of Hazards, Pathways & Receptors

Source	Potential Pollutant	Pathways	Receptor	Risk
Possible past minor spillages of materials. Possible contaminants from previous agriculture & farming.	Oils, fuels, greases, hydraulic fluids, metals, Creosote(s), oil, tar, pitch. Anthropogenic debris, e.g. ash, clinker	1-5	A. Present users (owner)	**RR=1 Very Low Risk** involved with pre-construction phase as some disturbance is required – farming & agriculture associated works have ceased.
			B. Groundworkers.	**RR=2 Low Risk** involved with excavation work - personnel to adopt robust RAMS and suitable precautions together with adequate washing facilities (which is an absolute obligation under CDM2015).
			C. Future workers, visitors and members of the public.	**RR=2 Low Risk** possible presence of exposing areas of *Infilled Ground* associated with the works for foundations, drainage and associated infrastructure.
		2	D. Controlled waters.	**RR=2 Low Risk.**
			E. Ecosystems	**RR=2 Low Risk.**
		2	F. Building Materials and Services.	**RR=2 Low Risk** provided no extraordinary construction materials /methods proposed.
Possible contaminants from previous structures	Asbestos	7	C. Future workers, visitors and members of the public.	**RR=0 Very Low Risk** – none observed
Underground workings, cavities, mines, landfills.	Mine, landfill and ground gases, Radon, VOCs	3	A - F	**RR=3 Medium Risk**. underground coal workings present + radon protection / special measures required.
Surface Workings	Past tipping, uncontrolled wastes, anthropogenic debris, e.g. ash, clinker	1	D - E	**RR=3 Low Risk**
Waste Materials	Past tipping, uncontrolled wastes			**RR=2 Low Risk.** No identifiable wastes obser5ved and requiring to be removed from site

9.0 FURTHER WORK & RECOMMENDATIONS

9.1 Evaluation of Risks

Based on the above assessment, the site is assessed to present the following risk levels:

- There is a **MEDIUM HAZARD POTENTIAL** with respect to underground mining.
- There is a **LOW HAZARD POTENTIAL** with respect to geology & engineering for Construction.
- There is a **LOW HAZARD POTENTAIL** for contaminants and ground gases.

There is a residual possibility that there may be areas of 'infilled ground' and areas where 're-worked' soils are found which may contain a range of substances and pathogens that might otherwise pose a potential hazard to health, such as heavy metals and metalloids, especially lead, zinc, copper and cadmium; and organic pollutants such as PAHs and pesticides; asbestos and pathogens. At the same time, it should always be acknowledged that the mere presence of a hazard at a site does not mean that there will necessarily be attendant risks.

There is also a *very low* risk of vapour inhalation by site workers due the possible historic storage of fuels and other chemicals associated with farming and agriculture - but in this case the quantities are **comparatively small** and soil and groundwater contamination is unlikely. In my opinion, it is highly unlikely that hydrocarbons will be present in significant or high (or any) concentrations associated with the proposed conversion works.

9.2 Recommendations for Further Work

a. Based on the proximity of historical quarries and coal mining activity there is a requirement to undertake a notional Intrusive **Phase II Site Investigation** with laboratory testing of sampled soils to fully mitigate the minor risks identified above. We would recommend a combined SI involving:

   - **A minimum of 2No. Trial Holes (typically to 1.2m deep).**
   - **A minimum of 1No. Rotary Boreholes to 30m deep.**

   The requirement of a rotary borehole to 30m deep is to check for the potential of shallow mine workings.

   All intrusive site investigation works (including soil sampling) should be carried out in accordance with the requirements of *BS EN 1997-1: 2004 Eurocode 7 - Geotechnical Design - Part 1: General Rules; BS EN 1997-2: 2007 Eurocode 7 - Geotechnical Design - Part 2: Ground Investigation and Testing*, and *BS 5930: 2015 Code of Practice for Ground Investigations* under the **full-time supervision of a Chartered Engineering Geologist**.

b. **Contamination Testing** should be carried in accordance with the requirements of BS 10175 clause 7.7.2.3.3 which suggests that the number of sampling points should be based on a minimum of three testing locations, subject to the overall size of the site. In this case we would recommend that samples are taken from each of the trial holes = **2No. soil samples in total**.

   - As a minimum, soils samples should be tested in the laboratory for *arsenic, lead, nickel, chromium* and the *polycyclic aromatic hydrocarbons* (PAHs) especially *benzo[a]pyrene* - all typically found in soil or water. Other pathogens which could pose a potential hazard to health, such as heavy metals and metalloids, and organic pollutants such as pesticides; asbestos etc., should also be considered, subject to the visual and olfactory observations from the fieldwork, and at the discretion of the Chartered Geologist undertaking the watching brief.

c. Regarding **Ground Gas**, the site is considered a **LOW** risk due to the absence of infilled ground and/or proximity to landfill but a **MEDIUM** risk due to past coal mining activity – known to be a credible source of ground gas.

A notional phase of Ground Gas Monitoring should therefore be carried out during the fieldwork phase and for a period thereafter. The period should be based on the table shown below, subject to the readings observed during the fieldwork stage.

Typical/idealised frequency and period of monitoring					
Sensitivity of the Development	**Generation potential of source**				
	Very low	**Low**	**Moderate**	**High**	**Very high**
Low (commercial)	4/1	6/2	6/3	12/6	12/12
Moderate (flats)	6/2	6/3	9/6	12/12	24/24
High (residential + gardens)	6/3	9/6	12/6	24/12	24/24

*[*NOTE! – the first number is the number of readings required; the second number is the time duration in months over which the gas monitoring should be carried out]*

Provisionally, we would recommend no more than **4 sets of readings taken over 1 month**, but in the event that ground gas readings are recorded during the BH drilling or the excavation of trial holes, or if unusually high quantities of contamination is observed visually or olfactorily during the fieldwork stage, then this should be increased to **6 sets of readings taken over 2 months** at the discretion of the Chartered Geologist on site undertaking the watching brief.

d. Notwithstanding the recommendations to undertake laboratory testing and a proportionate phase of ground gas monitoring in the fieldwork stage it is also noted that the conversion works require the installation of a **Basic Radon Protective CS2 Gas Membrane** in any event. This may mitigate the necessity to undertake exhaustive ground gas monitoring in accordance with *CL:AIRE Research Bulletin RB17 'A Pragmatic Approach to Ground Gas Risk Assessment',* as uprating traditional DPC membranes to radon equivalent results in the same type of membrane used to protect against the ingress of other CS2 ground gases such as methane or carbon dioxide, and this is usually considered acceptable on sites categorized as *Low Hazard Potential* (after *Wilson et al., 2007*; *Boyle and Witherington, 2007*).

9.3 Basis of Assessment & Recommendations for Planning Conditions

This assessment is a *Preliminary Phase 1 Investigation* intended to give an indication as to the need for further assessment of the site. This report may be submitted in support of either a planning application (or) for the purposes of due diligence on the part of the owner.

Regarding the potential for **Land Contamination** it is recommended to undertake a Phase 2 Site Investigation, and typically, should the LPA be minded to approve any application, such conditions are usually categorised as pre-commencement. An example of the appropriate wording might be:

Condition: *Prior to the commencement of any works on site the developer shall undertake a scheme of intrusive site investigations, designed by a competent person and adequate to properly assess the ground conditions at the site and establish the risk posed to the development by past usage. The site investigation should take into account the requirement for rotary boreholes to investigate the risk of shallow mine workings beneath the site and any ground gas monitoring recommended in the Phase 1 Desk Study. A report of findings arising from the intrusive site investigations and any remedial works and/or mitigation measures considered necessary shall be submitted for approval in writing with the planning authority together with a plan/timeframe for the implementation of the remedial works and/or mitigation measures.*

Reason: *A pre-commencement condition is required in order to establish the exact situation regarding potential for shallow mine workings to be present and for contamination to be encountered on the site.*

Testimony of Independence

I confirm that under para. 2.E.2 of Appendix 2E of *Planning Policy Guidance Note 14 (PPG14) – Development on Unstable Land, DoE, 1990* I am suitably qualified to make these statements, and I understand that my overriding duty is to present independent and impartial expert analysis, and I believe I have complied with that duty. The facts I have stated in this report are true and the opinions I have expressed are correct and they are entirely my own, based upon the evidence I have been shown and my own observations.

Signed

.....
Tim Hyett LLM MSc CEng MIEI CGeol FGS MCIOB
Chartered Consultant Engineering Geologist
Earth-Tech Consulting Ltd
5th October 2022

Appendix A Groundsure Enviro-Insight Report Ref: GS-8828402

Appendix B Groundsure Geo-Insight Report Ref: GS-8835727

Appendix C Radon Report Ref: GS-8828401

Appendix C Historical Mapping Ref: GS-8828403

[*<u>NOTE</u> – Appendices are provided in separate attachments due to file size**]**